

**Career Technical Education (CTE) Model Curriculum Standards  
Industry Sectors and Pathways**

## Table of Contents

### Agriculture and Natural Resources

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	6
Pathway Standards.....	7
A. Agricultural Business Pathway .....	7
B. Agricultural Mechanics Pathway .....	10
C. Agriscience Pathway.....	14
D. Animal Science Pathway.....	17
E. Forestry and Natural Resources Pathway.....	21
F. Ornamental Horticulture Pathway .....	25
G. Plant and Soil Science Pathway.....	28
Academic Alignment Matrix.....	31
Appendix: CTE Model Curriculum Standards Contributors .....	50



## **Agriculture and Natural Resources**

### ***Sector Description***

The Agriculture and Natural Resources sector is designed to provide a foundation in agriculture for all agriculture students in California. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation in seven pathways. The pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in Agricultural Business, Agricultural Mechanics, Agriscience, Animal Science, Forestry and Natural Resources, Ornamental Horticulture, and Plant and Soil Science. Integral components of classroom and laboratory instruction, supervised agricultural experience projects, and leadership and interpersonal skills development prepare students for continued training, advanced educational opportunities, or entry to a career.

## **Agriculture and Natural Resources Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Agriculture and Natural Resources academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Agriculture and Natural Resources sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication, such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits, such as trust, respect, and responsibility, and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Agriculture and Natural Resources sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.
- 4.7 Demonstrate the use of appropriate tools and technology used in the Agriculture and Natural Resources sector.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short as well as more sustained research to create alternative solutions to answer a question or solve a problem unique to the Agriculture and Natural Resources sector, using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Agriculture and Natural Resources sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.

- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

### **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Agriculture and Natural Resources sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Agriculture and Natural Resources sector.

### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Agriculture and Natural Resources industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Agriculture and Natural Resources sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.

- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Agriculture and Natural Resources sector laws and practices.

## **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the Future Farmers of America (FFA) career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills, as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Agriculture and Natural Resources sector issues and problems.
- 9.8 Define the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace settings.
- 9.9 Identify the ways in which pre-professional associations, such as the Future Farmers of America (FFA), and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.
- 9.10 Understand how to organize and structure work, individually and in teams, for effective performance and the attainment of goals.
- 9.11 Explain multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.
- 9.12 Demonstrate how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.
- 9.13 Participate in group or team activities, including those offered by the student organization, that develop skills in leadership, cooperation, collaboration, and effective decision making.

## **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Agriculture and Natural Resources sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Agriculture and Natural Resources sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Agriculture and Natural Resources sector.
- 10.3 Construct projects and products specific to the Agriculture and Natural Resources sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Interpret and explain the aims, purposes, history, and structure of the FFA student organization and know the opportunities it makes available.
- 10.6 Manage, and actively engage in, a career-related, supervised agricultural experience.
- 10.7 Understand the importance of maintaining and completing the California Agricultural Record Book.
- 10.8 Maintain and troubleshoot equipment used in the agricultural industry.

## **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Agriculture and Natural Resources anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the FFA career technical student organization.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Agriculture and Natural Resources sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Agriculture and Natural Resources sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.



## **Agriculture and Natural Resources Pathway Standards**

### **A. Agricultural Business Pathway**

In the Agricultural Business pathway, students learn about agricultural business operation and management. Topics include accounting, finance, economics, business organization, marketing, and sales.

Sample occupations associated with this pathway:

- ◆ Agriculture Inspector
- ◆ Farm and Ranch Manager
- ◆ Sales Representative
- ◆ Business Controller
- ◆ Agricultural Credit Manager

- A1.0 Demonstrate an understanding of decision-making processes within the American free-enterprise system.
- A1.1 Differentiate among the components of the American free-enterprise system and other forms of economic systems.
  - A1.2 Distinguish among the main characteristics of individual proprietorships, partnerships, corporations, franchises, and cooperatives.
  - A1.3 Compare the advantages and disadvantages of the types of business ownership.
  - A1.4 Analyze appropriate decision-making tools and financial records to make key management decisions.
  - A1.5 Analyze physical production relationships to determine optimum use levels.
  - A1.6 Calculate the fixed and variable costs associated with the production of agricultural products and determine the output level that will yield maximum profit.
- A2.0 Explain the fundamental economic principles of agribusiness and agricultural production.
- A2.1 Identify basic economic factors affecting agricultural production and agribusiness management decisions.
  - A2.2 Communicate basic agricultural economic terminology.
  - A2.3 Apply the law of supply and demand and evaluate its effect on price determination.
  - A2.4 Assess how agriculture uses scarce resources to meet the needs and demands of its consumers.
  - A2.5 Differentiate between elastic and inelastic supply and demand.
  - A2.6 Predict how the law of diminishing returns impacts agricultural production.
- A3.0 Explore the role of credit in agribusiness and agricultural production.
- A3.1 Analyze the factors that determine the cost of credit in order to select optimum credit sources (e.g., the advantages and disadvantages of

- borrowing from the various types of credit providers and sources for short-term, intermediate-term, and long-term credit).
- A3.2 Research and discuss the criteria lenders use to evaluate repayment capacity.
  - A3.3 Evaluate balance sheets and cash-flow statements to determine the ability to repay loans.
- A4.0 Use proper accounting principles and procedures to accomplish fiscal management and tax planning.
- A4.1 Compare and contrast cash and accrual accounting systems.
  - A4.2 Demonstrate the use and describe the importance of budgets, income statements, balance sheets, and financial statements.
  - A4.3 Interpret the basis of taxation within the tax system and its impact on the economy, including the role of taxes in agribusiness.
  - A4.4 Analyze the role of depreciation and purchasing in tax planning and liability.
  - A4.5 Determine property values and complete a depreciation schedule.
  - A4.6 Formulate the tax obligations for an agribusiness.
- A5.0 Manage risk and uncertainty.
- A5.1 Explore environmental issues that impact agribusiness.
  - A5.2 Determine the meaning and importance of risk and uncertainty.
  - A5.3 Describe alternative approaches to reducing risk, including the use of insurance for product liability, property, production or income loss, and for personnel life and health.
  - A5.4 Maintain appropriate evidence (e.g., Point of Origin, pick/pack dates, production records) to support and defend risk management.
  - A5.5 Identify best practices and include in farm planning to reduce risk.
  - A5.6 Prepare a comprehensive risk management and contingency plan.
- A6.0 Evaluate the role and value of agricultural organizations.
- A6.1 Distinguish the benefits of private, public, and governmental organizations, including the value and impact of cooperatives.
  - A6.2 Understand how participation in organizations would be beneficial in supporting various agricultural operations.
  - A6.3 Identify, and electronically access, public and private agricultural organizations.
- A7.0 Understand agricultural marketing systems.
- A7.1 Explain how marketing functions in a free-market society.
  - A7.2 Compare the advantages and disadvantages of the various marketing options for agricultural products and services.
  - A7.3 Analyze how the law of comparative advantage affects agricultural production.
  - A7.4 Explore the impact of advertising, promotion, and data analysis on the marketing of agricultural products and services.

- A7.5 Assess how promotion trends for agricultural products influence individuals.
- A7.6 Develop a marketing plan for an agricultural product or service.
- A8.0 Understand the sales of agricultural products and services.
  - A8.1 Determine the most effective methods for assessing customer needs and wants.
  - A8.2 Describe the stages in making a successful sale and the various techniques used to approach potential customers and overcome their objections.
  - A8.3 Examine the physiological and psychological factors that influence motivation to purchase, including the fundamental steps in making a purchase.
- A9.0 Differentiate among local, national, and international agricultural markets and communicate how trade affects the economy.
  - A9.1 Describe how the importance of agricultural imports and exports affects state and national economies.
  - A9.2 Summarize how governmental, economic, and cultural factors affect international trade.
  - A9.3 Compare and contrast United States trade policies with those of other important trading partners.
  - A9.4 Research how biotechnology affects trade and global economies.
  - A9.5 Evaluate how different cultural values affect agricultural production and marketing.
  - A9.6 Explain how negotiations and bargaining agreements affect trade agreements.
  - A9.7 Analyze agricultural marketing strategies in other parts of the world.

## **Agriculture and Natural Resources Pathway Standards**

### **B. Agricultural Mechanics Pathway**

The Agricultural Mechanics pathway prepares students for careers related to the construction, operation, and maintenance of equipment used by the agriculture industry. Basic agricultural mechanics skills and safety, standards B1.0 through B8.0, cover woodworking, electrical systems, plumbing, cold metal work, concrete, and welding technology. Advanced topics, standards B9.0 through B12.0, deal with metal fabrication, small engines, agriculture power and technology, and agriculture construction.

Sample occupations associated with this pathway:

- ◆ Agriculture Equipment Operator
- ◆ Farm Equipment Mechanic and Service Technician
- ◆ Agricultural Engineer
- ◆ Welder
- ◆ Equipment Fabricator

**B1.0** Implement personal and group safety practices.

- B1.1 Practice the rules for personal and group safety while working in an agricultural mechanics environment.
- B1.2 Integrate accepted shop management procedures and a safe working environment.
- B1.3 Safely secure loads on a variety of vehicles.

**B2.0** Apply the principles of basic woodworking.

- B2.1 Identify common wood products, lumber types, and sizes.
- B2.2 Measure and lay out lumber, calculating board feet and square feet.
- B2.3 Identify, select, and implement basic fastening systems.
- B2.4 Complete a woodworking project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, shaping, joining, and finishing.

**B3.0** Demonstrate basic electricity principles and wiring practices commonly used in agriculture.

- B3.1 Explain the relationship between voltage, amperage, resistance, and power in single-phase alternating current (AC) circuits.
- B3.2 Use proper electrical test equipment for AC and direct current (DC) circuits.
- B3.3 Analyze and correct basic circuit problems (e.g., open circuits, short circuits, incorrect grounding).
- B3.4 Implement proper basic electrical circuit and wiring techniques using nonmetallic cable and conduit as defined by the National Electric Code (NEC).
- B3.5 Interpret basic agricultural electrical plans.

- B3.6 Complete an electrical project, including interpreting a plan, following NEC code, selecting materials and components, and completing a circuit.
- B4.0 Select and apply plumbing system practices commonly used in agriculture.
  - B4.1 Match appropriate basic plumbing fitting skills with a variety of materials, such as copper, polyvinyl chloride (PVC), steel, polyethylene, and acrylonitrile butadiene styrene (ABS).
  - B4.2 Explain the environmental influences on plumbing and irrigation system choices (e.g., filter systems, water disposal, drip vs. flood).
  - B4.3 Research and communicate how various plumbing and irrigation systems are used in agriculture.
  - B4.4 Complete a plumbing project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, joining, and testing.
- B5.0 Understand agricultural cold metal processes.
  - B5.1 Identify common metals, sizes, and shapes.
  - B5.2 Demonstrate basic tool-fitting skills.
  - B5.3 Properly lay out materials for a given project.
  - B5.4 Demonstrate basic cold metal processes (e.g., shearing, cutting, drilling, threading, bending).
  - B5.5 Complete a cold metal project, including interpreting a plan, developing a bill of materials, selecting materials, shaping, fastening, and finishing.
- B6.0 Understand concrete and masonry practices commonly used in agriculture.
  - B6.1 Identify and explain the use of concrete and masonry tools and demonstrate proper handling of concrete materials.
  - B6.2 Practice bed preparation, concrete forms layout, and construction.
  - B6.3 Complete a concrete or masonry project, including calculating volume, developing a bill of materials, assembling, mixing, placing, and finishing.
- B7.0 Understand oxy-fuel cutting and welding.
  - B7.1 Explain the role of heat and oxidation in the cutting process.
  - B7.2 Properly set up, adjust, shut down, and maintain an oxy-fuel system.
  - B7.3 Flame-cut metal with an oxy-fuel cutting torch.
  - B7.4 Fusion-weld mild steel with and without filler rod by using oxy-fuel equipment.
  - B7.5 Repair metal objects using a variety of techniques, such as brazing or hard surfacing.
- B8.0 Understand electric arc welding processes.
  - B8.1 Select, properly adjust, safely employ, and maintain appropriate welding equipment (e.g., gas metal arc welding, shielded metal arc welding, gas tungsten arc welding).
  - B8.2 Read welding symbols and plans, select electrodes, fit-up joints, and control heat and distortion.

- B8.3 Apply gas metal arc welding, shielded metal arc welding, or flux core arc welding processes to fusion-weld mild steel with appropriate welding electrodes and related equipment.
- B8.4 Weld a variety of joints in various positions.
- B9.0 Assimilate metallurgy principles and fabrication techniques.
  - B9.1 Define metallurgy principles, including distortion, hardening, tempering, and annealing.
  - B9.2 Operate and maintain various arc welding and cutting systems safely and appropriately.
  - B9.3 Operate and maintain fabrication tools and equipment safely and appropriately.
  - B9.4 Design project plans by using mechanical drawing techniques.
  - B9.5 Finish a metal project by implementing proper sequencing.
  - B9.6 Manipulate and finish metal by using a variety of tools, machines, and techniques (e.g., lathe, mill, CNC plasma, shears, press break, grinders, and sanders).
  - B9.7 Construct a welding project using any electric welding process, appropriate products, joints, and positions, which will include interpreting a plan, determining proper assembly sequence, developing a bill of materials and cutting list, selecting and acquiring materials, and developing a clear and concise fabrication contract.
- B10.0 Understand small and compact engines.
  - B10.1 Understand and explain engine theory, including the application of mathematical and/or physical science laws for both two- and four-stroke cycle engines.
  - B10.2 Differentiate among types of small engines and their applications.
  - B10.3 Identify small-engine parts and explain the various systems (e.g., fuel, ignition, compression, cooling, and lubrication systems).
  - B10.4 Troubleshoot and solve problems with small engines.
  - B10.5 Disassemble, inspect, adjust, and reassemble a small engine.
  - B10.6 Look up and order parts, apply repair and maintenance recommendations from a repair manual, and complete appropriate forms, including work orders.
- B11.0 Understand the principles and applications of various engines and machinery used in agriculture.
  - B11.1 Identify common agricultural machinery and implements.
  - B11.2 Calibrate, operate, and maintain equipment safely and efficiently.
  - B11.3 Summarize the theory, operation, and troubleshooting of various types of engines found on agricultural machinery, including cooling, fuel, and lubrication systems.
  - B11.4 Explain the theory, operation, and troubleshooting of hydraulic systems.
  - B11.5 Explain the theory, operation, and troubleshooting of power train and power take-off systems.

- B11.6 Understand the theory and operation of 12-volt DC electronic and electrical systems (e.g., circuit design, starting, charging, and safety circuits).
- B12.0 Apply land measurement and construction techniques commonly used in agriculture.
  - B12.1 Describe common surveying techniques used in agriculture (e.g., leveling, land measurement, building layout, GPS).
  - B12.2 Draw and interpret architectural plans.
  - B12.3 Install single- and three-phase wiring and control systems found in agricultural structures, pumps, and irrigation systems.
  - B12.4 Install plumbing in agricultural structures (e.g., potable water, sewer, irrigation).
  - B12.5 Form, place, and finish concrete or masonry (e.g., concrete block).
  - B12.6 Construct agricultural structures by using wood framing and steel framing systems (e.g., barns, shops, greenhouses, animal structures).
  - B12.7 Develop clear and concise agricultural construction contracts.

## **Agriculture and Natural Resources Pathway Standards**

### **C. Agriscience Pathway**

The Agriscience pathway helps students acquire a broad understanding of a variety of agricultural areas, develop an awareness of the many career opportunities in agriculture, participate in occupationally relevant experiences, and work cooperatively with a group to develop and expand leadership abilities. Students study California agriculture, agricultural business, agricultural technologies, natural resources, and animal, plant, and soil sciences.

Sample occupations associated with this pathway:

- ◆ Research Assistant/Associate
- ◆ Water Quality Specialist
- ◆ Plant Scientist
- ◆ Agriscience Teacher
- ◆ Entomologist

C1.0 Evaluate the role of agriculture in the California economy.

C1.1 Understand the history of the agricultural industry in California.

C1.2 Describe how California agriculture affects the quality of life.

C1.3 Analyze the interrelationship of California agriculture and society at the local, state, national, and international levels.

C1.4 Research the economic impact of leading California agricultural commodities.

C1.5 Assess the economic impact of major natural resources in California.

C1.6 Distinguish between the economic importance of major agricultural exports and imports.

C1.7 Explore factors that affect food safety and producers' responsibilities to consumers.

C2.0 Examine the interrelationship between agriculture and the environment.

C2.1 Identify important agricultural environmental impacts on soil, water, and air.

C2.2 Explain current environmental challenges related to agriculture.

C2.3 Summarize how natural resources are used in agriculture.

C2.4 Compare and contrast practices for conserving renewable and nonrenewable resources.

C2.5 Research how new energy sources are developed from agricultural products (e.g., gas-cogeneration and ethanol).

C3.0 Analyze the effects of technology on agriculture.

C3.1 Describe how technology affects the logistics of moving an agricultural commodity from producer to consumer.

C3.2 Understand how technology influences factors such as labor, efficiency, diversity, availability, mechanization, and communication.



- C3.3 Communicate public concern for technological advancements in agriculture, such as genetically modified organisms.
  - C3.4 Research the laws and regulations concerning biotechnology.
  - C3.5 Integrate the use of technology when collecting and analyzing data.
- C4.0 Determine the importance of animals, the domestication of animals, and the role of animals in modern society.
- C4.1 Understand the evolution and roles of domesticated animals in society.
  - C4.2 Differentiate between domestication and natural selection.
  - C4.3 Compile the modern-day uses of animals and animal by-products.
  - C4.4 Defend various points of view regarding the use of animals.
  - C4.5 Research unique and alternative uses of animals (e.g., therapeutic riding programs and companion animals).
- C5.0 Compare the structure and function of plants, animals, bacteria, and viruses.
- C5.1 Identify the function of cells.
  - C5.2 Analyze the anatomy and physiology of cells.
  - C5.3 Understand various cell actions, such as osmosis and cell division.
  - C5.4 Compare and contrast plant and animal cells, bacteria, and viruses.
- C6.0 Explore animal anatomy and systems.
- C6.1 State the names, and find the locations, of the external anatomy of animals.
  - C6.2 Explain the anatomy and major functions of vertebrate systems, including digestive, reproductive, circulatory, nervous, muscular, skeletal, respiratory, and endocrine systems.
- C7.0 Comprehend basic animal genetics.
- C7.1 Differentiate between genotype and phenotype and describe how dominant and recessive genes function.
  - C7.2 Compare genetic characteristics among cattle, sheep, swine, and horse breeds.
  - C7.3 Predict phenotype and genotype ratios by using a Punnett Square.
  - C7.4 Explain the fertilization process.
  - C7.5 Distinguish between the purpose and processes of mitosis and meiosis.
- C8.0 Understand fundamental animal nutrition and feeding.
- C8.1 Identify types of nutrients required by farm animals (e.g., proteins, minerals, vitamins, carbohydrates, fats/oils, water).
  - C8.2 Analyze suitable common feed ingredients, including forages, roughages, concentrates, and supplements for ruminant, monogastric, equine, and avian digestive systems.
  - C8.3 Understand basic animal feeding guidelines and evaluate sample feeding programs for various species, including space requirements and economic considerations.

- C9.0 Evaluate basic animal health.
  - C9.1 Assess the appearance and behavior of a normal, healthy animal.
  - C9.2 Explain the ways in which housing, sanitation, and nutrition influence animal health and behavior.
  - C9.3 Analyze the causes and controls of common animal diseases.
  - C9.4 Summarize effective techniques for controlling parasites and explain why controlling parasites is important.
  - C9.5 Research the legal requirements for the procurement, storage, methods of application, and withdrawal times of animal medications, and know proper equipment handling and disposal techniques.
  
- C10.0 Explain soil science principles.
  - C10.1 Recognize the major soil components and types.
  - C10.2 Summarize how soil texture, structure, pH, and salinity affect plant growth.
  - C10.3 Assess water delivery and irrigation system options.
  - C10.4 Differentiate among the types, uses, and applications of amendments and fertilizers.
  
- C11.0 Analyze plant growth and development.
  - C11.1 Understand the anatomy and functions of plant systems and structures.
  - C11.2 Identify plant growth requirements.
  - C11.3 Discern between annual, biennial, and perennial life cycles.
  - C11.4 Examine sexual and asexual reproduction in plants.
  - C11.5 Understand photosynthesis and the roles of the sun, chlorophyll, sugar, oxygen, carbon dioxide, and water in the process.
  - C11.6 Summarize the respiration process in the breakdown of food and organic matter.
  
- C12.0 Understand fundamental pest management.
  - C12.1 Classify agricultural pests (e.g., insects, weeds, disease, and vertebrates).
  - C12.2 Compare chemical, mechanical, cultural, and biological methods of plant pest control.
  - C12.3 Analyze the major principles, advantages, and disadvantages of integrated pest management.
  
- C13.0 Design agricultural experiments using the scientific method.
  - C13.1 State the steps of the scientific method.
  - C13.2 Analyze an agricultural problem and devise a solution based on the scientific method.

## **Agriculture and Natural Resources Pathway Standards**

### **D. Animal Science Pathway**

In the Animal Science pathway, students study large, small, and specialty animals. Students explore the necessary elements, such as diet, genetics, habitat, and behavior, to create humane, ecologically, and economically sustainable animal production systems. The pathway includes the study of animal anatomy and physiology, nutrition, reproduction, genetics, health and welfare, animal production, technology, and the management and processing of animal products and by-products.

Sample occupations associated with this pathway:

- ◆ Veterinarian Technician
- ◆ Animal Caretaker/Kennel Operator
- ◆ Animal Breeder
- ◆ Ranch Manager
- ◆ Feed Nutritionist

D1.0 Evaluate the necessary elements for proper animal housing and animal-handling equipment.

- D1.1 Design an animal facility focusing on appropriate space and location requirements for habitat, housing, feed, and water.
- D1.2 Select habitat and housing conditions and materials, such as indoor and outdoor housing, fencing materials, air flow/ventilation, and shelters, to meet the needs of various animal species.
- D1.3 Interpret animal behaviors and execute protocols for safe handling of animals.
- D1.4 Defend the purpose and the safe and humane use of animal husbandry tools, such as hoof trimmers, electric shears, elastrators, dehorning tools, and scales.

D2.0 Apply principles of animal nutrition to ensure the proper growth, development, reproduction, and economic production of animals.

- D2.1 Assess the flow of nutrients from the soil, through the animal, and back to the soil.
- D2.2 Explore the principles for providing proper, balanced rations for a variety of production stages in ruminants and monogastrics.
- D2.3 Compare the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.
- D2.4 Distinguish how animal nutrition is affected by the digestive, endocrine, and circulatory systems.

D3.0 Apply principles of comparative anatomy and physiology to uses within various animal systems.

- D3.1 Compare and contrast animal cells, tissues, organs, and body systems.

- D3.2 Develop efficient procedures to produce consistently high-quality animals that are well suited for their intended purposes.
- D3.3 Relate the importance of animal organs to the health, growth, and reproduction of animals.
- D4.0 Demonstrate understanding of animal reproduction, including the function of reproductive organs.
  - D4.1 Illustrate animal conception, including estrus cycles, ovulation, and insemination.
  - D4.2 Research the gestation process and basic fetal development.
  - D4.3 Explain the parturition process, including the identification of potential problems and their solutions.
  - D4.4 Select animal breeding methods based on reproductive and economic efficiency.
  - D4.5 Select a breeding system based on the principles of genetics.
- D5.0 Discuss animal inheritance and selection principles, including the structure and role of deoxyribonucleic acid (DNA).
  - D5.1 Evaluate a group of animals for desired qualities, and discern among them for breeding selection.
  - D5.2 Select animals, based on quantitative breeding values, for specific characteristics.
  - D5.3 Research and discuss current technology used to measure desirable traits.
  - D5.4 Predict phenotypic and genotypic results of a dominant and recessive gene pair.
  - D5.5 Research the role of mutations, both naturally occurring and artificially induced, and hybrids in animal genetics.
- D6.0 Prescribe and implement a prevention treatment program for animal diseases, parasites, and other disorders.
  - D6.1 Evaluate the signs of normal health in contrast to illness and disease.
  - D6.2 Analyze the importance of animal behavior in diagnosing animal sickness and disease.
  - D6.3 Research common pathogens, vectors, and hosts that cause disease in animals.
  - D6.4 Evaluate preventative measures for controlling and limiting the spread of diseases, parasites, and disorders among animals.
  - D6.5 Discuss procedures used at the local, state, and national levels to ensure biosecurity of the animal industry.
  - D6.6 Explain the health risk of zoonotic diseases to humans, their historical influence, and future implications.
  - D6.7 Discuss the impacts on local, national, and global economies, as well as on consumers and producers, when animal diseases are not appropriately contained and eradicated.

- D7.0 Explore common pasture and rangeland management practices and their impact on a balanced ecosystem.
  - D7.1 Evaluate a rangeland and identify methods of rangeland improvement used in an effective animal production program.
  - D7.2 Summarize how rangeland management practices affect pasture production, erosion control, and the general balance of the ecosystem.
  - D7.3 Develop a management plan for rangelands, including how to calculate carrying capacity, for a variety of animal species and locations.
  - D7.4 Evaluate a plan to balance rangeland use for animal grazing and for wildlife habitat.
  
- D8.0 Explain challenges associated with animal waste management.
  - D8.1 Assess treatment and disposal management systems for animal waste.
  - D8.2 Compare various methods for using animal waste and the environmental impacts associated with each method.
  - D8.3 Research the health and safety regulations that are an integral part of properly managed animal waste systems.
  
- D9.0 Assess animal welfare concerns and management practices that support animal welfare.
  - D9.1 Evaluate the early warning signs of animal distress and how to rectify the problem.
  - D9.2 Discuss consumer concerns with animal production practices relative to human health.
  - D9.3 Summarize federal and state animal welfare laws and regulations, such as those dealing with abandoned and neglected animals, animal fighting, euthanasia, and medical research.
  - D9.4 Research the regulations for humane transportation and harvesting of animals, such as those delineated by the U.S. Department of Agriculture (USDA) Food Safety and Inspection Service and the Humane Methods of Slaughter Act.
  
- D10.0 Demonstrate understanding of the production of large animals (e.g., cattle, horses, swine, sheep, goats) and small animals (e.g., poultry, cavy, rabbits).
  - D10.1 Formulate and implement optimum requirements for diet, genetics, habitat, and behavior in the production of large and small animals.
  - D10.2 Develop, maintain, and use growth and management records for large or small animals to make data-driven management decisions.
  
- D11.0 Demonstrate understanding of the production of specialty animals (e.g., fish, marine animals, llamas, and tall, flightless birds).
  - D11.1 Assess specialty animals' role in agriculture (e.g., fish farms, pack animals, working dogs).
  - D11.2 Explore the unique nutrition, health, and habitat requirements for specialty animals.

- D11.3 Synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of specialty animals.
- D11.4 Develop, maintain, and utilize growth and management records for specialty animals to make data-driven management decisions.
- D12.0 Understand how animal products and by-products are processed and marketed.
  - D12.1 Research animal harvest, carcass inspection and grading, and meat processing safety regulations and practices and the removal and disposal of nonedible by-products, such as those outlined in Hazard Analysis and Critical Control Point, Sanitation Standard Operating Procedures, and good manufacturing practices documents.
  - D12.2 Compare the relative importance of the major meat, dairy, and egg classifications, including the per-capita consumption and nutritive value of those classifications.
  - D12.3 Discuss how meat-based, dairy, and egg retail products are produced.
  - D12.4 Describe how nonmeat products, such as wool, pelts, hides, and by-products, are harvested and processed.
  - D12.5 Evaluate how meat products and nonmeat products are marketed.
  - D12.6 Compare the value of animal by-products to nonagricultural industries.
  - D12.7 Apply point-of-origin safety and sanitation procedures in the production, harvest, handling, processing, and storing of meat products.

## **Agriculture and Natural Resources Pathway Standards**

### **E. Forestry and Natural Resources Pathway**

The Forestry and Natural Resources pathway helps students understand the relationships between California's natural resources and the environment. Topics include energy and nutrient cycles, water resources and management, soil conservation, wildlife preservation and management, forest and fire management, and lumber production. In addition, students study the outdoor recreation industry and multiple-use management.

Sample occupations associated with this pathway:

- ◆ Forestry Technician
- ◆ Park Ranger
- ◆ Fish Hatchery Technician
- ◆ Logging Operation Inspector
- ◆ Biological Science Technician

E1.0 Understand the importance of energy and energy cycles.

E1.1 Diagram the oxygen, carbon, nitrogen, and water cycles.

E1.2 Differentiate between renewable and nonrenewable energy sources.

E1.3 Differentiate between natural resource management conservation strategies and preservation strategies.

E1.4 Compare the effects on air and water quality of using different forms of energy.

E1.5 Analyze the way in which human activities influence energy cycles and natural resource management.

E2.0 Understand air and water use, their management practices, and conservation strategies.

E2.1 Explain the government's role in regulating air, soil, and water use management practices and conservation strategies.

E2.2 Research and discuss air and water conservation issues.

E2.3 Define appropriate water conservation measures.

E2.4 Interpret the component of a plan that monitors water quality.

E2.5 Interpret the component of a plan that monitors air quality.

E2.6 Analyze the way in which water management affects the environment and human needs.

E3.0 Explore soil composition and soil management.

E3.1 Demonstrate techniques used to classify soils.

E3.2 Explain the reasons for, and importance of, soil conservation.

E3.3 Analyze soils found in the different natural resource management areas.

E3.4 Develop and implement a soil management plan for a natural resource management area.

- E3.5 Understand how to analyze existing soil surveys to develop effective management plans.
- E4.0 Explore rangeland management.
  - E4.1 Map the locations of major U.S. and California rangeland areas.
  - E4.2 Summarize the interrelationship of rangeland management, the environment, wildlife management, and the livestock industry.
  - E4.3 Define practices used to improve rangeland quality.
  - E4.4 Analyze the carrying capacity in various rangelands for both wildlife species and domestic livestock.
  - E4.5 Distinguish among different browse and forage species in California rangelands.
  - E4.6 Evaluate a rangeland and develop a rangeland monitoring plan.
  - E4.7 Analyze the requirements and rights accompanying public land grazing permits and the government agencies involved (e.g., Bureau of Land Management and U.S. Forest Service) and abide by specific laws pertaining to natural resource systems.
- E5.0 Investigate wildlife management and habitat.
  - E5.1 Describe the relationship between habitat and wildlife population.
  - E5.2 List habitat requirements for different species and identify factors that influence population dynamics.
  - E5.3 Determine existing wildlife species populations.
  - E5.4 Explain mammalian and avian reproductive processes and infer how nutrition and habitat affect reproduction and population.
  - E5.5 Differentiate among a variety of management practices used to manage wildlife populations for hunting and other recreational purposes.
  - E5.6 Analyze the economic and environmental significance of sport hunting and fishing industries.
  - E5.7 Research and report on the purpose, history, terminology, and challenges of the Endangered Species Act and current activities related to the Act.
- E6.0 Understand aquatic resource use and management.
  - E6.1 Summarize the different types of aquatic resources.
  - E6.2 Identify and describe the major body parts, digestive systems, and reproductive organs of aquatic species.
  - E6.3 Determine the populations of existing aquatic species using a variety of methods.
  - E6.4 Analyze the relationship between water quality and aquatic species habitat.
  - E6.5 Explore a variety of management practices for managing aquatic species for sport fishing and other purposes.
  - E6.6 Make financial and production decisions and maintain growth and management records for a selected aquatic species.



- E7.0 Understand the outdoor recreation industry.
  - E7.1 List the potential environmental impacts of recreational activities and describe how to manage the resources affected.
  - E7.2 Demonstrate basic survival skills and first aid procedures.
  - E7.3 Construct and maintain trails.
  - E7.4 Select appropriate recreational gear for trips of varying types and durations and how to use it safely and appropriately (for minimum environmental impact).
  - E7.5 Set up a campsite for minimum environmental impact.
  
- E8.0 Explore basic plant physiology, anatomy, and taxonomy.
  - E8.1 Use scientific method to classify animals, including order, family, genus, and species.
  - E8.2 Use a dichotomous key to identify plants and animals.
  - E8.3 Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
  - E8.4 Recognize and explain the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
  
- E9.0 Explore the role of fire in natural resource management.
  - E9.1 Differentiate between desirable and undesirable fire in forest and rangeland ecosystems.
  - E9.2 Explain the significance of each of the components of the “fire triangle.”
  - E9.3 Know appropriate wildland fire-suppression practices.
  - E9.4 Develop a fire-control plan.
  - E9.5 Use fire-control tools safely.
  - E9.6 Research and report on the training requirements for fire-suppression certification.
  
- E10.0 Implement forest management practices.
  - E10.1 Describe how social, political, and economic factors can affect the use of forests.
  - E10.2 Discuss the California Forest Practice Act and the requirements for Timber Harvest and Habitat Conservation Plans.
  - E10.3 Analyze forest management systems (e.g., sustained yield, watershed management, ecosystem management, multiple-use management).
  - E10.4 Analyze harvest and renewability (e.g., reseeded and thinning) systems and identify the impact of each on the land.
  - E10.5 Explain silvicultural systems and skills and use appropriate related tools.
  - E10.6 Identify and diagnose damage from destructive insects, diseases, and weather and choose methods for their management.
  
- E11.0 Understand the basic concepts of measurement, surveying, and mapping.
  - E11.1 Describe the Public Land Survey System.
  - E11.2 Use surveying equipment, including global positioning satellites, maps, and a compass, to determine area, boundaries, and elevation differences.

- E11.3 Apply timber-cruising and log-scaling skills to determine timber and log volume for management and marketing.
- E11.4 Create a management plan map that includes layer information and data points from global information systems.
  
- E12.0 Produce, harvest, process, and market products from natural resource industries.
  - E12.1 Explain the marketing processes and manufacturing standards for a variety of natural resource products, including mining, quarrying, and drilling.
  - E12.2 Process natural resource products adhering to manufacturing standards.
  - E12.3 Analyze the production of specialty and seasonal products from natural resources.
  - E12.4 Compare different wood types and their uses.
  - E12.5 Diagram lumber manufacturing processes.
  
- E13.0 Understand public and private land issues.
  - E13.1 Interpret the differences between publicly and privately held lands.
  - E13.2 Explain the differences between public land designations (e.g., State Park, National Forest, wilderness areas, wild and scenic areas).
  - E13.3 Compare the role of public and private property rights and how they affect agriculture.
  - E13.4 Describe the role of government in managing public and private property rights.

## **Agriculture and Natural Resources Pathway Standards**

### **F. Ornamental Horticulture Pathway**

The Ornamental Horticulture pathway prepares students for careers in the nursery, landscaping, and floral industries. Topics include plant identification, plant physiology, soil science, plant reproduction, nursery production, and floriculture, as well as landscaping design, installation, and maintenance.

Sample occupations associated with this pathway:

- ◆ Florist/Floral Designer
- ◆ Landscape Design/Architect
- ◆ Hydroponics Grower
- ◆ Botanical Specialist
- ◆ Nursery/Greenhouse Manager

F1.0 Compare and contrast the hierarchical classification of plants.

F1.1 Practice how to classify and identify plants by order, family, genus, and species.

F1.2 Demonstrate how to identify plants by using a dichotomous key.

F1.3 Illustrate how common plant parts are used to classify the plants.

F1.4 Distinguish how to classify and identify plants by using botanical growth habits, landscape uses, and cultural requirements.

F1.5 Identify and select plants for local landscape applications.

F2.0 Summarize plant physiology and growth principles.

F2.1 Understand plant systems, nutrient transportation, structure, and energy storage.

F2.2 Diagram the seed's essential parts and explain the functions of each.

F2.3 Explain how primary, secondary, and trace elements are used in plant growth.

F2.4 Experiment with the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.

F2.5 Differentiate the tissues seen in a cross section of woody and herbaceous plants.

F2.6 Explore the factors that affect plant growth.

F3.0 Demonstrate plant propagation techniques.

F3.1 Explain the different forms of sexual and asexual plant reproduction.

F3.2 Demonstrate the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, seeds).

F3.3 Utilize and monitor plant reproduction for the development of a saleable product.

- F4.0 Develop and implement a plan for basic integrated pest management.
  - F4.1 Read and interpret pesticide labels and understand safe pesticide management practices.
  - F4.2 Research how pesticide regulations and government agencies affect agriculture.
  - F4.3 Identify common horticultural pests and diseases and methods of controlling them.
  - F4.4 Design an integrated approach to solving plant problems.
  
- F5.0 Summarize water and soil (media) management practices.
  - F5.1 Explain how basic soil science and water principles affect plant growth.
  - F5.2 Illustrate basic irrigation design and installation methods.
  - F5.3 Prepare and amend soils, implement soil conservation methods, and compare results.
  - F5.4 Research major issues related to water sources and water quality.
  - F5.5 Explain the components of soilless media and test the use of those media in various types of containers.
  
- F6.0 Apply ornamental plant nutrition practices.
  - F6.1 Analyze how primary and secondary nutrients and trace elements affect ornamental plants.
  - F6.2 Use basic nutrient testing procedures on soil and plant tissue.
  - F6.3 Analyze organic and inorganic fertilizers to understand their appropriate uses.
  - F6.4 Read and interpret labels to properly apply fertilizers.
  
- F7.0 Develop a plan for the selection, installation, and maintenance of turf.
  - F7.1 Explain the selection and management of landscape and sports field turf.
  - F7.2 Demonstrate how to select, install, and maintain a designated turf grass area.
  - F7.3 Distinguish how the use of turf benefits the environment.
  
- F8.0 Employ nursery production principles.
  - F8.1 Demonstrate the proper use of production facilities and common nursery equipment.
  - F8.2 Use common nursery production practices.
  - F8.3 Demonstrate how to propagate and maintain a horticultural crop to the point of sale.
  - F8.4 Design a marketing and merchandising strategy to use in nursery production.
  
- F9.0 Demonstrate the proper use of containers and horticultural tools, equipment, and facilities.
  - F9.1 Use different types of containers and demonstrate how to maintain growing containers in controlled environments.

- F9.2 Operate and maintain selected hand and power equipment safely and appropriately.
  - F9.3 Select proper tools for specific horticultural jobs.
  - F9.4 Install landscape components and electrical, land, and water features.
- F10.0 Understand basic landscape planning, design, construction, and maintenance.
- F10.1 Utilize terms associated with landscape and design in appropriate context.
  - F10.2 Produce a residential design, including how to render design to scale using design technology and principles.
  - F10.3 Use proper landscape planting and maintenance practices.
  - F10.4 Prune ornamental shrubs, trees, and fruit trees.
  - F10.5 Produce clear and concise landscape business contracts.
- F11.0 Understand basic floral design principles.
- F11.1 Demonstrate the use of plant materials and tools.
  - F11.2 Apply basic design principles to products and designs.
  - F11.3 Handle, prepare, and arrange cut flowers appropriately.
  - F11.4 Develop a marketing and merchandising strategy to use in the floral industry.

## **Agriculture and Natural Resources Pathway Standards**

### **G. Plant and Soil Science Pathway**

The Plant and Soil Science pathway covers topics such as plant classification, physiology, reproduction, plant breeding, biotechnology, and pathology. In addition, students learn about soil management, water, pests, and equipment, as well as cultural and harvest practices.

Sample occupations associated with this pathway:

- ◆ Soil Conservationist
- ◆ Environmental Analyst
- ◆ Plant and Soil Scientist
- ◆ Crop Consultant
- ◆ Pest Control Advisor

G1.0 Apply plant classification principles.

- G1.1 Classify and identify plants by order, family, genus, and species.
- G1.2 Practice how to identify plants by using a dichotomous key.
- G1.3 Demonstrate how common plant parts are used to classify the plants.
- G1.4 Communicate the differences between, and uses of, native and nonnative plants.
- G1.5 Distinguish the differences between monocots and dicots.
- G1.6 Explain the differences between plants under production and weeds.

G2.0 Explore cell biology.

- G2.1 Compare differences between prokaryotic cells and plant and animal eukaryotic cells and how viruses differ from them in complexity and general structure.
- G2.2 Test plant cellular function reactions when plants are grown under different conditions.
- G2.3 Explain functions organelles play in the health of the cell.
- G2.4 Recognize the part of the cell that is responsible for the genetic information that controls plant growth and development.
- G2.5 Summarize plant inheritance principles, including the structure and role of DNA.
- G2.6 List which organelles in plant cells carry out photosynthesis.

G3.0 Understand plant physiology and growth principles.

- G3.1 Investigate plant systems, nutrient transportation, and energy storage.
- G3.2 Label the seed's essential parts and describe their functions.
- G3.3 Discern how primary, secondary, and trace elements are used in plant growth.
- G3.4 Research the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.

- G3.5 Identify the tissues seen in a cross section of woody and herbaceous plants.
- G3.6 Conduct experiment(s) testing the factors that affect plant growth and predict plant response.
- G4.0 Demonstrate an understanding of sexual and asexual reproduction of plants.
  - G4.1 Explain the different forms of sexual and asexual plant reproduction.
  - G4.2 Demonstrate the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, and seeds).
  - G4.3 Use the proper sterile technique used in tissue culture.
- G5.0 Assess pest problems and management.
  - G5.1 Demonstrate how to categorize insects as pests, beneficial or neutral, and describe their roles.
  - G5.2 Explain the role of other pests, such as nematodes, molds, mildews, and weeds.
  - G5.3 Compare and contrast conventional, sustainable, and organic management methods to prevent or treat plant disease symptoms.
  - G5.4 Use integrated pest management to prevent, treat, and control plant disease symptoms (including conventional, sustainable, and organic management methods).
  - G5.5 Research how biotechnology can be used to manage pests.
- G6.0 Assess the role of soils in plant production.
  - G6.1 Understand soil types, soil texture, structure, and bulk density and explain the U.S. Department of Agriculture (USDA) soil-quality rating procedure.
  - G6.2 Analyze soil properties necessary for successful plant production, including pH, electrical conductivity (EC), and essential nutrients.
  - G6.3 Explain soil biology and diagram the cycles in nature as related to the soil food chain.
  - G6.4 Research how soil biology affects the environment and natural resources.
- G7.0 Integrate effective tillage and soil conservation management practices.
  - G7.1 Plan how to effectively manage and conserve soil through conventional, minimum, conservation, and no-tillage irrigation and through drainage and tillage practices.
  - G7.2 Assess how global positioning systems, surveying, laser leveling, and other tillage practices conserve soil.
  - G7.3 Use tools such as the USDA and the local Resource Conservation District soil survey maps to determine appropriate soil management practices.
- G8.0 Evaluate effective water management practices.
  - G8.1 Summarize California water history, current issues, water rights, water law, and water transfer through different distribution projects throughout the state.

- G8.2 Research and describe the local, state, and federal agencies that regulate water quality and availability in California.
  - G8.3 Define the definition of a watershed and explain how it is used to measure water quality.
  - G8.4 Explain effective water management and conservation practices, including the use of tailwater ponds.
  - G8.5 Use water-testing standards and perform bioassay and macro-invertebrate protocols to assess water quality.
- G9.0 Explain the concept of an “agrosystem” approach to production.
- G9.1 Identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).
  - G9.2 Compare and contrast the elements of conventional, sustainable, and organic production systems.
  - G9.3 Differentiate among the components of “whole-system management.”
- G10.0 Apply local crop management and production practices.
- G10.1 Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.
  - G10.2 Explain common marketing and shipping characteristics of local commodities.
  - G10.3 Interpret general maturity and harvest-time guidelines for specific local plant products.
  - G10.4 Apply point-of-origin safety and sanitation procedures in the production, harvesting, handling, processing, and storing of edible plant products.
- G11.0 Demonstrate competence in applications of scientific principles and techniques in plant science.
- G11.1 Research how changing technology, such as micro-propagation, biological pest controls, and genetic engineering (including DNA extraction and gel electrophoresis), affects plant production, yields, and management.
  - G11.2 Explain the various technology advancements that affect plant and soil science, such as global positioning systems, global information systems, variable rate technology, and remote sensing.
  - G11.3 Assess how herbicide-resistant plant genes can affect the environment.
  - G11.4 Communicate how genetic engineering techniques have been used to improve crop yields.
  - G11.5 Compare and contrast the effects of agricultural biotechnology, including genetically modified organisms, on the agriculture industry and the larger society and the pros and cons of such use.



**Academic Alignment Matrix**

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
<b>ENGLISH LANGUAGE ARTS</b>							
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST (Standard Area, Grade Level, Standard #)</b>							
9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C13.0	D1.0, D2.0, D3.0, D5.0, D6.0, D7.0, D9.0, D10.0, D11.0, D12.0	E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0	F1.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G3.0, G4.0, G6.0, G7.0, G8.0, G10.0
9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 9-10 texts and topics</i> .		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C5.0, C6.0, C9.0, C10.0, C11.0, C13.0	D5.0, D6.0, D7.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0	G6.0, G7.0, G8.0, G10.0
9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., <i>force, friction, reaction force, energy</i> ).	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G2.0, G3.0, G4.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	A3.0, A4.0, A6.0, A8.0	B1.0, B9.0, B12.0	C10.0, C11.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, G10.0,	E3.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0,	F1.0, F2.0, F3.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G3.0, G4.0, G6.0, G7.0, G10.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
				D11.0, D12.0			
11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, 11.0, B12.0	C13.0	D1.0, D2.0, D3.0, D5.0, D6.0, D7.0, D9.0, D10.0, D11.0, D12.0	E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0	F1.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G3.0, G4.0, G6.0, G7.0, G8.0, G10.0
1-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 11-12 texts and topics</i> .	A2.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C5.0, C6.0, C7.0, C8.0, C10.0, C11.0	D5.0, D6.0, D7.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0	G6.0, G7.0, G8.0, G10.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>							
9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A5.0, A7.0, A9.0	B12.0		D1.0	E3.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0		G3.0, G8.0, G11.0
9-10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B9.0, B10.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G2.0, G3.0, G4.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
9-10.8 Gather relevant information from multiple authoritative print and digital sources (primary and secondary) using advanced searches effectively; assess the usefulness of each source in answering the research questions; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citations.	A1.0, A2.0, A5.0, A6.0, A7.0, A9.0	B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
9-10.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G2.0, G3.0, G4.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A5.0, A7.0, A9.0	B12.0	C13.0	D1.0	E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0		G3.0, G8.0, G11.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B9.0, B10.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G2.0, G3.0, G4.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0,	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0,		D1.0, D2.0, D3.0, D4.0, D5.0, D6.0,	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0,	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0,	G1.0, G2.0, G3.0, G4.0, G5.0, G6.0,

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
	A7.0, A8.0, A9.0	B9.0, B10.0		D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F7.0, F8.0, F9.0, F10.0, F11.0	G7.0, G8.0, G9.0, G10.0, G11.0
11-12.10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	A2.0, A5.0, A7.0, A9.0,	B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0	D1.0, D4.0, D5.0, D6.0, D7.0, D9.0	E2.0, E3.0, E5.0, E10.0, E13.0	F8.0, F11.0	G5.0, G6.0, G8.0, G11.0
<b>MATHEMATICS</b>							
<b>Algebra – A-CED – Creating Equations</b>							
<i>Create equations that describe numbers or relationships</i>							
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.  1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step.			C13.0		E10.0		
<b>Algebra – A-APR – Arithmetic with Polynomials and Rational Expressions</b>							
<i>Perform arithmetic operations on polynomials</i>							

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication: add, subtract, and multiply polynomials, and divide polynomials by monomials. Solve problems in and out of context. (Common Core Standard A-APR-11)			C13.0				
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>							
<i>Solve equations and inequalities in one variable</i>							
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.  3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)			C13.0	D5.0	E10.0		
<b>Functions – F-IF – Interpreting Functions</b>							
<i>Interpret functions that arise in applications in terms of the context</i>							
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A1.0, A2.0		C13.0	D5.0			
<b>Geometry – G-CO – Congruence</b>							
<i>Make geometric constructions</i>							
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper		B6.0, B9.0,		D1.0	E11.0	F5.0, F10.0	G7.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.		B12.0					
<b>Geometry – G-MD – Geometric Measurement and Dimensions</b>							
<i>Explain volume formulas and use them to solve problems</i>							
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.		B6.0, B12.0		D1.0, D7.0	E4.0, E11.0	F5.0, F10.0	G7.0
<b>Geometry – G-MG – Modeling with Geometry</b>							
<i>Apply geometric concepts in modeling situations</i>							
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).		B4.0, B6.0, B11.0, B12.0	C8.0, C10.0	D1.0, D7.0	E4.0, E9.0, E11.0	F5.0, F7.0, F10.0, F11.0	G7.0
<b>Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry</b>							
<i>Define trigonometric ratios and solve problems involving right triangles</i>							
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.  8.1 Know and use angle and side relationships in problems with special right triangles, such as 30°, 60°, and 90° triangles and 45°, 45°, and 90° triangles. (CA Standard Geometry - 20.0)		B6.0, B9.0, B12.0		D1.0	E11.0	F10.0	

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>							
<i>Understand and evaluate random processes underlying statistical experiments</i>							
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A1.0, A2.0		C3.0	D11.0	E3.0, E4.0, E5.0, E6.0, E9.0, E10.0	F5.0	G7.0, G11.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>							
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A1.0, A2.0, A7.0		C7.0, C13.0	D5.0	E1.0, E10.0, E11.0, E12.0		G3., G6.0
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A1.0, A2.0		C3.0	D11.0	E3.0, E4.0, E5.0, E6.0, E9.0, E10.0	F5.0	G7.0, G11.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>							
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>							
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A1.0, A2.0		C3.0	D11.0	E4.0, E5.0, E6.0	F5.0	G7.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range,	A1.0, A2.0		C3.0	D11.0	E4.0, E5.0, E6.0	F5.0	G7.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
standard deviation) of two or more different data sets.							
<i>Interpret linear models</i>							
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	A1.0, A2.0		C3.0	D11.0	E4.0, E5.0, E6.0	F5.0	G7.0
<b>SCIENCE</b>							
<b>Scientific and Engineering Practices – SEP</b>							
1. Asking questions (for science) and defining problems (for engineering)		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F9.0, F10.0	G1.0, G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
2. Developing and using models		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C2.0, C5.0, C6.0, C7.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F10.0	G1.0, G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0



AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
3. Planning and carrying out investigations		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B9.0, B12.0	C2.0, C4.0, C5.0, C9.0, C12.0, C13.0	D1.0, D2.0, D6.0	E7.0	F2.0, F3.0, F4.0, F5.0, F6.0, F10.0	G2.0, G3.0, G5.0
4. Analyzing and interpreting data		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B12.0	C1.0, C4.0, C5.0, C8.0, C12.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0,	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F8.0, F10.0	G1.0, G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
5. Using mathematics and computational thinking		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B9.0, B12.0	C7.0, C13.0	D1.0, D2.0, D6.0, D10.0, D11.0, D12.0	E5.0, E6.0, E7.0, E10.0, E12.0, E13.0	F2.0, F3.0, F4.0, F5.0, F6.0, F10.0	G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G11.0
6. Constructing explanations (for science) and designing solutions (for engineering)		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D10.0, D11.0, D12.0	E5.0, E6.0, E7.0, E10.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
7. Engaging in argument from evidence		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0,	C2.0, C4.0, C13.0	D1.0, D2.0, D6.0, D8.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E9.0, E10.0, E12.0,	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0,	G1.0, G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
		B11.0, B12.0			E13.0	F11.0	
8. Obtaining, evaluating, and communicating information		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C3.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G2.0, G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0, G11.0
<b>Crosscutting Concept – CC</b>							
1. Patterns		B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C7.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0, F11.0	G1.0, G2.0, G3.0, G4.0, G5.0, G6.0, G8.0, G9.0, G10.0, G11.0
2. Cause and effect: Mechanism and explanation		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E9.0, E10.0, E11.0	F2.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0	G2.0, G3.0, G4.0, G6.0, G8.0, G9.0, G10.0, G11.0
3. Scale, proportion, and quantity		B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E9.0, E10.0, E11.0	F1.0, F2.0, F6.0, F7.0, F8.0, F9.0, F10.0	G1.0, G2.0, G3.0, G6.0, G8.0, G9.0, G10.0, G11.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
4. Systems and system models		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B12.0	C5.0, C6.0, C11.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0	G1.0, G2.0, G3.0, G6.0, G8.0, G9.0, G10.0, G11.0
5. Energy and matter: Flows, cycles, and conservation		B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B12.0	C2.0, C13.0	D1.0, D2.0, D6.0, D7.0, D8.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E9.0, E10.0, E11.0	F2.0, F9.0, F10.0	G2.0, G3.0, G6.0, G8.0, G9.0, G11.0
6. Structure and function		B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C5.0, C6.0, C10.0, C11.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0, E9.0, E10.0, E11.0, E12.0, E13.0	F1.0, F2.0, F3.0, F4.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0	G1.0, G2.0, G3.0, G5.0, G6.0, G8.0, G9.0, G10.0, G11.0
7. Stability and change		B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C13.0	D1.0, D2.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E9.0, E10.0, E11.0	F2.0, F5.0, F6.0, F7.0, F8.0, F9.0, F10.0	G2.0, G3.0, G5.0, G6.0, G8.0, G9.0, G10.0, G11.0
<b>Physical Sciences – PS</b>							
PS1: Matter and Its Interactions		B5.0, B7.0, B9.0	C8.0	D8.0, D12.0	E1.0	F6.0	

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
PS1.A: Structure and Properties of Matter PS1.B: Chemical Reactions							
PS2: Motion and Stability: Forces and Interactions PS2.A: Forces and Motion PS2.B: Types of interactions PS2.C: Stability and Instability in Physical Systems		B10.0, B11.0, B12.0  B4.0					
PS3: Energy PS3.A: Definitions of Energy PS3.B: Conservation of Energy and Energy Transfer PS3.C: Relationship Between Energy and Forces PS3.D: Energy in Chemical Processes and Everyday Life		B3.0, B7.0, B8.0, B9.0, B12.0					
PS3.D: Energy in Chemical Processes and Everyday Life			C6.0, C8.0, C9.0, C11.0	D2.0, D3.0, D4.0, D6.0	E8.0	F2.0	
PS4: Waves and Their Applications in Technologies for Information Transfer PS4.A: Wave Properties		B12.0					
<b>Life Sciences – LS</b>							
LS1: From Molecules to Organisms: Structures and Processes							
LS1.A: Structure and Function			C5.0, C6.0, C8.0, C9.0,	D2.0, D3.0, D4.0, D5.0, D6.0	E3.0, E5.0, E6.0, E8.0	F1.0, F2.0, F3.0, F4.0, F6.0	G1.0, G2.0, G3.0, G4.0,

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
			C10.0, C11.0	D10.0 D11.0			G5.0, G6.0
LS1.B: Growth and Development of Organisms			C5.0, C7.0, C8.0 C11.0	D5.0, D10.0, D11.0 D12.0	E8.0	F2.0, F3.0 F4.0, F5.0, F7.0, F8.0	G2.0, G3.0, G4.0, G5.0
LS1.C: Organization for Matter and Energy Flow in Organisms			C4.0, C5.0, C11.0	D8.0	E8.0	F2.0, F7.0	G2.0, G3.0
LS1.D: Information Processing	A8.0			D3.0, D1.0			
LS2: Ecosystems: Interactions, Energy, and Dynamics							
LS2.A: Interdependent Relationships in Ecosystems			C9.0, C10.0, C11.0, C12.0	D6.0, D7.0, D8.0, D12.0	E2.0, E3.0, E8.0	F2.0, F4.0	G3.0, G5.0, G6.0, G7.0, G8.0, G9.0, G10.0
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems			C11.0	D2.0, D7.0	E1.0, E8.0	F2.0, F4.0, F6.0, F8.0	G3.0, G5.0
LS2.C: Ecosystems Dynamics, Functioning, and Resilience			C11.0	D7.0	E4.0, E5.0, E6.0, E8.0, E9.0 E10.0	F2.0, F4.0	G3.0, G5.0, G10.0
LS2.D: Social Interactions and Group Behavior			C2.0, C9.0	D1.0, D10.0, D11.0			
LS3: Heredity: Inheritance and Variation of Traits							
LS3.A: Inheritance of Traits			C3.0, C7.0, C11.0	D3.0, D5.0	E8.0	F2.0, F3.0	G3.0, G4.0, G11.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
LS3.B: Variation of Traits			C7.0, C12.0	D3.0, D5.0	E8.0	F2.0, F3.0	G3.0, G4.0, G11.0
LS4: Biological Evolution: Unity and Diversity							
LS4.B: Natural Selection			C3.0, C4.0, C9.0, C11.0, C12.0	D6.0			G11.0
LS4.C: Adaptation LS4.D: Biodiversity and Humans	A9.0		C4.0, C12.0		E2.0, E8.0		G11.0
<b>Earth and Space Sciences – ESS</b>							
ESS2: Earth's Systems ESS2.A: Earth Materials and Systems			C1.0, C2.0		E1.0, E2.0		
ESS2.C: The Roles of Water in Earth's Surface Processes ESS2.E: Biogeology			C10.0		E1.0, E6.0		G8.0
ESS3: Earth and Human Activity ESS3.A: Natural Resources			C1.0, C2.0		E3.0, E4.0, E9.0	F5.0	G5.0
ESS3.B: Natural Hazards			C1.0				
ESS3.C: Human Impacts on Earth Systems			C4.0		E4.0, E5.0, E7.0, E10.0		G9.0, G11.0

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
<b>Engineering, Technology, and the Applications of Science – ETS</b>							
ETS1: Engineering Design ETS1.A: Defining and Delimiting an Engineering Problem ETS1.B: Developing Possible Solutions ETS1.C: Optimizing the Design Solution		B3.0, B4.0, 5.0, B6.0, B7.0, 8.0, B9.0, B10.0, B11.0, B12.0				F10.0	G7.0, G8.0
ETS2: Links Among Engineering, Technology, Science, and Society ETS2.A: Interdependence of Science, Engineering, and Technology ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World		B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0  C3.0, C4.0	D2.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0, D12.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E9.0, E10.0, E11.0, E12.0	F2.0, F3.0, F4.0, F5.0, F6.0, F8.0, F9.0, F10.0	G2.0, G3.0, G4.0, G5.0, G6.0, G7.0, G8.0, G10.0, G11.0
<b>HISTORY/SOCIAL SCIENCE</b>							
<b>Principles of Economics – PE</b>							
12.1 Students understand common economic terms and concepts and economic reasoning.							
12.1.1. Examine the causal relationship between scarcity and the need for choices.	A2.0						
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.	A2.0						

<b>AGRICULTURE AND NATURAL RESOURCES</b>	<b>PATHWAYS</b>						
	<b>A. Agricultural Business</b>	<b>B. Agricultural Mechanics</b>	<b>C. Agriscience</b>	<b>D. Animal Science</b>	<b>E. Forestry and Natural Resources</b>	<b>F. Ornamental Horticulture</b>	<b>G. Plant and Soil Science</b>
12.1.3. Identify the difference between monetary and non-monetary incentives and how changes in incentives cause changes in behavior.	A2.0						
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.	A2.0				E2.0, E13.0		
12.2 Students analyze the elements of America's market economy in a global setting.							
12.2.1. Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.	A2.0						
12.2.2. Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.	A1.0, A2.0						
12.2.3. Explain the roles of property rights, competition, and profit in a market economy.	A1.0, A2.0, A3.0, A4.0, A5.0, A7.0, A8.0, A9.0						
12.2.4. Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.	A2.0, A7.0, A9.0						
12.2.5. Understand the process by which competition among buyers and sellers determines a market price.	A1.0, A2.0, A7.0, A9.0						
12.2.6. Describe the effect of price controls on buyers and sellers.	A2.0, A7.0						



<b>AGRICULTURE AND NATURAL RESOURCES</b>	<b>PATHWAYS</b>						
	<b>A. Agricultural Business</b>	<b>B. Agricultural Mechanics</b>	<b>C. Agriscience</b>	<b>D. Animal Science</b>	<b>E. Forestry and Natural Resources</b>	<b>F. Ornamental Horticulture</b>	<b>G. Plant and Soil Science</b>
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.	A9.0						
12.2.8. Explain the role of profit as the incentive to entrepreneurs in a market economy.	A1.0, A2.0, A7.0						
12.2.10. Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.	A2.0						
12.4 Students analyze the elements of the U.S. labor market in a global setting.							
12.4.3. Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.	A2.0						
12.4.4. Explain the effects of international mobility of capital and labor on the U.S. economy.	A9.0						
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.							
12.6.1. Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.	A9.0						

AGRICULTURE AND NATURAL RESOURCES	PATHWAYS						
	A. Agricultural Business	B. Agricultural Mechanics	C. Agriscience	D. Animal Science	E. Forestry and Natural Resources	F. Ornamental Horticulture	G. Plant and Soil Science
12.6.2. Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.	A9.0						
12.6.3. Understand the changing role of international political borders and territorial sovereignty in a global economy.	A9.0						
12.6.4. Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.	A9.0						
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.							
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.					E2.0		
<b>U.S. History and Geography – US</b>							
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.							
11.6.3. Discuss the human toll of the Depression, natural disasters, and unwise agricultural practices and their effects on the depopulation of rural regions and on political movements of the left and right, with particular attention to the Dust Bowl refugees and their social and economic impacts in California.			C1.0				

<b>AGRICULTURE AND NATURAL RESOURCES</b>	<b>PATHWAYS</b>						
	<b>A. Agricultural Business</b>	<b>B. Agricultural Mechanics</b>	<b>C. Agriscience</b>	<b>D. Animal Science</b>	<b>E. Forestry and Natural Resources</b>	<b>F. Ornamental Horticulture</b>	<b>G. Plant and Soil Science</b>
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.							
11.11.5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.					E2.0 E10.0, E13.0		
11.11.7. Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.					E2.0		

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Agriculture and Natural Resources**

Bob Heuvel, Administrator, California Department of Education  
Hugh Mooney, Education Consultant, California Department of Education

#### *Standards Review Team*

Don Borges, Director, Agricultural Education Tech Prep, Modesto Junior College  
Glen Casey, Professor, California Polytechnic State University, San Luis Obispo  
Karen Dalton-Wemp, Owner, Mission Vineyard Sheep  
Bill Loveridge, Retired Instructor  
Cindy Rohde, Instructor, Pierce Joint Unified School District  
Mike Rourke, Instructor, Trinity County Office of Education  
Rosco Vaughn, Professor, California State University, Fresno

#### *Standards Writing Team*

Karen Dalton-Wemp, Owner, Mission Vineyard Sheep  
Jill Sperling, Instructor, Kingsburg Joint Union High School District

## Table of Contents

### Arts, Media, and Entertainment

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	5
Pathway Standards.....	7
A. Design, Visual, and Media Arts Pathway .....	7
B. Performing Arts Pathway.....	11
C. Production and Managerial Arts Pathway .....	15
D. Game Design and Integration Pathway.....	18
Academic Alignment Matrix.....	23
Appendix: CTE Model Curriculum Standards Contributors .....	41



## **Arts, Media, and Entertainment *Sector Description***

Of all the career industries, the Arts, Media, and Entertainment sector requires perhaps the greatest cross-disciplinary interaction because the work in this sector has a propensity to be largely project-based, requiring both independent work and interdependent management skills for career success. New technologies are also constantly reshaping the boundaries and skill sets of many arts career pathways. Consequently, core arts-sector occupations demand constantly varying combinations of artistic imagination, metaphoric representation, symbolic connections, and technical skills. Successful career preparation involves both broad and in-depth academic and technical preparation as well as the cultivation of twenty-first-century skill assets, such as flexibility, problem-solving abilities, and interpersonal skills. Careers in the Arts, Media, and Entertainment sector fall into four general pathways: Design, Visual, and Media Arts; Performing Arts; Production and Managerial Arts; and Game Design and Integration. The anchor and pathway standards make explicit the appropriate knowledge, skills, and practical experience students should have in order to pursue their chosen profession, whether that profession requires postsecondary education, graduate training, or apprenticeship.

Learning the skills and knowledge for creating, refining, and sharing work in the Arts, Media, and Entertainment industry sector promotes teamwork, communication, creative thinking, and decision making abilities—traits that are necessary to function successfully in the competitive and media-rich twenty-first century. Through the manipulation of sight, sound, and motion, those choosing a pathway from this sector reach out in unique ways to enhance the quality of life for those around them.

## **Arts, Media, and Entertainment Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Arts, Media, and Entertainment academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Arts, Media, and Entertainment sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Arts, Media, and Entertainment sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short as well as more sustained research to create alternative solutions to answer a question or solve a problem unique to the Arts, Media, and Entertainment sector, using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Arts, Media, and Entertainment sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.



- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Arts, Media, and Entertainment sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Arts, Media, and Entertainment sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Arts, Media, and Entertainment industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Arts, Media, and Entertainment sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.

- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Arts, Media, and Entertainment sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organizations. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Arts, Media, and Entertainment sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Arts, Media, and Entertainment sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Arts, Media, and Entertainment sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Arts, Media, and Entertainment sector.
- 10.3 Construct projects and products specific to the Arts, Media, and Entertainment sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Arts, Media, and Entertainment anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organizations.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Arts, Media, and Entertainment sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Arts, Media, and Entertainment sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Arts, Media, and Entertainment Pathway Standards**

### **A. Design, Visual, and Media Arts Pathway**

The Design, Visual, and Media Arts pathway includes those occupations that use visual art, digital media, and Web-based tools and materials as the primary means of communication and expression. In addition to an understanding of current workplace practice, this career pathway requires the development of knowledge and skills in both visual art concepts as well as new and emerging digital processes by which individuals are able to create and communicate complex concepts in a broad range of occupations and professions.

Sample occupations associated with this pathway:

- ◆ Digital Animator
- ◆ Artistic Director
- ◆ Commercial Artist
- ◆ Web Designer
- ◆ Museum Curator

A1.0 Demonstrate ability to reorganize and integrate visual art elements across digital media and design applications.

A1.1 View and respond to a variety of industry-related artistic products integrating industry appropriate vocabulary.

A1.2 Identify and use the principles of design to discuss, analyze, and create projects and products across multiple industry applications.

A1.3 Describe the use of the elements of art to express mood in digital or traditional art work found in the commercial environment.

A1.4 Select industry-specific works and analyze the intent of the work and the appropriate use of media.

A1.5 Research and analyze the work of an artist or designer and how the artist's distinctive style contributes to their industry production.

A1.6 Compare and analyze art work done using electronic media with those done with materials traditionally used in the visual arts.

A1.7 Analyze and discuss complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual in works of art.

A1.8 Compare how distortion is used in a variety of media to modify the message being communicated.

A1.9 Analyze the material used by a given artist and describe how its use influences the meaning of the work.

A2.0 Apply artistic skills and processes to solve a variety of industry-relevant problems in a variety of traditional and electronic media.

A2.1 Demonstrate skill in the manipulation of digital imagery (either still or video) in an industry-relevant application.

- A2.2 Demonstrate personal style and advanced proficiency in communicating an idea, theme, or emotion in an industry-relevant artistic product.
  - A2.3 Apply refined observation and drawing skills to solve an industry-relevant problem.
  - A2.4 Use visual metaphors in creating an artistic product.
  - A2.5 Compile a portfolio of multiple original two- and three-dimensional works of art that reflect technical skills in an industry-relevant application.
  - A2.6 Create an artistic product that involves the effective use of the elements of art and the principles of design.
  - A2.7 Create original works of art of increasing complexity and skill in a variety of media that reflect their feelings and points of view.
  - A2.8 Plan and create artistic products that reflect complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual.
  - A2.9 Create a multimedia work of art that demonstrates knowledge of media and technology skills.
- A3.0 Analyze and assess the impact of history and culture on the development of professional arts and media products.
- A3.1 Identify and describe the role and influence of new technologies on contemporary arts industry.
  - A3.2 Describe how the issues of time, place, and cultural influence and are reflected in a variety of artistic products.
  - A3.3 Identify contemporary styles and discuss the diverse social, economic, and political developments reflected in art work in an industry setting.
  - A3.4 Identify art in international industry and discuss ways in which the work reflects cultural perspective.
  - A3.5 Analyze similarities and differences of purpose in art created in culturally diverse industry applications.
  - A3.6 Investigate and discuss universal concepts expressed in visual media products from diverse cultures.
- A4.0 Analyze, assess and identify effectiveness of artistic products based on elements of art, the principles of design, and professional industry standards.
- A4.1 Develop written consumer assessment rubrics for separate, industry-specific art products.
  - A4.2 Deconstruct how beliefs, cultural traditions, and current social, economic, and political contexts influence commercial media (traditional and electronic).
  - A4.3 Analyze the aesthetic value of a specific commercial work of art and defend that analysis from an industry perspective.
  - A4.4 Analyze the relationship between the artist, artistic product and audience in both an existing and self-generated project.
  - A4.5 Analyze and articulate how society influences the interpretation and effectiveness of an artistic product.
  - A4.6 Create an artistic product for a specific industry and modify that product to accommodate a different aesthetic perspective.

- A5.0 Identify essential industry competencies, explore commercial applications and develop a career specific personal plan.
  - A5.1 Compare and contrast the ways in which different artistic media (television, newspapers, magazines, and electronic media) cover the same commercial content.
  - A5.2 Explore the role of art and design across various industry sectors and content areas.
  - A5.3 Deconstruct works of art, identifying psychological content found in the symbols and images and their relationship to industry and society.
  - A5.4 Predict how changes in technology might change the role and function of the visual arts in the workplace.
  - A5.5 Create a commercial artistic product that communicates a cross-cultural or universal theme.
  - A5.6 Prepare portfolios of original art created for a variety of purposes and commercial applications.
  - A5.7 Synthesize traditional art work and new technologies to design an artistic product to be used by a specific industry.
  
- A6.0 Analyze characteristics of subgenres (e.g., satire, parody, allegory, pastoral) that are used in poetry, prose, plays, novels, short stories, essays, and other basic genres.
  - A6.1 Evaluate the ways in which irony, tone, mood, the author's style, and the "sound" of language achieve specific rhetorical or aesthetic purposes or both.
  - A6.2 Analyze the way in which authors through the centuries have used archetypes drawn from myth and tradition in literature, film, political speeches, and religious writings.
  - A6.3 Debate the philosophical arguments presented in literary works to determine whether the authors' positions have contributed to the quality of each work and the credibility of the characters (philosophical approach).
  
- A7.0 Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
  - A7.1 Use point of view, characterization, style (e.g., use of irony), and related elements for specific rhetorical and aesthetic purposes.
  - A7.2 Use language in natural, fresh, and vivid ways to establish a specific tone.
  - A7.3 Enhance meaning by employing rhetorical devices, including extended use of parallelism, repetition, analogy; incorporation of visual aids (e.g., graphs, tables, pictures); and the issuance of a call for action.
  - A7.4 Integrate databases, graphics, and spreadsheets into electronically-processed documents.
  - A7.5 Revise text to highlight the individual voice, improve sentence variety and style, and enhance subtlety of meaning and tone in ways that are consistent with the purpose, audience, and genre.

- A8.0 Understand the key technical and technological requirements applicable to various segments of the Media and Design Arts Pathway.
  - A8.1 Understand the component steps and skills required to design, edit, and produce a production for audio, video, electronic, or printed presentation.
  - A8.2 Use technology to create a variety of audio, visual, written, and electronic products and presentations.
  - A8.3 Know the features and uses of current and emerging technology related to computing (e.g., optical character recognition, sound processing, cable TV, cellular phones).
  - A8.4 Analyze the way in which technical design (e.g., color theory, lighting, graphics, typography, posters, sound, costumes, makeup) contributes to an artistic product, performance, or presentation.
  - A8.5 Differentiate writing processes, formats, and conventions used for various media.
  - A8.6 Analyze and assess technical support options related to various media and design arts.
  - A8.7 Evaluate how advanced and emerging technologies (e.g., virtual environment or voice recognition software) affect or improve media and design arts products or productions.

## **Arts, Media, and Entertainment Pathway Standards**

### **B. Performing Arts Pathway**

The Performing Arts pathway focuses on the direct creation of art and entertainment by the individual artist instead of through a secondary physical medium. Performing artists are themselves the medium of creative expression.

Sample occupations associated with this pathway:

- ◆ Composer, Music Arranger, Conductor
- ◆ Actor (e.g., Stage, Film, Video, DVD), Performing Artist
- ◆ Singer, Dancer, Musician
- ◆ Voiceover Artist, Narrator

- B1.0 Explore and formulate responses to peer and professional work using the fundamental elements of Theater, Dance, and Music.
- B1.1 Demonstrate movement skills, process sensory information, and describe movement using the professional vocabulary of dance.
  - B1.2 Apply highly developed physical coordination and control when performing complex loco motor and axial movement phrases from a variety of genres (e.g., refined body articulation, agility, balance, strength).
  - B1.3 Apply a wide range of kinesthetic communication demonstrating clarity of intent and stylistic nuance.
  - B1.4 Differentiate dance vocabulary to describe movement and dance in a professional setting.
  - B1.5 Create and perform complicated works of dance at a level of professionalism (i.e., a high level of refinement).
  - B1.6 Perform in multiple professional dance genres integrating an advanced level of technical skill and clear intent.
  - B1.7 Deconstruct formal and informal (improvisational) performances of theater, dance, and music, both live and electronic, and evaluate using appropriate artistic vocabulary.
- B2.0 Read, listen to, deconstruct, and analyze peer and professional music using the elements and terminology of music.
- B2.1 Read a full instrument or vocal score with a direct industry connection (Film score, Philharmonic score, commercial underscore).
  - B2.2 Describe how the elements of music are used.
  - B2.3 Transcribe simple songs into melodic and rhythmic notation when presented.
  - B2.4 Sight-read music accurately and expressively.
  - B2.5 Analyze and describe significant musical events perceived and remembered in a given industry generated example.
  - B2.6 Analyze and describe the use of musical elements in a given professional work that makes it unique, interesting, and expressive.



- B2.7 Demonstrate the different uses of form, both past and present, in a varied repertoire of music in commercial settings from diverse genres, styles, and professional applications.
- B3.0 Observe, deconstruct, and analyze peer and professional theater, film, video, and electronic media and respond using the vocabulary of theater.
  - B3.1 Identify the use of metaphor, subtext, and symbolic elements in text and performance of professional theatrical work (live or recorded).
  - B3.2 Research, analyze, and plan a theatrical performance (live or recorded) with the director, designer, or playwright.
  - B3.3 Create a product which assesses professional theater, film, and video performance products using the vocabulary of theater, such as genre, style, acting values, theme, and design.
- B4.0 Apply choreographic principles, processes, and skills to create and communicate meaning through improvisation, composition, and performance of dance for a variety of professional applications.
  - B4.1 Specify applications of VPA Creative Expression Standards for Dance at the proficient level.
  - B4.2 Notate dances using a variety of systems (Labanotation, motif writing, and personal systems).
  - B4.3 Apply basic music elements (rhythm, meter, tempo, timbre) to construct and perform dances for a variety of professional settings.
  - B4.4 Create a dance that utilizes an established dance style or genre in response to an industry-specific prompt.
  - B4.5 Perform works by various dance artists communicating the original intent of the work while employing personal artistic intent and interpretation.
  - B4.6 Perform combinations, in response to audition requirements, in a variety of professional dance genres that demonstrate proficiency relative to industry expectations.
  - B4.7 Create a diverse body of work in dance, which demonstrates originality, unity, clarity of intent, and a dynamic range of movement appropriate to a variety of professional applications.
  - B4.8 Create a performance piece using dance structures, musical forms, theatrical elements, and technology for a specific professional application.
  - B4.9 Perform original works that employ personal artistic intent and respond to industry-specific criteria.
- B5.0 Apply vocal and/or instrumental skill and knowledge to perform a varied repertoire of music appropriate to music industry application.
  - B5.1 Sing or play a repertoire of musical literature representing various genres, styles, and cultures with expression and technical accuracy.
  - B5.2 Sing or play music written in multiple parts, individually or with a group.
  - B5.3 Sight read and perform a brief musical composition from a professional resource.

- B5.4 Employ a variety of music technology to record, integrate, or modify a live or recorded performance to produce a new artistic product.
  - B5.5 Compose music in distinct styles.
  - B5.6 Compose and arrange music for various combinations of voice and acoustic and digital/electronic instruments using appropriate ranges and traditional and nontraditional sound sources.
  - B5.7 Create melodic and rhythmic improvisations in a style or genre within a musical culture (gamelan, jazz, and mariachi).
- B6.0 Apply skill and knowledge in acting, directing, design, and composition to create formal and informal (improvised) theater, film, video, and electronic media performances.
- B6.1 Demonstrate media appropriate acting choices using script analysis, character research, reflection, and revision in live and recorded performance applications.
  - B6.2 Use acting choices, such as script analysis, character research, reflection, and revision; and apply to a variety of professional settings.
  - B6.3 Create performance products applying basic dramatic structure: exposition, complication, conflict, crises, climax, and resolution.
  - B6.4 Design, produce, or perform scenes applicable to a variety of professional settings and media applications.
  - B6.5 Improvise or write dialogues and scenes applying basic dramatic structure (exposition, complication, crises, climax, and resolution) appropriate to a variety of industry settings.
  - B6.6 Work collaboratively as designer, producer, or actor to meet directorial goals in scenes and plays from a variety of professional sources.
- B7.0 Analyze the historical and cultural perspective of multiple industry performance products from a discipline-specific perspective.
- B7.1 Identify and compare how film, theater, television, and electronic media productions influence values and behaviors.
  - B7.2 Analyze the historical and cultural perspective of the dancer in the professional setting.
  - B7.3 Analyze the historical and cultural perspective of the musician in the professional setting.
  - B7.4 Analyze the historical and cultural perspective of the actor and performance artist in the professional setting.
  - B7.5 Create a product comparing and contrasting universal themes and sociopolitical issues in a variety of music, dance, or theatrical products.
- B8.0 Deconstruct the aesthetic values that drive professional performance and the artistic elements necessary for industry production.
- B8.1 Critique discipline-specific professional works using the language and terminology specific to the discipline.
  - B8.2 Use selected criteria to compare, contrast, and assess various professional performance forms.

- B8.3 Analyze the aesthetic principles that apply in a professional work designed for live performance, film, video, or live broadcast.
- B8.4 Use complex evaluation criteria and terminology to compare and contrast a variety of genres of professional performance products.
- B9.0 Explore the connection between artistic preparation and professional standards and practices.
  - B9.1 Examine the training, education, and experience needed to pursue discipline-specific performance options.
  - B9.2 Demonstrate effective knowledge and skills with the audiovisual equipment and technology used in professional performance.
  - B9.3 Demonstrate entry-level competencies for a career in an artistic or technical field in the theatrical arts.
  - B9.4 Understand the technical aspects of lights, sound, properties, costumes, and makeup from the perspective of the professional performer.
  - B9.5 Contrast differing roles in professional skill sets of creators, performers, and others involved in the production and presentation of the performing arts.
  - B9.6 Create a career plan leading to professional performance in one of the performance disciplines.

## **Arts, Media, and Entertainment Pathway Standards**

### **C. Production and Managerial Arts Pathway**

Whatever the form or medium of creative expression, all careers in the Arts, Media, and Entertainment sector require “publication” or a public presentation in one way or another. Consequently, the Production and Managerial Arts pathway focuses on both the technical skills and the organizational and managerial knowledge necessary to bring arts, media, and entertainment to the public.

Sample occupations associated with this pathway:

- ◆ Event Planner
- ◆ Producers/Directors for Theater, Television, Concerts, and Motion Picture
- ◆ Stage Manager/Production Manager
- ◆ Talent Management
- ◆ Theatrical and Broadcast Technician

C1.0 Demonstrate knowledge of industry safety standards and practices in all areas of technical production.

C1.1 Demonstrate understanding of various power tools used in construction and rigging.

C1.2 Demonstrate knowledge of basic electrical safety.

C1.3 Demonstrate understanding of safe workplace practices, including tool safety, rigging, electrical, and construction safety and awareness of hazardous materials in the workplace.

C1.4 Apply safety related decision making and problem-solving techniques to live, recorded, or multimedia generated production.

C2.0 Understand the technical support functions and artistic competencies in film, video, and live production.

C2.1 Analyze the production sequence involved in creating a media based or live performance production.

C2.2 Produce a production flow chart for a live theatrical or media based production.

C2.3 Plan one technical component of a production from design to performance.

C3.0 Analyze and differentiate the function of the various members of a production team.

C3.1 Identify the skills and competencies of the various members of a production team including producer, production manager, director, assistant director, stage manager, production designer(s), post production, etc.

C4.0 Demonstrate key skills and an understanding of the complexities of production planning.

- C4.1 Know the main elements and functional responsibilities involved in the production and presentation of the performing, visual, and media arts.
  - C4.2 Know how artistic processes, organizational structure, and business principles, including funding and budgeting, are interrelated in both live and media production.
  - C4.3 Identify the responsibilities and activities associated with the preproduction, production, and post-production of a creative project.
  - C4.4 Demonstrate understanding of the appropriate use of technology in each phase of the production planning.
  - C4.5 Create a call sheet for equipment, crew, technical support, and cast requirements for an arts, media, and entertainment production.
- C5.0 Apply knowledge of services, equipment capabilities, the workflow process, data acquisition, and technology to a timely completion of projects.
- C5.1 Identify essential qualifications and technological competencies for each team member, including artists, designers, performers, composers, writers, and technicians.
  - C5.2 Plan the general coordination of various elements in a project or production.
- C6.0 Understand the key elements of developing and promoting a production from creation to distribution.
- C6.1 Design a production flow chart identifying chain of responsibility for a specific type of arts, media, and entertainment production.
  - C6.2 Create a budget for an aspect of an arts, media, and entertainment production of the arts, media, and entertainment industry.
  - C6.3 Design a promotional packet demonstrating knowledge of promotional
  - C6.4 Create a promotional example using electronic media.
  - C6.5 Create a public service announcement using two or more production methods materials, such as standard public service announcements
- C7.0 Know various media production, communication, and dissemination techniques and methods, including written, oral, visual, and electronic media.
- C7.1 Identify and describe licensing management for live and media based productions and intellectual properties.
  - C7.2 Identify successful business models and analyze various facets of those models, such as market analysis, marketing strategy, and product value.
  - C7.3 Discuss the relationships between publishers, developers, distributors, marketers, and retailers.
  - C7.4 Understand the role of audience and market research in promotional planning
  - C7.5 Understand the components of marketing campaigns for live and media based productions, including advertising in both traditional and social media.

**C7.6** Demonstrate understanding of the distribution component of both live and media based production including Web, print, radio, television, and communication based options.

## **Arts, Media, and Entertainment Pathway Standards**

### **D. Game Design and Integration Pathway**

Students who follow the Game Design and Integration pathway prepare for careers within the game design industry and in related technical fields. Students will develop foundational knowledge in game design, animation, graphics, and computer software and hardware. They will apply skills in Mathematics, Physics, English Language Arts, Social Science, and Entrepreneurship. Most importantly, students will learn the twenty-first century skills of creativity, critical thinking, communication, collaboration, and technical expertise, which will increase employment capacity across the job market. In the Game Design and Integration Pathway students prepare for both entry-level employment and additional postsecondary training needed for advancement in the highly competitive game design industry. They prepare for occupations such as Game Tester/Analyst, 2-D and 3-D Animator, Storyboard, Level Artist, Texture Artist, Cinematic Artist, Game Designer, Game Programmer, and Production Team Manager. Students completing this pathway develop the skills and knowledge to be creative partners in video game design while building capacity for employment in all areas of the creative workforce.

Sample occupations associated with this pathway:

- ◆ 2-D/3-D Animator
- ◆ Computer Game Designer/Developer
- ◆ Game Tester
- ◆ Electronic Simulation Consultant

D1.0 Demonstrate understanding of current trends and the historical significance of both electronic and non-electronic games. Students will analyze different game systems and identify how these systems have influenced consumer technology.

D1.1 Research and analyze different game genres, including multiplayer games.

D1.2 Define and use necessary vocabulary related to games, their genres, game platforms, and game hardware.

D1.3 Research, compare, and categorize different game platforms and game hardware.

D1.4 Analyze the technology transfer from video games to other industries, such as education, medical, corporate training, and military simulation.

D1.5 Present a mock-up of a future generation game platform and hardware system based on research of current and emerging technologies and future predictions.

D2.0 Analyze the core tasks and challenges of video game design and explore the methods used to create and sustain player immersion.

D2.1 Identify and define the roles and responsibilities of each member of a video game design team.

- D2.2 Break down and identify the fundamental building blocks of game play: player goals, player actions, rewards, and challenges.
  - D2.3 Research various input controls and display types then identify how these impact game play.
  - D2.4 Research and define the term “player immersion.”
  - D2.5 Explore and explain the factors that create player immersion in a game.
  - D2.6 Compare and contrast player-centric design and designer-centric design in video games.
  - D2.7 Describe a designer-centric game to highlighting features other than game play and entertainment value.
  - D2.8 Prototype a small game using real-world objects, such as dice, cards, balls, pen and paper, etc.
- D3.0 Acquire and apply appropriate game programming concepts and skills to develop a playable video game.
- D3.1 Implement common programming concepts, including logic operators, conditional statements, loops, variables, events, actions, and handling user input.
  - D3.2 Understand the basics of game physics, including collision and motion.
  - D3.3 Examine the use of math and physics (such as gravity and friction) in game development.
  - D3.4 Explore the basics of random number generation.
  - D3.5 Implement a small video game utilizing mathematics and physics that features at least one moving object (such as a spaceship) which rotates along an axis and moves in whichever direction it is facing after rotation. The game must include collision physics.
- D4.0 Students will demonstrate mastery of game art and multimedia, including music, sound, art, and animation.
- D4.1 Demonstrate understanding of the elements of art, including line, shape, color, value, texture, space, and balance, to set the mood and feel of a scene.
  - D4.2 Research and describe the different perspectives used in video games, including first person, second person, and third person perspectives.
  - D4.3 Explain how to create the illusion of 3-D in a 2-D environment.
  - D4.4 Create 2-D art and 3-D models.
  - D4.5 Create an animation sequence.
  - D4.6 Design a game environment using lines, fills, and color to set a specific mood and feel of a scene.
  - D4.7 Create, record, and edit audio for a game.
  - D4.8 Define and discuss intellectual property, copyrights, trademarks, and piracy as they relate to art and multimedia assets in a game.
  - D4.9 Understand the basics of character design and development, world design, and level design.
  - D4.10 Create a storyboard for a game cut-scene applying the basic principles of design and concepts of cinematography.



- D5.0 Demonstrate an understanding of testing techniques used to evaluate, assess, rate, and review quality assurance of video games.
  - D5.1 Test and analyze games to determine the quality of rules, interfaces, navigation, performance, and game play.
  - D5.2 Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
  - D5.3 Compare and contrast the differences between functionality and usability of software.
  - D5.4 Evaluate games in terms of accessibility issues.
  - D5.5 Demonstrate technical reading and writing skills.
  - D5.6 Test a classmate's game project and create a bug report for the game. For each error submitted, write steps in sufficient detail so it is identifiable and reproducible to the developer. Use a metric to identify how critical the error is based on its negative impact on game play.
  
- D6.0 Understand the general procedures, documentation, and requirements of large scale game design projects. Examine and categorize the significant processes in the production of games.
  - D6.1 Identify processes of design and development from concept to production, including content creation, filling team roles, design documentation, communication, and scheduling for video game design teams.
  - D6.2 Discuss the iterative nature of game and simulation design.
  - D6.3 Develop design plans, character sketches, documentation, and storyboards for proposed games.
  - D6.4 Enumerate individual tasks of a project using basic time management skills to complete each task and track its completion.
  - D6.5 Describe the importance and interrelationship between development schedule and budget constraints in a video game design project.
  - D6.6 Compare and contrast common uses of different game development tools.
  - D6.7 Create a set of original design documents and build a small game.
  
- D7.0 Understand the fundamentals of business and marketing, including entrepreneurship, global marketing, and localization.
  - D7.1 Identify, define, and discuss the different ways games are funded, distributed, marketed, and sold.
  - D7.2 Identify and describe licensing management for different game platforms, tools, and intellectual properties.
  - D7.3 Identify successful business models and analyze various facets of those models, such as market analysis, marketing strategy, and product value.
  - D7.4 Understand the components of marketing campaigns for games, including advertising in traditional and social media.
  - D7.5 Understand the role community management plays in marketing and business models.
  - D7.6 Discuss the relationships between publishers, developers, distributors, marketers, and retailers.

- D7.7 Evaluate game journalism and professional reviews in terms of bias.
  - D7.8 Explore and describe the effects of globalization on the design and production of video games.
  - D7.9 Evaluate how video games adhere to government rating systems.
  - D7.10 Create a plan for a game to target a specific audience within three different countries while adhering to their governments' rating systems.
- D8.0 Understand the impact of games and the role of play in human culture. Analyze the ethics and global impact of the game industry.
- D8.1 Discuss the word "play" and its many definitions.
  - D8.2 Investigate and discuss how play can help humans acquire knowledge and social skills.
  - D8.3 Describe the benefits of games and simulations, including online economies and community building.
  - D8.4 Compare and contrast the different opinions on the effects of games on behavior, cognitive development, and motor skills.
  - D8.5 Describe how frequent exposure and/or access to video games has reshaped the level of technical proficiency of our work force.
  - D8.6 Explore and discuss the impact of video games on the economy.
  - D8.7 Design a game you believe will have positive impact on the world.
- D9.0 Identify career goals and develop a career plan that explores employment opportunities in the video game industry.
- D9.1 Demonstrate personal and interpersonal skills appropriate for the workplace, such as responsibility, dependability, punctuality, positive attitude, initiative, respect for self and others, and professional dress.
  - D9.2 Investigate how the skills acquired in game design/development can be applied to other industries.
  - D9.3 Use personal assessment tools to identify personal and professional strengths and weaknesses.
  - D9.4 Analyze job and career requirements as related to career interests and opportunities in the game industry.
  - D9.5 Investigate the common employment contracts in the game industry, such as Nondisclosure Agreements, "Work for Hire" agreements, and "Noncompete" clauses.
  - D9.6 Create a resume and use it during a mock interview. At the end of the interview process, apply negotiation skills as they relate to salary and benefits packages.
- D10.0 Students will build a game that demonstrates teamwork and project management by creating a game design production plan that describes the game play, outcomes, controls, rewards, interface, and artistic style of a video game.
- D10.1 Use design documents to create a game design production plan.
  - D10.2 Solicit and accept constructive criticism.
  - D10.3 Use computer tools to create game programming, art, and audio.
  - D10.4 Create and use animated objects in a game.

- D10.5 Create sound and music to enhance the game experience.
- D10.6 Test and debug the completed game.
- D10.7 Apply listening, speaking, and collaborative communication skills to effectively convey information.
- D10.8 Demonstrate a professional level of written and oral communication as necessary in the game industry.

## Academic Alignment Matrix

<b>ARTS, MEDIA, AND ENTERTAINMENT</b>	<b>PATHWAYS</b>			
	<b>A. Design, Visual, and Media Arts</b>	<b>B. Performing Arts</b>	<b>C. Production and Managerial Arts</b>	<b>D. Game Design and Integration</b>
<b>ENGLISH LANGUAGE ARTS</b>				
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D4.0, D7.0, D8.0
11-12.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D4.0, D6.0, D7.0, D8.0
11-12.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D4.0, D6.0, D7.0, D8.0, D9.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0
<b>Reading Standards for Literature – RSL (Standard Area, Grade Level, Standard #)</b>				
11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain	A6.0, A7.0	B3.0, B6.0		D4.0, D6.0, D8.0, D9.0
11-12.2. Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.	A6.0, A7.0	B3.0, B6.0		D1.0, D4.0, D8.0

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
11-12.3. Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters/archetypes are introduced and developed).	A6.0, A7.0	B3.0, B6.0		D4.0, D8.0
11-12.4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful.	A6.0, A7.0	B3.0, B6.0		D4.0, D8.0
11-12.5. Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.	A6.0, A7.0	B3.0, B6.0		D4.0, D6.0, D7.0, D8.0
11-12.6 Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).	A6.0, A7.0	B3.0, B6.0		D7.0
11-12.7. Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)	A6.0, A7.0	B3.0, B6.0		D4.0, D6.0, D8.0
11-12.9 Demonstrate knowledge of eighteenth-, nineteenth- and twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.	A6.0, A7.0	B3.0, B6.0		D8.0
11-12.10 by the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently.	A6.0, A7.0	B3.0, B6.0		D4.0, D8.0
<b>Reading Standards for Information Text – RSIT (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D4.0, D7.0
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0,	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0,	D4.0

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
one another to provide a complex analysis; provide an objective summary of the text.		B7.0, B8.0, B9.0	C7.0	
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D4.0
11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D4.0, D8.0, D9.0
11-12.5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0			D7.0, D8.0, D9.0
11-12.6. Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0			D7.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D4.0, D8.0, D9.0
11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., <i>The Federalist</i> , presidential addresses).				D7.0, D8.0, D9.0
<b>Reading Standards for Literacy in History/Social Studies – RHSS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.	A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D1.0, D4.0, D8.0
11-12.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.	A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D1.0, D7.0, D8.0
11-12.3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the	A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D4.0

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
text leaves matters uncertain.				
11-12.4. Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10).	A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D4.0, D8.0
11-12.5. Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.	A2.0, A3.0, A4.0, A5.0, A6.0	B7.0	C7.0	D1.0, D4.0, D6.0, D7.0, D8.0
11-12.6. Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.	A2.0, A3.0, A4.0, A5.0, A6.0	B7.0		D1.0, D8.0
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.	A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D1.0, D2.0, D4.0, D5.0, D8.0, D9.0
11-12.8. Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.	A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D1.0, D4.0, D7.0, D8.0
11-12.9 Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.	A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D1.0, D8.0
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes to any gaps or inconsistencies in the account.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D1.0, D7.0, D8.0
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D1.0, D2.0, D4.0, D8.0
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D3.0, D5.0, D10.0
11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D3.0, D5.0, D6.0
11-12.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D3.0, D5.0, D7.0

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
11-12.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D5.0, D6.0
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0
11-12.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D2.0, D3.0, D5.0
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D4.0, D5.0, D6.0, D7.0, D8.0
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A5.0, A8.0	B4.0, B5.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0	D3.0, D5.0, D6.0, D7.0, D8.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D4.0, D7.0, D8.0
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D8.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D4.0, D7.0, D8.0, D9.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D8.0, D9.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D2.0, D5.0, D8.0



<b>ARTS, MEDIA, AND ENTERTAINMENT</b>	<b>PATHWAYS</b>			
	<b>A. Design, Visual, and Media Arts</b>	<b>B. Performing Arts</b>	<b>C. Production and Managerial Arts</b>	<b>D. Game Design and Integration</b>
subject, demonstrating understanding of the subject under investigation.				
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D6.0, D8.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D8.0,
11-12.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0	D1.0, D6.0, D8.0
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST</b>				
11-12.1. Write arguments focused on discipline-specific content.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D8.0
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D5.0, D7.0, D8.0
11-12.3. Incorporate narrative elements effectively into arguments and informative/explanatory texts.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D2.0, D5.0, D7.0, D8.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate tot task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D1.0, D2.0, D4.0, D6.0, D7.0, D8.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D1.0, D5.0, D8.0, D9.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D1.0, D5.0, D6.0, D8.0, D9.0, D10.0

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D1.0, D4.0, D7.0, D8.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D10.0
11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D1.0, D8.0
11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C5.0	D1.0, D4.0, D6.0, D8.0
<b>MATHEMATICS</b>				
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>				
Interpret the structure of expressions 1. Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret <math>P(1+r)^t</math> as the product of <math>P</math> and a factor not depending on <math>P</math>.</i>		B4.0, B5.0		D3.0, D5.0, D6.0, D10.0
2.1 Apply basic factoring techniques to second- and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials. (CA Standard Algebra I - 11.0)				D3.0
<i>Write expressions in equivalent forms to solve problems</i>				

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
<p>3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*</p> <p>a. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.</p> <p>c. Use the properties of exponents to transform expressions for exponential functions. For example the expression <math>1.15^t</math> can be rewritten as <math>(1.15^{1/12})^{12t} = 1.012^{12t}</math> to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</p> <p>d. Prove simple laws of logarithms. (CA Standard Algebra II - 11.0)</p> <p>e. Use the definition of logarithms to translate between logarithms in any base. (CA Standard Algebra II - 13.0)</p> <p>f. Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values. (CA Standard Algebra 11- 14.0)</p>				D3.0, D5.0
<p>4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.</p>		B9.0		D3.0
<b>Algebra – A-CED – Creating Equations</b>				
<i>Create equations that describe numbers or relationships</i>				
<p>1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.</p> <p>1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)</p>	A1.0			
<p>2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p>	A1.0			
<p>3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</p>	A1.0			

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .	A1.0			
<b>Functions – F-IF – Interpreting Functions</b>				
<i>Understand the concept of a function and use function notation</i>				
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .	A3.0	B2.0, B9.0	C1.0	D3.0
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	A3.0	B2.0, B4.0		D3.0
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$ , $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$ .	A3.0	B2.0, B4.0		D3.0, D10.0
<i>Interpret functions that arise in applications in terms of the context</i>				
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A3.0, A5.0, A8.0	B2.0, B4.0		D3.0, D10.0
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.	A8.0	B2.0, B4.0		D3.0, D6.0, D10.0
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A8.0	B2.0, B4.0		D3.0, D10.0

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>				
1. Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	A1.0, A2.0			D3.0, D5.0, D10.0
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	A2.0			D3.0, D5.0, D10.0
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	A2.0			D3.0, D5.0, D7.0, D10.0
<b>Geometry – G-CO – Congruence</b>				
<i>Experiment with transformations in the plane</i>				
1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	A4.0		C2.0, C4.0	D3.0, D10.0
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	A4.0		C2.0, C4.0	
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	A4.0	B3.0	C2.0, C4.0	D3.0, D10.0
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>				
<i>Explain volume formulas and use them to solve problems</i>				
1. Give an informal argument for the formulas for the circumference of a Circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection		B3.0	C1.0	

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
arguments, Cavalieri's principle, and informal limit arguments.				
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.		B3.0	C1.0	
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.			C1.0	
<i>Visualize relationships between two-dimensional and three-dimensional objects</i>			C1.0	
4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three dimensional objects generated by rotations of two-dimensional objects.	A2.0	B3.0	C1.0	
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	A2.0		C1.0	
<b>Geometry – G-MG – Modeling with Geometry</b>				
<i>Apply geometric concepts in modeling situations</i>				
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	A2.0, A8.0	B1.0, B6.0, B8.0	C6.0	D3.0, D4.0, D10.0
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A8.0	B1.0, B6.0, B8.0	C6.0	
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A1.0, A8.0	B1.0, B6.0, B8.0	C6.0	D3.0, D4.0, D10.0
<b>Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry</b>				
<i>Understand similarity in terms of similarity transformations</i>				
1. Verify experimentally the properties of dilations given by a center and a scale factor: <ul style="list-style-type: none"> <li>a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.</li> <li>b. The dilation of a line segment is longer or shorter in the ratio given the scale factor.</li> </ul>			C1.0	

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
<i>Prove theorems involving similarity</i>				
4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.			C1.0	
5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.		B2.0	C1.0	D3.0, D10.0
<i>Apply trigonometry to general triangles</i>				
9. (+) Derive the formula $A = 1/2 ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.			C1.0	
10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.			C1.0	D3.0, D10.0
11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).			C1.0	D3.0, D10.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>				
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>				
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A7.0	B8.0	C5.0	D3.0, D7.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A7.0	B8.0	C5.0	D6.0, D7.0
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A7.0	B8.0	C5.0	D7.0
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A7.0		C5.0	D6.0, D7.0
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>				
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal,	A7.0	B8.0	C5.0	D6.0

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
and conditional relative frequencies). Recognize possible associations and trends in the data.				
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	A7.0		C5.0	
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>				
<i>Calculate expected values and use them to solve problems</i>				
1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.			C1.0, C6.0	D3.0
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.			C1.0	D3.0
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.			C1.0	
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?			C1.0	
<i>Use probability to evaluate outcomes of decisions</i>				



ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant. b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	A7.0		C1.0, C6.0	
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).			C1.0	
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).			C1.0	
<b>SCIENCE</b>				
<b>Scientific and Engineering Practices – SEP</b>				
1. Asking questions (for science) and defining problems (for engineering)	A1.0, A5.0		C1.0, C5.0	D3.0, D6.0, D7.0
2. Developing and using models	A2.0, A3.0, A7.0, A8.0			D3.0, D6.0, D7.0, D10.0
3. Planning and carrying out investigations	A4.0, A5.0			
4. Analyzing and interpreting data	A4.0, A8.0	B7.0	C2.0, C3.0, C5.0	D3.0, D5.0, D6.0, D7.0, D10.0
5. Using mathematics and computational thinking	A2.0, A7.0, A8.0		C6.0	D3.0, D5.0, D6.0, DE7.0
6. Constructing explanations (for science) and designing solutions (for engineering)	A2.0, A8.0	B8.0		D1.0, D3.0, D5.0, D6.0
7. Engaging in argument from evidence		B8.0	C1.0, C7.0	D3.0, D5.0, D6.0, D7.0, D8.0, D10.0
8. Obtaining, evaluating, and communicating information	A1.0, A4.0	B8.0	C1.0, C7.0	
<b>Crosscutting Concept – CC</b>				
1. Patterns	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C4.0	

ARTS, MEDIA, AND ENTERTAINMENT	PATHWAYS			
	A. Design, Visual, and Media Arts	B. Performing Arts	C. Production and Managerial Arts	D. Game Design and Integration
<b>Physical Sciences – PS</b>				
PS1: Matter and Its Interactions				D3.0, D10.0
PS1.A: Structure and Properties of Matter	A1.0			D3.0, D10.0
PS2: Motion and Stability: Forces and Interactions				
PS2.A: Forces and Motion		B1.0, B5.0, B7.0	C1.0	D3.0
PS2.B: Types of interactions		B2.0, B5.0, B6.0, B7.0	C1.0, C5.0	
PS2.C: Stability and Instability in Physical Systems	A1.0, A2.0	B1.0, B5.0, B7.0, B8.0	C1.0	
PS3: Energy				
PS3.A: Definitions of Energy			C1.0	
PS3.B: Conservation of Energy and Energy Transfer			C1.0, C4.0	D3.0
PS3.C: Relationship Between Energy and Forces			C1.0	D3.0, D5.0, D10.0
PS4: Waves and Their Applications in Technologies for Information Transfer				
PS4 C: Information Technologies and Instrumentation	A1.0, A2.0, A3.0, A5.0, A7.0, A8.0	B6.0	C5.0, C7.0	D2.0, D3.0, D5.0, D10.0
<b>Life Sciences – LS</b>				
LS1: From Molecules to Organisms: Structures and Processes				
LS1.A: Structure and Function	A1.0	B1.0	C1.0, C3.0	
LS1.B: Growth and Development of Organisms				
LS1.C: Organization for Matter and Energy Flow in Organisms	A2.0		C2.0	
LS1.D: Information Processing	A1.0			
LS2: Ecosystems: Interactions, Energy, and Dynamics				
LS2.A: Interdependent Relationships in Ecosystems	A4.0		C1.0, C5.0	
LS2.D: Social Interactions and Group Behavior		B1.0	C5.0	
LS4: Biological Evolution: Unity and Diversity				
LS4.A: Evidence of Common Ancestry and Diversity	A3.0			
LS4.B: Natural Selection	A3.0, A5.0			
LS4.C: Adaptation				
LS4.D: Biodiversity and Humans	A1.0	B1.0, B4.0, B5.0		

<b>ARTS, MEDIA, AND ENTERTAINMENT</b>	<b>PATHWAYS</b>			
	<b>A. Design, Visual, and Media Arts</b>	<b>B. Performing Arts</b>	<b>C. Production and Managerial Arts</b>	<b>D. Game Design and Integration</b>
<b>Engineering, Technology, and the Applications of Science – ETS</b>				
ETS1: Engineering Design				
ETS1.A: Defining and Delimiting an Engineering Problem	A2.0, A3.0, A4.0, A5.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0	C1.0, C2.0	D3.0, D5.0, D10.0
ETS1.B: Developing Possible Solutions	A2.0, A3.0, A4.0, A5.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0	C1.0, C2.0	D5.0, D10.0
ETS1.C: Optimizing the Design Solution	A2.0, A3.0, A4.0, A5.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0	C1.0, C2.0	D10.0
ETS2: Links Among Engineering, Technology, Science, and Society				
ETS2.A: Interdependence of Science, Engineering, and Technology	A2.0, A3.0, A4.0, A5.0, A7.0, A8.0	B2.0, B3.0, B5.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C5.0, C7.0	D1.0, D3.0, D5.0, D7.0, D10.0
ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A1.0, A2.0, A3.0, A4.0, A5.0, A7.0, A8.0	B2.0, B3.0, B5.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C5.0, C7.0	D1.0, D10.0
<b>HISTORY/SOCIAL SCIENCE</b>				
<b>Principles of American Democracy and Economics – AD</b>				
12.8 Students evaluate and take and defend positions on the influence of the media on American political life.	A1.0, A2.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	C7.0	D1.0, D7.0, D8.0
12.8.2. Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.	A3.0			
12.10 Students formulate questions about and defend their analyses of tensions within our constitutional democracy and the importance of maintaining a balance between the following concepts: majority rule and individual rights; liberty and equality; state and national authority in a federal system; civil disobedience and the rule of law; freedom of the press and the right to a fair trial; the relationship of religion and government.	A1.0, A2.0, A3.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	C7.0	
<b>Principles of Economics – PE</b>				
12.1 Students understand common economic terms and concepts and economic reasoning.	A5.0			D6.0, D7.0
12.2 Students analyze the elements of America's market economy in a global setting.	A5.0			D1.0, D6.0, D7.0

<b>ARTS, MEDIA, AND ENTERTAINMENT</b>	<b>PATHWAYS</b>			
	<b>A. Design, Visual, and Media Arts</b>	<b>B. Performing Arts</b>	<b>C. Production and Managerial Arts</b>	<b>D. Game Design and Integration</b>
12.2.1. Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.				D7.0
12.2.2. Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.				D7.0
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.				D7.0
12.3 Students analyze the influence of the federal government on the American economy.	A5.0			D6.0
12.4 Students analyze the elements of the U.S. labor market in a global setting.	A5.0			D1.0, D7.0
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.				D7.0
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.	A5.0			D1.0, D7.0
<b>U.S. History and Geography – US</b>				
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.	A3.0, A6.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C2.0, C5.0, C7.0	D1.0
11.5.2. Analyze the international and domestic events, interests, and philosophies that prompted attacks on civil liberties, including the Palmer Raids, Marcus Garvey's "back-to-Africa" movement, the Ku Klux Klan, and immigration quotas and the responses of organizations such as the American Civil Liberties Union, the National Association for the Advancement of Colored People, and the Anti-Defamation League to those attacks.	A3.0			
11.5.5. Describe the Harlem Renaissance and new trends in literature, music, and art, with special attention to the work of writers (e.g., Zora Neale Hurston, Langston Hughes).	A3.0	B7.0		

<b>ARTS, MEDIA, AND ENTERTAINMENT</b>	<b>PATHWAYS</b>			
	<b>A. Design, Visual, and Media Arts</b>	<b>B. Performing Arts</b>	<b>C. Production and Managerial Arts</b>	<b>D. Game Design and Integration</b>
11.5.6. Trace the growth and effects of radio and movies and their role in the worldwide diffusion of popular culture.	A3.0	B7.0		
11.8 Students analyze the economic boom and social transformation of post-World War II America.	A2.0, A3.0, A6.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0, B8.0	C7.0	D1.0, D7.0
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.	A2.0, A3.0, A6.0, A8.0	B1.0, B4.0, B5.0, B6.0, B7.0, B8.0	C2.0, C5.0, C7.0	D1.0, D6.0, D7.0, D8.0
11.11.3. Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.	A3.0			
<b>World History, Culture, and Geography – WH</b>				
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.	A3.0	B7.0		
10.6 Students analyze the effects of the First World War.	A3.0, A6.0	B1.0, B3.0, B4.0, B7.0		
10.8 Students analyze the causes and consequences of World War II.				
10.8.5. Analyze the Nazi policy of pursuing racial purity, especially against the European Jews; its transformation into the Final Solution; and the Holocaust that resulted in the murder of six million Jewish civilians.	A3.0			
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A2.0, A3.0, A8.0	B5.0, B6.0, B7.0	C1.0, C2.0, C5.0, C7.0	D1.0, D7.0, D8.0

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Arts, Media, and Entertainment**

Keith Edmonds, Administrator, California Department of Education  
Jack Mitchell, Education Consultant, California Department of Education

#### *Standards Review Team*

Kris McClung, Instructor, Coronado Unified School District  
Paul Minnicucci, Executive Director, Nevada County Television  
Dain Olsen, Instructor, Los Angeles Unified School District

#### *Standards Writing Team*

Kristine Alexander, Executive Director, The California Arts Project  
Brandii Grace, Professional Game Designer and Postsecondary Educator  
Aureliano Nava, Technology Coordinator, Los Angeles Unified School District  
Jennifer Nelson, Instructor, South El Monte ROP  
Michael Ploor, National Board Certified Teacher, Career and Technical Education,  
Hillsborough County School District, Tampa, Florida  
Steven Scanlan, Instructor, Los Angeles Unified School District  
Scott Spector, Instructor, Los Angeles Unified School District  
Shawn Sullivan, Instructor, Elk Grove Unified School District  
Carter Tatge, STEM Fuse  
Chuck Wade, Instructor, Petaluma Unified School District

#### *Common Core Alignment Team*

Rachelle Barkus, Instructor, Modesto City Schools  
Kent Braithwaite, Instructor, Conejo Valley Unified School District  
Tim Cook, Instructor, Pomona Unified School District  
Debbie Hawks, Instructor, Pasadena Unified School District  
Simon Moore, Instructor, Coachella Valley Unified School District  
Ashley Sarver, Instructor, School for Independent Learners

**Table of Contents**  
**Building and Construction Trades**

**Sector Description** ..... 1

Knowledge and Performance Anchor Standards ..... 2

    1.0 Academics ..... 2

    2.0 Communications ..... 2

    3.0 Career Planning and Management ..... 2

    4.0 Technology ..... 3

    5.0 Problem Solving and Critical Thinking ..... 3

    6.0 Health and Safety ..... 3

    7.0 Responsibility and Flexibility ..... 4

    8.0 Ethics and Legal Responsibilities ..... 5

    9.0 Leadership and Teamwork ..... 5

    10.0 Technical Knowledge and Skills ..... 5

    11.0 Demonstration and Application..... 6

Pathway Standards ..... 7

    A. Cabinetry, Millwork, and Woodworking Pathway..... 7

    B. Engineering and Heavy Construction Pathway ..... 11

    C. Mechanical Systems Installation and Repair Pathway ..... 15

    D. Residential and Commercial Construction Pathway..... 19

Academic Alignment Matrix..... 24

Appendix: CTE Model Curriculum Standards Contributors ..... 33

References ..... 33



## **Building and Construction Trades *Sector Description***

This sector provides a foundation in the Building and Construction Trades industry for secondary students in California. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation in the Building and Construction Trades industry. The sector encompasses four career pathways: Cabinetry, Millwork, and Woodworking; Engineering and Heavy Construction; Mechanical Systems Installation and Repair; and Residential and Commercial Construction. These pathways emphasize processes, systems, and the way in which structures are built. The knowledge and skills are acquired in a sequential, standards-based pathway program that integrates hands-on, project-based, and work-based instruction. Standards included in the Building and Construction Trades sector are designed to prepare students for technical training, postsecondary education, and entry to a career.



## **Building and Construction Trades Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Building and Construction Trades academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Building and Construction Trades sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.  
(Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Building and Construction Trades sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Building and Construction Trades sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Building and Construction Trades sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

- 6.2 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.3 Set up a work area, or shop, to avoid potential health concerns and safety hazards, including but not limited to electrical (shock), wires (tripping), fumes (lung health), noise (hearing loss), fire (burns), and so forth, incorporating ergonomics.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).
- 6.8 Report hazards found on the job site to supervisor/teacher.
- 6.9 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.10 Maintain proper use of safety apparel at all times, including but not limited to, eye protection, hearing protection, skin protection, head protection, footwear and protection from airborne particulate matter.
- 6.11 Comply with the safe handling, storage and disposal of chemicals, materials and adhesives in accordance with local, state, and federal safety and environmental regulations (OSHA, Environmental Protection Agency [EPA], Hazard Communication [HazCom], Material Safety Data Sheets [MSDS], etc.).
- 6.12 Demonstrate the proper care and safe use of hand, portable and stationary power tools.

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Building and Construction Trades sector workplace environment and community settings.

(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Building and Construction Trades sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Building and Construction Trades industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Building and Construction Trades sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Building and Construction Trades sector laws and practices.

## **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Building and Construction Trades sector issues and problems.

## **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Building and Construction Trades sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Building and Construction Trades sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Building and Construction Trades sector.
- 10.3 Construct projects and products specific to the Building and Construction Trades sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Demonstrate the basic care, proper maintenance, and use of hand, portable, and stationary tools related to the Building and Construction trades.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Building and Construction Trades anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organizations.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Building and Construction Trades sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Building and Construction Trades sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Building and Construction Trades Pathway Standards**

### **A. Cabinetry, Millwork, and Woodworking Pathway**

The Cabinetry, Millwork, and Woodworking pathway provides learning opportunities for students interested in preparing for careers in cabinet construction, millwork, finish carpentry, and furniture making for both production and custom products.

Sample occupations associated with this pathway:

- ◆ Cabinetmaker
- ◆ Cabinet Installer
- ◆ Woodworking Machinery Operator
- ◆ Custom Millwork Project Estimator
- ◆ Woodworking Engineer/Drafter (CAD)

A1.0 Demonstrate competence in planning, design, layout, and technical drawing interpretation for practical use in cabinetmaking and millworking.

A1.1 Identify common sizes in relation to furniture and cabinets.

A1.2 Describe the relationship between the function and form of a cabinet.

A1.3 Calculate board, square, and linear feet.

A1.4 Estimate material costs.

A1.5 Apply design elements: shapes, textures, lines, and colors to create functional and attractive cabinets, furniture, and millwork.

A1.6 Apply principles of design, harmony, repetitions, balance, and proportion to create functional and attractive cabinets, furniture, and millwork.

A1.7 Read and interpret technical drawings.

A1.8 Sketch a project using manual drawing techniques.

A1.9 Use drafting tools to create a pictorial and working drawing for a basic cabinet.

A2.0 Differentiate between the various furniture and cabinet styles used in the cabinet and furniture industry.

A2.1 Identify various cabinet styles and list characteristics of traditional, provincial, and contemporary designs.

A2.2 Identify various kitchen, bath, and utility cabinet components.

A2.3 Explain the progress of cabinetry and furniture styles from the seventeenth century to today.

A3.0 Interpret and apply information to develop a bill of materials, estimate the cost of materials, and develop a plan of procedures to complete a project.

A3.1 List the sequence of cutting procedures, assembly, and finishing steps.

A3.2 Evaluate an existing bill of materials for accuracy.

A3.3 Determine the cost of materials needed for a cabinet or furniture project.

A3.4 Optimize available materials from a cutting diagram.

- A3.5 Compare and contrast the cost of a specific project using different materials.
- A3.6 Develop a materials list, cut list, and cost estimate from a working drawing for a specific cabinet project.
- A4.0 Demonstrate proper selection and use of woodworking tools.
  - A4.1 Demonstrate the accurate use of common measuring and layout tools.
  - A4.2 Select the proper layout tools for specific tasks.
  - A4.3 Select the proper cutting tools for specific operations (e.g., straight cuts, curves, drilling holes).
  - A4.4 Select the most appropriate blade for a given operation.
  - A4.5 Select the proper boring tools for specific operations.
  - A4.6 Select the proper hand-shaping tools for specific operations.
  - A4.7 Select proper clamping tools for specific operations.
- A5.0 Identify wood products and materials used in the furniture and cabinetmaking industry and describe their characteristics and uses.
  - A5.1 Define the difference between a hardwood and softwood.
  - A5.2 Identify several different species of hardwood and their characteristics that are common to the cabinetmaking and millwork industry.
  - A5.3 Identify several different species of softwood and their characteristics that are common to the cabinetmaking and millwork industry.
  - A5.4 Identify common defects found in wood and list possible solutions.
  - A5.5 Identify and be able to differentiate panel products and their uses in the cabinetmaking industry.
  - A5.6 Describe the cutting and handling techniques used for sheet goods.
  - A5.7 Compare and contrast the advantages and disadvantages of sheet goods versus solid wood stock.
  - A5.8 Identify standard sizes and grades of various laminates.
  - A5.9 Describe how the expansion and contraction of solid wood affects the design of joinery used in furniture and cabinet construction.
  - A5.10 Identify the proper adhesive required for applying laminate.
  - A5.11 Identify standard sizes and grades of various veneers.
  - A5.12 Identify the proper adhesive(s) required for applying veneers.
  - A5.13 Identify the different types of pattern matching in veneers.
- A6.0 Compare and contrast the advantages and disadvantages of using laminates versus using veneers.
  - A6.1 Demonstrate a working knowledge of joinery, fasteners, and adhesives.
  - A6.2 Define the purposes for metallic fasteners in furniture and cabinetmaking.
  - A6.3 Select the proper metallic fasteners for specific applications.
  - A6.4 Demonstrate the proper use of metallic fasteners for specific applications.

- A6.5 Compare and contrast joints commonly used in the cabinetmaking and millworking industries (i.e., strength, appearance, and ease of construction).
  - A6.6 Determine the appropriate application of a variety of joinery techniques, including dowels, biscuits, pocket holes, and mortise and tenon
  - A6.7 Identify characteristics of adhesives that affect the assembly time, cure time, and strength of the product.
  - A6.8 Select the proper adhesive(s) to construct wood joints used in furniture or cabinets.
  - A6.9 Demonstrate initial assembly and dry clamping procedures.
  - A6.10 Demonstrate the proper use and application of adhesives.
  - A6.11 Demonstrate the proper cleanup procedures for specific adhesives.
  - A6.12 Select the correct type of wood joint used for a specific application and material.
  - A6.13 Demonstrate the ability to construct a variety of wood joints (i.e. butt, miter, compound miter, half lap, mortise and tenon).
- A7.0 Demonstrate competence in various construction processes in the cabinetmaking, furniture making, and millworking industries.
    - A7.1 Square and surface a board to a specific size.
    - A7.2 Demonstrate common case construction.
    - A7.3 Demonstrate common frame and panel construction.
    - A7.4 Construct a case with a face frame using appropriate construction techniques.
    - A7.5 Construct a frameless case using appropriate construction techniques.
    - A7.6 Construct a cabinet drawer using appropriate construction techniques.
    - A7.7 Construct a cabinet door using appropriate construction techniques.
    - A7.8 Demonstrate the use of a jig, template, or fixture in a production project.
    - A7.9 Use appropriate methods and tools to check the accuracy of a project.
    - A7.10 Demonstrate the use of a mass production technique (i.e., parts duplication and assembly processes).
    - A7.11 Lay out, install, and adjust the appropriate drawer hardware to include drawer slides and pulls.
    - A7.12 Lay out, install, and adjust the appropriate door hardware to include European and standard hinges.
    - A7.13 Apply a plastic laminate to a surface using appropriate adhesive and trim to fit.
    - A7.14 Use the appropriate adhesives and fasteners to install different types of trim, moldings, or other edge treatments.
- A8.0 Utilize appropriate abrasives to prepare a project for a specific finish.
    - A8.1 Select the proper abrasive for shaping and smoothing materials.
    - A8.2 Select the proper grit sizes and sequences for shaping and smoothing operations.



- A8.3 Demonstrate proper selection, application, and cleaning methods for various types of filler materials.
- A8.4 Properly prepare a surface for finishing.
- A9.0 Understand finishes and when to apply paint, stains, sealers, varnishes, and catalyzed finishes, including water and oil based finishes.
  - A9.1 Demonstrate proper selection and application methods of different types of stains for a specific application.
  - A9.2 Demonstrate cleaning procedure for various types of stains.
  - A9.3 Select the proper type of sealer and finish coat for a specific application.
  - A9.4 Demonstrate proper application methods for different types of sealers and finish coats.
  - A9.5 Demonstrate cleaning procedures for various types of sealer and finish coats.
  - A9.6 Apply a suitable finish to a specific cabinet or millwork project.
- A10.0 Demonstrate proper techniques for cabinet installation.
  - A10.1 Transport a project from one location to another without damage.
  - A10.2 Lay out a cabinet installation according to a floor plan.
  - A10.3 Create and adjust a layout to plumb, square, and level.
  - A10.4 Install a base and upper cabinet.
  - A10.5 Scribe a cabinet to fit a corner or against an irregular wall surface.
- A11.0 Identify the advantages and disadvantages for various countertop materials.
  - A11.1 Identify a variety of materials used for kitchen and bath countertops and list their advantages and disadvantages.
  - A11.2 Describe the methods for attaching different countertops to a cabinet.
  - A11.3 Install of a variety of countertop materials using appropriate fastening methods.
  - A11.4 Use a cut-in template for the installation of sink, faucets, cooktop, and other fixtures.

## **Building and Construction Trades Pathway Standards**

### **B. Engineering and Heavy Construction Pathway**

The Engineering and Heavy Construction pathway provides learning opportunities for students interested in preparing for careers in engineering and heavy industrial construction (roads, highways, subdivisions). The pathway includes instruction in the way in which these structures are built (Class A California License).

Sample occupations associated with this pathway:

- ◆ Cement Mason
- ◆ Heavy Equipment Operator
- ◆ Iron Worker
- ◆ Welder
- ◆ Civil Engineer

#### **B1.0 Understand soil characteristics and properties.**

- B1.1 Understand the importance of knowing a sites water table and its effect on site preparation.
- B1.2 Understand the importance for collecting and testing soil samples.
- B1.3 Read and interpret a soils report.
- B1.4 Demonstrate the proper procedures to collect, prepare, and test soil samples.
- B1.5 Understand the importance and impact of environmental concerns and regulations in relation to building site preparation.
- B1.6 Describe various geologic structures and land forms and determine the best approach for preparing a site for construction.
- B1.7 Match types of stakes to their correct usage and explain markings on grade stakes and benchmark (BM) stakes.

#### **B2.0 Demonstrate the use of survey and mapping equipment.**

- B2.1 Apply conventional engineering and heavy construction measurement processes accurately (e.g., laser transits, laser levels, geographic information system [GIS] instruments) for surveying and plan development.
- B2.2 Use conventional engineering and heavy construction mathematical functions to calculate on-site preparation and site development and improvement materials.
- B2.3 Identify and apply appropriate grade calculations from site plans.
- B2.4 Demonstrate the ability to use survey equipment.
- B2.5 Perform a level survey.
- B2.6 Conduct a boundary survey and maintain proper field notes.
- B2.7 Read and analyze a topographic contour map.
- B2.8 Generate topographic contours from field notes.

- B3.0 Demonstrate a basic understanding of grading and drainage.
  - B3.1 Define selected terms associated with plan reading, grade setting, and drainage.
  - B3.2 Distinguish soil types and land cover as related to runoff, precipitation, drainage, and seepage.
  - B3.2 Recognize non-point-source (NPS) pollution, erosion, and erosion control methods.
  - B3.3 List sources of NPS and their possible impact related to water quality.
  - B3.4 Prepare site plan and grading and drainage plan.
  
- B4.0 Demonstrate understanding of water and wastewater systems.
  - B4.1 Explain and diagram the water cycle.
  - B4.2 Describe drinking-water sources, contaminants, disposal options, regulations, and basic treatment methods.
  - B4.3 Perform basic calculations for sizing pipe and pumps for the movement of water.
  - B4.4 Define gravity and forced systems.
  
- B5.0 Identify common types of heavy equipment and describe their unique features and uses.
  - B5.1 Describe the basic hitch configurations and their proper connections.
  - B5.2 Describe the basic load-handling safety practices.
  - B5.3 Demonstrate proper use of American National Standards Institute (ANSI) hand signals.
  - B5.4 Describe basic safety precautions taken into consideration while operating heavy equipment.
  - B5.5 Identify the common operating controls found on various pieces of heavy equipment.
  - B5.6 Identify and describe the use of slings and common rigging hardware.
  - B5.7 Perform basic prestart inspection, startup, operational movement, and shutdown for heavy equipment under the guidance of an instructor.
  - B5.8 Identify and explain the different types of construction cranes.
  - B5.9 Describe crane operations and safety.
  - B5.10 Demonstrate good lifting practices and proper rigging.
  
- B6.0 Demonstrate the operation of heavy equipment.
  - B6.1 Operate a tractor mower.
  - B6.2 Operate a forklift.
  - B6.3 Operate a tractor with a box blade.
  - B6.4 Operate a backhoe.
  - B6.5 Operate a grader.
  - B6.6 Operate a dump truck.
  
- B7.0 Demonstrate basic concrete maintenance and repair methods.
  - B7.1 Identify and use appropriate concrete tools.

- B7.2 Construct forms for pouring concrete.
  - B7.3 Understand the use and need for reinforcing concrete.
  - B7.4 Mix concrete.
  - B7.5 Place concrete.
  - B7.6 Finish concrete.
- B8.0 Understand project management procedures and processes as they occur in an engineering and heavy construction project.
- B8.1 Understand the roles in heavy construction of design engineers, estimators, superintendents, project managers, foremen, operators/drivers, administrators, and inspectors.
  - B8.2 Demonstrate understanding of contract administration (e.g., invoicing vendors, subcontractors), including the “draw and voucher” accounting/record system used in construction project management.
  - B8.3 Estimate the cost of supplies and materials for an engineering and heavy construction project.
  - B8.4 Plan all construction phases, including subcontractor schedules, clearing, rough grading, wet and dry utilities, fine grading, concrete, asphalt, inspections, and job closeout.
  - B8.5 Understand the layout of utilities in regards to underground electrical, sewer, water, phone, cable, etc.
  - B8.6 Demonstrate understanding of storm drainage, retention ponds, wastewater treatment, etc.
  - B8.7 Understand the importance of hydroelectric, solar, wind, and alternative energy resources in the development of California infrastructure.
  - B8.8 Construct projects accurately from commercial specifications and technical drawings ensuring compliance with state and local building codes.
  - B8.9 Solve common construction problems (e.g., grading, drainage) by using commercial construction codes, building standards, and appropriate mathematical calculations.
- B9.0 Describe the value and necessity of practicing occupational safety in the engineering and heavy construction laboratory or shop.
- B9.1 Know the rules and responsibilities of the various governmental safety agencies and their impact on engineering and heavy construction.
  - B9.2 Understand the importance of safety and safe work practices (e.g., fire safety, protective clothing) in the welding phases of engineering and heavy construction and the safe operation of heavy equipment (e.g., earth movers, graders, bulldozers).
  - B9.3 Demonstrate the safe use of scaffolding and ladders.
  - B9.4 Demonstrate the importance of work site safety as it pertains to hazardous waste disposal and procedures for containment of toxic and hazardous materials.

- B10.0 Recognize the variety of building phases, systems, and techniques used in engineering and heavy construction.
  - B10.1 Understand the development of building plans and schedules using processes common to engineering and heavy construction.
  - B10.2 Know the appropriate processes and materials in architectural design, project development, and engineering and heavy construction (e.g., structural, electrical, mechanical, and finish phases).
  
- B11.0 Understand the impact of financial, technical, and environmental trends on the past and future of the construction industry.
  - B11.1 Understand significant historical trends in engineering and heavy construction technology.
  - B11.2 Understand environmental regulations that influence engineering and heavy construction projects.
  - B11.3 Demonstrate understanding of California Environmental Quality Act (CEQA) and Environmental Impact Reports (EIRs) as they apply to heavy construction, including highway and bridge projects.
  - B11.4 Identify local and state building codes as appropriate to heavy construction, especially as it relates to highway and bridge projects.

## **Building and Construction Trades Pathway Standards**

### **C. Mechanical Systems Installation and Repair Pathway**

The Mechanical Systems Installation and Repair pathway provides students with competencies fundamental for preparing for employment or advanced training in heating, ventilation, air-conditioning (HVAC) and appliance installation, maintenance, and repair. The pathway includes preparation for a Class C California License and EPA certification.

Sample occupations associated with this pathway:

- ◆ HVAC Installation and Maintenance Specialist
- ◆ Plumbing Installer
- ◆ Sheet Metal Fabricator
- ◆ Mechanical Engineer/Technician
- ◆ Mechanical Construction Field Manager

- C1.0 Demonstrate an understanding of the methods and devices used to improve air quality and comfort.
- C1.1 Explain the historical development and principals of air-conditioning and refrigeration.
  - C1.2 Describe the differences between air-conditioning and refrigeration.
  - C1.3 Explain the impact of heating, air-conditioning, and refrigeration on society.
  - C1.4 Explain the differences in comfort applications (cooling/heating air) and process applications (improving air quality).
  - C1.5 Describe the benefits of conditioned air and environments.
  - C1.5 Explain the methods and devices used to improve air quality.
  - C1.6 List several situations in which the improvement of air quality is essential.
  - C1.7 Debate current issues and concerns, such as indoor air quality, the ozone layer, and computer technology, in the heating, air-conditioning, and refrigeration industry and in the environment and explain their future ramifications.
  - C1.8 Describe the purpose and importance of local, state, and federal heating, air-conditioning, and refrigeration codes and standards.
  - C1.9 Identify various HVAC professional organizations, associations, and societies, and explain their purposes.
- C2.0 Describe the basic components and concepts of heating, air-conditioning, and refrigeration.
- C2.1 Demonstrate a working knowledge of the four major components of a refrigeration system.
  - C2.2 Identify and explain the characteristics of vapor compression refrigeration.

- C2.3 Explain the advantages and disadvantages of the different refrigerants used in a vapor compression system.
- C2.4 Distinguish between split systems and package systems.
- C3.0 Demonstrate an understanding of the scientific theories and physical properties of heat and matter.
  - C3.1 Describe and explain freezing point, critical temperature, and absolute zero.
  - C3.2 Describe matter and heat and their relation to heat transfer.
  - C3.3 Compare and contrast the characteristics of heat, humidity, and temperature.
  - C3.4 Distinguish between, and explain the characteristics of, the three different states of matter.
  - C3.5 Define the differences between latent heat and sensible heat.
- C4.0 Analyze the effects and reactions of fluids, pressures, and temperatures on refrigerants.
  - C4.1 Summarize the refrigeration cycle.
  - C4.2 Define and explain “fluid,” “pressure,” and “temperature.”
  - C4.3 Utilize pressure and temperature charts.
  - C4.4 Demonstrate ways to measure and calculate absolute and gauge pressures according to industry standards.
  - C4.5 Identify and explain the classifications, uses, and properties of different refrigerants.
  - C4.6 Explain how fluids react and flow in a closed system versus an open system.
  - C4.7 Identify and classify the color-coding of refrigerant cylinders.
  - C4.8 Practice proper methods of storing, transferring, and recovering refrigerants.
  - C4.9 Summarize the effects of contaminants or using an improper refrigerant in a system.
- C5.0 Demonstrate skills necessary to fabricate and service the tubing, piping, and fittings utilized in accordance with accepted industry standards.
  - C5.1 Understand the basic codes in the Uniform Plumbing Codes (UPC).
  - C5.2 Select materials and fittings for use in piping a system.
  - C5.3 Demonstrate techniques for cutting, deburring, and bending tubing.
  - C5.4 Connect tubing utilizing proper fittings and connection methods.
  - C5.5 Demonstrate the ability to identify and select the appropriate materials for the soldering and brazing of tubing.
  - C5.6 Explain the purposes and procedures for protecting piping materials and fittings from effects of heat.
  - C5.7 Demonstrate the ability to braze and/or solder tubing, including aluminum.
  - C5.8 Silver-braze bras, steels, and copper.

- C5.9 Fabricate and leak test the piping, tubing, and connections of a heating, air-conditioning, and/or refrigeration unit.
- C6.0 Demonstrate the skills necessary to service, maintain, and repair heating, air-conditioning, and refrigeration system components and accessories.
  - C6.1 Explain the types, operation, use, and maintenance requirements of different compressors (e.g., reciprocating, rotary, screw, and scroll).
  - C6.2 Analyze the operating condition of a compressor.
  - C6.3 Explain the types, operation, use, and maintenance requirements of condensers and evaporators.
  - C6.4 Explain the types, operation, use, and maintenance requirements of different metering devices.
  - C6.5 Evaluate the performance of a metering device.
  - C6.6 Explain the methods of compression, lubrication, and compressor loading and unloading.
  - C6.7 Analyze and evaluate the proper operating condition of a compressor.
  - C6.8 Locate and explain the uses of refrigerant flow accessories.
  - C6.9 Locate and explain the uses of system accessories (e.g., receivers, solenoids, valves, heat exchangers, filters, and separators).
  - C6.10 Analyze, troubleshoot, and correct mechanical problems in a heating, air-conditioning, and refrigeration system.
  - C6.11 Evaluate system performance.
- C7.0 Demonstrate a practical knowledge of basic electricity and skills necessary to service and maintain the electrical components of heating, air-conditioning, and refrigeration equipment.
  - C7.1 Explain the principles and properties of electricity.
  - C7.2 Compare and contrast single-phase versus three-phase electrical distribution.
  - C7.3 Define and distinguish amps, ohms, volts, and watts.
  - C7.4 Demonstrate the ways to measure watts, voltage, amperage, and resistance using appropriate instruments while adhering to industry standards.
  - C7.5 Illustrate and summarize a wiring schematic diagram for a heating or cooling system.
  - C7.6 Analyze and troubleshoot the protection devices, such as fuses and breakers, in an electrical system.
  - C7.7 Interpret charts and tables from the National Electrical Codes (NEC).
- C8.0 Troubleshoot electrical control systems, motors, and their components.
  - C8.1 Identify and explain the operations of electrical control systems and their components.
  - C8.2 Install and troubleshoot electrical control systems.
  - C8.3 Describe the operation and function of different types of electromechanical thermostats.



- C8.4 Analyze operational problems with different types of electromechanical thermostats.
  - C8.5 Describe the electrical and mechanical operations of a basic heat pump.
  - C8.6 Demonstrate the ability to wire a basic heating, air-conditioning, and/or refrigeration system.
  - C8.7 Identify and explain the functions of various types of motors and their individual components.
  - C8.8 Describe the differences between single-phase and three-phase motors.
  - C8.9 Analyze and test motors using a variety of different methods.
  - C8.10 Assess an electric motor for proper function and repair as necessary.
- C9.0 Demonstrate a practical knowledge of solid-state electronics.
- C9.1 Explain the basic principles and functions of Direct Digital Control (DDC).
  - C9.2 Describe basic solid-state circuits and boards.
  - C9.3 Identify, analyze, and replace solid-state circuit boards.
  - C9.4 Explain the major functions of a building-management system.
  - C9.5 Install and program a programmable thermostat.
- C10.0 Demonstrate a practical knowledge of combustion heating systems.
- C10.1 Explain combustion theory.
  - C10.2 Identify and explain the various types, operations, and functions of various types of gas valves and regulators.
  - C10.3 Determine the suitable application, and analyze the proper functioning, of gas valves and regulators.
  - C10.4 Demonstrate the installation, maintenance, testing, and repair of a gas operated heating system.
  - C10.5 Create a wiring schematic for a gas furnace.
  - C10.6 Sketch the proper gas flow for a gas furnace.
  - C10.7 Analyze, troubleshoot, and correct problems in a combustion-type heating system.
- C11.0 Demonstrate practical knowledge of systems designed to improve air quality.
- C11.1 Explain the scientific principles of psychrometrics.
  - C11.2 Define relative, specific, and absolute humidity.
  - C11.3 Distinguish between dew point, dry bulb, and wet bulb temperature.
  - C11.4 Summarize concerns related to indoor air quality.
  - C11.5 Compare and contrast the benefits of air-filtration, air-handling, and ventilation systems.
  - C11.6 Create, analyze, and maintain a system designed to improve air quality.

## **Building and Construction Trades Pathway Standards**

### **D. Residential and Commercial Construction Pathway**

The Residential and Commercial Construction pathway provides learning opportunities for students interested in preparing for careers in construction and building design, performance, and sustainability. The standards focus on the manner in which residential and commercial structures are designed and built. The pathway includes instruction in the way in which these structures are built (Class B California License).

Sample occupations associated with this pathway:

- ◆ Plumber
- ◆ Electrician
- ◆ Building Inspector
- ◆ Estimator
- ◆ Carpenter

D1.0 Recognize the impact of financial, technical, environmental, and labor trends on the past and future of the construction industry.

D1.1 Understand significant historical trends in the construction industry.

D1.2 Understand the environmental regulations that influence residential and commercial design.

D1.3 Demonstrate knowledge of the California Environmental Quality Act (CEQA) and Environmental Impact Review (EIRs) impacts on residential and commercial construction.

D2.0 Apply the appropriate mathematical calculations used in the construction trades.

D2.1 Apply formulas to determine; area, volume, lineal, board, and square feet.

D2.2 Apply the Pythagorean Theorem to calculate pipe offsets, roof slope, and check for square.

D2.3 Estimate the materials needed to complete a specific task.

D2.4 Determine the total developed length of the water supply piping system.

D2.5 Calculate the residual pressure at the highest outlet per the requirements of the Plumbing Code.

D2.6 Calculate the total fixture unit demand from the fixtures indicated on the construction drawings using the tables of the plumbing code.

D2.7 Calculate the proper slope for drain, waste and vent (DWV) piping.

D2.8 Apply Ohm's Law to calculate resistance, current flow, and voltage in series, parallel, and combination circuits.

D2.9 Calculate the load on an electrical system from general lighting and small and large appliances.

D3.0 Interpret and apply information from technical drawings, schedules, and specifications used in the construction trades.

- D3.1 Identify the elements used in technical drawings, including types of lines, symbols, details, and views.
  - D3.2 Identify and interpret the elements of technical drawings, including plan, elevation, section, and detail views.
  - D3.3 Interpret technical drawings specifications.
  - D3.4 Identify plumbing, electrical, and mechanical symbols and other abbreviations used in construction drawings.
  - D3.5 Interpret and scale dimensions from a set of plans using an architect's scale.
  - D3.6 Interpret sectional and detail drawings to determine construction details such as corners, rough openings, stairs, and roof systems.
  - D3.7 Understand the sequencing and phases of residential and commercial construction projects.
- D4.0 Demonstrate techniques for proper site preparation.
- D4.1 Use leveling devices to check for elevation, level, and plumb.
  - D4.2 Demonstrate how to establish grades using survey instruments.
  - D4.3 Install batter boards.
  - D4.4 Check site layout for square using the diagonal method.
  - D4.5 Describe excavation and backfill methods.
  - D4.6 Identify different methods and equipment used for compaction.
  - D4.7 Identify types of backfill materials and how they are used.
- D5.0 Demonstrate foundation layout techniques to include setting forms, placing reinforcements, and placing concrete according to construction drawings, specifications, and building codes.
- D5.1 Describe the sequencing procedures for placing large and small slabs.
  - D5.2 Demonstrate how to establish elevations for concrete structures.
  - D5.3 Lay out location and elevation of concrete/masonry structures based on construction drawings.
  - D5.4 Develop a material take-off in accordance with construction drawings and specifications.
  - D5.5 Lay out location for reinforcements, expansion joints, openings, and embedded items based on construction drawings, specifications, and building codes.
  - D5.6 Construct, place, and brace forms for concrete as detailed in construction drawings for footings, slab, and raised floors.
  - D5.7 Place and secure reinforcement as detailed by construction drawings, building codes, and industry standards.
  - D5.8 Place secure embedded hardware as detailed on construction drawings.
  - D5.9 Demonstrate proper removal and care of concrete forms.
  - D5.10 Use appropriate tools and techniques for placing, compacting, screeding, and finishing consolidating concrete in slabs and footings.
- D6.0 Demonstrate carpentry techniques for the construction of a single-family residence.

- D6.1 Properly place a moisture barrier and pest control guard on a foundation.
  - D6.2 Attach a sill plate at top of concrete foundation.
  - D6.3 Lay out, cut, and install joist supports, rim joists, and floor joists as specified on construction plans.
  - D6.4 Install a subfloor.
  - D6.5 Demonstrate wall and plate layout, including rough openings.
  - D6.6 Measure, cut, and assemble wall components using appropriate tools and fasteners.
  - D6.7 Demonstrate the ability to square wall systems and install wall bracing and shear panels according to code.
  - D6.8 Stand, square, plumb, and brace walls.
  - D6.9 Describe the applications and uses of metal stud framing.
  - D6.10 Lay out, cut, and install ceiling joists and common and jack rafters.
  - D6.11 Frame and erect shed and gable roof systems.
  - D6.12 Lay out and install trusses “on-center” with specified hardware.
  - D6.13 Install appropriate blocking, bracing, lookouts, fascia, and drip edge.
  - D6.14 Frame for roof penetrations and attic access.
  - D6.15 Apply roof sheathing and install appropriate flashings.
  - D6.16 Understand different roofing materials and methods of application.
- D7.0 Demonstrate proper installation techniques of interior finish materials and protective finishes.
- D7.1 Identify types and uses of wall finishing materials.
  - D7.2 Cut, fit, and install gypsum wallboard onto a framed wall using appropriate fasteners.
  - D7.3 Describe the finishes and textures for gypsum wallboard.
  - D7.4 Properly prepare walls to receive protective finishes.
  - D7.5 Apply finishes according to specifications and industry standards.
  - D7.6 Identify types and application of finish flooring materials.
  - D7.7 Install pre-hung interior doors.
  - D7.8 Install interior trim and case work.
- D8.0 Demonstrate the application of exterior finish materials and protective finishes in building construction.
- D8.1 Describe the installation procedures and techniques of masonry siding materials.
  - D8.3 Install wood, vinyl, and/or manufactured siding.
  - D8.4 Demonstrate preparation techniques for applying exterior paint and stain.
  - D8.5 Apply exterior paint and stain according to specifications.
  - D8.6 Describe various types and uses of doors and windows used in building construction.
  - D8.7 Install pre-hung windows and doors using appropriate flashing and trim.
  - D8.8 Caulk and seal joints to prevent air and moisture infiltration and increase energy efficiency.
  - D8.9 Install vents for efficient attic and crawl space ventilation.

- D8.10 Install various types of floor, wall, and ceiling thermal insulation.
- D8.11 Describe mold-prevention techniques.
  
- D9.0 Understand, integrate, and employ sustainable construction practices in the building trades.
  - D9.1 Identify design and energy solutions for improving building energy efficiency.
  - D9.2 Identify materials used in building construction to increase energy efficiency and sustainability.
  - D9.3 Calculate energy requirements and loads for buildings and structures.
  - D9.4 Demonstrate the application of constructing materials intended to improve building efficiency and sustainability.
  - D9.5 Analyze and evaluate buildings for energy efficiency and performance.
  - D9.6 Develop solutions to improve building energy performance and efficiency.
  
- D10.0 Demonstrate skills necessary to complete a plumbing system in a single-family residence in accordance with accepted industry standards.
  - D10.1 Demonstrate techniques for cutting, deburring, and joining metallic and nonmetallic water piping.
  - D10.2 Lay out and install hot and cold water piping to fixture locations as indicated on the construction documents.
  - D10.3 Perform pressure test of an installed piping system.
  - D10.4 Install fastened in-place fixture valves and shut-off valves as indicated on construction drawings.
  - D10.5 Install and secure proper drainage piping to fixture locations.
  - D10.6 Determine the proper slope for DWV piping using hand levels, laser levels, and transits.
  - D10.7 Install traps and vents as indicated by construction drawings, specifications, and government codes.
  - D10.8 Install angle stops at water supply stub outs.
  - D10.9 Install plumbing fixtures.
  - D10.10 Connect the water supply to faucets and water closets.
  - D10.11 Connect fixture tailpieces to fixtures and to traps.
  - D10.12 Check for the proper functioning of fixtures.
  
- D11.0 Demonstrate skills necessary to complete an electrical system in a single-family residence in accordance with accepted industry standards.
  - D11.1 Determine whether or not an electrical circuit is “live.”
  - D11.2 Prepare rough framing for the installation of electrical cables and conduit.
  - D11.3 Lay out components to the tolerances indicated on the construction drawings, specifications, and government codes.
  - D11.4 Install typical devices, junction boxes, and panels.
  - D11.5 Install lighting and ceiling fan support boxes according to the National Electrical Code (NEC).

- D11.6 Install conduit typical of residential construction and pull conductors through conduit as required by the NEC.
- D11.7 Splice and tap conductors for the installation of fixtures and devices.
- D11.8 Install low voltage control and communication cables.
- D11.9 Demonstrate grounding techniques for all electrical boxes, cabinets, and enclosures.
- D11.10 Terminate electrical connections to receptacles, switches, lighting fixtures, large appliances, and other devices.
- D11.11 Select receptacles and switches based on load requirements.
- D11.12 Terminate equipment grounding and neutral conductor at the electrical service.
- D11.13 Terminate communication and control wiring.

## Academic Alignment Matrix

<b>BUILDING AND CONSTRUCTION TRADES</b>	<b>PATHWAYS</b>			
	<b>A. Cabinetry, Millwork, and Woodworking</b>	<b>B. Engineering and Heavy Construction</b>	<b>C. Mechanical Systems Installation and Repair</b>	<b>D. Residential and Commercial Construction</b>
<b>ENGLISH LANGUAGE ARTS</b>				
<b>Language Standards – LS – (Standard Area, Grade Level, Standard #)</b>				
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0	B1.0, B2.0, B3.0, B4.0	C1.0, C2.0, C3.0, C4.0	D7.0, D8.0
<b>Reading Standards for Information Text – RSIT – (Standard Area, Grade Level, Standard #)</b>				
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0	C1.0, C2.0, C3.0, C4.0	D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A2.0	B1.0	C1.0	
11-12.10 By the end of grade 11, read and comprehend literary nonfiction in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0	C1.0, C2.0, C3.0, C4.0	D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0
<b>Reading Standards for Literacy in History/Social Studies – RHSS – (Standard Area, Grade Level, Standard #)</b>				
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.	A2.0	B10.0	C1.0	
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST – (Standard Area, Grade Level, Standard #)</b>				
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0	C1.0, C2.0, C3.0, C4.0	D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A3.0	B1.0, B2.0, B3.0	C3.0	D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0

BUILDING AND CONSTRUCTION TRADES	PATHWAYS			
	A. Cabinetry, Millwork, and Woodworking	B. Engineering and Heavy Construction	C. Mechanical Systems Installation and Repair	D. Residential and Commercial Construction
11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.		B1.0, B2.0	C3.0	D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A1.0, A2.0	B1.0, B3.0	C1.0	D3.0
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A1.0, A2.0	B1.0, B4.0	C1.0, C3.0, C4.0, C9.0, C13.0	D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B10.0	C1.0, C3.0, C4.0, C9.0, C13.0	D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0
<b>Writing Standards – WS – (Standard Area, Grade Level, Standard #)</b>				
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A2.0	B1.0	C1.0, C4.0	
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A2.0, A3.0			
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A3.0	B1.0	C1.0	
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A3.0	B1.0	C1.0	
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A3.0	B1.0	C1.0	D1.0, D3.0
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST – (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Write arguments focused on discipline-specific content.	A1.0			
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A1.0	B10.0	C1.0	
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate tot task, purpose, and audience.	A1.0			



BUILDING AND CONSTRUCTION TRADES	PATHWAYS			
	A. Cabinetry, Millwork, and Woodworking	B. Engineering and Heavy Construction	C. Mechanical Systems Installation and Repair	D. Residential and Commercial Construction
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A3.0		C1.0	
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A3.0			
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0	B1.0, B7.0, B10.0	C1.0	D1.0, D3.0
11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.	A1.0			D4.0, D7.0, D8.0
11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	A1.0			
<b>MATHEMATICS</b>				
<b>Algebra – A-CED – Creating Equations</b>				
<i>Create equations that describe numbers or relationships</i>				
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	A3.0	B7.0, B8.0	C6.0	D2.0
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R.		B2.0, B8.0	C3.0, C4.0, C9.0	D2.0
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>				
<i>Represent and solve equations and inequalities graphically</i>				
10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	A1.0, A10.0			
<b>Functions – F-TF – Trigonometric Functions</b>				
<i>Extend the domain of trigonometric functions using the unit circle</i>				
1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 1.1 Understand the notion of angle and how to measure it, in both degrees and radians. Convert between degrees and radians. (CA Standard Trigonometry - 1.0)	A10.0	B4.0		D 5.0, D7.0

BUILDING AND CONSTRUCTION TRADES	PATHWAYS			
	A. Cabinetry, Millwork, and Woodworking	B. Engineering and Heavy Construction	C. Mechanical Systems Installation and Repair	D. Residential and Commercial Construction
<b>Geometry – G-C – Circles</b>				
<i>Understand and apply theorems about circles</i>				
1. Prove that all circles are similar.	A7.0, A10.0			D2.0, D3.0, D5.0, D6.0, D7.0, D8.0
<i>Find arc lengths and areas of sectors of circles</i>				
5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	A7.0	B2.0, B8.0		D3.0
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>				
<i>Explain volume formulas and use them to solve problems</i>				
1. Give an informal argument for the formulas for the circumference of a Circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.	A1.0, A3.0, A5.0, A6.0, A8.0	B7.0	C12.0	D4.0, D5.0, D7.0, D8.0, D10.0, D11.0
<i>Visualize relationships between two-dimensional and three-dimensional objects</i>				
4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three dimensional objects generated by rotations of two-dimensional objects.	A1.0, A3.0, A5.0, A6.0, A8.0	B2.0, B7.0	C9.0, C12.0	D4.0, D5.0, D7.0, D8.0, D10.0, D11.0
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	A1.0, A3.0, A5.0, A6.0, A8.0	B7.0	C9.0, C12.0	D4.0, D5.0, D7.0, D8.0, D10.0, D11.0
<b>Geometry – G-GPE – Expressing Geometric Properties with Equations</b>				
<i>Use coordinates to prove simple geometric theorems algebraically</i>				
4. Use coordinates to prove simple geometric theorems algebraically. <i>For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point <math>(1, \sqrt{3})</math> lies on the circle centered at the origin and containing the point <math>(0, 2)</math>.</i>	A1.0, A3.0, A5.0, A6.0, A8.0			D2.0, D3.0, D11.0
5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	A7.0, A10.0	B2.0, B8.0		D4.0, D5.0, D6.0, D7.0, D8.0
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	A6.0, A3.0, A5.0	B7.0	C6.0	D2.0, D3.0, D5.0, D6.0, D7.0, D10.0
<b>Geometry – G-MG – Modeling with Geometry</b>				
<i>Apply geometric concepts in modeling situations</i>				
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	A1.0	B7.0		
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A1.0	B4.0, B7.0		

BUILDING AND CONSTRUCTION TRADES	PATHWAYS			
	A. Cabinetry, Millwork, and Woodworking	B. Engineering and Heavy Construction	C. Mechanical Systems Installation and Repair	D. Residential and Commercial Construction
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A1.0	B2.0, B4.0, B7.0, B8.0		
<b>Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry</b>				
<i>Define trigonometric ratios and solve problems involving right triangles</i>				
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. 8.1 Know and use angle and side relationships in problems with special right triangles. such as, 30°, 60°, and 90° triangles and 45°, 45°, and 90° triangles. (CA Standard Geometry - 20.0)	A1.0, A7.0, A10.0			D3.0, D4.0, D5.0
<b>Number and Quantity – N-Q – Quantities</b>				
<i>Reason quantitatively and use units to solve problems.</i>				
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A1.0	B7.0		
2. Define appropriate quantities for the purpose of descriptive modeling.		B2.0, B7.0		
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A1.0	B7.0	C6.0	
<b>Number and Quantity – N-VM – Vector and Matrix Quantities</b>				
<i>Represent and model with vector quantities</i>				
1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $v$ , $ v $ , $  v  $ , $v$ ).	A5.0, A6.0			D4.0, D6.0
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.	A5.0, A6.0			D4.0, D6.0
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.	A5.0, A6.0			D4.0, D6.0
<i>Perform operations on vectors</i>				
4. (+) Add and subtract vectors. a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. c. Understand vector subtraction $v - w$ as $v + (-w)$ , where $-w$ is the additive inverse of $w$ , with the same magnitude as $w$ and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.	A5.0, A6.0			D4.0, D6.0

BUILDING AND CONSTRUCTION TRADES	PATHWAYS			
	A. Cabinetry, Millwork, and Woodworking	B. Engineering and Heavy Construction	C. Mechanical Systems Installation and Repair	D. Residential and Commercial Construction
5. (+) Multiply a vector by a scalar. a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$ . b. Compute the magnitude of a scalar multiple $cv$ using $\ cv\  =  c v$ . Compute the direction of $cv$ knowing that when $ c  \neq 0$ , the direction of $cv$ is either along $v$ (for $c > 0$ ) or against $v$ (for $c < 0$ ).	A5.0, A6.0			D4.0, D6.0
<b>Calculus – C</b>				
11.0 Students use differentiation to solve optimization (maximum-minimum problems) in a variety of pure and applied contexts.	A3.0	B4.0, B7.0		
16.0 Students use definite integrals in problems involving area, velocity, acceleration, volume of a solid, area of a surface of revolution, length of a curve, and work.	A1.0, A3.0, A5.0, A6.0, A8.0	B4.0, B7.0		D2.0, D4.0, D5.0, D7.0, D8.0, D10.0, D11.0
<b>SCIENCE</b>				
<b>Scientific and Engineering Practices – SEP</b>				
1. Asking questions (for science) and defining problems (for engineering)	A1.0, A3.0, A7.0, A8.0	B2.0, B4.0, B7.0	C1.0, C4.0, C6.0, C9.0, C10.0, C12.0	D2.0
2. Developing and using models	A3.0	B2.0, B3.0, B4.0, B7.0	C2.0, C3.0, C4.0, C9.0, C12.0, C13.0	
3. Planning and carrying out investigations	A1.0, A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B7.0	C1.0, C3.0, C4.0, C6.0, C9.0, C10.0, C12.0, C13.0	D5.0
4. Analyzing and interpreting data	A1.0, A3.0, A5.0, A6.0, A7.0, A8.0, A10.0	B1.0, B2.0, B4.0, B7.0, B10.0	C1.0, C3.0, C4.0, C6.0, C9.0	D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0
5. Using mathematics and computational thinking	A1.0, A3.0, A5.0, A6.0, A7.0, A8.0, A10.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C4.0, C9.0, C10.0, C11.0, C12.0, C13.0	D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0

BUILDING AND CONSTRUCTION TRADES	PATHWAYS			
	A. Cabinetry, Millwork, and Woodworking	B. Engineering and Heavy Construction	C. Mechanical Systems Installation and Repair	D. Residential and Commercial Construction
6. Constructing explanations (for science) and designing solutions (for engineering)	A1.0, A3.0, A4.0, A6.0, A7.0	B1.0, B4.0, B5.0, B7.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C9.0, C10.0, C11.0, C12.0, C13.0	
7. Engaging in argument from evidence			C1.0	
8. Obtaining, evaluating, and communicating information	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A10.0			D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0
<b>Crosscutting Concept – CC</b>				
1. Patterns	A1.0, A2.0, A3.0, A8.0	B1.0, B2.0, B3.0, B10.0	C1.0, C2.0, C3.0, C4.0, C9.0, C10.0	
2. Cause and effect: Mechanism and explanation		B3.0, B7.0	C1.0, C2.0	
3. Scale, proportion, and quantity	A1.0, A3.0, A4.0, A5.0, A6.0, A7.0, A10.0	B1.0, B2.0, B3.0, B4.0, B7.0	C4.0, C5.0, C6.0, C9.0, C13.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0
4. Systems and system models		B2.0, B3.0, B4.0	C2.0, C3.0, C4.0, C9.0, C13.0	D2.0
5. Energy and matter: Flows, cycles, and conservation		B4.0	C2.0, C3.0, C4.0, C9.0, C12.0	D2.0
6. Structure and function	A1.0, A3.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B5.0, B6.0, B9.0	C4.0, C5.0, C6.0, C10.0	D6.0, D7.0, D8.0, D10.0
7. Stability and change	A1.0	B1.0, B2.0, B3.0	C1.0, C2.0, C4.0, C13.0	D2.0, D5.0, D6.0

BUILDING AND CONSTRUCTION TRADES	PATHWAYS			
	A. Cabinetry, Millwork, and Woodworking	B. Engineering and Heavy Construction	C. Mechanical Systems Installation and Repair	D. Residential and Commercial Construction
<b>Physical Sciences – PS</b>				
PS1: Matter and Its Interactions				
PS1.A: Structure and Properties of Matter	A6.0, A8.0			
PS1.B: Chemical Reactions	A6.0, A8.0			
PS2: Motion and Stability: Forces and Interactions				
PS2.A: Forces and Motion		B4.0	C8.0	
PS2.C: Stability and Instability in Physical Systems		B1.0, B5.0	C12.0	D2.0, D4.0, D5.0, D6.0
PS3: Energy				
PS3.A: Definitions of Energy			C3.0, C0.4, C6.0, C7.0, C9.0	D2.0, D9.0
PS3.B: Conservation of Energy and Energy Transfer			C3.0, C4.0, C6.0, C9.0, C10.0	D9.0
PS4: Waves and Their Applications in Technologies for Information Transfer				
PS4.C: Information Technologies and Instrumentation				D11.0
<b>Life Science – LS</b>				
LS1: From Molecules to Organisms: Structures and Processes				
LS1.B: Growth and Development of Organisms	A5.0			
<b>Earth and Space Sciences – ESS</b>				
ESS2: Earth's Systems				
ESS2.A: Earth Materials and Systems		B8.0		
ESS2.B: Plate Tectonics and Large-Scale System Interactions		B1.0		
ESS2.C: The Roles of Water in Earth's Surface Processes		B11.0		
ESS2.D: Weather and Climate		B3.0	C11.0	
ESS2.E: Biogeology		B4.0		
<b>Engineering, Technology, and the Applications of Science – ETS</b>				
ETS1: Engineering Design				
ETS1.A: Defining and Delimiting an Engineering Problem	A1.0, A3.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B7.0, B9.0, B10.0	C1.0, C4.0, C5.0, C6.0, C9.0, C12.0, C13.0	D2.0, D3.0, D5.0, D9.0

<b>BUILDING AND CONSTRUCTION TRADES</b>	<b>PATHWAYS</b>			
	<b>A. Cabinetry, Millwork, and Woodworking</b>	<b>B. Engineering and Heavy Construction</b>	<b>C. Mechanical Systems Installation and Repair</b>	<b>D. Residential and Commercial Construction</b>
ETS1.B: Developing Possible Solutions	A1.0, A3.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B7.0, B9.0, B10.0	C1.0, C4.0, C5.0, C6.0, C9.0, C12.0, C13.0	D2.0, D3.0, D5.0, D9.0
ETS1.C: Optimizing the Design Solution	A1.0, A3.0, A7.0			D9.0
ETS2: Links Among Engineering, Technology, Science, and Society				
ETS2.A: Interdependence of Science, Engineering, and Technology		B1.0, B4.0, B10.0	C1.0, C3.0, C4.0, C9.0, C12.0, C13.0	D2.0
ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A1.0, A2.0, A3.0, A6.0, A7.0	B7.0		D1.0
<b>HISTORY/SOCIAL SCIENCE</b>				
<b>Principles of American Democracy and Economics – AD</b>				
12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their Interdependence, and the meaning and importance of those values and principles for a free society.				D10.0, D11.0
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.		B8.0, B10.0	C1.0	D1.0, D10.0, D11.0
<b>Principles of Economics – PE</b>				
12.1 Students understand common economic terms and concepts and economic reasoning.				D3.0, D5.0, D8.0
12.2 Students analyze the elements of America's market economy in a global setting.		B10.0		D3.0
<b>U.S. History and Geography – US</b>				
11.8 Students analyze the economic boom and social transformation of post-World War II America.	A2.0	B10.0		

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Building and Construction Trades**

Lloyd McCabe, Administrator, California Department of Education  
John Dunn, Education Consultant, California Department of Education

#### *Standards Review Team*

Jim Campbell, Private Contractor, Campbell's Construction  
Lance Gunnensen, Instructor, Davis Joint Unified School District  
Glenn Hillegas, Executive VP, San Diego Association of General Contractors  
Carol Johnston, Director, Sacramento County Office of Education  
Richard Stoker, Professor, Los Rio Community College District

#### *Standards Writing Team*

David Dabaco, Instructor, Lincoln Unified School District  
Tom Vessella, Professor, Los Angeles Trade Technical College  
Jeff Wright, Instructor, Lincoln Unified School District

#### *Common Core Alignment Team*

Curtis Earle, Instructor, Los Angeles Unified School District  
Jeff Kamansky, Instructor, Oceanside Unified School District  
Sheryl Roccoforte, Instructor, Oceanside Unified School District  
Zach Ronnenberg, Instructor, Davis Joint Unified School District  
Frank Zuidema, Instructor, Oceanside Unified School District

### **References**

Nevada Department of Education, Office of Career, Technical and Adult Education.  
2004. "Residential Building Construction Skill Standards." <http://cteae.nv.gov/>.



**Table of Contents**  
**Business and Finance**

Sector Description ..... 1

Knowledge and Performance Anchor Standards ..... 2

    1.0 Academics ..... 2

    2.0 Communications ..... 2

    3.0 Career Planning and Management ..... 2

    4.0 Technology ..... 3

    5.0 Problem Solving and Critical Thinking ..... 3

    6.0 Health and Safety ..... 3

    7.0 Responsibility and Flexibility ..... 4

    8.0 Ethics and Legal Responsibilities ..... 4

    9.0 Leadership and Teamwork ..... 5

    10.0 Technical Knowledge and Skills ..... 5

    11.0 Demonstration and Application ..... 6

Pathway Standards ..... 7

    A. Business Management Pathway ..... 7

    B. Financial Services Pathway ..... 10

    C. International Business Pathway ..... 14

Academic Alignment Matrix ..... 17

Appendix: CTE Model Curriculum Standards Contributors ..... 37

References ..... 38



## **Business and Finance**

### ***Sector Description***

Persons trained in fields such as business management, international trade, and various financial services specialties (e.g., accounting, banking, and investing) will find that their skills are highly marketable. Students master basic business principles and procedures before proceeding to the career path specializations. The specializations emphasize concepts of accounting and finance, including computer applications, taxes, investments, and asset management as well as pathways in international business and business management. Because almost every business and organization has a financial and management component, students will find that opportunities exist in many career paths in addition to those in business and finance.

## **Business and Finance Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Business and Finance academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Business and Finance sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance and impact small businesses have on our state, nation and world economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Business and Finance sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Business and Finance sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Business and Finance sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.

- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Business and Finance sector workplace environment and community settings.  
(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Business and Finance sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Business and Finance industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Business and Finance sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Business and Finance sector laws and practices.

## **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the Future Business Leaders of America (FBLA) career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Business and Finance sector issues and problems.

## **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Business and Finance sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Business and Finance sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Business and Finance sector.
- 10.3 Construct projects and products specific to the Business and Finance sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Interpret financial data, analyze results, and make sensible business decisions to promote a financially reliable business.
- 10.6 Evaluate the variety, nature, and diversity of investment vehicles and the elements that contribute to financial growth and success.
- 10.7 Adapt the distribution concepts and processes needed to move, store, locate, and transfer ownership of goods or services.
- 10.8 Integrate the techniques and strategies used to foster positive, ongoing relationships with customers, suppliers, investors, and community.
- 10.9 Evaluate the impact of local, state, federal, and/or international regulations on business and financial management decisions.

- 10.10 Apply the economic principles and concepts fundamental to business operations.
- 10.11 Recognize the importance of marketing in a global economy.
- 10.11 Develop a system for keeping and using financial records and a personal financial plan to manage cash flow and maintain creditworthiness.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Business and Finance anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the Future Business Leaders of America (FBLA) career technical student organization.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Business and Finance sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Business and Finance sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Business and Finance Pathway Standards**

### **A. Business Management Pathway**

Management consists of planning, leading, and controlling an organization or effort to accomplish a goal. In the Business Management pathway, students learn entrepreneurship and business fundamentals, goal-setting, resource allocation, organizational structure and management techniques, economics, financial data, risk management, information technology, and supply chain management.

Sample occupations associated with this pathway:

- ◆ Human Resources Specialist
- ◆ Education Administrator
- ◆ Purchasing Agent
- ◆ Office Manager
- ◆ Chief Financial Officer

- A1.0 Explain entrepreneurship and the fundamentals of developing a new business.
- A1.1 Recognize personal traits and leadership styles of entrepreneurs and business leaders.
  - A1.2 Analyze management theories and their application within the business environment.
  - A1.3 Develop personal management skills to function effectively, efficiently, and collaboratively in a business environment.
  - A1.4 Determine the type of business organization most appropriate for various business profiles.
  - A1.5 Construct and defend a business plan (components may include an executive summary, organizational structure, market analysis, Strengths Weaknesses Opportunities and Threats (SWOT) analysis, marketing plan, operating procedures, financial data, and feasibility and supporting documentation).
- A2.0 Plan, organize, secure, and manage resources of a project to achieve specific goals.
- A2.1 Determine Specific, Measurable, Achievable, Realistic and Time-bound (SMART) goals for a specific project.
  - A2.2 Develop a project schedule, including the constraints of cost, time, and scope, to illustrate project structure using Gantt, Program Evaluation Review Technique (PERT), or other project planning tools.
  - A2.3 Optimize allocation of resources necessary to achieve predefined objectives.
  - A2.4 Evaluate beneficial change, or added value, of a specific project.
- A3.0 Investigate the functions and techniques of management and organizational structure and distinguish between small and large companies.
- A3.1 Explain the organizational structure of various business environments.



- A3.2 Describe management's role in demonstrating leadership, motivating employees, resolving conflict, addressing stress, and recognizing formal and informal employee groups.
  - A3.3 Recognize a business' responsibility to employees, shareholders, society, and the environment.
  - A3.4 Summarize techniques for managing human resources to maximize operational efficiencies and effectiveness.
  - A3.5 Describe the role of organized labor and its influence on government and businesses.
  - A3.6 Apply operations management principles and procedures to the design of an operations plan.
- A4.0 Apply economic concepts as they relate to business.
    - A4.1 Identify factors of production needed to create wealth.
    - A4.2 Explain the role of business in a free-enterprise system.
    - A4.3 Recognize the determinants of supply and demand and their impact on pricing.
    - A4.4 Calculate productivity with various levels of input.
    - A4.5 Illustrate the business cycle elaborating on leading, coinciding, and lagging economic indicators.
    - A4.6 Show the relationship between economic conditions and financial markets, including exchange rates.
- A5.0 Analyze financial data in order to make short-term and long-term decisions.
    - A5.1 Describe factors that affect the value of an asset, inflation, interest rates, risk, and return.
    - A5.2 Determine investment and finance options available at different stages of a business or product life cycle.
    - A5.3 Compare and interpret financial reports for internal and external use to analyze risk and return to make business decisions.
    - A5.4 Analyze how credit reports quantify credit worthiness.
    - A5.5 Assess how types of financial markets influence interest rates, inflation, balance of trade, and unemployment and the impact on business decisions.
    - A5.6 Create and use budgets to guide financial decision making.
- A6.0 Explain the importance of risk management and regulatory compliance in business.
    - A6.1 Identify, assess, and prioritize risks.
    - A6.2 Describe the concept and process of risk management, including the use of risk management tools such as insurance.
    - A6.3 Compare and contrast the various types of taxes in terms of the business structure.

- A7.0 Utilize information and technology tools to conduct business effectively and efficiently.
  - A7.1 Describe appropriate computer hardware used in business.
  - A7.2 Apply appropriate software used in business.
  - A7.3 Examine technological trends and analyze the impact of technological innovations on the marketing and distribution of goods and services.
  - A7.4 Integrate appropriate use of the Internet in business.
  - A7.5 Investigate data security systems for business.
  
- A8.0 Construct a Marketing Plan.
  - A8.1 Describe effective marketing techniques.
  - A8.2 Explore how products and services are conceived, developed, maintained, and improved in response to market opportunities.
  - A8.3 Conduct market analysis and assess the business organization's position within their industry.
  - A8.4 Interpret how market research is used to develop strategies for marketing.
  - A8.5 Differentiate the components of a promotional plan (e.g., advertising, public relations, and sales promotion) and describe how the plan is used to achieve a stated outcome.
  - A8.6 Practice selling techniques used to aid customers and clients in making buying decisions.
  
- A9.0 Apply principles of supply chain management and SCM 2.0 to a business model.
  - A9.1 Describe Logistics Management systems.
  - A9.2 Illustrate the management of the complete flow of materials and activities in the supply chain from suppliers to customers.
  - A9.3 Summarize materials management, including effective inventory management practices, E= Procurement, and continuous control practices.
  - A9.4 Create a master plan for resources that addresses market demand, sales, and operations planning.
  - A9.5 Change variables in a master plan for resources, analyze its effect, and recommend corrective actions.

## **Business and Finance Pathway Standards**

### **B. Financial Services Pathway**

Financial services are an essential aspect of every business institution and organization. Students in this pathway investigate the field of financial management, including how it is impacted by industry standards as well as economic, financial, technological, international, social, legal, and ethical factors. Students formulate and interpret financial information for use in financial management decision making, such as compliance and risk management. This pathway may include programs of study for accounting, banking, securities and investments, and other financial specializations.

Sample occupations associated with this pathway:

- ◆ Accounts Payable Clerk
- ◆ Investment Consultant
- ◆ Tax Preparer
- ◆ Auditor
- ◆ Accountant

**B1.0** Create and use budgets to guide financial decision making.

- B1.1 Identify various forms of income and analyze factors that affect income as part of the career decision making process.
- B1.2 Evaluate the opportunity costs of savings and investment options to meet short and long term goals.
- B1.3 Apply a decision making model to maximize consumer satisfaction when buying consumer goods and service.
- B1.4 Analyze factors that affect the choice, cost, and legal aspects of using credit.
- B1.5 Develop and defend a spending/savings plan.
- B1.6 Develop tax planning strategies for financial planning.
- B1.7 Devise a plan to protect against identity theft.

**B2.0** Explain how the application of Generally Accepted Accounting Principles (GAAP) impacts the recording of transactions and the preparation of financial statements.

- B2.1 Describe the two methods of accounting (cash and accrual) and the different accounting concepts (financial, tax, cost, nonprofit and auditing) used to report a business' financial position as it pertains to sole proprietorships, corporations, and partnerships.
- B2.2 Complete the steps in the accounting cycle in order to prepare financial statements and communicate how accounting procedures affect financial statements.
- B2.3 Use planning and control principles to evaluate the performance of an organization.
- B2.4 Discuss state and federal regulation of the accounting industry.
- B2.5 Discuss International Financial Reporting Standards (IFRS) and the convergence between IFRS and GAAP.

- B2.6 Develop a working knowledge of individual income tax procedures and compliance with tax laws and regulations.
- B3.0 Interpret financial formulas commonly found in financial institutions to aid in the growth and stability of financial services.
  - B3.1 Identify key ratios and banking calculations such as interest and annual percentage rate.
  - B3.2 Identify strategies and systems in real-world situations to maintain, monitor, control, and plan the use of financial resources.
  - B3.3 Use equations, graphical representations, and other accounting tools to classify, record, and summarize financial data.
  - B3.4 Identify strategies financial institutions utilize to make decisions about profitability, such as savings and lending ratios.
- B4.0 Interpret financial data, analyze results, and make sound business decisions to promote a financially healthy business.
  - B4.1 Apply differential analysis and present value concepts to make decisions.
  - B4.2 Interpret financial ratios and other metrics, such as cash flow and breakeven analysis, concentration risk, return on investment, leveraged debt, market share, and opportunity costs.
  - B4.3 Analyze an annual report and financial statement to predict profitability.
  - B4.4 Develop a working knowledge of individual income tax procedures and requirements to comply with tax laws and regulations.
- B5.0 Evaluate the impact of federal, state, and local regulations on financial management decisions.
  - B5.1 Explain the role of the Federal Reserve System, Internal Revenue Service (IRS), and Consumer Protection Laws.
  - B5.2 Describe provisions of bankruptcy law.
  - B5.3 Compare state and federal regulatory compliance of financial institutions and related services.
  - B5.4 Calculate the impact of various taxes on financial decisions.
- B6.0 Apply economic concepts as they relate to financial services.
  - B6.1 Define capital and explain how it is used to create wealth.
  - B6.2 Identify causes of stock price fluctuations and the relationship between bond prices and yields.
  - B6.3 Illustrate the business cycle elaborating on leading, coinciding, and lagging economic indicators.
  - B6.4 Assess the ways in which financial markets influence interest rates, inflation, balance of trade, and unemployment and the impact on business decisions.
  - B6.5 Explain the role of investment banking in the primary marketplace.

- B7.0 Explain the concepts, role, and importance of international finance and risk management.
  - B7.1 Compare the variety of ways in which funds are transferred in foreign trade.
  - B7.2 Analyze factors that affect currency and exchange rates.
  - B7.3 Formulate an insurance and risk management plan.
  - B7.4 Explain the importance of actuarial science in the insurance industry.
  - B7.5 Compare and contrast risk management methods of avoidance, reduction, assumption, and shifting.
  - B7.6 Analyze choices available to consumers for protection against risk and financial loss.
  - B7.7 Identify main operations and evaluate services provided by financial institutions.
  
- B8.0 Evaluate the variety, nature, and diversity of investment vehicles and the elements that contribute to financial growth and success.
  - B8.1 Explain the time value of money.
  - B8.2 Describe the functions, responsibilities, and ethical considerations of a financial institution.
  - B8.3 Recognize the categories and characteristics of major investment vehicles, such as stocks, bonds, real estate, mutual funds, venture capital, retirement investment plans, and education savings plans.
  - B8.4 Describe reasons why investors buy and sell and the methods they use.
  - B8.5 Describe factors that affect the value of an asset, including industry trends, price to earnings ratio, cash flow, growth rate, timing, inflation, interest rate, opportunity cost, risk, and required return.
  - B8.6 Consult federal resources and independent rating companies for reports and research on investment vehicles and providers.
  - B8.7 Select sources to finance venture creation/start-up.
  - B8.8 Describe the role of the Securities and Exchange Commission (SEC) and the Financial Industry Regulation Authority (FINRA) and explain regulation of the industry, including legal and ethical considerations in all aspects of financial services.
  
- B9.0 Evaluate financial services providers and explore the duties and activities of financial service careers.
  - B9.1 Identify electronic banking technologies.
  - B9.2 Identify licensure requirements for various professionals in the financial services industry.
  - B9.3 Demonstrate characteristics of professionalism in working relationships with customers and employees.
  - B9.4 Demonstrate techniques for managing human resources to maximize operational efficiencies and effectiveness.
  - B9.5 Discuss legal and ethical considerations in providing financial advice, buying or selling securities, insurance or real estate, and borrowing or lending money.

- B9.6 Examine the environments in which securities and investments services are offered, including securities sales agents, securities and investment firms, and securities markets.
- B9.7 Determine client needs and wants and develop and present a written investment recommendation to the client using standard writing conventions.
- B9.8 Scrutinize lending and borrowing practices.

## **Business and Finance Pathway Standards**

### **C. International Business Pathway**

The relative ease of travel and the use of electronic communication have seemingly diminished the size of the globe, yet the interdependence of countries for goods and services causes this marketplace to grow, thrive, and become increasingly more competitive. Students focusing on the occupational area of international trade develop an understanding of the global business environment and the interconnectedness of cultural, political, legal, historical, economic, and ethical systems.

Sample occupations associated with this pathway:

- ◆ International Shipping Specialist
- ◆ Export Sales Representative
- ◆ Customs Broker
- ◆ Customs Inspector
- ◆ International Market Researcher

C1.0 Describe the fundamental concepts of international business.

C1.1 Identify forms of business ownership and entrepreneurial opportunities available in international business.

C1.2 Conduct market research for a product or service traded internationally.

C1.3 Illustrate the process of buying, selling, and promoting products in a modern global trade.

C1.4 Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.

C1.5 Construct and defend a business plan for a product or service traded internationally.

C2.0 Describe the interrelatedness of geographic, social, cultural, political, and legal factors and how they shape the global business environment.

C2.1 Interpret the effect of culture, customs, and politics on trade.

C2.2 Illustrate how geographic conditions affect trade.

C2.3 Apply communications strategies necessary and appropriate for effective and profitable international businesses relations.

C2.4 Analyze special challenges in human resources and strategic management in international business.

C3.0 Apply economic concepts as they relate to international business.

C3.1 Describe the laws of absolute and comparative advantage.

C3.2 Explain the importance of productivity and analyze how specialization, division of labor, investment in physical and human capital, and technological change affect productivity and global trade.

C3.3 Examine the role of trade, trade agreements, protectionism, and monetary markets in the global economy.

- C3.4 Relate the balance of trade concepts to the import/export process.
- C3.5 Examine the ways in which a country's natural, financial, and human resources influence international business.
- C3.6 Analyze the role of government in economic systems.
  
- C4.0 Describe common financing sources and the payment methods used for international business transactions.
  - C4.1 Explain the concepts, role, and importance of international finance and risk management.
  - C4.2 Analyze factors that affect currency and exchange rates.
  - C4.3 Compare the variety of ways in which funds are transferred in foreign trade.
  - C4.4 Assess the ways in which financial markets influence interest rates, inflation, balance of trade, and unemployment and the impact on business decisions.
  - C4.5 Produce documentation for international trade, including letters of credit, import/export documents, permits, taxes, and duties.
  
- C5.0 Recognize the role of information and communications technology in modern global trade.
  - C5.1 Identify hardware and software commonly used in international business operations.
  - C5.2 Integrate appropriate use of the Internet in business.
  - C5.3 Analyze security measures used to protect businesses and consumers engaging in international e-commerce.
  
- C6.0 Analyze international markets and competition.
  - C6.1 Apply marketing concepts to international business situations.
  - C6.2 Differentiate between the types of market structures and their effect on the price and the quality of goods and services produced.
  - C6.3 Research measures used to evaluate the economic conditions of a country.
  - C6.4 Identify factors that determine balance of trade and research balance of trade for a developed nation, a developing nation, and an undeveloped nation.
  - C6.5 Develop strategies to adapt and respond to meeting the differences in culture, market, habits, experience, and laws.
  
- C7.0 Assess the risks associated with various methods of entering the global marketplace.
  - C7.1 Calculate the effects of exchange rate fluctuation.
  - C7.2 Determine pricing for products and services traded internationally.
  - C7.3 Set inventory levels based upon location of customers, durability of products, and logistics.
  - C7.4 Analyze choices available to international businesses for protection against risk and financial loss.



- C7.5 Determine exposure of doing business internationally and develop a recommendation for entering the international market.
- C8.0 Reconstruct the logistics of importing and exporting products and services.
  - C8.1 Explain how private, nonprofit, and government agencies assist in global trade.
  - C8.2 Determine the effect of imports and exports on production and manufacturing.
  - C8.3 Distinguish between direct and indirect distribution channels.
  - C8.4 Compare how products are prepared for international versus domestic distribution.
  - C8.5 Contrast the four forms of international operations: working through a foreign intermediary, licensing agreement with the foreign business, forming a strategic alliance, or becoming a multinational corporation.
  - C8.6 Analyze special challenges in operations and strategic management in international business.

## Academic Alignment Matrix

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
<b>ENGLISH LANGUAGE ARTS</b>			
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>			
11.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A3.0, A4.0, A6.0, A8.0, A9.0	B1.0, B2.0, B11.0	C1.0, C3.0, C4.0
11.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A3.0, A4.0, A6.0, A8.0, A9.0	B1.0	C1.0, C4.0
11.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A3.0	B4.0, B5.0	C2.0, C6.0
11.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A2.0, A3.0	B4.0, B5.0	C2.0, C6.0
11.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	A1.0	B4.0, B10.0	C2.0, C6.0
11.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0	B2.0, B10.0	C1.0, C6.0, C8.0
<b>Reading Standards for Informational Text – RSIT (Standard Area, Grade Level, Standard #)</b>			
11.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	A4.0	B5.0, B6.0, B8.0	C1.0, C8.0
11.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A3.0, A5.0	B5.0	

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
11.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10, B11	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
11.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A5.0, A6.0, A7.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10	C1.0, C8.0
11.5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.	A4.0, A6.0, A7.0	B1.0, B2.0, B3.0, B6.0, B7.0, B8.0, B10.0	C5.0, C6.0, C7.0
11.6. Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.		B1.0	
11.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>			
11.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	A8.0, A9.0	B1.0, B3.0, B6.0	C3.0
11.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B2.0, B4.0, B5.0, B7.0, B8.0, B9.0, B10.0, B11.0	C.1.0, C2.0, C4.0, C5.0, C6.0, C7.0, C8.0
11.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
11.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
11.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
11.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
11.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
11.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
<b>MATHEMATICS</b>			
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>			
<i>Interpret the structure of expressions</i>			
1. Interpret expressions that represent a quantity in terms of its context. <ul style="list-style-type: none"> <li>a. Interpret parts of an expression, such as terms, factors, and coefficients.</li> <li>b. Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret <math>P(1+r)^t</math> as the product of P and a factor not depending on P.</i></li> </ul>		B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0

BUSINESS AND FINANCE	PATHWAYS		
	A. Business Management	B. Financial Services	C. International Business
<p>2. Use the structure of an expression to identify ways to rewrite it. <i>For example, see <math>x^4 - y^4</math> as <math>(x^2)^2 - (y^2)^2</math>, thus recognizing it as a difference of squares that can be factored as <math>(x^2 - y^2)(x^2 + y^2)</math>.</i></p> <p>a. <i>Use the distributive property to express a sum of terms with a common factor as a multiple of a sum of terms with no common factor. For example, express <math>xy^2 + x^2y</math> as <math>xy(y + x)</math>. (Common Core Standard A-SSE-2a)</i></p> <p>b. <i>Use the properties of operations to express a product of a sum of terms as a sum of products. For example, use the properties of operations to express <math>(x + 5)(3 - x + c)</math> as <math>-x^2 + cx - 2x + 5c + 15</math>. (Common Core Standard A-SSE-2b)</i></p>		B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<b>Algebra – A-CED – Creating Equations</b>			
<i>Create equations that describe numbers or relationships</i>			
<p>1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.</p> <p>1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)</p>		B1.0	
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		B1.0	
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.		B1.0	
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .		B1.0	

BUSINESS AND FINANCE	PATHWAYS		
	A. Business Management	B. Financial Services	C. International Business
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>			
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>			
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.		B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.		B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<i>Solve equations and inequalities in one variable</i>			
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.  3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)		B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<b>Functions – F-IF – Interpreting Functions</b>			
<i>Understand the concept of a function and use function notation</i>			
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .	A4.0, A5.0, A6.0, A7.0, A8.0		
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	A4.0, A5.0, A6.0, A7.0, A8.0		
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$ , $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$ .	A4.0, A5.0, A6.0, A7.0, A8.0		

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
<i>Interpret functions that arise in applications in terms of the context</i>			
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A4.0, A5.0, A6.0, A7.0, A8.0	B3.0, B4.0	
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.	A4.0, A5.0, A6.0, A7.0, A8.0		
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A4.0, A5.0, A6.0, A7.0, A8.0	B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C3.0, C6.0, C7.0, C8.0
<i>Analyze functions using different representations</i>			
7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. <p>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</p> <p>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</p> <p>d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</p> <p>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</p>	A4.0, A5.0, A6.0, A7.0, A8.0	B3.0	

BUSINESS AND FINANCE	PATHWAYS		
	A. Business Management	B. Financial Services	C. International Business
<p>8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p>a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as <math>y = (1.02)^t</math>, <math>y = (0.97)^t</math>, <math>y = (1.01)^{12t}</math>, <math>y = (1.2)^{t/10}</math>, and classify them as representing exponential growth or decay.</p>	A4.0, A5.0, A6.0, A7.0, A8.0		
<p>9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</p>	A4.0, A5.0, A6.0, A7.0, A8.0		
<p>10. Demonstrate an understanding of functions and equations defined parametrically and graph them. (CA Standard Math Analysis - 7.0)</p>	A4.0, A5.0, A6.0, A7.0, A8.0		
<b>Functions – F-BF – Building Functions</b>			
<i>Build a function that models a relationship between two quantities</i>			
<p>1. Write a function that describes a relationship between two quantities.</p> <p>a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> <p>b. Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</i></p> <p>c. (+) Compose functions. For example, if <math>T(y)</math> is the temperature in the atmosphere as a function of height, and <math>h(t)</math> is the height of a weather balloon as a function of time, then <math>T(h(t))</math> is the temperature at the location of the weather balloon as a function of time.</p>	A9.0		



<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	A9.0		
<i>Build new functions from existing functions</i>			
3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ , $k f(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.  3.1 Solve problems involving functional concepts. such as, composition. defining the inverse function and performing arithmetic operations on functions. (CA Standard Algebra II - 24.0)	A9.0		
4. Find inverse functions.  a. Solve an equation of the form $f(x) = c$ for a simple function $f$ that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$ .  b. (+) Verify by composition that one function is the inverse of another.  c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.  d. (+) Produce an invertible function from a non-invertible function by restricting the domain.	A9.0		
5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.	A9.0		
<b>Geometry – G-CO – Congruence</b>			
<i>Make geometric constructions</i>			

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.		B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<b>Geometry – G-MG – Modeling with Geometry</b>			
<i>Apply geometric concepts in modeling situations</i>			
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).		B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).		B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)		B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<b>Number and Quantity – N-RN – The Real Number System</b>			
<i>Extend the properties of exponents to rational exponents</i>			
1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.		B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.		B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
<i>Use properties of rational and irrational number</i>			
3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.		B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<b>Number and Quantity – N-VM – Vector and Matrix Quantities</b>			
<i>Perform operations on matrices and use matrices in applications</i>			
6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.		B1.0	
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.		B1.0	
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.		B1.0	
9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.		B1.0	
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.		B1.0	
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.		B1.0	
12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.		B1.0	
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>			
<i>Understand and evaluate random processes underlying statistical experiments</i>			

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?	A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>			
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A1.0, A2.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
6. Evaluate reports based on data.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>			
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>			
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.  b. Informally assess the fit of a function by plotting and analyzing residuals.  c. Fit a linear function for a scatter plot that suggests a linear association.		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<i>Interpret linear models</i>			
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	A5.0, A6.0, A7.0, A8.0	B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
9. Distinguish between correlation and causation.		B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>			
<i>Understand independence and conditional probability and use them to interpret data</i>			
1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	A4.0, A5.0, A6.0, A7.0	B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.	A4.0, A5.0, A6.0, A7.0	B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
3. Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$ , and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.	A4.0, A5.0, A6.0, A7.0	B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.	A4.0, A5.0, A6.0, A7.0	B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C6.0, C7.0, C8.0
<i>Use the rules of probability to compute probabilities of compound events in a uniform probability model</i>			
6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.	A4.0, A5.0, A6.0, A7.0		
7. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ , and interpret the answer in terms of the model.	A4.0, A5.0, A6.0, A7.0		
8. (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)$ , and interpret the answer in terms of the model.	A4.0, A5.0, A6.0, A7.0		
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.	A4.0, A5.0, A6.0, A7.0		

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>			
<i>Calculate expected values and use them to solve problems</i>			
1.(+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.	A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	A4.0, A5.0, A6.0, A7.0, A8.0, A9.0		C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
3.(+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated, find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.	A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?	A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
<i>Use probability to evaluate outcomes of decisions</i>			
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.  a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.  b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	A2.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	A2.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	A2.0, A8.0, A9.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
<b>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</b>			
7.0 Students demonstrate an understanding of the standard distributions (normal, binomial, and exponential) and can use the distributions to solve for events in problems in which the distribution belongs to those families.	A4.0, A5.0, A6.0, A7.0		C3.0, C4.0, C6.0, C7.0, C8.0
10.0 Students know the definitions of the mean, median and mode of distribution of data and can compute each of them in particular situations.	A4.0, A5.0, A6.0, A7.0		C3.0, C4.0, C6.0, C7.0, C8.0
15.0 Students are familiar with the notions of a statistic of a distribution of values, of the sampling distribution of a statistic. And of the variability of a statistic.	A4.0, A5.0, A6.0, A7.0		C3.0, C4.0, C6.0, C7.0, C8.0
16.0 Students know basic facts concerning the relation between the mean and the standard deviation of a sampling distribution and the mean and the standard deviation of the population distribution.	A4.0, A5.0, A6.0, A7.0		C3.0, C4.0, C6.0, C7.0, C8.0
<b>Calculus – C</b>			
11.0 Students use differentiation to solve optimization (maximum–minimum problems) in a variety of pure and applied contexts.	A4.0, A5.0, A6.0, A7.0		C3.0, C4.0, C6.0, C7.0, C8.0
<b>HISTORY/SOCIAL SCIENCE</b>			
<b>Principles of American Democracy and Economics – AD</b>			
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.			



<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
12.7.2. Identify the major responsibilities and sources of revenue for state and local governments.		B8.0	
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.		B8.0	
<b>Principles of Economics – PE</b>			
12.1 Students understand common economic terms and concepts and economic reasoning.	A1.0, A2.0	B1.0, B8.0	
12.1.1. Examine the causal relationship between scarcity and the need for choices.	A1.0, A2.0, A4.0, A7.0, A8.0	B1.0, B6.0, B8.0	
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.	A1.0, A2.0, A4.0, A7.0	B1.0, B2.0, B4.0, B6.0, B8.0	C1.0, C3.0, C4.0, C6.0, C8.0
12.1.3. Identify the difference between monetary and non-monetary incentives and how changes in incentives cause changes in behavior.		B1.0, B11.0	
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.	A3.0, A4.0, A6.0, A9.0	B1.0, B4.0	
12.1.5. Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).	A4.0		
12.2 Students analyze the elements of America's market economy in a global setting.	A1.0, A3.0, A4.0	B1.0, B3.0, B4.0, B8.0, B10.0, B11.0	C2.0, C6.0
12.2.1. Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.	A4.0, A8.0		C1.0, C2.0, C3.0, C6.0, C7.0, C8.0
12.2.2. Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.	A4.0, A8.0	B1.0, B4.0	C1.0, C2.0, C3.0, C6.0, C7.0, C8.0
12.2.3. Explain the roles of property rights, competition, and profit in a market economy.	A3.0, A4.0, A8.0, A9.0		C1.0, C2.0, C3.0, C6.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
12.2.4. Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.	A4.0, A8.0		
12.2.5. Understand the process by which competition among buyers and sellers determines a market price.	A4.0	B1.0, B4.0, B6.0	
12.2.6. Describe the effect of price controls on buyers and sellers.	A3.0, A4.0		
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.	A7.0, A4.0	B6.0	
12.2.8. Explain the role of profit as the incentive to entrepreneurs in a market economy.	A1.0, A3.0, A4.0, A9.0	B6.0, B8.0	
12.2.9. Describe the functions of the financial markets.	A5.0	B3.0, B4.0, B6.0 B8.0, B10.0, B11.0	
12.2.10. Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.	A1.0, A4.0		
12.3 Students analyze the influence of the federal government on the American economy.	A3.0, A4.0, A5.0, A6.0, A8.0, A9.0	B1.0, B2.0, B4.0, B5.0, B6.0, B10.0	
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.	A3.0, A4.0, A9.0	B1.0, B2.0, B3.0, B5.0	C2.0, C3.0, C7.0, C8.0
12.3.2. Identify the factors that may cause the costs of government actions to outweigh the benefits.	A3.0, A4.0	B1.0, B4.0, B6.0	C2.0, C3.0, C7.0, C8.0
12.3.3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.	A5.0, A6.0, A8.0	B1.0, B3.0, B4.0, B5.0, B6.0	C2.0, C3.0, C7.0, C8.0
12.3.4. Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).	A5.0, A8.0	B2.0, B3.0, B5.0, B6.0, B10.0	C2.0, C3.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
12.4 Students analyze the elements of the U.S. labor market in a global setting.	A3.0, A4.0, A5.0, A7.0		
12.4.1. Understand the operations of the labor market, including the circumstances surrounding the establishment of principal American labor unions, procedures that unions use to gain benefits for their members, the effects of unionization, the mini-mum wage, and unemployment insurance.	A4.0	B7.0, B8.0	C1.0, C2.0, C3.0, C6.0, C7.0, C8.0
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.	A3.0, A4.0, A5.0, A7.0	B7.0, B8.0	
12.4.3. Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.	A6.0, A7.0		
12.4.4. Explain the effects of international mobility of capital and labor on the U.S. economy.	A7.0		C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0 C8.0
12.5 Students analyze the aggregate economic behavior of the U.S. economy.	A4.0, A5.0		
12.5.1. Distinguish between nominal and real data.	A4.0	B1.0, B5.0, B11.0	
12.5.2. Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, inflation or deflation rate, and a rate of economic growth.	A4.0, A5.0	B5.0, B6.0	C6.0
12.5.3. Distinguish between short-term and long-term interest rates and explain their relative significance.	A5.0	B3.0, B4.0, B6.0, B8.0, B10.0	
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.	A4.0, A5.0, A7.0		C1.0, C3.0, C4.0, C6.0, C7.0, C8.0
12.6.1. Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.		B7.0	C1.0, C2.0, C3.0, C6.0, C7.0, C8.0

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
12.6.2. Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.		B7.0	C1.0, C2.0, C3.0, C6.0, C7.0, C8.0
12.6.3. Understand the changing role of international political borders and territorial sovereignty in a global economy.		B7.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
12.6.4. Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.	A4.0, A5.0, A7.0	B7.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0
<b>U.S. History and Geography – US</b>			
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.		B1.0, B5.0	
11.6.5. Trace the advances and retreats of organized labor, from the creation of the American Federation of Labor and the Congress of Industrial Organizations to current issues of a postindustrial, multinational economy, including the United Farm Workers in California.	A3.0		
11.9 Students analyze U.S. foreign policy since World War II.		B5.0	
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.			C1.0, C2.0, C6.0
11.11.1. Discuss the reasons for the nation's changing immigration policy, with emphasis on how the Immigration Act of 1965 and successor acts have transformed American society.	A3.0		
<b>World History, Culture, and Geography – WH</b>			
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.			
10.3.1. Analyze why England was the first country to industrialize.	A1.0, A7.0		

<b>BUSINESS AND FINANCE</b>	<b>PATHWAYS</b>		
	<b>A. Business Management</b>	<b>B. Financial Services</b>	<b>C. International Business</b>
10.3.5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.	A1.0		
10.3.6. Analyze the emergence of capitalism as a dominant economic pattern and the responses to it, including Utopianism, Social Democracy, Socialism, and Communism.	A1.0		

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Business and Finance**

Lloyd McCabe, Administrator, California Department of Education  
Kay Ferrier, Education Consultant, California Department of Education  
Mindi Yates, Education Consultant, California Department of Education

#### *Standards Review Team*

Patricia Biagi, Curriculum Specialist, Sonoma County Office of Education  
Joe Gaestel, Instructor, Merced High School  
Tena Lozano, Director, CU Development, California and Nevada  
Credit Union Leagues  
Tony Tyler, Instructor, Corona–Norco Unified School District  
Sarah Vielma, Business Occupations Consultant, Los Angeles County  
Office of Education

#### *Standards Writing Team*

Patricia Biagi, Curriculum Specialist, Sonoma County Office of Education  
Adam Connors, Director, CK Cooper and Company  
Steven Devan, President and CEO, Grossmont Schools Federal Credit Unions  
Bruce Kajiwara, CPA  
Panda Morgan, Director, Northeastern California Small Business Development  
Center (SBDC)  
Patrick Rogan, CPA, California Society of Certified Public Accountants (CalCPA)  
Sheryl Ryder, Coordinator, California Business Education Leadership Project, Napa  
County Office of Education  
Ellen Tower, Instructor, San Diego Unified School District  
Virginia Wade, SVP Employee Services, SAFE Credit Union  
Kevin Zimmer, Vice President, Relationship Management and Business  
Development, LPL Financial

#### *Common Core Alignment Team*

Susan Beckenham, Instructor, Providence High School, Burbank  
John Fleming, Instructor, Sacramento City Unified School District  
Yvette Fraga, Instructor, Los Angeles Unified School District  
Robert Guernsey, Instructor, Sacramento City Unified School District  
Kamilah Jackson, Instructor, Los Angeles Unified School District  
Linh Tran, Instructor, Sacramento City Unified School District

## References

- American Association of Colleges for Teacher Education and the Partnership for 21st Century Skills (P21). 2010. "Preparing Students for the 21st Century Economy." <http://www.edsynergy.org/what-students-need-to-know-in-the-21st-century.htm> (accessed December 20, 2012).
- Association of American Colleges and Universities and the National Leadership Council for Liberal Education and America's Promise. 2007. *College Learning for the New Global Century*. [http://www.aacu.org/leap/documents/GlobalCentury\\_final.pdf](http://www.aacu.org/leap/documents/GlobalCentury_final.pdf). (accessed December 20, 2012).
- Association for Operations Management. 2012. "Certified in Production and Inventory Management." <http://www.apics.org/careers-education-professional-development/certification/cpim> (accessed December 20, 2012).
- Brown, Betty, Les Dlabay, Jack Kapoor, William Hoyt, and Robert Hughes. 2005. *Business and Personal Finance*. Woodland Hills, CA: Glencoe McGraw-Hill.
- California Department of Education (CDE). 2006. *California Career Technical Education Model Curriculum Standards, Grades Seven Through Twelve*. Sacramento: CDE. <http://www.cde.ca.gov/ci/ct/sf/documents/ctestandards.pdf> (accessed December 31, 2012).
- . 2007. *Career Technical Education Framework for California Public Schools, Grades Seven Through Twelve*. Sacramento: CDE. <http://www.cde.ca.gov/ci/ct/sf/documents/cteframework.pdf> (accessed December 31, 2012).
- California Employment Development Department, Labor Market Information Division. 2010. *California's Green Economy: Summary of Survey Results*. [http://www.energy.ca.gov/cleanenergyjobs/GrSurveyRpt\\_1115.pdf](http://www.energy.ca.gov/cleanenergyjobs/GrSurveyRpt_1115.pdf) (accessed December 20, 2012).
- Center for 21st Century Skills. 2012. "Six Critical Skills that Form the Foundation for 21st Century Success." <http://www.skills21.org/> (accessed December 20, 2012).
- Gareis, Christopher, and Leslie Grant. 1984. *Teacher-Made Assessments*. Larchmont, NY: Eye on Education, Inc.
- International Society for Technology in Education. 2007. "The ISTE NETS and Performance Indicators for Students (NETs)." [http://www.iste.org/Libraries/PDFs/NETS-S\\_Standards.sflb.ashx](http://www.iste.org/Libraries/PDFs/NETS-S_Standards.sflb.ashx) (accessed December 20, 2012).

Mariotti, Steve. 2006. *Entrepreneurship: How to Start and Operate a Small Business*. New York: Network for Teaching Entrepreneurship (NFTE).

MBA Research and Curriculum Center. 2012. "National Standards, Executive Summary." Columbus, OH. <http://www.mbaresearch.org> (accessed December 31, 2012).

Partnership for 21st Century Skills. 2011. <http://www.p21.org/> (accessed December 20, 2012).

Rue, Leslie W., and Lloyd L. Byars. 2011. *Business Management: Real-World Applications and Connections*. Woodland Hills, CA: Glencoe McGraw-Hill.

Texas Education Agency. 2010. "Career and Technical Education—Texas Essential Knowledge and Skills and Coherent Sequences, Subchapter D, Business Management and Administration." <http://www.tea.state.tx.us/index2.aspx?id=5415> (accessed December 31, 2012).

United States Department of Labor. 1991. The Secretary's Commission on Achieving Necessary Skills, *What Work Requires of Schools: A SCANS Report for America 2000*. <http://wdr.doleta.gov/SCANS/whatwork/whatwork.pdf> (accessed December 20, 2012).



**Table of Contents**  
**Education, Child Development, and Family Services**

**Sector Description** ..... 1

Knowledge and Performance Anchor Standards ..... 2

    1.0 Academics ..... 2

    2.0 Communications ..... 2

    3.0 Career Planning and Management ..... 2

    4.0 Technology ..... 3

    5.0 Problem Solving and Critical Thinking ..... 3

    6.0 Health and Safety ..... 3

    7.0 Responsibility and Flexibility ..... 4

    8.0 Ethics and Legal Responsibilities ..... 4

    9.0 Leadership and Teamwork ..... 5

    10.0 Technical Knowledge and Skills ..... 5

    11.0 Demonstration and Application..... 6

Pathway Standards ..... 8

    A. Child Development Pathway ..... 8

    B. Consumer Services Pathway ..... 13

    C. Education Pathway ..... 17

    D. Family and Human Services Pathway..... 21

Academic Alignment Matrix..... 25

Appendix: CTE Model Curriculum Standards Contributors**Error! Bookmark not defined.**9

References ..... 49



# Education, Child Development, and Family Services

## *Sector Description*

The Education, Child Development, and Family Services sector provides students with the academic and technical preparation to pursue high-skill, high-demand careers in these related and growing industries. The sector encompasses four distinct, yet interrelated, career pathways: Child Development, Consumer Services, Education, and Family and Human Services. The Child Development pathway provides students with the skills and knowledge they need to pursue careers in child care and related fields, and the Education pathway emphasizes the preparation of students to become teachers. The Consumer Services pathway gives students the employment and management skills needed in careers that involve helping consumers. The Family and Human Services pathway provides students with skills needed for careers related to family and social services. The standards are designed to integrate academic and career technical concepts. The anchor standards include Consumer and Family Studies comprehensive technical knowledge and skills that prepare students for learning in the pathways. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates hands-on projects, work-based instruction, and leadership development—for example, through FHA-HERO, the California affiliate of Family, Career and Community Leaders of America (FCCLA). Standards in the Education, Child Development, and Family Services sector are designed to prepare students for technical training, postsecondary education, and entry to a career.

## **Education, Child Development, and Family Services Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Education, Child Development, and Family Services academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Education, Child Development, and Family Services sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication, such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits, such as trust, respect, and responsibility, and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Education, Child Development, and Family Services sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Education, Child Development, and Family Services sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Education, Child Development, and Family Services sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.

- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

### **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Education, Child Development, and Family Services sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Education, Child Development, and Family Services sector.

### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Education, Child Development, and Family Services industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Education, Child Development, and Family Services sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.

- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Education, Child Development, and Family Services sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the career technical student organization (FHA-HERO, the California Affiliate of FCCLA). (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills, as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations (such as FHA-HERO) and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Education, Child Development, and Family Services sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Education, Child Development, and Family Services sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

**This section is specific to the foundational knowledge and skills required for Consumer and Family Studies.**

- 10.1 Interpret and explain terminology and practices specific to the Education, Child Development, and Family Services sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Education, Child Development, and Family Services sector.
- 10.3 Construct projects and products specific to the Education, Child Development, and Family Services sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.

- 10.5 Summarize the decisions and responsibilities involved in parenting in various cultures.
- 10.6 Describe and identify the stages of pregnancy, from conception through birth, and the implications of environment and heredity on the health and well-being of a child.
- 10.7 Explain the importance of studying child growth and development from infancy through adolescence.
- 10.8 Explain positive guidance and discipline techniques that promote feelings of self-worth as they apply to the developmental stages of children.
- 10.9 Demonstrate an understanding of the value and methods of providing infants, children, and adolescents with play and developmentally appropriate learning activities.
- 10.10 Describe the process of making consumer decisions, including the comparison of goods and services.
- 10.11 Practice how to manage financial resources to achieve personal and family goals.
- 10.12 Compare consumer resources, rights, and responsibilities and their relationship to the various levels of the economy.
- 10.13 Recognize the function of the family as a basic unit of society and the contributions of the family unit to the development of individuals.
- 10.14 Analyze the factors that affect the development of individuals and how to build positive relationships.
- 10.15 Describe the adjustments needed to adapt to major life changes throughout the human life cycle.
- 10.16 Apply strategies and resources for managing conflicts and crises.
- 10.17 Summarize the importance of wellness and safety to individual and family health and well-being.
- 10.18 Demonstrate an understanding of how to prevent and control infection and disease to produce the optimum health of individuals and families.
- 10.19 Explain the strategies that enable persons to manage and balance personal, family, and work responsibilities to enhance productivity and attain a quality of life.
- 10.20 Assess the individual, family, and workplace factors that influence decisions at each stage of the human life cycle.
- 10.21 Demonstrate an understanding of how knowledge, skills, attitudes, and behaviors learned in consumer and family studies can be transferred to advanced training and education or to careers related to the Education, Child Development, and Family Services sector.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Education, Child Development, and Family Services anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings, and through the career technical student organization (FHA-HERO, the California Affiliate of FCCLA).

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Education, Child Development, and Family Services sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Education, Child Development, and Family Services sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.



## **Education, Child Development, and Family Services Pathway Standards**

### **A. Child Development Pathway**

The Child Development pathway is designed to prepare students to pursue a career in the field of child care and development for infants, toddlers, and young children. Students study child growth and development, safety and emergency procedures, nutrition and health practices, positive interaction and guidance techniques, learning theories, and developmentally appropriate practices and curriculum activities. Students apply this knowledge in a variety of early childhood programs, such as child development laboratories, public and private preschools, family day care settings, and recreational facilities. Students completing the program may apply for the Child Development Assistant Permit from the California Commission on Teacher Credentialing.

Sample occupations associated with this pathway:

- ◆ Child Care Worker
- ◆ Child Development Specialist
- ◆ Child Psychologist
- ◆ Family Service Advocate

A1.0 Recognize the essential aspects of the early childhood education, child care, and development industry and the industry's role in state and local economies.

A1.1 Describe the organizational structures in early childhood education, child care, and development facilities.

A1.2 Explain the effect of the child care and development industry on state and local economies.

A1.3 Understand the interdependence of various career roles and how those roles contribute to the success of the child care and development program or work site.

A1.4 Research the functions and roles of the various careers in the child care and development industry.

A1.5 Identify the components of professionalism and how to practice professional behaviors.

A1.6 Analyze the legislative, economic, educational, and social trends that affect the child care and development industry.

A2.0 Identify and apply operational procedures and organizational policies at various early childhood education, child care, and development facilities.

A2.1 Identify the operational procedures at various types of facilities and their importance to the success of the organization.

A2.2 Understand the operational policies and procedures related to early education, child care, and development program components (e.g., adult-child and adult-guardian interaction, physical environment, health, safety, nutrition, curriculum, and assessment).

- A2.3 Explain the importance of, and procedures for, keeping child and classroom records and documentation.
  - A2.4 Summarize appropriate business systems that help with billing, ordering, budgeting, collecting fees, and reporting requirements.
  - A2.5 Illustrate the workforce management strategies that are effective for planning, making decisions, sharing responsibility, and negotiating.
- A3.0 Summarize child care and development standards, licensing, regulations, and codes, including California Code of Regulations Title 5 and Title 22.
- A3.1 Recognize the standards and licensing regulations for child care facilities.
  - A3.2 Identify the educational and industry-related requirements for child care facilities staff.
  - A3.3 Understand how local, state, and federal laws and regulations for child care facilities are enforced by regulatory agencies.
  - A3.4 Adhere to the health, safety, regulatory, and procedural requirements for the work site.
  - A3.5 Summarize the employer and employee responsibilities for complying with laws and regulations affecting the needs, interests, and rights of young children.
  - A3.6 Detect the indicators of child abuse or neglect and the responsibilities of staff as mandated reporters.
- A4.0 Apply critical safety, emergency, and disaster procedures at the work site.
- A4.1 Understand the state and federal environmental and safety regulations and the use of Material Safety Data Sheets (MSDS) as they relate to the child care and development industry.
  - A4.2 Implement the staff procedures, duties, and responsibilities related to safety, emergency, and disaster preparedness plans.
  - A4.3 Demonstrate how and when to use certified first aid, cardiopulmonary resuscitation (CPR), and other emergency procedures.
  - A4.4 Predict the typical hazards at the work site and know procedures and practices that contribute to a safe and healthy environment.
- A5.0 Explain important elements of a child's physical, intellectual, emotional, and social growth and development.
- A5.1 List the biological and environmental factors that influence the development of infants, toddlers, and children.
  - A5.2 Describe the developmental stages of infants, toddlers, and children.
  - A5.3 Summarize the ways in which diversity, family, and culture influence the development of children.
  - A5.4 Understand the importance of including infants, toddlers, and children with special needs.
  - A5.5 Analyze the importance of observational assessment and how to link assessment findings to individualized child planning.

- A5.6 Evaluate the importance of learning environments, experiences, and interactions and their connections to each stage of physical, intellectual, social, and emotional development.
- A5.7 Defend the benefits of parental involvement to the development of a child's physical, intellectual, emotional, and social growth and development.
- A6.0 Employ the principles of positive interactions, guidance, and discipline in the workplace.
  - A6.1 Describe how to help children develop a positive self-image and self-esteem and develop self-discipline and respect for oneself and others.
  - A6.2 Use the importance of building positive relationships between the caregiver, children, and families to provide effective guidance and discipline.
  - A6.3 Diagram the elements of positive guidance and discipline techniques that are based on the stages of children's development.
  - A6.4 Identify practical strategies for finding positive solutions to common behavioral problems.
  - A6.5 Plan and demonstrate how the staff can adjust the environment to promote a child's independence and personal and social competence.
- A7.0 Compare and apply the essential components of an effective learning environment for the early childhood classroom.
  - A7.1 Describe the components of an effective learning environment that reflects children's interests and developmental needs.
  - A7.2 Identify the early childhood education classroom learning areas and the contribution of each to the development of children.
  - A7.3 Classify multiple ways of promoting children's learning at different developmental stages and ages by using the continuum of teaching behaviors from directive to nondirective.
  - A7.4 Demonstrate appropriate teaching techniques and interaction styles for working with children of varying ages, learning styles, and cultural backgrounds.
  - A7.5 Illustrate the ways in which classroom environments promote productive interaction among children and adults to create a positive atmosphere and sense of community.
  - A7.6 Research and present the major learning theories and curriculum models and evaluate their application in early childhood education programs.
- A8.0 Select and apply developmentally appropriate practices for curriculum development.
  - A8.1 Develop components of a developmentally appropriate curriculum in each area of the balanced daily routine: indoor/outdoor, quiet/active, individual and small group/large group, large muscle/small muscle, and child-initiated and staff-initiated activities.

- A8.2 Observe children and document the observations in a factual and anecdotal format tying observations to developmental milestones.
  - A8.3 Integrate language acquisition strategies and support for English-Language learners.
  - A8.4 Plan and conduct activities that reinforce foundation skills, reflect an integrated and emergent curriculum, and support school readiness.
- A9.0 Practice the principles and practices of good nutrition, health, and safety for infants and children.
- A9.1 List the procedures used to clean a facility that follow a logical sequence and universal health precautions.
  - A9.2 Practice the procedures for preventing the spread of infections and illnesses, including those for food-borne pathogens.
  - A9.3 Use the appropriate sanitation and hygiene techniques for infants, toddlers, children, and staff.
  - A9.4 Communicate the proper procedures to follow when preparing and serving nutritional snacks and meals, including those that foster independent eating practices and promote good nutrition and hygiene habits.
  - A9.5 Recognize, describe, and report signs and symptoms of illness, injury, discomfort, or special needs in infants, toddlers, and children.
- A10.0 Communicate and interact effectively with families and communities.
- A10.1 Name the benefits of establishing strong relationships with families and communities.
  - A10.2 Interpret how positive family-staff relationships, family members, and the community contribute to the physical, intellectual, social, and emotional development of the child.
  - A10.3 Compare and contrast how language, culture, and educational backgrounds may affect family structures and communication within and among families and communities.
  - A10.4 Devise ways to use opportunities throughout the daily routine to build trusting relationships and effective communication with families and others.
  - A10.5 Advocate for high-quality programs and services for children and families.
- A11.0 Identify teaching materials and resources that enhance classroom instruction and indoor and outdoor learning in early childhood education, child care, and development programs.
- A11.1 Select and develop age-appropriate and developmentally appropriate teaching materials and resources.
  - A11.2 Use the appropriate and current instructional technology and equipment to develop program materials and support learning.
  - A11.3 Evaluate the various types and sources of quality, age-appropriate, and developmentally appropriate materials and equipment.
- A12.0 Illustrate how to support the learning process in an assisting role.

- A12.1 Define the strategies for supervising and maintaining a supportive learning environment for infants, toddlers, and children.
- A12.2 Understand the established standards and the standard operating procedures in classrooms, libraries, halls, and bathrooms and on the school grounds.
- A12.3 Classify the typical learning challenges that students encounter in curricular areas.
- A12.4 Implement planned activities to facilitate multidisciplinary learning and reinforce concepts.
- A12.5 Differentiate how to provide instructional assistance to small and large learning groups.
- A12.6 Identify and compile samples used for assessing a child and developing a portfolio.

## **Education, Child Development, and Family Services Pathway Standards**

### **B. Consumer Services Pathway**

The Consumer Services pathway focuses on a broad-based curriculum designed to prepare students for careers helping customers, including credit counselors, consumer reporters, writers, and consumer affairs directors. Students learn employment, entrepreneurial, and management skills that include business structure; consumer rights and responsibilities; testing and demonstration of products; consumer communications; and energy, environment, and resource management.

Sample occupations associated with this pathway:

- ◆ Media Product Demonstrator
- ◆ Customer Service Representative
- ◆ Personal Financial Advisor
- ◆ Accountant
- ◆ Credit Counselor

- B1.0 Describe important aspects of the consumer services industry and the role of the industry in local, state, national, and global economies.
- B1.1 Identify the ways in which national and international policies and procedures affect the daily operations of a consumer services organization.
  - B1.2 Summarize the legislative, economic, educational, and social trends that affect careers in the consumer services industry.
  - B1.3 Explain the effect of this industry on businesses and the state's economy.
  - B1.4 Identify the ways in which industries, companies, and agencies provide consumer information and services.
  - B1.5 Communicate the role of consumer affairs personnel in an organization.
- B2.0 Understand the principles of effective workforce and organizational management, including the roles and responsibilities of management and employees.
- B2.1 Explain the outcomes of effective leadership and management, such as profitability, solvency, productivity, consumer and client satisfaction, and business growth.
  - B2.2 Demonstrate the main workforce management strategies, such as shared responsibilities and negotiation, collaboration/consensus building, and communication.
  - B2.3 Summarize the interrelationship and interdependence and diversity of management and employees as they relate to workforce productivity.
  - B2.4 Use organizational procedures and tools, such as business plans, budgets/financials, spreadsheets for payroll and inventories, recordkeeping, and communication with consumers.
- B3.0 Demonstrate the operational procedures and safety practices that are commonly used in the consumer services industry.

- B3.1 Define the correct technical terms to describe products, procedures, and equipment specific to the consumer services industry.
  - B3.2 Demonstrate the procedures for preparing, expediting, and tracking forms needed for requisitioning supplies and materials.
  - B3.3 Analyze the purpose of, and information in, Material Safety Data Sheets (MSDS).
- B4.0 Understand essential consumer protection laws and regulations.
- B4.1 Recall and chart the evolution of consumer protection legislation.
  - B4.2 Describe the role of local, state, and national public and private agencies in consumer and business protection.
  - B4.3 Identify the effects of environmental laws and safety regulations on consumers.
  - B4.4 Explain the legal implications of a contract and interpret the consequences of consumer actions related to various types of contracts.
  - B4.5 Illustrate essential consumer protection laws and regulations commonly used in the consumer services industry.
- B5.0 Summarize consumer rights and responsibilities in the consumer services industry.
- B5.1 Identify effective strategies and laws that consumers can use when exercising their rights and useful methods for resolving complaints.
  - B5.2 Demonstrate how individuals can have an effect on the legislative process as it relates to consumer regulations.
  - B5.3 Illustrate the various advertising techniques with respect to consumer rights, marketing, technology, and point of sale methods.
  - B5.4 Analyze the effect of consumer protection laws on the cost and quality of goods and services.
  - B5.5 Diagram the effects of identity theft on diverse individuals, businesses, and local economies.
- B6.0 Communicate the significance of national and international influences, current events, and diversity within the consumer services industry.
- B6.1 Identify the national and international issues that affect consumers.
  - B6.2 Analyze the influence of different global industries, economies, regulations, and political and economic systems on the consumer services industry.
  - B6.3 Predict how aspects of diversity, such as culture, age, socioeconomic, gender, language, and abilities, affect consumer services.
- B7.0 Compare and contrast customer relationships and their impact on businesses and employees in the consumer services industry.
- B7.1 Identify the factors that contribute to quality customer relationships.
  - B7.2 Demonstrate the methods used to establish trust between a client and a customer service employee.

- B7.3 Explain how the customer's point of view and suggestions affect management policies and decisions.
  - B 7.4 Assess customer needs or desires and recommend products and services.
  - B 7.5 Discern logical, legal, ethical, and expedient solutions to consumer concerns by empowering employees to resolve consumer issues at the lowest level.
  - B 7.6 Illustrate how the Internet and new technology, including social media, improve communication and facilitate business operations, as well as can harm or improve a business reputation.
- B8.0 Use the skills and techniques needed to prepare advertising, public relations, and informational materials for consumers.
- B8.1 Identify the local, state, national, and international agencies, organizations, and media resources that provide current consumer information, including Internet and social media.
  - B8.2 List the tools and techniques used for communicating with consumers, including those used for advertising.
  - B8.3 Demonstrate how to prepare and deliver materials and presentations that consumers will understand, such as videos, visual presentations, media kits, public service announcements, and fact sheets.
  - B8.4 Develop communications, timelines, agendas, schedules, meeting arrangements, and advertising media for public relations activities.
  - B8.5 Analyze public relations plans in terms of their effect on customer relations and the operations of an organization.
- B9.0 Summarize important consumer programs and services provided by energy, environmental, and resource management businesses.
- B 9.1 Identify the various sources of energy available to consumers and the strategies that improve energy efficiency.
  - B9.2 Explain the environmental impact of residential and commercial waste disposal and recycling issues.
  - B9.3 Compare the costs and benefits of consumer programs for consumers, communities, and businesses.
- B10.0 Research the basic procedures required to research, test, label, and demonstrate products to provide information needed by employees, consumers, and clients.
- B10.1 Identify the trends that affect customer demand for products and services, including green products, to promote environmental friendliness and sustainability.
  - B10.2 Describe the purpose and significance of market research before a new product or service is developed and introduced.
  - B10.3 Describe the standard testing procedures and strategies used to analyze data and integrate findings to revise products.
  - B10.4 Explain the industry standards and government regulations that require specific information to be included on labels and care instructions.



- B10.5 Compare features, benefits, prices, product information, styles, and performance of goods.
- B10.6 Plan, produce, and evaluate demonstrations that educate consumers and promote a variety of products.
- B11.0 Practice personal financial management, its effects on the economy, and career, personal, and family goals.
  - B11.1 Describe the effects of short-term and long-term financial plans on consumer decisions.
  - B11.2 Define and identify credit terminology, credit ratings and sources, costs of credit, and risks and benefits of credit.
  - B11.3 Identify ways to resolve credit issues and explain the effect of credit issues on the consumer and the economy.
  - B11.4 Illustrate the costs of bankruptcy to the individual, the consumer, the institution, and the economy.
  - B11.5 Analyze budgets for a variety of individuals and families in accord with estimated income, needs, desires, goals, and lifestyles.
  - B11.6 Analyze, describe, and contrast various types of investments and risk assessment programs.
- B12.0 Explore the effect of the U.S. economic system on personal income, financial management, individual and family security, and consumer decisions.
  - B12.1 Describe the interrelationship between the economy and consumer spending and saving.
  - B12.2 Explain inflation and recession and how they affect the financial status of individuals and families.
  - B12.3 Compare the services provided by various financial institutions and departments of government.
  - B12.4 Review Truth in Lending legislation and California's Rosenthal Act related to consumers and their rights.

## **Education, Child Development, and Family Services Pathway Standards**

### **C. Education Pathway**

The Education pathway is designed to prepare students for professional or learning support positions in education, prekindergarten through grade twelve. Students study human development; standards, regulations, and codes; positive guidance and counseling techniques; age-appropriate and grade-appropriate learning strategies; learning theories; and standards-based curriculum and instructional design. Students can apply and practice their knowledge and skills at a variety of elementary and secondary education sites.

Sample occupations associated with this pathway:

- ◆ Before/Afterschool Program Aide
- ◆ Primary/Secondary School Teacher
- ◆ School Counselor
- ◆ Educational Administrator
- ◆ Speech Therapist

- C1.0 Describe the structure of the education industry and its role in local, state, and global economies.
- C1.1 Identify the effect of the education industry on state and local economies.
  - C1.2 Describe the basic structure of public education in California (e.g., prekindergarten through grade twelve, community college, the California State University, the University of California), as well as private institutions.
  - C1.3 Understand the legislative, economic, and social trends that affect the education industry.
  - C1.4 Explain the differences in organizational structures at educational facilities, including relationships and interactions among personnel.
- C2.0 Name operational procedures and organizational policies at various levels in education.
- C2.1 Identify the business procedures related to the acquisition of supplies and collection of fees.
  - C2.2 Recognize the main workforce management strategies in education (e.g., shared responsibility and negotiation).
  - C2.3 Implement appropriate procedures at the classroom level (e.g., attendance; observations; evaluations; illness, incident, accident, and injury reports).
- C3.0 State specific applications of government regulations in the education industry.
- C3.1 Describe the critical health and safety procedures that are used at a school site.
  - C3.2 Identify the indicators of child abuse and neglect and the role of the mandated reporter.

- C3.3 Locate and understand the credentialing requirements for teachers of students in prekindergarten through community college.
- C4.0 Practice critical emergency and disaster procedures at a school site.
  - C4.1 Identify state and federal environmental and safety regulations and the use of Material Safety Data Sheets (MSDS) as they relate to the education industry.
  - C4.2 Recognize the typical hazards at the work site and know the procedures and practices that contribute to a safe and healthy environment.
  - C4.3 Describe the staff procedures, duties, and responsibilities related to safety, emergency, and disaster preparedness plans.
  - C4.4 Demonstrate how to use certified first aid, cardiopulmonary resuscitation (CPR), and other emergency procedures.
- C5.0 Summarize important elements of the physical, intellectual, emotional, and social development of children and adolescents.
  - C5.1 Identify how typical and common atypical developmental patterns affect the educational progress of children and adolescents.
  - C5.2 Explain the role of family involvement in the physical, intellectual, emotional, and social development of children and adolescents.
  - C5.3 Diagram factors in heredity, family, culture, diversity, economic, abilities, and environment that may influence the development of children and adolescents.
  - C5.4 Assess and evaluate evidence-based educational practices for the inclusion of children and adolescents with special needs.
- C6.0 Use positive interaction, guidance, and discipline in the educational environment.
  - C6.1 List common behavior problems, possible causes, and develop potential positive solutions.
  - C6.2 Define the types of positive guidance techniques that are used in various ages and stages of a child's development.
  - C6.3 Demonstrate how to support the development of a positive self-image and self-esteem as well as independence and respect for oneself and others.
  - C6.4 Practice strategies for building relationships and effective classroom management, including appropriate guidance and discipline.
  - C6.5 Develop strategies for building relationships with all stakeholders.
- C7.0 Explain the role and purpose of standards-based instruction and assessment.
  - C7.1 Identify relevant curriculum standards and demonstrate their use in instruction.
  - C7.2 Understand the processes, implementations, and educator responsibilities of individualized education programs (IEPs) and Section 504 plans of the Rehabilitation Act and the Americans with Disabilities Act.
  - C7.3 Understand the types, important elements, and purposes of student assessments.

- C7.4 Explain the process of assessment for early identification of remedial needs or other interventions.
  - C7.5 Use the basic components of effective standards-based lesson plans appropriate for varying ages, learning styles, and diverse cultural backgrounds and abilities to write lesson plans.
  - C7.6 Practice using teaching strategies that promote student learning, critical thinking, and problem solving.
  - C7.7 Identify relevant curriculum standards, their significance to student success, and demonstrate their use in instruction.
- C8.0 Compare basic principles and practices of good nutrition and health and wellness for children.
- C8.1 Describe crucial safety and sanitary procedures to follow in the classroom related to good nutrition and health.
  - C8.2 Identify services available to at-risk students and how to link students to resources.
  - C8.3 Apply appropriate sanitation, health, and hygiene procedures for preventing the spread of infections and illnesses and for responding to allergic reactions.
  - C8.4 Research the nutritional needs of children and the allergies commonly associated with food.
  - C8.5 Detect common indicators of nutrition-related disorders and diseases.
- C9.0 Assess how to communicate and interact effectively with families and community groups.
- C9.1 Recognize the factors that influence effective communication between the school and home and how to foster familial involvement.
  - C9.2 Summarize the ways in which age, abilities, language, culture, economics, and educational backgrounds may affect communication within and among families and the school.
  - C9.3 Explain issues of diversity and how to exhibit sensitivity to cultural differences.
- C10.0 Integrate the process of developing quality teaching materials and resources for classroom instruction.
- C10.1 Evaluate various types and sources of quality, developmentally appropriate materials and equipment.
  - C10.2 Demonstrate the appropriate use of current and emerging technology to develop instructional materials and support learning.
  - C10.3 Assess available materials and resources for quality, accuracy, relevance, and grade appropriateness.
  - C10.4 Design grade-appropriate instructional materials and resources, including those that augment educational materials adopted by the State Board of Education.

- C11.0 Evaluate the role of instructional staff in supporting the learning process.
  - C11.1 Name behavior standards expected of students in classrooms, libraries, and bathrooms on the school grounds and during educational and recreational trips.
  - C11.2 Demonstrate techniques for providing positive feedback on student work, attendance, and classroom performance.
  - C11.3 Explain how to help the teacher with student instruction, assessment, and confidentiality.
  - C11.4 Analyze a variety of individual and group teaching strategies and learning theories that promote effective learning.
  - C11.5 Research the common typical and atypical learning challenges for students in a variety of curricular areas.
  
- C12.0 Formulate the components of effective after-school and recreational programs for individuals and groups.
  - C12.1 List the purposes of after-school and recreational activities.
  - C12.2 Summarize the important components and typical age-appropriate or ability-appropriate activities of various after-school and recreational programs.
  - C12.3 Assess the recreational interests and needs of individuals and groups and develop appropriate activities.

## **Education, Child Development, and Family Services Pathway Standards**

### **D. Family and Human Services Pathway**

Employment growth in the Family and Human Services pathway will likely be driven by an increasing demand for family assistance. Students learn employment and management skills, such as positive guidance, professional behavior and standards, and laws and regulations related to the field. Students also learn about nutrition, health, aging, and safety.

Sample occupations associated with this pathway:

- ◆ Personal Care Assistant
- ◆ Human Services Program Specialist
- ◆ Social Outreach Director
- ◆ Community Organizational Director

- D1.0 Recognize important aspects of the family and human services industry and the role of the industry in local, state, national, and global economies.
- D1.1 Describe the ways in which agencies and organizations provide family and human services.
  - D1.2 Communicate the role and effect of this industry on individuals, families, and the state's economy.
  - D1.3 Explore the legislative, economic, and social trends that have an effect on careers in the family and human services industry.
  - D1.4 Diagram the organizational structure and hierarchy that shows the relationships and interactions among departments in both public and private sectors of this industry.
- D2.0 Describe the principles of effective workforce and organizational management, including the roles and responsibilities of management and employees.
- D2.1 Define the outcomes of effective leadership and management, such as profitability, solvency, productivity, positive work environment, and client satisfaction.
  - D2.2 Practice the main workforce management strategies, such as shared responsibilities, collaboration, consensus-building, and communication.
  - D2.3 Compare the interrelationship, interdependence, and diversity of management and employees as they relate to workforce productivity.
  - D2.4 Experiment with using organizational procedures and tools, such as business plans, budgets/financials, spreadsheets for payroll and inventories, recordkeeping, and communication with consumers.
  - D2.5 Create a plan of how to identify and gain access to various sources of funding and services that serve individuals, families, and communities.
- D3.0 Locate the facilities and operational procedures used in the family and human services industry.

- D3.1 List the various types of care facilities that promote the independence of clients.
  - D3.2 Describe the operational procedures related to quality control, inventory control, maintenance, storage, security, mailing, receiving, billing, and payment.
  - D3.3 Become familiar with various types of liability, insurance policies, code compliance, service agreements, and contracts.
  - D3.4 Evaluate facilities for the safety, well-being, and needs of diverse clients.
- D4.0 Adhere to the laws and regulations that affect providers of family and human services and their diverse clients.
- D4.1 Recognize the local, state, and federal laws, regulations, and agencies established to protect children, adolescents, and adults, including older adults and other persons with special needs and abilities.
  - D4.2 Identify the ways in which local, state, and federal regulations and laws are enforced by regulatory agencies, including the California Occupational Safety and Health Administration, the Americans with Disabilities Act, and the Health Insurance Portability and Accountability Act.
  - D4.3 Understand the typical policies and procedures established by employers to comply with local, state, and federal regulations and laws.
- D5.0 Interpret the stages of human development and the related needs of individuals and families.
- D5.1 Identify the behaviors and resources that foster the health and well-being of individuals and families.
  - D5.2 Classify common needs, problems, and adjustments associated with life changes.
  - D5.3 Develop ways to enhance the social and emotional health of individuals and families.
  - D5.4 Diagram the characteristics and changing needs of the various stages of development throughout the life span.
  - D5.5 Assess the special needs of clients and identify resources and agencies that provide services.
- D6.0 Apply the basic principles that promote health and well-being throughout the life span.
- D6.1 Select strategies that promote good health practices for all ages.
  - D6.2 Recognize and describe signs and symptoms of health, illness, discomfort, and disease.
  - D6.3 Evaluate foods in terms of their economic and nutritional value.
  - D6.4 Plan and demonstrate exercise activities that are enjoyable, safe, and appropriate for the individual needs of clients.
  - D6.5 Plan and prepare snacks and meals that meet the dietary needs of persons, including those with special dietary needs, by using sanitary and safe food-handling procedures.

- D7.0 Practice important safety, emergency, and disaster procedures to use for a variety of populations.
  - D7.1 Recognize how to establish and promote good safety habits for all ages.
  - D7.2 Discern the causes and preventions of common accidents and injuries.
  - D7.3 Identify the specific health considerations of persons with disabilities.
  - D7.4 Practice the correct procedures for dealing with emergencies and disasters.
  - D7.5 Perform the procedures for basic first aid and cardiopulmonary resuscitation (CPR) for infants, children, and adults.
  - D7.6 Comply with the procedures that prevent the spread of illnesses, infections, and diseases, including blood-borne pathogens.
  
- D8.0 Develop interpersonal skills required to interact effectively with individuals and families of all ages and abilities.
  - D8.1 Use the strategies that promote positive interaction between individuals, families, and agencies.
  - D8.2 Apply effective ways to communicate and interact with culturally diverse individuals and families, such as using mediation, conflict resolution, and decision-making skills.
  - D8.3 Create effective ways to teach individuals and families communication, mediation, conflict-resolution, and decision-making skills.
  
- D9.0 Integrate positive guidance and its application in helping individuals and families.
  - D9.1 Interpret the concept of positive guidance and its benefits across one's life span.
  - D9.2 Implement positive guidance techniques that are appropriate for clients and that promote independence.
  - D9.3 Predict possible causes of behavior problems and conflict and demonstrate positive solutions, including behavior modification.
  
- D10.0 Facilitate daily living activities of individuals and families.
  - D10.1 List the tasks of daily living and the types of assistance persons need with these activities, including assistance for persons with special needs.
  - D10.2 Understand the importance of personal care and well-being to the physical and emotional health of clients.
  - D10.3 Demonstrate the importance of privacy, independence, dignity, confidentiality, and respect for clients.
  - D10.4 Develop procedures for shopping, banking, recordkeeping, and other services that will assist clients.
  - D10.5 Research the various types of disabilities, potential barriers, and types of accommodations needed for clients.
  - D10.6 Experiment with important consumer information, such as comparison shopping, disclosure on labels, warranties and guarantees, consumer fraud and identity theft, consumer redress, and consumer rights and responsibilities.



- D11.0 Distinguish common problems and crises affecting individuals and families of all ages.
  - D11.1 Summarize the signs of emotional and physical abuse, emotional crises, and mental health issues, such as depression, isolation, substance abuse, stress, elder abuse, financial abuse, and neglect.
  - D11.2 Explain behaviors that require intervention and outside assistance.
  - D11.3 Demonstrate how to provide the information that individuals and families need to make decisions about seeking professional help.
  
- D12.0 Advocate for the importance of social involvement for individuals and families.
  - D12.1 Defend the value of social, recreational, and educational activities for all ages.
  - D12.2 Locate and evaluate the appropriateness of facilities and community resources for social support, recreational, and educational activities.
  - D12.3 Recommend appropriate community resources for social, recreational, and educational activities to meet client needs for all ages.
  - D12.4 Plan, conduct, and evaluate social, recreational, and educational activities appropriate to the physical, psychological, cultural, and socioeconomic needs of individuals and families

## Academic Alignment Matrix

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>ENGLISH LANGUAGE ARTS</b>				
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
<b>Reading Standards for Informational Text – RSIT (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
<b>Reading Standards for Literacy in History/Social Studies – RHSS (Standard Area, Grade Level, Standard #)</b>				
11- 12.3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledgement where the text leaves matters uncertain.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A10.0, A12.0	B1.0, B4.0, B5.0, B6.0, B11.0, B12.0	C1.0, C5.0, C6.0, C9.0, C12.0	D1.0, D4.0, D5.0, D11.0, D12.0
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST (Standard Area, Grade Level, Standard #)</b>				
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A9.0, A11.0, A12.0	B1.0, B2.0, B3.0, B7.0, B9.0, B10.0, B12.0	C1.0, C2.0, C3.0, C4.0, C8.0, C10.0	D2.0, D3.0, D4.0, D6.0, D7.0, D10.0
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on	A9.0, A11.0, A12.0	B1.0, B2.0, B3.0, B7.0, B9.0, B10.0, B12.0	C1.0, C2.0, C3.0, C4.0, C8.0, C10.0	D2.0, D3.0, D4.0, D6.0, D7.0, D10.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
explanations in the text.				
11-12-4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A9.0, A11.0, A12.0	B1.0, B2.0, B3.0, B7.0, B9.0, B10.0, B12.0	C1.0, C2.0, C3.0, C4.0, C8.0, C10.0	D2.0, D3.0, D4.0, D6.0, D7.0, D10.0
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A9.0, A11.0, A12.0	B1.0, B2.0, B3.0, B7.0, B9.0, B10.0, B12.0	C1.0, C2.0, C3.0, C4.0, C8.0, C10.0	D2.0, D3.0, D4.0, D6.0, D7.0, D10.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>				
<p>11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.</p> <p>a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.</p> <p>b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.</p> <p>c. Use specific rhetorical devices to support assertions (e.g., appeal to logic through reasoning; appeal to emotion or ethical belief; relate a personal anecdote. Case study or analogy).</p> <p>d. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the</p>	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<p>norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the argument presented.</p>				
<p>11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>a. Introduce a topic or thesis statement; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.</p> <p>c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.</p> <p>d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p>	<p>A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0</p>	<p>B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0</p>	<p>C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0</p>	<p>D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0</p>

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
11-12.3 Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
11-12.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0	X D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0, D12.0
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST</b>				
11-12.1. Write arguments focused on discipline-specific content.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0, C10.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D10.0, D11.0, D12.0
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0, C10.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D10.0, D11.0, D12.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0, C10.0, C12.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D10.0, D11.0, D12.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>MATHEMATICS</b>				
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>				
<i>Write expressions in equivalent forms to solve problems</i>				
<p>3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <p>a. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.</p> <p>c. Use the properties of exponents to transform expressions for exponential functions. For example the expression <math>1.15^t</math> can be rewritten as <math>(1.15^{1/12})^{12t} = 1.012^{12t}</math> to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</p> <p>d. Prove simple laws of logarithms. (CA Standard Algebra II - 11.0)</p> <p>e. Use the definition of logarithms to translate between logarithms in any base. (CA Standard Algebra II - 13.0)</p> <p>f. Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values. (CA Standard Algebra 11- 14.0)</p>	<p>A3.0, A4.0</p>	<p>B5.0, B10.0, B11.0</p>	<p>C1.0, C2.0, C3.0</p>	<p>D2.0, D3.0</p>
<p>4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.</p>	<p>A2.0</p>	<p>B5.0, B11.0</p>	<p>C1.0, C2.0, C3.0</p>	<p>D2.0, D3.0</p>



<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>Algebra – A-CED – Creating Equations</b>				
<i>Create equations that describe numbers or relationships</i>				
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.  1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	A5.0, A7.0	B7.0	C12.0	D5.0
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A5.0, A7.0, A9.0	B5.0	C8.0	D6.0
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A5.0, A7.0, A9.0	B5.0, B6.0	C8.0	D6.0
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>				
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>				
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A5.0	B5.0	C5.0	D5.0
<i>Solve equations and inequalities in one variable</i>				

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.  3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)	A1.0	B9.0, B11.0, B12.0	C5.0	
<i>Solve systems of equations</i>				
5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.		B2.0		
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.		B2.0		
<b>Functions – F-IF – Interpreting Functions</b>				
<i>Interpret functions that arise in applications in terms of the context</i>				
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.		B11.0, B12.0		
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.		B11.0, B12.0		
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.		B11.0, B12.0		

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>Functions – F-BF – Building Functions</b>				
<i>Build a function that models a relationship between two quantities</i>				
1. Write a function that describes a relationship between two quantities.  b. Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</i>		B6.0, B7.0		
2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.		B6.0		
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>				
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).			C6.0	
<b>Geometry – G-C – Circles</b>				
<i>Understand and apply theorems about circles</i>				
1. Prove that all circles are similar.	A5.0, A8.0		C10.0	
<b>Geometry – G-CO – Congruence</b>				
<i>Make geometric constructions</i>				
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	A4.0		C4.0	

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>				
<i>Explain volume formulas and use them to solve problems</i>				
1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.	A8.0, A11.0		C5.0, C10.0	
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.	A4.0, A8.0, A11.0			
<i>Visualize relationships between two-dimensional and three-dimensional objects</i>				
4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three dimensional objects generated by rotations of two-dimensional objects.	A8.0, A11.0		C5.0, C10.0	
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	A8.0, A11.0		C5.0, C10.0	
<b>Geometry – G-MG – Modeling with Geometry</b>				
<i>Apply geometric concepts in modeling situations</i>				
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder.	A1.0, A5.0, A6.0, A7.0, A8.0, A9.0, A12.0	B8.0	C2.0, C12.0	
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A1.0, A5.0, A6.0, A7.0, A8.0, A9.0, A12.0	B3.0, B8.0	C2.0, C12.0	D2.0, D6.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A1.0, A5.0, A6.0, A7.0, A8.0, A9.0, A12.0	B3.0	C2.0, C12.0	D3.0
<b>Number and Quantities – N-Q – Quantities</b>				
<i>Reason quantitatively and use units to solve problems</i>				
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A7.0, A8.0, A9.0	B8.0, B9.0	C5.0, C6.0, C11.0, C12.0	D2.0, D3.0, D4.0, D5.0
2. Define appropriate quantities for the purpose of descriptive modeling.	A2.0, A4.0, A6.0, A9.0, A10.0, A11.0	B5.0, B6.0	C6.0, C8.0, C9.0, C10.0	D7.0, D9.0, D10.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A3.0	B2.0, B8.0, B9.0	C2.0, C5.0	D1.0, D2.0, D3.0
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>				
<i>Understand and evaluate random processes underlying statistical experiments</i>				
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A1.0, A5.0, A12.0	B7.0, B8.0, B10.0	C1.0	D1.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>				
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A5.0	B7.0, B10.0, B11.0	C2.0, C5.0, C7.0, C9.0	D5.0, D12.0
6. Evaluate reports based on data.	A5.0, A8.0, A11.0	B7.0, B10.0, B11.0	C2.0, C5.0, C7.0, C9.0	D5.0, D12.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>				
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>				
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A1.0, A5.0, A6.0	B2.0, B7.0, B12.0	C5.0, C6.0, C7.0, C9.0, C10.0, C12.0	D3.0, D5.0, D6.0, D7.0
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>				
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.  b. Informally assess the fit of a function by plotting and analyzing residuals.	A5.0, A6.0, A7.0, A8.0, A10.0	B2.0, B7.0, B12.0	C5.0, C6.0, C7.0, C9.0, C10.0, C12.0	D3.0, D5.0, D6.0, D7.0
<i>Interpret linear models</i>				
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	A5.0, A6.0, A7.0, A8.0, A10.0	B2.0, B7.0, B12.0	C5.0, C6.0, C7.0, C9.0, C10.0, C12.0	D3.0, D5.0, D6.0, D7.0
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>				
<i>Understand independence and conditional probability and use them to interpret data</i>				
1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	A1.0, A2.0, A4.0	B1.0, B2.0, B3.0, B4.0, B6.0, B9.0, B12.0	C1.0, C2.0, C3.0	D1.0, D2.0, D3.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.		B3.0		
3. Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$ , and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.		B3.0		
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.		B3.0		
<i>Use the rules of probability to compute probabilities of compound events in a uniform probability model</i>				
6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.	A8.0	B2.0	C5.0, C8.0	
7. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ , and interpret the answer in terms of the model.		B2.0		
8. (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)$ , and interpret the answer in terms of the model.		B2.0		
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.		B2.0		

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>				
<i>Calculate expected values and use them to solve problems</i>				
1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.	A4.0, A6.0, A8.0, A10.0, A12.0	B1.0, B10.0, B11.0	C6.0, C7.0, C8.0, C10.0	D5.0, D6.0, D8.0, D9.0, D10.0, D11.0
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.		B1.0		
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.		B1.0		
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?		B1.0		
<i>Use probability to evaluate outcomes of decisions</i>				
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.  a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.	A1.0, A11.0	B1.0, B11.0	C1.0, C10.0	D1.0, D2.0, D10.0, D12.0



<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>SCIENCE</b>				
<b>Scientific and Engineering Practices – SEP</b>				
1. Asking questions (for science) and defining problems (for engineering)	A2.0, A3.0	B9.0, B10.0	C4.0, C10.0	D3.0, D10.0
2. Developing and using models	A1.0, A8.0	B10.0, B11.0	C12.0	D9.0
3. Planning and carrying out investigations	A8.0, A11.0, A12.0	B6.0, 10.0	C9.0, C11.0, C12.0	D1.0, D2.0, D3.0, D9.0, D10.0, D11.0
4. Analyzing and interpreting data	A1.0, A3.0, A5.0, A6.0, A7.0, A10.0	B11.0	C1.0, C8.0	D6.0, D9.0, D11.0
5. Using mathematics and computational thinking	A2.0	B1.0, B2.0, B8.0, B9.0, B10.0, B11.0	C1.0, C7.0, C10.0	D2.0
7. Engaging in argument from evidence		B11.0		D3.0
8. Obtaining, evaluating, and communicating information	A1.0, A3.0, A5.0, A6.0, A7.0, A12.0	B1.0, B3.0, B8.0	C7.0, C9.0, C11.0	D1.0, D3.0, D4.0, D5.0, D6.0, D7.0, D11.0
<b>Crosscutting Concept – CC</b>				
1. Patterns	A8.0	B10.0	C7.0	D5.0
2. Cause and effect: Mechanism and explanation	A4.0, A5.0, A6.0, A7.0, A9.0	B11.0	C6.0, C7.0, C8.0	D1.0, D2.0, D3.0, D9.0, D10.0
3. Scale, proportion, and quantity	A1.0, A12.0	B11.0, B12.0	C1.0, C2.0, C6.0	D1.0, D3.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
4. Systems and system models	A4.0, A5.0	B4.0, B9.0, B10.0	C4.0	
5. Energy and matter: Flows, cycles, and conservation	A5.0			
7. Stability and change	A7.0		C6.0, C9.0	
<b>Physical Sciences – PS</b>				
PS1: Matter and Its Interactions				
PS1.A: Structure and Properties of Matter	A4.0, A11.0	B3.0, B4.0	C4.0, C8.0	D6.0, D7.0
PS1.B: Chemical Reactions	A4.0, A3.0 A9.0	B4.0	C4.0, C8.0	D6.0,D7.0
PS2: Motion and Stability: Forces and Interactions				
PS2.A: Forces and Motion	A4.0		C4.0	D7.0
PS2.B: Types of interactions	A4.0	B9.0	C4.0	D7.0
PS2.C: Stability and Instability in Physical Systems	A4.0		C4.0	D7.0
PS3: Energy				
PS3.A: Definitions of Energy	A3.0, A4.0	B1.0, B4.0, B9.0	C4.0	D7.0
PS3.B: Conservation of Energy and Energy Transfer	A3.0, A4.0	B4.0	C4.0	D7.0
PS3.D: Energy in Chemical Processes and Everyday Life	A4.0	B9.0	C3.0	D6.0
PS4: Waves and Their Applications in Technologies for Information Transfer				
PS4.C: Information Technologies and Instrumentation	A11.0	B3.0	C10.0	D10.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
<b>Life Sciences – LS</b>				
LS1: From Molecules to Organisms: Structures and Processes				
LS1.A: Structure and Function			C8.0	D5.0, D6.0
LS1.B: Growth and Development of Organisms	A5.0, A8.0, A9.0, A11.0	B10.0	C8.0	D5.0, D6.0
LS1.D: Information Processing	A5.0, A8.0, A10.0, A11.0	B1.0, B3.0, B8.0, B10.0	C5.0, C6.0, C7.0, C9.0, C10.0	D5.0, D6.0, D8.0, D10.0, D12.0
LS2: Ecosystems: Interactions, Energy, and Dynamics				
LS2.A: Interdependent Relationships in Ecosystems	A5.0, A6.0	B4.0, B7.0, B9.0	C5.0, C6.0, C8.0	D5.0, D6.0, D8.0
LS2.C: Ecosystems Dynamics, Functioning, and Resilience		B4.0, B6.0, B7.0		D6.0
LS2.D: Social Interactions and Group Behavior	A2.0, A5.0, A6.0, A7.0, A10.0	B5.0, B7.0	C2.0, C3.0, C5.0, C6.0, C9.0	D6.0, D8.0, D10.0, D12.0
LS3: Heredity: Inheritance and Variation of Traits				
LS3.A: Inheritance of Traits	A5.0	B6.0	C5.0	D5.0
LS3.B: Variation of Traits	A5.0		C5.0	D5.0
LS4: Biological Evolution: Unity and Diversity				
LS4.B: Natural Selection	A4.0, A5.0, A6.0	B6.0		
LS4.C: Adaptation	A5.0, A7.0, A8.0		C5.0	D5.0, D6.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
LS4.D: Biodiversity and Humans	A2.0, A3.0, A9.0	B10.0	C2.0, C3.0, C4.0, C7.0, C8.0, C12.0	D1.0, D4.0, D5.0, D6.0, D8.0, D10.0, D12.0
<b>Earth and Space Sciences – ESS</b>				
ESS2: Earth's Systems				
ESS2.A: Earth Materials and Systems	A2.0, A3.0, A4.0	B4.0		D7.0
ESS2.B: Plate Tectonics and Large-Scale System Interactions	A2.0, A3.0, A4.0		C4.0	D7.0
ESS2.D: Weather and Climate	A4.0	B3.0	C4.0	D7.0
ESS3: Earth and Human Activity				
ESS3.A: Natural Resources	A2.0, A11.0	B1.0, B4.0, B6.0, B9.0, B10.0	C10.0	
ESS3.B: Natural Hazards		B4.0, B6.0		D7.0
ESS3.C: Human Impacts on Earth Systems		B1.0, B4.0, B6.0, B9.0, B10.0	C2.0, C3.0, C8.0	
ESS3.D: Global Climate Change		B1.0, B4.0, B6.0, B9.0, B10.0		
<b>Engineering, Technology, and the Applications of Science – ETS</b>				
ETS1: Engineering Design				

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
ETS1.A: Defining and Delimiting an Engineering Problem	A2.0, A3.0, A4.0, A5.0, A7.0, A12.0			D5.0, D8.0
ETS1.B: Developing Possible Solutions	A2.0, A3.0, A4.0, A5.0, A7.0, A12.0			D5.0, D8.0
ETS1.C: Optimizing the Design Solution	A2.0, A3.0, A4.0, A5.0, A7.0, A12.0			D5.0, D8.0
ETS2: Links Among Engineering, Technology, Science, and Society				
ETS2.A: Interdependence of Science, Engineering, and Technology		B3.0, B9.0, B10.0	C3.0	
ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A7.0	B3.0, B6.0, B7.0, B8.0, B10.0	C4.0, C7.0, C8.0, C9.0, C10.0	
<b>HISTORY/SOCIAL SCIENCE</b>				
<b>Principles of American Democracy and Economics – AD</b>				
12.1 Students explain the fundamental principles and moral values of American democracy as expressed in the U.S. Constitution and other essential documents of American democracy.	A1.0	B1.0	C5.0, C6.0	D1.0, D4.0
12.2 Students evaluate and take and defend positions on the scope and limits of rights and obligations as democratic citizens, the relationships among them, and how they are secured.	A9.0	B2.0, B5.0, B11.0	C1.0, C5.0, C9.0	D2.0, D4.0, D11.0, D12.0
12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their Interdependence, and the meaning and importance of those values and principles for a free society.	A1.0	B1.0	C1.0	D4.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
12.5 Students summarize landmark U.S. Supreme Court interpretations of the Constitution and its amendments.	A1.0	B.1.0	C1.0	D4.0
12.6 Students evaluate issues regarding campaigns for national, state, and local elective offices.	A1.0	B1.0	C1.0	D12.0
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.	A3.0, A9.0	B1.0, B4.0, B5.0, B10.0, B12.0	C1.0, C3.0, C7.0	D1.0, D4.0, D7.0
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.	A1.0	B1.0	C1.0	D1.0, D4.0
<b>Principles of Economics – PE</b>				
12.1 Students understand common economic terms and concepts and economic reasoning.				
12.1.1. Examine the causal relationship between scarcity and the need for choices.	A1.0, A2.0, A11.0	B1.0, B5.0, B7.0, B11.0	C1.0, C10.0, C11.0, C12.0	
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.	A1.0, A2.0, A11.0	B1.0		
12.1.3. Identify the difference between monetary and non-monetary incentives and how changes in incentives cause changes in behavior.	A1.0, A2.0, A11.0	B1.0		
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.	A1.0, A2.0, A11.0	B1.0		
12.1.5. Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).		B12.0		
12.2 Students analyze the elements of America's market economy in a global setting.				
12.2.1. Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.	A1.0	B1.0, B5.0	C1.0	D1.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
12.2.2. Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.	A1.0	B1.0	C1.0	D1.0
12.2.3. Explain the roles of property rights, competition, and profit in a market economy.		B1.0	C1.0, C2.0	
12.2.4. Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.		B1.0, B7.0		
12.2.5. Understand the process by which competition among buyers and sellers determines a market price.	A1.0	B1.0, B6.0, B10.0	C1.0	D1.0
12.2.6. Describe the effect of price controls on buyers and sellers.	A1.0	B1.0, B6.0, B8.0	C1.0	D1.0
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.	A1.0	B1.0, B6.0	C1.0	D1.0
12.2.8. Explain the role of profit as the incentive to entrepreneurs in a market economy.	A1.0	B1.0	C1.0	D1.0
12.2.9. Describe the functions of the financial markets.		B1.0		
12.2.10. Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.		B1.0, B9.0		
12.3 Students analyze the influence of the federal government on the American economy.				
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.		B3.0, B4.0, B5.0, B12.0	C1.0, C2.0, C3.0, C8.0	D4.0

<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
12.3.3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.		B3.0, B4.0, B5.0, B12.0	C1.0, C2.0, C3.0, C8.0	D4.0
12.4 Students analyze the elements of the U.S. labor market in a global setting.	A1.0		C1.0	D2.0
12.5 Students analyze the aggregate economic behavior of the U.S. economy.		B12.0	C1.0	
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.		B6.0	C1.0	D1.0
<b>U.S. History and Geography – US</b>				
11.3 Students analyze the role religion played in the founding of America, its lasting moral, social, and political impacts, and issues regarding religious liberty.		B2.0, B10.0		D1.0
11.8 Students analyze the economic boom and social transformation of post-World War II America.		B1.0, B2.0, B4.0, B5.0, B7.0, B10.0, B12.0		D1.0, D2.0
11.10 Students analyze the development of federal civil rights and voting rights.			C1.0, C5.0	D4.0
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.	A1.0, A8.0, A9.0, A10.0	B1.0, B4.0, B5.0, B6.0, B7.0, B9.0, B11.0, B12.0	C3.0, C5.0, C7.0, C8.0, C9.0, C10.0, C12.0	D1.0, D8.0, D4.0, D6.0, D11.0, D12.0
<b>World History, Culture, and Geography – WH</b>				
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.				
10.3.5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.	A1.0	B1.0, B12.0	C1.0	D1.0



<b>EDUCATION, CHILD DEVELOPMENT, AND FAMILY SERVICES</b>	<b>PATHWAYS</b>			
	<b>A. Child Development</b>	<b>B. Consumer Services</b>	<b>C. Education</b>	<b>D. Family and Human Services</b>
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0	B.10, B6.0	C1.0, C6.0	D.1,0

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Education, Child Development, and Family Services**

Bob Heuvel, Administrator, California Department of Education  
Angie Ford, Education Consultant, California Department of Education

#### *Standards Review Team*

Jolene Fassbinder, Executive Director, UCLA, MedNet  
Linda Lovett, Owner, Lovett's Child Development Center  
Joaquin Murphy, Program Representative III, California Department of Consumer  
Affairs  
Patricia Peck, Professor, California State University, Sacramento  
Ann Ramirez, Preformal Instructional Paraprofessional, Modesto City Schools  
Sonja Shumaker, Retired Instructor  
Patti Stanley, Instructor, Modesto City Schools

#### *Standards Writing Team*

Patricia Peck, Professor, California State University, Sacramento  
Brad Vander Hamm, Instructor, Lodi Unified School District

#### *Common Core Alignment Team*

Rachelle Barkus, Instructor, Modesto City Schools  
Kent Braithwaite, Instructor, Conejo Valley Unified School District  
Tim Cook, Instructor, Pomona Unified School District  
Debbie Hawks, Instructor, Pasadena Unified School District  
Simon Moore, Instructor, Coachella Valley Unified School District  
Patricia Peck, Professor, California State University, Sacramento  
Ashley Sarver, Instructor, School for Independent Learners

### **References**

California Department of Education. 2011. California *Education Code*, Table of Contents. <http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=edc&codebody=&hits=20> (accessed December 20, 2012).

California Department of Social Services. 2007. Child Care, Residential, and Family Child Care Licensing. <http://www.dss.cahwnet.gov/ord/PG240.htm> (accessed December 20, 2012).

## Table of Contents

### Energy, Environment, and Utilities

Sector Description .....	1
Knowledge and Performance Anchor Standards.....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	6
Pathway Standards .....	7
A. Environmental Resources Pathway .....	7
B. Energy and Power Technology Pathway .....	10
C. Telecommunications Pathway.....	13
Academic Alignment Matrix .....	17
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>
References .....	35



## Energy, Environment, and Utilities *Sector Description*

This sector is designed to provide a foundation of knowledge and skills in careers related to energy, environment, and utilities. The pathways emphasize real-world, occupationally relevant knowledge, skills, and experiences of significant scope and depth in Environmental Resources, Energy and Power Technology, and Telecommunications. The standards integrate academic and technical preparation and focus on career awareness, career exploration, preparation for entry to technical-level employment, and alignment with postsecondary programs focused on energy, utilities, and related fields.

## **Energy, Environment, and Utilities Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Energy, Environment, and Utilities academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire, and accurately use Energy, Environment, and Utilities sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.  
(Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Energy, Environment, and Utilities sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Energy, Environment, and Utilities sector using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Energy, Environment, and Utilities sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Review the responsibility of the Occupational Safety and Health Administration (OSHA) to ensure workplace safety.
- 6.8 Identify both potential hazards and accident scenarios in the work environment.
- 6.9 Follow established safety procedures (OSHA regulations and utility company procedures).
- 6.10 Evaluate changes in the environment with respect to their impact on safety of self and others.
- 6.11 Comply with energy industry safety procedures and proper ways to perform work.
- 6.12 Use safety equipment as specified by user manuals and safety training.
- 6.13 Use personal protective equipment (PPE), including safety glasses, hearing protection, gloves, work boots, and hard hats.
- 6.14 Keep personal safety equipment in good working order.
- 6.15 Use tools and equipment in compliance with user manuals and training.
- 6.16 Recognize potential and actual hazardous conditions as they arise.

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Energy, Environment, and Utilities sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Energy, Environment, and Utilities sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Energy, Environment, and Utilities industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Energy, Environment, and Utilities sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Energy, Environment, and Utilities sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Energy, Environment, and Utilities sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Energy, Environment, and Utilities sector.

- 10.1 Interpret and explain terminology and practices specific to the Energy, Environment, and Utilities sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Energy, Environment, and Utilities sector.



- 10.3 Construct projects and products specific to the Energy, Environment, and Utilities sector requirements and expectations.
- 10.4 Coordinate with industry experts for specific technical knowledge and skills.
- 10.5 Maintain and troubleshoot equipment used in the energy, environment, and utilities industry.
- 10.6 Identify and evaluate questions that require skilled investigation to solve current problems cited in literature or media, or observed through personal observations.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Energy, Environment, and Utilities anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organization.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Energy, Environment, and Utilities sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Energy, Environment, and Utilities sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Energy, Environment, and Utilities Sector Pathway Standards**

### **A. Environmental Resources Pathway**

The Environmental Resources pathway prepares students for employment, postsecondary education, and/or training in a variety of environmental industries.

Sample occupations associated with this pathway:

- ◆ Air Quality Technician
- ◆ Climatologist
- ◆ Environmental Biologist/Technician/Scientist
- ◆ Environmental Health and Safety Officer
- ◆ Hazardous Waste Operations and Emergency Response Technician

A1.0 Identify energy resources and the effects of these resources on the environment.

A1.1 Classify energy resources by type: depletable, nondepletable, renewable, and nonrenewable.

A1.2 Discover new and emerging energy resources.

A1.3 Compare the advantages and disadvantages of energy resources in terms of the effects on the environment.

A1.4 List jobs in the community that result from, or are influenced by, processing and using energy resources.

A2.0 Identify and describe the global interactive systems and elements that create and sustain climate.

A2.1 Describe the natural elements that interact to create climate.

A2.2 Identify world climate patterns and summarize factors that affect climate.

A2.3 Analyze the impact of climate upon human activities and needs.

A2.4 Identify the greenhouse effect and climate change.

A2.5 Explain how greenhouse gases are generated.

A2.6 Assess impacts of greenhouse gases on the environment.

A3.0 Evaluate regional interactive systems and elements that create harmful environmental effects.

A3.1 Describe the sources of, and impacts attributable to, pollution and contamination.

A3.2 Recognize the actions that cause resource depletion.

A3.3 Define the causes of erosion and soil depletion.

A3.4 Describe the attributes and proliferation of hardscape.

A3.5 Identify the sources of, and impacts attributable to, habitat alteration.

A4.0 Research the environmental implications of energy conversion processes and energy transmission systems.

A4.1 Define the basic terms, characteristics, and concepts of physical and chemical processes related to energy conversion.

A4.2 Identify the basic principles of energy systems, including chemical,

- hydraulic, pneumatic, electrical, nuclear, solar, wind, and geothermal.
- A4.3 Analyze the impacts of energy conversion processes as they relate to activities across the environment.
  - A5.0 Identify the role and impact of waste management systems and their operations on the environment.
    - A5.1 Understand the role of waste and storm water management systems, their operation, and their impact on the environment.
    - A5.2 Explore the causes and effects of pollution linked to wastewater treatment facilities.
    - A5.3 Identify wastewater treatment processes that lessen environmental impacts and improve water reuse.
    - A5.4 Explain the types and sources of hazardous waste and associated safety practices and legal requirements for handling and disposing of such waste.
    - A5.5 Design solid waste disposal processes that lessen environmental impacts and improve recycling.
  - A6.0 Understand the field of land use management and its potential for environmental impact.
    - A6.1 Describe the need for, and role of, habitat preservation.
    - A6.2 Describe the composition, role, and function of ecosystems, including trends affecting viability.
    - A6.3 Demonstrate the need for, and methods of, land use planning.
    - A6.4 Identify the aspects of land use planning and describe current trends.
    - A6.5 Summarize the relationship between land use planning and energy use and distribution.
    - A6.6 Explain the laws and regulations pertaining to land use planning.
    - A6.7 Develop strategies to maximize the effectiveness of land use planning.
  - A7.0 Research the role of air quality management and systems, their operations, and their impact on the environment.
    - A7.1 Understand the elements that create outdoor air quality.
    - A7.2 Summarize the causes of air pollutants and their chemical composition.
    - A7.3 Research air pollutants and their threat to human health.
    - A7.4 Understand U.S. and California laws and regulations related to air pollution control programs and health effects of air pollution.
    - A7.5 Describe the basic U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB) roles and regulations.
  - A8.0 Implement processes to support energy efficiency.
    - A8.1 Understand the relationship between power and energy efficiency.
    - A8.2 Outline how domestic and industrial appliances and systems affect the environment, such as water units and heating and cooling systems.
    - A8.3 Compare costs of alternate/renewable energy sources, systems, and appliances and traditional energy sources, systems, and appliances.

- A8.4 Conduct an energy audit.
- A9.0 Research drinking-water sources, systems, treatment, and conservation.
  - A9.1 Understand water reuse: issues, strategies, technologies, and applications.
  - A9.2 Analyze strategies for improving energy efficiencies in water collection and distribution.
  - A9.3 Describe the role of environmental engineering and green energy in water systems.
  - A9.4 Understand the functions and operations of water storage, reservoirs, aqueducts, and dams.
- A10.0 Evaluate the impact and flow management of storm water, rivers, and groundwater.
  - A10.1 Understand the designs and tools used in water flow management.
  - A10.2 Describe watershed modeling.
  - A10.3 Understand the principles and applications of drainage engineering.
  - A10.4 Use the Hydrologic Engineering Centers River Analysis System (HEC-RAS).
  - A10.5 Analyze and interpret contaminated harbor and river sediment.
  - A10.6 Describe the concerns and strategies for catastrophic storm water events and management.
- A11.0 Prepare an efficient solar heated water design and installation plan.
  - A11.1 Identify the characteristics of solar heated water design and installation.
  - A11.2 Describe the requirements of solar water heaters that meet regulations.
  - A11.3 Describe solar hot water financial support programs and regulations.
  - A11.4 Analyze efficient solar water heating systems.
- A12.0 Identify and analyze issues, legislation, and regulations related to energy and the environment.
  - A12.1 Identify and discuss major environmental laws and policies, including the regulatory and legislative processes used to create such laws.
  - A12.2 Understand current regulations concerning recycling, solid waste, land use management, water quality, and renewable and nonrenewable energy.
  - A12.3 Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy.
  - A12.4 Create an environmental law or regulation and explain how it will impact the environment.

## **Energy, Environment, and Utilities Sector Pathway Standards**

### **B. Energy and Power Technology Pathway**

The Energy and Power Technology pathway provides learning opportunities for students interested in preparing for careers in the energy and power industries.

Sample occupations associated with this pathway:

- ◆ Energy Efficiency Evaluation Specialist
- ◆ Energy Engineer
- ◆ Energy Generation/Power Distribution, Maintenance, Inspection, and Repair Technicians
- ◆ Energy/Building Retrofit Specialist
- ◆ Plant/Field Weatherization Installer

- B1.0 Explore the basic conventional and emerging principles and concepts of the energy industry, including energy production, energy transmission, and alternative energy technologies.
- B1.1 Describe the past, present, and anticipated demand for, and use of, energy.
  - B1.2 Identify the differences and challenges in energy needs, sources, and uses in developing regions.
  - B1.3 Explain the flow of energy from generation through distribution to the customer.
  - B1.4 Demonstrate an understanding of basic direct current (DC) electrical-circuit skills.
  - B1.5 Identify the role and function of generation, transmission, and distribution organizations.
  - B1.6 Explain the different structures of energy companies, including investor-owned utilities, municipalities (and associated utility practices, such as water/wastewater), electric cooperatives, and independent power producers and the different lines of energy business, including electric and gas.
  - B1.7 Explain the role of regulatory bodies in the energy industry (Federal Energy Regulatory Commission, Public Utilities Commission (PUC)).
  - B1.8 Describe the process of electric metering and billing for energy consumption.
- B2.0 Identify various conventional electric power generation fuel sources and the cost and efficiency issues associated with each.
- B2.1 Explain the conventional electric power generation system and process (coal, oil, natural gas, solar, wind, geothermal, and hydroelectric).
  - B2.2 Explain how each source was created and is used to produce electricity.
  - B2.3 Evaluate and list the advantages and disadvantages for each energy source.
  - B2.4 Describe how cost and efficiency rates are determined for each source.

- B3.0 Investigate emerging and alternative electric power generation technologies and fuel sources.
  - B3.1 Explain biomass conversion, including thermal and chemical processes used to produce electric energy.
  - B3.2 Describe the major sources, scale, and impacts of biomass energy.
  - B3.3 Define biofuels use and production.
  - B3.4 Explain how nuclear power is used to produce electric energy.
  - B3.5 Explain the process of nuclear fission.
  - B3.6 Explain how ocean wave energy is used to produce electric energy.
  - B3.7 Describe how wave power is harnessed in near shore, offshore, and far shore locations.
  - B3.8 Explain wave energy technologies (terminator devices, oscillating water column, point absorbers, attenuators, and overtopping devices).
  - B3.9 Compare and contrast the advantages and disadvantages of using ocean wave energy technologies for energy.
  
- B4.0 Understand nonnuclear power generation plant operations (coal, oil, natural gas, solar, wind, geothermal power, hydroelectric, or biofuel).
  - B4.1 Explain and use the fundamental laws and principles of electricity and magnetism.
  - B4.2 Classify the components of electrical generating systems, including boilers, generators, alternators, turbines, motors, engines, pumps, and switchgear.
  - B4.3 Discriminate the differences and similarities of power generation, including use of different fuel types and different power plant uses.
  - B4.4 Summarize the basic operating principles of fossil, hydroelectric, and internal combustion systems.
  - B4.5 Describe the location of equipment in the plant, how the equipment operates, and normal operating parameters.
  - B4.6 Describe the theory, construction, and application of the mechanical components of various types of power generation systems.
  
- B5.0 Understand and apply basic knowledge and skills necessary for nuclear power generation and nuclear power plant personnel.
  - B5.1 Use the fundamental concepts associated with electricity (e.g., electric charge, electric current).
  - B5.2 Understand the components of electrical systems, including switchyard construction, transformers, relays, circuit breakers, and motors.
  - B5.3 Explain the basic atomic and nuclear physics terms, unit, definitions, and basic concepts, including atomic structure, nuclear interactions and reactions, sources of residual heat/decay heat, and reactor operation.
  - B5.4 Understand reactor theory and operations.
  - B5.5 Explain the general design overview of the basic reactor types.
  - B5.6 Demonstrate understanding of reactor startup and shutdown procedures.
  - B5.7 Explain the fission process, including the construction of fission product barriers.

- B5.8 Operate, repair, and test machines, devices, and equipment based on electrical or mechanical principles in order to diagnose machine malfunctions, using basic hand and small electric tools and equipment.
- B5.9 Conduct tests and inspections of products, services, or processes to evaluate quality or performance.
  
- B6.0 Research methods of energy procurement, transmission, distribution, and storage.
  - B6.1 Describe the electric power transmission principles and processes.
  - B6.2 Explain the need for electric distribution systems and how they are designed to operate.
  - B6.3 Understand the emerging technologies in electric power transmission
  - B6.4 Identify electric power transmission equipment and systems.
  
- B7.0 Understand the interrelationships among components of systems.
  - B7.1 Understand the components and workings of the electric transmission and distribution network.
  - B7.2 Understand the components and workings of the gas transmission and distribution network.
  - B7.3 Define and explain “voltage,” “current,” “resistance,” “power,” and “energy.”
  - B7.4 Measure voltage, amperage, and resistance using a volt-ohm meter (VOM) and a digital volt-ohm meter (DVM).
  - B7.5 Explain and apply Ohm’s Law.
  - B7.6 Design and construct an electrical circuit with a power generation source.

## Energy, Environment, and Utilities Sector Pathway Standards

### C. Telecommunications Pathway

The Telecommunications pathway prepares students for employment and postsecondary education and training in the wireless and fixed-line communications industries. The sharing of information is essential for personal, commercial, educational, government, and military functions. Information is stored, sent, and accessed primarily via the telecommunications industries.

Sample occupations associated with this pathway:

- ◆ Cable/Telecommunications Installation and Maintenance Technicians
- ◆ Line Workers
- ◆ Network Operators, Technicians, Designers, and Managers
- ◆ Network Security Administrator
- ◆ Satellite Systems Installation/Engineers

- C1.0 Understand the basic principles and concepts that impact the telecommunications industry, including systems, concepts, and regulations.
- C1.1 Understand the relationship between telecommunications and society.
- C1.2 Evaluate the effects of telecommunications media and networks (telephone, television, cellular, social networking, etc.).
- C1.3 Understand the fundamentals of voice telephony and voice characteristics.
- C1.4 Compare analog transmission concepts (bandwidth, voiceband, modulation), analog circuits and sounds, and plain ordinary telephone service (POTS).
- C1.5 Understand digital transmission concepts (capacity, bits-per-second), converting sound to digital signals (PCM, CODECS), and compensating for transmission impairments (attenuation, noise, delay, jitter).
- C1.6 Define voice over IP (VOIP).
- C1.7 Describe public switched telephone network (PSTN) and signaling system 7 (SS7).
- C1.8 Understand signaling: pulse dialing and dual tone multiple frequency (DTMF).
- C2.0 Demonstrate understanding and use of the basic and emerging technologies that impact the telecommunications industry.
- C2.1 Describe the differences between analog and digital transmission and the migration to a converged digital/optical network for voice, data, and video.
- C2.2 Compare and contrast the components of voice networks, such as carrier switches, routing, PBXs, T1 trunks, switched versus dedicated circuits, and packet and wireless networks.
- C2.3 Define the components of data networks, such as modems, virtual circuits, hubs, switches, and routers.



- C2.4 Evaluate the differences between the various access methods, including DSL, cable modems, wireless (cellular, WiMax, Wi-Fi), T1, and carrier Ethernet.
  - C2.5 Compare private voice network design alternatives using tie-lines, Centrex, virtual private networks (VPN), and hosted services.
  - C2.6 Understand the basics of local, metropolitan, and wide area networks (LANs, MANs and WANs), including the differences between network bridging/switching and routing.
  - C2.7 Recognize technologies such as frame relay, ATM, MLPS, Ethernet, and TCP/IP and determine each technology's impact on network design, communication capabilities, and quality of service (QOS).
  - C2.8 Compare the benefits, drawbacks, and technology behind voice over IP (VOIP) using IP PBXs, IP phones and Internet telephony service providers (ITSP), and IPTV.
  - C2.9 Obtain a working knowledge of communications protocols and standards with an emphasis on their importance in network engineering and network operation.
  - C2.10 Understand the uses and effects of new technologies, such as social networking and cloud computing, on the network.
- C3.0 Examine the role and functions of satellites in telecommunications.
    - C3.1 Understand the evolution of satellite communications.
    - C3.2 Analyze the limitations of terrestrial communications and the advantages and disadvantages of satellites.
    - C3.3 Illustrate and describe the basic elements of satellite communications.
    - C3.4 Describe common types of satellites and their respective functions.
    - C3.5 Learn the vocabulary and acronyms associated with satellite communications.
    - C3.6 Understand satellite orbits, including launch vehicles and the launching of satellites.
    - C3.7 Understand satellite systems, including geo-synchronous earth orbiting (GEO), low-earth orbiting (LEO), medium-earth orbiting (MEO), high-earth orbiting (HEO), and mobile satellite systems.
    - C3.8 Analyze satellite system architecture, including the network configuration, remotes, satellite subsystems, ground stations, and network management.
    - C3.9 Understand frequency bands and those used in satellite communications.
    - C3.10 Understand the importance of modulation, multiplexing, and multiple access.
    - C3.11 Explain propagation and interference, including radio noise, ionosphere effects, troposphere effects, interference between satellite networks, and interference with terrestrial networks.
    - C3.12 Research applications and trends in satellite communications, including personal, commercial, military and government, and global applications.

- C4.0 Research the components, interaction, and operations of wireless telecommunications systems.
  - C4.1 Understand mobile wireless services and applications.
  - C4.2 Demonstrate device management.
  - C4.3 Describe access technologies, including wireline and wireless end to end switching and signaling.
  - C4.4 Identify switching, routing, and security systems and technologies for wireless and Internet networking.
  - C4.5 Understand radio frequency (RF), air interface, and radio access network (RAN).
  - C4.6 Explain code division multiple access (CDMA), wireless technologies, services, and applications.
  - C4.7 Research the different functions and uses of wireless and cable networks.
  - C4.8 Describe mobile network components and basic operation, including cellular principles and AMPS (1G), 2G; digital radio voice communications and digital cellular; data communications and spectrum-sharing technologies; frequency division multiple access (FDMA), time division multiple access (TDMA), CDMA, orthogonal frequency division multiplexing (OFDM) and 3G cellular; CDMA and 4G mobile cellular; LTE, wireless local area networks (LANs) and WiFi.
  - C4.9 Understand the function and basic operations of communications satellites.
  
- C5.0 Research the components, interaction, and operations of fixed-wire telecommunications systems.
  - C5.1 Demonstrate and apply safety procedures and practices for traffic control, pole climbing, roadside safety, electrical hazards, and data line safety checks.
  - C5.2 Demonstrate proficiency in making electrical connections, splices, and basic field repair.
  - C5.3 Understand the differences between function and uses of wireless and cable networks.
  - C5.4 Understand access technologies, including wireline and wireless end to end switching and signaling.
  - C5.5 Practice troubleshooting and repairing telecommunication system wiring.
  - C5.6 Demonstrate proficiency in basic AC and DC circuits.
  - C5.7 Inspect and demonstrate proficiency in the use of tools, equipment, and test equipment used in the voice and data communications industry.
  - C5.8 Install, repair, terminate, and test network cabling.
  - C5.9 Demonstrate cable repair techniques.
  - C5.10 Prepare work site plans to demonstrate proficiency in site requirements and considerations.
  - C5.11 Understand the theory of twisted pair design and shielding.

- C6.0 Consider privacy and security issues of the telecommunications systems.
  - C6.1 Understand switching, routing, and security systems and technologies for wireless and Internet networking.
  - C6.2 Explain the need and strategies for network security and integrity.
  - C6.3 Demonstrate the appropriate applications of network and user data mining and behavior profiling.
  - C6.4 Explain industry code of conduct.
- C7.0 Demonstrate proficiency in customer relations.
  - C7.1 Demonstrate appropriate personal hygiene and professional attire.
  - C7.2 Apply techniques for instilling customer confidence and satisfaction.
  - C7.3 Apply techniques for keeping the customer informed.
  - C7.4 Describe and demonstrate effective follow-up techniques.
  - C7.5 Demonstrate discretion in interacting with customers in field and retail environments.
  - C7.6 Illustrate basic conflict-resolution practices.

## Academic Alignment Matrix

<b>ENERGY, ENVIRONMENT, AND UTILITIES</b>	<b>PATHWAYS</b>		
	<b>A. Environmental Resources</b>	<b>B. Energy and Power Technologies</b>	<b>C. Telecommunications</b>
<b>English Language Arts</b>			
<b>Language Standards – LS – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A 2.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0	C1.0, C2.0, C3.0, C4.0, C5.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A2.0		C1.0, C2.0, C3.0, C4.0, C5.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0. A9.0, A10.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0	C1.0, C2.0, C3.0, C4.0, C5.0
<b>Reading Standards for Information Text – RSIT – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0. A9.0, A10.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0	
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0. A9.0, A10.0, A12.0		C1.0, C2.0, C3.0, C4.0, C5.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A7.0		C5.0, C7.0
11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., <i>The Federalist</i> , presidential addresses).	A 7.0, A12.0	B4.0	
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST – (Standard Area, Grade Level, Standard #)</b>			
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A8.0	B1.0,B5.0, B7.0	C6.0, C7.0
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A2.0, A3.0, A4.0, A5.0, A7.0	B3.0	C5.0, C7.0
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A2.0, A3.0, A4.0, A5.0, A7.0	B1.0, B5.0, B7.0	C1.0, C2.0, C3.0, C4.0, C5.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A9.0, A10.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
<b>Writing Standards – WS – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A9.0, A10.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	C2.0, C3.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A9.0, A10.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	C3.0, C6.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A5.0, A6.0, A7.0, A9.0, A11.0	B1.0, B5.0, B7.0	C1.0, C4.0, C5.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.		B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	C1.0, C4.0, C5.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A5.0, A6.0, A7.0, A9.0, A11.0		C1.0, C4.0, C5.0
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST – (Standard Area, Grade Level, Standard #)</b>			
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.		B1.0	C2.0, C3.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A5.0, A8.0	B5.0, B7.0	C1.0, C4.0, C5.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.			C1.0, C4.0, D5.0
11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.	A5.0, A8.0	B5.0, B7.0	C1.0, C4.0, C5.0
<b>MATHEMATICS</b>			
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>			
<i>Interpret the structure of expressions</i>			
1. Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret <math>P(1+r)^t</math> as the product of P and a factor not depending on P.</i>	A2.0, A3.0, A5.0, A6.0, A8.0, A9.0, A10.0, A11.0		C1.0
<i>Write expressions in equivalent forms to solve problems</i>			
3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. For example the expression $1.15^t$ can be rewritten as $(1.15^{1/12})^{12t} = 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. d. Prove simple laws of logarithms. (CA Standard Algebra II - 11.0) e. Use the definition of logarithms to translate between logarithms in any base. (CA Standard Algebra II - 13.0) f. Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values. (CA Standard Algebra 11- 14.0)	A10.0		
4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.	A10.0		

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>Algebra – A-CED – Creating Equations</b>			
<i>Create equations that describe numbers or relationships</i>			
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	A2.0		
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A2.0	B1.0	C1.0, C2.0
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A2.0, A6.0		C2.0
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .			C2.0
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>			
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>			
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	A2.0		C1.0, C2.0
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A10.0		
<i>Solve equations and inequalities in one variable</i>			
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. 3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)	A2.0		
<i>Solve systems of equations</i>			
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	A6.0		

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>Functions – F-IF – Interpreting Functions</b>			
<i>Interpret functions that arise in applications in terms of the context</i>			
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A2.0		
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A2.0		
<i>Analyze functions using different representations</i>			
7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. <ul style="list-style-type: none"> <li>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</li> <li>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</li> <li>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</li> <li>d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</li> <li>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</li> </ul>	A10.0		
9. Compare properties of <i>two</i> functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	A6.0	B1.0	C2.0
10. Demonstrate an understanding of functions and equations defined parametrically and graph them. (CA Standard Math Analysis - 7.0)		B1.0	
<b>Functions – F-BF – Building Functions</b>			
<i>Build a function that models a relationship between two quantities</i>			
1. Write a function that describes a relationship between two quantities. <ul style="list-style-type: none"> <li>a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</li> <li>b. Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</i></li> </ul>			C2.0



ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
c. (+) Compose functions. For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.			
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>			
1. Distinguish between situations that can be modeled with linear functions and with exponential functions. <ul style="list-style-type: none"> <li>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</li> <li>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</li> <li>c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.</li> </ul>	A2.0		
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).		B1.0	C2.0
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.			C2.0
<i>Interpret expressions for functions in terms of the situation they model</i>			
5. Interpret the parameters in a linear or exponential function in terms of a context.		B1.0	C2.0
<b>Functions – F-TF – Trigonometric Functions</b>			
<i>Extend the domain of trigonometric functions using the unit circle</i>			
1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. <ul style="list-style-type: none"> <li>1.1 Understand the notion of angle and how to measure it, in both degrees and radians. Convert between degrees and radians. (CA Standard Trigonometry - 1.0)</li> </ul>			C3.0
2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.			C3.0
<i>Model periodic phenomena with trigonometric functions</i>			
5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.			C3.0
7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.			C3.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>Geometry – G-C – Circles</b>			
<i>Understand and apply theorems about circles</i>			
2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	A10.0		C3.0
4. (+) Construct a tangent line from a point outside a given circle to the circle.			C3.0
<i>Find arc lengths and areas of sectors of circles</i>			
5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.			C3.0
<b>Geometry – G-CO – Congruence</b>			
<i>Experiment with transformations in the plane</i>			
1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.			C3.0
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).			C3.0
<i>Make geometric constructions</i>			
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.			C3.0
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>			
<i>Explain volume formulas and use them to solve problems</i>			
1. Give an informal argument for the formulas for the circumference of a Circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. 2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.			C3.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.			
<b>Geometry – G-GPE – Expressing Geometric Properties with Equations</b>			
<i>Translate between the geometric description and the equation for a conic section</i>			
3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. 3.1 Demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it. (CA Standard Algebra II 16.0) 3.2 Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$ , use the method for completing the square to put the equation into standard form and recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Then graph the equation. (CA Standard Algebra 11-17.0) 3.3 Be familiar with conic sections both analytically and geometrically. (CA Standard Math Analysis - 5.0)			C3.0
<b>Geometry – G-MG – Modeling with Geometry</b>			
<i>Apply geometric concepts in modeling situations</i>			
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	A2.0		C2.0
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A2.0, A6.0		
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A2.0, A6.0		C2.0
<b>Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry</b>			
<i>Apply trigonometry to general triangles</i>			
11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).			C3.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>Geometry – G-PCC – Polar Coordinates and Curves</b>			
<i>Graph polar coordinates and curves.</i>			
1. Be familiar with polar coordinates. In particular, determine polar coordinates of a point given in rectangular coordinates and vice versa. (CA Standard Trigonometry -15.0)	A2.0		
<b>Number and Quantity – N-Q – Quantities</b>			
<i>Reason quantitatively and use units to solve problems</i>			
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A6.0		
2. Define appropriate quantities for the purpose of descriptive modeling.	A2.0, A6.0		
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A2.0, A6.0		
<b>Number and Quantity – N-VM – Vector and Matrix Quantities</b>			
<i>Represent and model with vector quantities</i>			
1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $v$ , $ v $ , $\ v\ $ , $v$ ).			C3.0
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.			C3.0
<i>Perform operations on vectors</i>			
4. (+) Add and subtract vectors. <ul style="list-style-type: none"> <li>a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.</li> <li>b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.</li> <li>c. Understand vector subtraction <math>v - w</math> as <math>v + (-w)</math>, where <math>-w</math> is the additive inverse of <math>w</math>, with the same magnitude as <math>w</math> and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.</li> </ul>			C3.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>			
<i>Understand and evaluate random processes underlying statistical experiments</i>			
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A2.0, A8.0	B1.0	C6.0
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?	A2.0, A8.0	B5.0	C6.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>			
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A8.0	B5.0	C6.0
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A8.0	B5.0	
6. Evaluate reports based on data.	A2.0, A8.0	B1.0, B5.0	C6.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>			
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A2.0, A8.0	B5.0	
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A2.0, A8.0	B5.0	
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A2.0, A8.0	B5.0	
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A8.0	B5.0	
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>			
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	A2.0, A8.0	B1.0	

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	A2.0, A8.0	B1.0	
<i>Interpret linear models</i>			
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	A2.0	B1.0	
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.	A8.0		
9. Distinguish between correlation and causation.	A2.0		
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>			
<i>Understand independence and conditional probability and use them to interpret data</i>			
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.		B1.0	
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>			
<i>Use probability to evaluate outcomes of decisions</i>			
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant. b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.		B1.0	C6.0
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).		B1.0	C6.0
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	A6.0, A9.0	B1.0, B2.0, B5.0	C6.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</b>			
10.0 Students know the definitions of the mean, median, and mode of distribution of data and can compute each of them in particular situations.	A2.0, A9.0	B1.0, B5.0	C6.0
<b>Calculus – C</b>			
6.0 Students find the derivatives of parametrically defined functions and use implicit differentiation in a wide variety of problems in physics, chemistry, economics, and so forth.	A10.0	B2.0	
11.0 Students use differentiation to solve optimization (maximum-minimum problems) in a variety of pure and applied contexts.	A6.0, A9.0, A10.0	B2.0	C3.0
12.0 Students use differentiation to solve related rate problems in a variety of pure and applied contexts.	A6.0, A9.0, A10.0	B2.0	C3.0
16.0 Students use definite integrals in problems involving area, velocity, acceleration, volume of a solid, area of a surface of revolution, length of a curve, and work.	A9.0, A10.0	B2.0	C3.0
<b>SCIENCE</b>			
<b>Scientific and Engineering Practices – SEP</b>			
1. Asking questions (for science) and defining problems (for engineering)	A1.0, A2.0, A3.0, A4.0, A5.0, A9.0, A10.0, A12.0	B1.0, B2.0, B3.0, B4.0, B6.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C8.0
2. Developing and using models	A10.0, A11.0	B1.0, B7.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
3. Planning and carrying out investigations	A2.0, A5.0, A8.0, A10.0, A11.0	B5.0, B7.0	C3.0, C4.0, C5.0, C6.0
4. Analyzing and interpreting data	A1.0, A2.0, A3.0, A8.0, A10.0, A11.0	B1.0, B2.0, B3.0, B5.0, B7.0	C3.0, C4.0, C5.0, C6.0, C7.0
5. Using mathematics and computational thinking	A8.0, A11.0	B2.0, B7.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
6. Constructing explanations (for science) and designing solutions (for engineering)	A2.0, A5.0, A6.0, A7.0, A10.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0	C3.0, C4.0, C5.0, C6.0, C7.0
7. Engaging in argument from evidence	A1.0, A2.0, A4.0, A7.0, A10.0, A12.0	B3.0, B4.0	C3.0, C4.0, C5.0, C6.0
8. Obtaining, evaluating, and communicating information	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A10.0, A11.0	B1.0, B2.0, B3.0, B4.0, B5.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>Crosscutting Concept – CC</b>			
1. Patterns	A1.0, A2.0, A4.0, A5.0, A9.0	B2.0, B4.0, B7.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
2. Cause and effect: Mechanism and explanation	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A10.0	B1.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
3. Scale, proportion, and quantity	A2.0, A4.0, A8.0	B1.0, B2.0, B6.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
4. Systems and system models	A2.0, A4.0, A5.0, A9.0, A10.0, A11.0	B4.0, B5.0, B6.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
5. Energy and matter: Flows, cycles, and conservation	A1.0, A2.0, A4.0, A5.0, A7.0, A8.0, A9.0, A11.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
6. Structure and function	A6.0, A10.0		C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
<b>Physical Sciences – PS</b>			
PS1: Matter and Its Interactions			
PS1.A: Structure and Properties of Matter	A2.0, A3.0	B2.0, B5.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
PS1.B: Chemical Reactions	A2.0, A4.0, A7.0	B3.0, B4.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
PS1.C: Nuclear Processes		B3.0, B5.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
PS2: Motion and Stability: Forces and Interactions			
PS2.A: Forces and Motion	A10.0	B3.0	C5.0, C6.0
PS2.B: Types of interactions	A10.0	B1.0, B3.0, B7.0	
PS2.C: Stability and Instability in Physical Systems	A10.0	B3.0	
PS3: Energy			
PS3.A: Definitions of Energy	A1.0, A4.0, A8.0	B1.0, B2.0, B3.0, B5.0, B7.0	C3.0, C4.0, C5.0, C6.0
PS3.B: Conservation of Energy and Energy Transfer	A1.0, A4.0, A8.0	B1.0, B2.0, B3.0	C3.0, C4.0, C5.0, C6.0
PS3.C: Relationship Between Energy and Forces	A10.0	B2.0, B3.0, B4.0	C3.0, C4.0, C5.0, C6.0
PS3.D: Energy in Chemical Processes and Everyday Life	A1.0, A2.0	B3.0, B4.0	C3.0, C4.0, C5.0, C6.0
PS4: Waves and Their Applications in Technologies for Information Transfer			
PS4.A: Wave Properties		B3.0	C1.0, C2.0, C3.0, C4.0,



ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
			C5.0, C6.0
PS4.B: Electromagnetic Radiation	A2.0	B2.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
PS4.C: Information Technologies and Instrumentation			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
<b>Life Sciences – LS</b>			
LS2: Ecosystems: Interactions, Energy, and Dynamics			
LS2.A: Interdependent Relationships in Ecosystems	A3.0, A6.0		
LS2.B: Cycles of matter and Energy Transfer in Ecosystems	A2.0	B3.0	
LS2.C: Ecosystems Dynamics, Functioning, and Resilience	A3.0, A6.0		
LS4: Biological Evolution: Unity and Diversity			
LS4.C: Adaptation	A6.0		
LS4.D: Biodiversity and Humans	A6.0		
<b>Earth and Space Sciences – ESS</b>			
ESS2: Earth's Systems			
ESS2.A: Earth Materials and Systems			
ESS2.B: Plate Tectonics and Large-Scale System Interactions			
ESS2.C: The Roles of Water in Earth's Surface Processes			
ESS2.D: Weather and Climate	A2.0, A11.0		C3.0, C4.0
ESS2.E: Biogeology	A2.0, A3.0		
ESS3: Earth and Human Activity			
ESS3.A: Natural Resources	A8.0		
ESS3.B: Natural Hazards	A1.0, A6.0, A7.0	B1.0	C2.0, C3.0, C4.0
ESS3.C: Human Impacts on Earth Systems	A6.0		
ESS3.D: Global Climate Change	A2.0		
<b>Engineering, Technology, and the Applications of Science – ETS</b>			
ETS1: Engineering Design			
ETS1.A: Defining and Delimiting an Engineering Problem			
ETS1.B: Developing Possible Solutions			
ETS1.C: Optimizing the Design Solution	A5.0, A10.0, A11.0	B5.0, B7.0	C2.0, C3.0, C4.0, C5.0, C6.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
ETS2: Links Among Engineering, Technology, Science, and Society ETS2.A: Interdependence of Science, Engineering, and Technology ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A2.0	B1.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
<b>HISTORY/SOCIAL SCIENCE</b>			
<b>Principles of American Democracy and Economics (government) – AD</b>			
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.			
12.7.1. Explain how conflicts between levels of government and branches of government are resolved			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
12.7.2. Identify the major responsibilities and sources of revenue for state and local governments.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
12.7.3. Discuss reserved powers and concurrent powers of state governments.			
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
12.7.6. Compare the processes of lawmaking at each of the three levels of government, including the role of lobbying and the media.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
<b>Principles of Economics – PE</b>			
12.1 Students understand common economic terms and concepts and economic reasoning.			
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
12.2 Students analyze the elements of America's market economy in a global setting.			
12.2.3. Explain the roles of property rights, competition, and profit in a market economy.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
12.3 Students analyze the influence of the federal government on the American economy.			
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0

ENERGY, ENVIRONMENT, AND UTILITIES	PATHWAYS		
	A. Environmental Resources	B. Energy and Power Technologies	C. Telecommunications
<b>U.S. History and Geography – US</b>			
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.			
11.5.7. Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.		B1.0	
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.			
11.6.4. Analyze the effects of and the controversies arising from New Deal economic policies and the expanded role of the federal government in society and the economy since the 1930s (e.g., Works Progress Administration, Social Security, National Labor Relations Board, farm programs, regional development policies, and energy development projects such as the Tennessee Valley Authority, California Central Valley Project, and Bonneville Dam).			C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
11.6.5. Trace the advances and retreats of organized labor, from the creation of the American Federation of Labor and the Congress of Industrial Organizations to current issues of a postindustrial, multinational economy, including the United Farm Workers in California.			C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
11.8 Students analyze the economic boom and social transformation of post-World War II America.			
11.8.7. Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.			C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.			
11.11.5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.			C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
<b>World History, Culture, and Geography – WH</b>			
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.			
10.3.2. Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).		B1.0	

<b>ENERGY, ENVIRONMENT, AND UTILITIES</b>	<b>PATHWAYS</b>		
	<b>A. Environmental Resources</b>	<b>B. Energy and Power Technologies</b>	<b>C. Telecommunications</b>
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Energy, Environment, and Utilities**

Lloyd McCabe, Administrator, California Department of Education  
Mindi Yates, Education Consultant, California Department of Education

#### *Standards Review Team*

Jerry Bernstein, Director, City College of San Francisco  
Linda Christopher, Director, Linking Education and Economic Development  
Duane Crum, California State Leader, Project Lead the Way  
Peter Davis, Statewide Director, Advanced Transportation, Technology, and  
Energy (ATTE) Initiative  
David Esmaili, Director, ATTE Initiative, West Valley College  
Daniel Feemster, Manager, Curriculum Development, Pacific Gas and  
Electric Company  
Siobhan Foley, Director, Education and Outreach, Center for Sustainable Energy  
J. Gonzales, Advisor, Secondary Programs, Los Angeles Unified School District  
Andrea Gooden, Senior Project Manager, Pacific Gas and Electric Company  
Chris Graillat, Workforce Development Coordinator, California Energy Commission  
Carlos Hernandez, Program Manager, Workforce Education and Training, Southern  
California Edison  
Kevin Pledger, Instructor, San Joaquin County Office of Education  
Nikole Reaksecker, Program Manager, Energy Coalition  
Mario Rendon, Principal Program Manager, Power Pathway, Pacific Gas and  
Electric Company  
Susan Tidyman, Career Academic Support Unit, University of California, Berkeley  
Case Van Dam, Professor and Director, California Wind Energy Collaborative  
Susan Wheeler, Coordinator, Education Relations, Sacramento Metropolitan  
Utility District  
David Yeroshek, Instructor, Twin Rivers Unified School District

#### *Standards Writing Team*

Ronda Adams, Associate Superintendent, Educational Services, Yolo County Office  
of Education  
Bob Bachmeier, Math Specialist, Yolo County Office of Education  
Carlos Hernandez, Program Manager, Workforce Education and Training, Southern  
California Edison  
Bill Lehtonen, Director, Public Outreach, International Association of Plumbing and  
Mechanical Officials  
Steve Lehtonen, Director of Environmental Education, International Association of  
Plumbing and Mechanical Officials

Janet Malig, Director, Advanced Transportation, Technology, and Energy (ATTE) Initiative, Cerritos College  
Larry McLaughlin, Director, ATTE Initiative, College of the Desert  
Greg Newhouse, Director, ATTE Initiative, San Diego Miramar College  
Roland Otto, Project Manager, Institute for Sustainable Performance of Buildings  
Kevin Pledger, Instructor, Venture Academy, Imagine IT  
David Yeroshek, Instructor, Twin Rivers Unified School District

### *Common Core Alignment Team*

Autumn Chapman, Instructor, Oakland Unified School District  
Pamela Davis, Instructor, Sacramento City Unified School District  
Kristi Leonard, Instructor, Lake Tahoe Unified School District  
Marcia McAllister, Instructor, Sacramento City Unified School District  
Sofia Paez-Valdez, Instructor, Pasadena Unified School District  
Sherry Penaflor, Instructor, Coachella Valley Unified School District  
Zach Ronnenberg, Instructor, Davis Joint Unified School District  
Russell Wong, Instructor, Pasadena Unified School District

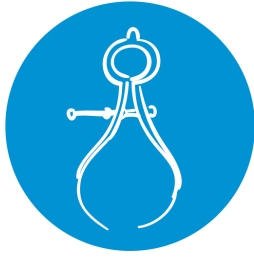
### **References**

- California Energy Commission. 2012. "Resources for Teachers and Parents."  
[http://energyquest.ca.gov/teachers\\_resources/index.html](http://energyquest.ca.gov/teachers_resources/index.html) (accessed December 20, 2012).
- Interstate Renewable Energy Council. 2012. <http://www.irecusa.org/> (accessed December 20, 2012).
- Sustainability Education and Economic Development (SEED) and the American Association of Community Colleges. 2012.  
<http://www.theseedcenter.org/default.aspx> (accessed December 20, 2012).
- United States Department of Energy. 2006. "DOE Online K–12 Instructional Resources." <http://ed.fnal.gov/doe/index.html> (accessed December 20, 2012).

## Table of Contents

### Engineering and Architecture

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	5
Pathway Standards.....	7
A. Architectural Design Pathway .....	7
B. Engineering Technology Pathway.....	9
C. Engineering Design Pathway .....	12
D. Environmental Engineering Pathway .....	14
Academic Alignment Matrix.....	18
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>



## Engineering and Architecture *Sector Description*

This sector is designed to provide a foundation in engineering, architecture, and design for students in California. Students are engaged in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and career preparation in four pathways that emphasize real-world, occupationally relevant experiences of significant scope and depth: Architectural Design; Engineering Technology; Engineering Design; and Environmental Engineering. To prepare students for continued training, advanced educational opportunities, and direct entry to a career, the Engineering and Architecture programs offer the following components: classroom, laboratory, and hands-on contextual learning; project- and work-based instruction; and leadership and interpersonal skills development.



## **Engineering and Architecture Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Engineering and Architecture academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Engineering and Architecture sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication, such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits, such as trust, respect, and responsibility, and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Engineering and Architecture sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained research projects to create alternative solutions to answer a question or solve a problem unique to the Engineering and Architecture sector using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Engineering and Architecture sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

### **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Engineering and Architecture sector workplace environment and community settings.

(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Engineering and Architecture sector.

### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Engineering and Architecture industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Engineering and Architecture sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.

- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Engineering and Architecture sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills, as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Engineering and Architecture sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Engineering and Architecture sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Engineering and Architecture sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Engineering and Architecture sector.
- 10.3 Construct projects and products specific to the Engineering and Architecture sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Engineering and Architecture anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings, and through the SkillsUSA career technical student organization.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Engineering and Architecture sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Engineering and Architecture sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## Engineering and Architecture Pathway Standards

### A. Architectural Design Pathway

The Architectural Design pathway provides learning opportunities for students interested in preparing for careers in such areas as architecture, industrial design, and civil engineering.

Sample occupations associated with this pathway:

- ◆ Drafter
- ◆ Architect
- ◆ Structural Designer
- ◆ Building Department Plan Examiner
- ◆ City Planner

- A1.0 Understand how history shaped architecture and know significant events in the history of architectural design.
- A1.1 Know significant historical architectural projects and their effects on society.
  - A1.2 Understand the development of architectural systems in relation to aesthetics, efficiency, and safety.
- A2.0 Compare the theoretical, practical, and contextual issues that influence design.
- A2.1 Describe the influence of community context and zoning requirements on architectural design.
  - A2.2 Understand the ways in which sociocultural conditions and issues influence architectural design.
  - A2.3 Compare the theoretical and practical effects of human and physical factors on the development of architectural designs.
  - A2.4 Analyze project design and complete a cost analysis.
- A3.0 Understand the sketching processes used in concept development.
- A3.1 Apply sketching techniques to a variety of architectural models.
  - A3.2 Produce proportional two- and three-dimensional sketches and designs.
  - A3.3 Present conceptual ideas, analysis, and design concepts using freehand graphic communication techniques.
- A4.0 Understand the use of computer-aided drafting (CAD) in developing architectural designs.
- A4.1 Develop a preliminary architectural proposal using CAD software.
  - A4.2 Analyze viability of a project as the design is developed using Building Information Modeling (BIM).
- A5.0 Compare the relationship between architecture and the external environment.
- A5.1 Understand significance of sustainable building design practices that incorporate beneficial energy and environmental design policies.

- A5.2 Develop a site analysis that considers passive energy techniques, sustainability issues, and landscaping.
  - A5.3 Create a building design that incorporates passive and/or active energy efficient technologies.
- A6.0 Understand methods used to analyze simple structures.
    - A6.1 Understand load transfer mechanisms.
    - A6.2 Understand stress-strain relationships of building structures.
    - A6.3 Interpret structural design considerations, including load-bearing relationships of shear walls, columns, and beams.
    - A6.4 Design a simple structure by using structural analysis principles.
- A7.0 Understand the properties of structural materials.
    - A7.1 Understand the integration of architectural factors, such as soil mechanics, foundation design, engineering materials, and structure design.
    - A7.2 Develop a stress analysis chart of typical structural components.
    - A7.3 Evaluate available building materials (e.g., steel, concrete, and wood) by considering their properties and their effect on building form.
    - A7.4 Develop a preliminary building plan using the appropriate materials.
- A8.0 Systematically complete an architectural project.
    - A8.1 Describe the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems.
    - A8.2 Develop a preliminary proposal for presentation of an architectural design.
    - A8.3 Read and interpret architectural and construction plans, drawings, diagrams, and specifications.
    - A8.4 Develop a complete set of architectural plans and drawings.
    - A8.5 Estimate the materials needed for a project by reading an architectural drawing.
    - A8.6 Plan a project using site and building restrictions imposed by various entities (e.g., Planning, Zoning, Building, and Home Owners Association [HOA]).
    - A8.7 Plan the sequence of events leading to an architectural project.
- A9.0 Using various methods create both written and digital portfolios to represent architectural renderings.
    - A9.1 Develop a binder or digital portfolio representative of completed work for presentation.
    - A9.2 Prepare an effective oral presentation of the portfolio content.

## Engineering and Architecture Pathway Standards

### B. Engineering Technology Pathway

The Engineering Technology pathway provides learning opportunities for students interested in preparing for careers in the design, production, or maintenance of mechanical, electrical, electronics, or electromechanical products and systems.

Sample occupations associated with this pathway:

- ◆ Surveyor
- ◆ Research and Development Analyst
- ◆ Engineering Technologist
- ◆ Field Engineer
- ◆ Operations Engineer

B1.0 Communicate and interpret information clearly in industry-standard visual and written formats.

B1.1 Explain the classification and use of various components, symbols, abbreviations, and media common to technical drawings.

B1.2 Describe the current industry standards for illustration and layout.

B1.3 Draw flat layouts of a variety of objects by using the correct drafting tools, techniques, and media.

B1.4 Organize and complete an assembly drawing using information collected from detailed drawings.

B1.5 Create reports and data sheets for writing specifications.

B2.0 Demonstrate the sketching process used in concept development.

B2.1 Understand the process of producing proportional two- and three-dimensional sketches and designs.

B2.2 Apply sketching techniques to a variety of architectural and engineering models.

B2.3 Present conceptual ideas, analysis, and design concepts using freehand graphic communication techniques.

B3.0 Identify the fundamentals of the theory, measurement, control, and applications of electrical energy, including alternating and direct currents.

B3.1 Understand the characteristics of alternating current (AC) and how it is generated; the characteristics of the sine wave; and of AC, tuned, and resonant circuits; and the nature of the frequency spectrum.

B3.2 Analyze relationships between voltage, current, resistance, and power related to direct current (DC) circuits.

B3.3 Calculate, construct, measure, and interpret both AC and DC circuits.

B3.4 Understand how electrical control and protection devices are used in electrical systems.

B3.5 Calculate loads, currents, and circuit-operating parameters.



- B3.6 Classify and use various electrical components, symbols, abbreviations, media, and standards of electrical drawings.
  - B3.7 Analyze, repair, or measure electrical and electronic systems, circuits, or components using appropriate electronic instruments.
  - B3.8 Predict the effects of circuit conditions on the basis of measurements and calculations of voltage, current, resistance, and power.
- B4.0 Understand the concepts of physics that are fundamental to engineering technology.
- B4.1 Describe Newton's laws and how they affect and define the movement of objects.
  - B4.2 Explain how the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.
  - B4.3 Compare the effects and applications of heat transfer and thermal dynamic processes.
  - B4.4 Explore the fundamentals and properties of waveforms and how waveforms may be used to carry energy.
  - B4.5 Analyze how electric and magnetic phenomena are related and know common practical applications.
- B5.0 Understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems.
- B5.1 Differentiate between scalars and vectors.
  - B5.2 Solve problems by using the concept of vectoring to predict resultants.
  - B5.3 Compare and explore the six simple machines and their applications.
  - B5.4 Evaluate how energy is transferred and predict the effects of resistance in mechanical, electrical, fluid, and thermal systems.
  - B5.5 Formulate and solve problems by using the appropriate units applied in mechanical, electrical, fluid, and thermal engineering systems.
- B6.0 Employ the design process to solve analysis and design problems.
- B6.1 Understand the steps in the design process.
  - B6.2 Determine what information and principles are relevant to a problem and its analysis.
  - B6.3 Choose between alternate solutions in solving a problem and be able to justify the choices made in determining a solution.
  - B6.4 Translate word problems into mathematical statements when appropriate.
  - B6.5 Demonstrate the process of developing multiple details, within design constraints, into a single solution.
  - B6.6 Construct a prototype from plans and test it.
  - B6.7 Evaluate and redesign a prototype on the basis of collected test data.
- B7.0 Understand industrial engineering processes, including the use of tools and equipment, methods of measurement, and quality assurance.
- B7.1 Know the structure and processes of a quality assurance cycle.
  - B7.2 Describe the major manufacturing processes.

- B7.3 Use tools, fasteners, and joining systems employed in selected engineering processes.
  - B7.4 Estimate and measure the size of objects in both Standard International and United States units.
  - B7.5 Apply appropriate geometric dimensioning and tolerancing (GD&T) practices.
  - B7.6 Calibrate precision measurement tools and instruments to measure objects.
- B8.0 Understand fundamental control system design and develop systems that complete preprogrammed tasks.
- B8.1 Identify the elements and processes necessary to develop a controlled system that performs a task.
  - B8.2 Demonstrate the use of sensors for data collection and process correction in controlled systems.
  - B8.3 Perform tests, collect data, analyze relationships, and display data in a simulated or modeled system using appropriate tools and technology.
  - B8.4 Program a computing device to control systems or process.
  - B8.5 Use motors, solenoids, and similar devices as output mechanisms in controlled systems.
  - B8.6 Assemble input, processing, and output devices to create controlled systems capable of accurately completing a preprogrammed task.
- B9.0 Understand the fundamentals of systems and market influences on products as they are developed and released to production.
- B9.1 Understand the process of product development.
  - B9.2 Understand decision matrices and the use of graphic tools in illustrating the development of a product and the processes involved.
- B10.0 Design and construct a culminating project effectively using engineering technology.
- B10.1 Use methods and techniques for employing all engineering technology equipment appropriately.
  - B10.2 Apply conventional engineering technology processes and procedures accurately, appropriately, and safely.
  - B10.3 Apply the concepts of engineering technology to the tools, equipment, projects, and procedures of the Engineering Technology Pathway.
- B11.0 Understand the methods of creating both written and digital portfolios.
- B11.1 Develop a binder or digital portfolio representative of student work for presentation.
  - B11.2 Give an effective oral presentation of a portfolio.

## Engineering and Architecture Pathway Standards

### C. Engineering Design Pathway

The Engineering Design pathway provides learning opportunities for students interested in preparing for careers in the design and production of visual communications.

Sample occupations associated with this pathway:

- ◆ Mechanical/Electrical Drafter
- ◆ Design Engineer
- ◆ Manufacturing Design Engineer
- ◆ Project Architect

C1.0 Understand historical and current events related to engineering design and their effects on society.

C1.1 Know historical and current events that have relevance to engineering design.

C1.2 Interpret the development of graphic language in relation to engineering design.

C2.0 Understand the effective use of engineering design equipment.

C2.1 Employ engineering design equipment using the appropriate methods and techniques.

C2.2 Apply conventional engineering design equipment procedures accurately, appropriately, and safely.

C2.3 Apply the concepts of engineering design to the tools, equipment, projects, and procedures of the Engineering Design Pathway.

C3.0 Understand the sketching process used in concept development.

C3.1 Apply sketching techniques to a variety of architectural models.

C3.2 Produce proportional two- and three-dimensional sketches and designs.

C3.3 Present conceptual ideas, analysis, and design concepts using freehand, graphic, communication techniques.

C4.0 Understand measurement systems as they apply to engineering design.

C4.1 Know how the various measurement systems are used in engineering drawings.

C4.2 Understand the degree of accuracy necessary for engineering design.

C5.0 Use proper projection techniques to develop orthographic drawings.

C5.1 Understand the concepts and procedures necessary for producing drawings.

C5.2 Develop multiview drawings using the orthographic projection process.

C5.3 Understand the various techniques for viewing objects.

C5.4 Use the concepts of geometric construction in the development of design drawings.

- C5.5 Apply pictorial drawings derived from orthographic multiview drawings and sketches.
- C6.0 Understand the applications and functions of sectional views.
  - C6.1 Understand the function of sectional views.
  - C6.2 Clarify hidden features of an object using a sectional view and appropriate cutting planes.
- C7.0 Understand the applications and functions of auxiliary views.
  - C7.1 Understand the function of auxiliary views.
  - C7.2 Use auxiliary views to clarify the true shape and size of an object.
- C8.0 Understand and apply proper dimensioning standards to drawings.
  - C8.1 Know a variety of drafting applications and understand the proper dimensioning standards for each.
  - C8.2 Apply dimension to various objects and features.
- C9.0 Understand the tolerance relationships between mating parts.
  - C9.1 Understand what constitutes mating parts in engineering design.
  - C9.2 Interpret geometric tolerancing symbols in a drawing.
  - C9.3 Use tolerancing in an engineering drawing.
- C10.0 Understand the methods of applying text to a drawing.
  - C10.1 Describe the processes of lettering and/or text editing.
  - C10.2 Implement standard methods of title block creation and use.
  - C10.3 Develop drawings using notes and specifications.
  - C10.4 Plan, prepare, and interpret drawings and models through traditional drafting or computer-aided design (CAD) techniques.
- C11.0 Understand the methods of creating both written and digital portfolios.
  - C11.1 Develop a binder or digital portfolio representative of completed work for presentation.
  - C11.2 Give an effective oral presentation of a portfolio.

## Engineering and Architecture Pathway Standards

### D. Environmental Engineering Pathway

The Environmental Engineering pathway includes design and development processes, equipment, and systems that are used to create, monitor, prevent, or correct environmental events and conditions.

Sample occupations associated with this pathway:

- ◆ Environmental Safety Technician
- ◆ Environmental Specialist
- ◆ Environmental Analyst
- ◆ Environmental Scientist
- ◆ Air Pollution Control Engineer

D1.0 Communicate and interpret information clearly in industry-standard visual and written formats.

D1.1 Know the current industry standards for illustration and layout.

D1.2 Understand the classification and use of various electronic components, symbols, abbreviations, and media common to electronic drawings.

D1.3 Organize and complete site plans.

D2.0 Understand the design process and how to solve analysis and design problems.

D2.1 Understand the steps in the design process.

D2.2 Determine what information and principles are relevant to a problem and its analysis.

D2.3 Choose between alternate solutions in solving a problem and be able to justify choices in determining a solution.

D2.4 Understand the process of developing multiple details into a single solution.

D2.5 Translate word problems into mathematical statements when appropriate.

D2.6 Build a prototype from plans and test it.

D2.7 Evaluate and redesign a prototype on the basis of collected test data.

D3.0 Understand the fundamentals of earth science as they relate to environmental engineering.

D3.1 Know the fundamental stages of geochemical cycles.

D3.2 Understand the effects of pollution on hydrological features.

D3.3 Classify the three major groups of rocks, according to their origin, on the basis of texture and mineral composition.

D3.4 Analyze the importance and use of soil and evaluate how soil may be preserved and conserved.

D3.5 Assess and evaluate geological hazards.

D3.6 Interpret and evaluate topographical maps and images.

D3.7 Locate and evaluate soil or geological conditions or features using global positioning systems equipment and related technology.

- D3.8 Analyze soil erosion and identify the causes.
- D4.0 Understand the effects of the weather, the hydrosphere, and the atmosphere on the environment.
  - D4.1 Know the common causes of atmospheric contamination.
  - D4.2 Understand the effects of weather fronts on regional air pollution.
  - D4.3 Understand the relationship between the health of the marine environment and climate control.
  - D4.4 Understand the effects of human activity on the atmospheric environment.
  - D4.5 Analyze and predict conditions of meteorological events.
  - D4.6 Analyze the mechanisms for air mass movement.
  - D4.7 Analyze atmospheric pressure and weather systems.
- D5.0 Understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems.
  - D5.1 Know the six simple machines and their applications.
  - D5.2 Know how energy is transferred and the effects of resistance in mechanical, electrical, fluid, and thermal systems.
  - D5.3 Understand scalars and vectors.
  - D5.4 Solve problems by using the concept of vectoring to predict the resultant forces.
  - D5.5 Solve problems by using the appropriate units applied in mechanical, electrical, fluid, and thermal engineering systems.
- D6.0 Evaluate regional interactive systems and elements that create harmful environmental effects.
  - D6.1 Describe the sources of, and impacts attributable to, pollution and contamination.
  - D6.2 Recognize the actions that cause resource depletion.
  - D6.3 Define the causes of erosion and soil depletion.
  - D6.4 Describe the attributes and proliferation of hardscape.
  - D6.5 Identify the sources of, and impacts attributable to, habitat alteration.
- D7.0 Understand the concepts of physics that are fundamental to engineering technology.
  - D7.1 Understand Newton's laws and how they affect and define the movement of objects.
  - D7.2 Understand how the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.
  - D7.3 Understand how electric and magnetic phenomena are related and know common practical applications.
  - D7.4 Analyze the fundamentals and properties of waveforms and how waveforms may be used to carry energy.

- D8.0 Understand the effective use of environmental and natural science equipment.
  - D8.1 Use appropriate methods and techniques for employing environmental and natural science equipment.
  - D8.2 Apply conventional environmental and natural science processes and procedures accurately, appropriately, and safely.
  - D8.3 Apply the concepts of environmental and natural science to the tools, equipment, projects, and procedures of the Environmental Engineering Pathway.
  
- D9.0 Identify the role and impact of waste management systems, and their operations, on the environment.
  - D9.1 Understand the role of waste and storm water management systems, their operation, and their impact on the environment.
  - D9.2 Explore the causes and effects of pollution linked to wastewater treatment facilities.
  - D9.3 Identify wastewater treatment processes that lessen environmental impacts and improve water reuse.
  - D9.4 Explain the types and sources of hazardous waste and associated safety practices and legal requirements for handling and disposing of such waste.
  - D9.5 Design solid waste disposal processes that lessen environmental impacts and improve recycling.
  
- D10.0 Understand the field of land use management and its potential for environmental impact.
  - D10.1 Describe the need for and role of habitat preservation.
  - D10.2 Describe the composition, role, and function of ecosystems, including trends affecting viability.
  - D10.3 Explain the laws and regulations pertaining to ecosystem preservation and use.
  - D10.4 Demonstrate the need for, and methods of, land use planning.
  - D10.5 Identify the aspects of land use planning and describe current trends.
  - D10.6 Summarize the relationship between land use planning and energy use and distribution.
  - D10.7 Explain the laws and regulations pertaining to land use planning.
  - D10.8 Develop strategies to maximize the effectiveness of land use planning.
  
- D11.0 Research the role of air quality management and systems, their operations, and their impact on the environment.
  - D11.1 Understand the elements that create outdoor air quality.
  - D11.2 Summarize the causes of air pollutants and their chemical composition.
  - D11.3 Research air pollutants and their threat to human health.
  - D11.4 Understand U.S. and California laws and regulations related to air pollution control programs and health effects of air pollution.
  - D11.5 Describe the basic U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB) roles and regulations.

- D12.0 Implement processes to support energy efficiency.
  - D12.1 Understand the relationship between power and energy efficiency.
  - D12.2 Outline how domestic and industrial appliances and systems affect the environment, such as water units and heating and cooling systems.
  - D12.3 Compare costs of alternate/renewable energy sources, systems, and appliances and traditional energy sources, systems, and appliances.
  - D12.4 Conduct an energy audit.
  
- D13.0 Research drinking-water sources, systems, treatment, and conservation.
  - D13.1 Understand water reuse: issues, strategies, technologies, and applications.
  - D13.2 Analyze strategies for improving energy efficiencies in water collection and distribution.
  - D13.3 Describe the role of environmental engineering and green energy in water systems.
  - D13.4 Understand the functions and operations of water storage, reservoirs, aqueducts, and dams.
  - D13.5 Identify and explain the applicable codes and regulations.
  
- D14.0 Evaluate the impact and flow management of storm water, rivers, and groundwater.
  - D14.1 Understand the designs and tools used in water flow management.
  - D14.2 Describe watershed modeling.
  - D14.3 Understand the principles and applications of drainage engineering.
  - D14.4 Use the Hydrologic Engineering Centers River Analysis System (HEC-RAS).
  - D14.5 Analyze and interpret contaminated harbor and river sediment.
  - D14.6 Describe the concerns and strategies for catastrophic storm water events and management.



## Academic Alignment Matrix

<b>ENGINEERING AND ARCHITECTURE</b>	<b>PATHWAYS</b>			
	<b>A. Architectural Design</b>	<b>B. Engineering Technology</b>	<b>C. Engineering Design</b>	<b>D. Environmental Engineering</b>
<b>ENGLISH LANGUAGE ARTS</b>				
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A9.0	B1.0	C11.0	D1.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A9.0	B1.0	C11.0	D1.0
<b>Reading Standards for Information Text – RSIT (Standard Area, Grade Level, Standard #)</b>				
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A1.0, A2.0, A5.0, A8.0	B1.0	C1.0	D1.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0			
<b>Reading Standards for Literacy in History/Social Studies – RHSS (Standard Area, Grade Level, Standard #)</b>				
11-12.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.	A1.0, A2.0		C1.0	
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.	A1.0		C1.0	
11-12.10. by the end of grade 12, read and comprehend history/social studies texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0		C1.0	
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST (Standard Area, Grade Level, Standard #)</b>				
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A1.0, A5.0, A9.0	B4.0, B5.0, B7.0, B8.0, B9.0,	C1.0, C4.0, C11.0	D2.0, D3.0, D4.0, D6.0
11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A9.0	B11.0	C11.0	
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A1.0, A9.0	B9.0, B10.0, B11.0	C1.0, C11.0	
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A5.0	B1.0, B4.0, B5.0, B7.0, B8.0, B9.0	C1.0, C4.0	D1.0, D2.0, D3.0, D4.0, D3.0, D6.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.		B11.0		
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A9.0	B11.0	C11.0	
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A9.0		C11.0	
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A9.0		C11.0	
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A9.0		C11.0	
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A9.0		C11.0	
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A9.0		C11.0	
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST</b>				
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A9.0		C11.0	
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.		B1.0		
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A9.0	B1.0, B11.0	C11.0	
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.		B1.0		
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.		B1.0		

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<b>MATHEMATICS</b>				
<b>Algebra – A-CED – Creating Equations</b>				
<i>Create equations that describe numbers or relationships</i>				
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	A2.0, A6.0	B6.0, B10.0		D2.0
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A2.0, A6.0	B6.0, B10.0		D2.0
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A2.0, A6.0	B6.0, B10.0		D2.0
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .	A6.0			
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>				
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>				
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	A2.0, A8.0	B3.0, B10.0		
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A2.0, A8.0	B3.0, B10.0		
<i>Solve equations and inequalities in one variable</i>				
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. 3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)	A2.0, A8.0	B3.0, B10.0		

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<p>4. Solve quadratic equations in one variable.</p> <p>a. Use the method of completing the square to transform any quadratic equation in <math>x</math> into an equation of the form <math>(x - p)^2 = q</math> that has the same solutions. Derive the quadratic formula from this form.</p> <p>b. Solve quadratic equations by inspection (e.g., for <math>x^2 = 49</math>), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as <math>a \pm bi</math> for real numbers <math>a</math> and <math>b</math>.</p>	A8.0	B3.0, B4.0, B10.0		D7.0
<i>Solve systems of equations</i>				
5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	A8.0			
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	A8.0	B3.0, B10.0		
7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$ .	A8.0			
<b>Functions – F-IF – Interpreting Functions</b>				
<i>Understand the concept of a function and use function notation</i>				
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .	A3.0	B2.0, B10.0	C3.0	
<i>Analyze functions using different representations</i>				
<p>7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p> <p>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</p> <p>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</p> <p>d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</p> <p>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and</p>	A3.0	B2.0, B10.0	C3.0	

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
trigonometric functions, showing period, midline, and amplitude.				
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$ , $y = (0.97)^t$ , $y = (1.01)^{12t}$ , $y = (1.2)^{vt/10}$ , and classify them as representing exponential growth or decay.	A3.0	B2.0, B10.0	C3.0	
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>				
1. Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.				D5.0
<b>Functions – F-TF – Trigonometric Functions</b>				
<i>Extend the domain of trigonometric functions using the unit circle</i>				
1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 1.1 Understand the notion of angle and how to measure it, in both degrees and radians. Convert between degrees and radians. (CA Standard Trigonometry - 1.0)	A6.0	B3.0, B4.0, B10.0	C4.0	D6.0, D7.0
2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	A6.0	B3.0, B4.0, B10.0		D7.0
3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$ , $\pi/4$ and $\pi/6$ , and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$ , $\pi + x$ , and $2\pi - x$ in terms of their values for $X$ , where $x$ is any real number. 3.1 Know the definitions of the tangent and cotangent functions and graph them. (CA Standard Trigonometry - 5.0) 3.2 Know the definitions of the secant and cosecant functions and graph them. (CA Standard Trigonometry-6.0)	A6.0	B3.0, B4.0, B10.0		D7.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<i>Model periodic phenomena with trigonometric functions</i>				
5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.		B3.0, B4.0, B10.0		D2.0, D6.0
6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. 6.1 Know the definitions of the inverse trigonometric functions and graph the functions. (CA Standard Trigonometry - 8.0)				D6.0
<b>Geometry – G-CO – Congruence</b>				
<i>Make geometric constructions</i>				
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	A3.0, A5.0, A7.0, A8.0	B2.0, B10.0	C3.0, C5.0	
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.			C5.0	
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>				
<i>Explain volume formulas and use them to solve problems</i>				
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.		B6.0, B7.0, B10.0	C8.0	D2.0
<b>Geometry – G-MG – Modeling with Geometry</b>				
<i>Apply geometric concepts in modeling situations</i>				
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A3.0, A5.0, A7.0, A8.0	B6.0, B10.0	C8.0, C9.0	D2.0
<b>Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry</b>				
<i>Understand similarity in terms of similarity transformations</i>				
1. Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	A3.0, A5.0, A7.0, A8.0	B2.0, B10.0	C3.0	

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<b>Number and Quantity – N-Q – Quantities</b>				
<i>Reason quantitatively and use units to solve problems</i>				
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A2.0, A6.0, A8.0	B3.0, B4.0, B10.0		D7.0
2. Define appropriate quantities for the purpose of descriptive modeling.	A2.0, A6.0, A8.0	B3.0, B4.0, B10.0		D7.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A2.0, A6.0, A8.0	B3.0, B4.0, B10.0	C4.0	D7.0
<b>Number and Quantity – N-VM – Vector and Matrix Quantities</b>				
<i>Represent and model with vector quantities</i>				
1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $v$ , $ v $ , $\ v\ $ , $v$ ).	A6.0	B5.0, B10.0	C8.0	D4.0, D5.0
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.	A6.0	B5.0, B10.0	C8.0	D4.0, D5.0
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.	A6.0	B5.0, B10.0	C8.0	D4.0, D5.0
<i>Perform operations on vectors</i>				D4.0
4. (+) Add and subtract vectors. a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. c. Understand vector subtraction $v - w$ as $v + (-w)$ , where $-w$ is the additive inverse of $w$ , with the same magnitude as $w$ and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.	A6.0	B5.0, B10.0	C8.0	D4.0, D5.0
5. (+) Multiply a vector by a scalar. a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$ . b. Compute the magnitude of a scalar multiple $cv$ using $\ cv\  =  c v$ . Compute the direction of $cv$ knowing that when $ c v \neq 0$ , the direction of $cv$ is either along $v$ (for $c > 0$ ) or against $v$ (for $c < 0$ ).	A6.0	B5.0, B10.0	C8.0	D4.0, D5.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<i>Perform operations on matrices and use matrices in applications</i>				D4.0, D5.0
6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.	A6.0	B5.0, B9.0, B10.0		D4.0, D5.0
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.	A6.0	B5.0, B9.0, B10.0		D4.0, D5.0
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.	A6.0	B5.0, B9.0, B10.0		D4.0, D5.0
9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	A6.0	B5.0, B9.0, B10.0		D4.0, D5.0
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.	A6.0	B5.0, B9.0, B10.0		D4.0, D5.0
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.	A6.0	B5.0, B9.0, B10.0		D4.0, D5.0
12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.	A6.0	B5.0, B9.0, B10.0		D4.0, D5.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>				
Summarize, represent, and interpret data on a single count or measurement variable				
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A2.0	B1.0, B8.0, B10.0		
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A2.0	B1.0, B10.0		
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A2.0	B1.0, B10.0		
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A2.0	B1.0, B10.0		
Summarize, represent, and interpret data on two categorical and quantitative variables				
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.		B1.0, B8.0, B10.0		



ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.		B1.0, B10.0		
<b>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</b>				
1.0 Students solve probability problems with finite sample spaces by using the rules for addition, multiplication, and complementation for probability distributions and understand the simplifications that arise with independent events.		B5.0		D5.0
2.0 Students know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.		B5.0		D5.0
3.0 Students demonstrate an understanding of the notion of discrete random variables by using this concept to solve for the probabilities of outcomes, such as the probability of the occurrence of five or fewer heads in 14 coin tosses.		B5.0		D5.0
4.0 Students understand the notion of a continuous random variable and can interpret the probability of an outcome as the area of a region under the graph of the probability density function associated with the random variable.		B5.0		D5.0
5.0 Students know the definition of the mean of a discrete random variable and can determine the mean for a particular discrete random variable.		B5.0		D5.0
6.0 Students know the definition of the variance of a discrete random variable and can determine the variance for a particular discrete random variable.		B5.0		D5.0
7.0 Students demonstrate an understanding of the standard distributions (normal, binomial, and exponential) and can use the distributions to solve for events in problems in which the distribution belongs to those families.		B5.0		D5.0
8.0 Students determine the mean and the standard deviation of a normally distributed random variable.		B5.0		D5.0
9.0 Students know the central limit theorem and can use it to obtain approximations for probabilities in problems of finite sample spaces in which the probabilities are distributed binomially.		B5.0		D5.0
10.0 Students know the definitions of the mean, median and mode of distribution of data and can compute each of them in particular situations.		B5.0		D5.0
11.0 Students compute the variance and the standard deviation of a distribution of data.		B5.0		D5.0
12.0 Students find the line of best fit to a given distribution of data by using least squares regression.		B5.0		D5.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
13.0 Students know what the correlation coefficient of two variables means and are familiar with the coefficient's properties.		B5.0		D5.0
14.0 Students organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line graphs and bar graphs, stem-and-leaf displays, scatterplots, and box-and-whisker plots.		B5.0		D5.0
15.0 Students are familiar with the notions of a statistic of a distribution of values of the sampling distribution of a statistic. And of the variability of a statistic.		B5.0		D5.0
16.0 Students know basic facts concerning the relation between the mean and the standard deviation of a sampling distribution and the mean and the standard deviation of the population distribution.		B5.0		D5.0
17.0 Students determine confidence intervals for a simple random sample from a normal distribution of data and determine the sample size required for a desired margin of error.		B5.0		D5.0
18.0 Students determine the P- value for a statistic for a simple random sample from a normal distribution.		B5.0		D5.0
19.0 Students are familiar with the chi- square distribution and chi- square test and understand their uses.		B5.0		D5.0
<b>SCIENCE</b>				
<b>Scientific and Engineering Practices – SEP</b>				
1. Asking questions (for science) and defining problems (for engineering)	A5.0, A8.0	B1.0, B3.0, B6.0, B8.0, B9.0, B10.0		D5.0, D7.0
2. Developing and using models	A4.0, A5.0, A6.0, A8.0	B1.0, B2.0, B3.0, B6.0, B8.0, B10.0		D3.0, D4.0, D5.0, D7.0
3. Planning and carrying out investigations		B2.0, B3.0, B6.0, B8.0, B10.0		D5.0, D7.0
4. Analyzing and interpreting data	A2.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C7.0, C8.0, C9.0	D2.0, D3.0, D5.0, D7.0
5. Using mathematics and computational thinking	A2.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0	D4.0, D5.0, D6.0, D7.0
6. Constructing explanations (for science) and designing solutions (for engineering)	A5.0	B3.0, B4.0, B5.0, B6.0, B10.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0	D5.0, D7.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
7. Engaging in argument from evidence	A9.0	B3.0, B6.0, B10.0, B11.0	C11.0	D5.0, D7.0
8. Obtaining, evaluating, and communicating information	A2.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B9.0, B10.0, B11.0	C3.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0
<b>Crosscutting Concept – CC</b>				
1. Patterns	A2.0, A3.0, A7.0	B3.0, B4.0, B5.0, B6.0, B8.0, B10.0		D1.0, D2.0, D3.0, D4.0, D5.0
2. Cause and effect: Mechanism and explanation	A1.0, A5.0, A7.0	B3.0, B4.0, B5.0, B6.0, B8.0, B10.0		D2.0, D3.0, D4.0, D5.0, D6.0
3. Scale, proportion, and quantity	A1.0, A2.0, A3.0, A4.0, A5.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0	C2.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0
4. Systems and system models	A5.0	B3.0, B4.0, B5.0, B6.0, B8.0, B9.0, B10.0	C7.0	D2.0, D3.0, D4.0, D5.0, D6.0
5. Energy and matter: Flows, cycles, and conservation	A5.0	B3.0, B4.0, B5.0, B10.0		D2.0, D3.0, D4.0, D5.0, D6.0
6. Structure and function	A1.0, A2.0, A3.0, A5.0, A7.0, A8.0	B6.0, B7.0, B8.0, B10.0	C2.0	D2.0, D5.0
7. Stability and change	A5.0, A7.0	B3.0, B10.0	C2.0	D2.0, D3.0, D5.0, D6.0
<b>Physical Sciences – PS</b>				
PS1: Matter and Its Interactions				
PS1.A: Structure and Properties of Matter	A7.0	B3.0, B4.0, B5.0, B10.0		D2.0, D6.0
PS1.B: Chemical Reactions		B4.0, B5.0, B10.0		D2.0, D6.0
PS1.C: Nuclear Processes		B4.0, B5.0, B10.0		D6.0
PS2: Motion and Stability: Forces and Interactions				
PS2.A: Forces and Motion	A6.0, A7.0	B4.0, B5.0, B10.0		D4.0, D5.0, D6.0, D7.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
PS2.B: Types of interactions	A6.0, A7.0	B4.0, B5.0, B10.0		D4.0, D5.0, D6.0 D7.0
PS2.C: Stability and Instability in Physical Systems	A1.0, A6.0, A7.0	B4.0, B5.0, B10.0		D4.0, D5.0, D6.0 D7.0
PS3: Energy				
PS3.A: Definitions of Energy	A5.0	B3.0, B4.0, B5.0, B8.0, B10.0		D4.0, D6.0
PS3.B: Conservation of Energy and Energy Transfer	A5.0	B3.0, B4.0, B5.0, B8.0, B10.0		D4.0, D6.0
PS3.C: Relationship Between Energy and Forces		B4.0, B5.0, B8.0, B10.0		D4.0, D6.0
PS3.D: Energy in Chemical Processes and Everyday Life	A5.0	B4.0, B5.0, B8.0, B10.0		D4.0, D6.0
PS4: Waves and Their Applications in Technologies for Information Transfer				
PS4.A: Wave Properties		B3.0, B4.0, B5.0, B10.0		D6.0, D7.0
PS4.B: Electromagnetic Radiation		B4.0, B5.0, B10.0		D6.0, D7.0
PS4.C: Information Technologies and Instrumentation		B3.0, B4.0, B5.0, B10.0		D6.0
<b>Earth and Space Sciences – ESS</b>				
ESS2: Earth's Systems				
ESS2.A: Earth Materials and Systems		B3.0		D2.0, D3.0, D7.0
ESS2.B: Plate Tectonics and Large-Scale System Interactions		B3.0		D2.0, D3.0, D4.0, D7.0
ESS2.C: The Roles of Water in Earth's Surface Processes		B3.0		D2.0, D3.0, D4.0, D7.0, D9.0, D13.0, D14.0
ESS2.D: Weather and Climate		B3.0		D3.0, D7.0, D10.0
ESS2.E: Biogeology				D11.0, D13.0
ESS3: Earth and Human Activity				
ESS3.A: Natural Resources	A5.0	B3.0		D3.0, D7.0, D9.0
ESS3.B: Natural Hazards		B3.0		D2.0, D7.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
ESS3.C: Human Impacts on Earth Systems	A5.0	B3.0		D2.0, D3.0, D7.0, D9.0, D10.0, D12.0
ESS3.D: Global Climate Change	A5.0	B3.0		D3.0, D7.0, D10.0, D11.0, D12.0
<b>Engineering, Technology, and the Applications of Science – ETS</b>				
ETS1: Engineering Design				
ETS1.A: Defining and Delimiting an Engineering Problem	A5.0, A6.0, A8.0	B3.0, B6.0, B8.0, B10.0		D5.0
ETS1.B: Developing Possible Solutions	A5.0, A6.0, A8.0	B3.0, B6.0, B8.0, B10.0		D5.0
ETS1.C: Optimizing the Design Solution	A5.0, A6.0, A8.0	B3.0, B6.0, B8.0, B10.0		D5.0
ETS2: Links Among Engineering, Technology, Science, and Society				
ETS2.A: Interdependence of Science, Engineering, and Technology	A5.0, A6.0, A7.0	B3.0, B4.0, B5.0, B10.0	C2.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0, C10.0, C11.0	D2.0, D4.0, D6.0
ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A1.0, A2.0, A5.0, A8.0	B9.0, B10.0	C11.0	
<b>HISTORY/SOCIAL SCIENCE</b>				
<b>Principles of American Democracy and Economics – AD</b>				
12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their Interdependence, and the meaning and importance of those values and principles for a free society.		B9.0	C1.0	D2.0
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.	A1.0, A2.0, A5.0	B9.0	C1.0	D2.0
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.	A2.0			D10.0, D11.0, D13.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<b>Principles of Economics – PE</b>				
12.1 Students understand common economic terms and concepts and economic reasoning.	A1.0, A2.0, A5.0	B9.0	C1.0	D2.0, D3.0
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.				D10.0, D11.0, D13.0
12.2 Students analyze the elements of America's market economy in a global setting.	A2.0, A5.0	B9.0	C1.0	D3.0
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.	A1.0	B9.0		
<b>U.S. History and Geography – US</b>				
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.	A1.0		C1.0	
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.	A1.0		C1.0	
11.5.7. Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.			C1.0	
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.	A1.0, A5.0		C1.0	
11.6.4. Analyze the effects of and the controversies arising from New Deal economic policies and the expanded role of the federal government in society and the economy since the 1930s (e.g., Works Progress Administration, Social Security, National Labor Relations Board, farm programs, regional development policies, and energy development projects such as the Tennessee Valley Authority, California Central Valley Project, and Bonneville Dam).			C1.0	
11.8 Students analyze the economic boom and social transformation of post-World War II America.	A1.0, A2.0, A5.0	B9.0	C1.0	
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.	A1.0, A2.0, A5.0	B9.0	C1.0	D3.0
11.11.5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.				D10.0, D11.0, D13.0

ENGINEERING AND ARCHITECTURE	PATHWAYS			
	A. Architectural Design	B. Engineering Technology	C. Engineering Design	D. Environmental Engineering
<b>World History, Culture, and Geography – WH</b>				
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.	A1.0, A2.0, A5.0	B9.0	C1.0	
10.9 Students analyze the international developments in the post-World World War II world.	A1.0	B9.0	C1.0	
10.10 Students analyze instances of nation-building in the contemporary world in at least two of the following regions or countries: the Middle East, Africa, Mexico and other parts of Latin America, and China.	A5.0	B9.0	C1.0	
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0, A2.0, A3.0, A5.0	B9.0	C1.0	
<b>Chronological and Spatial Reasoning – CSR</b>				
1. Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.	A1.0		C1.0	
2. Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.	A1.0			
4. Students relate current events to the physical and human characteristics of places and regions.			C1.0	
<b>Historical Research, Evidence, and Point of View – HR</b>				
4. Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.	A1.0			
<b>Historical Interpretation – HI</b>				
1. Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.	A1.0		C1.0	
3. Students interpret past events and issues within the context in which an event unfolded rather than solely in terms of present-day norms and values.	A1.0			

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Engineering and Architecture**

Lloyd McCabe, Administrator, California Department of Education  
John Dunn, Education Consultant, California Department of Education

#### *Standards Review Team*

Mark Martin, Director, Laney College  
Arnold Ruskin, Instructor, San Diego Union High School District  
Barbara Worden, Instructor, Liberty Union High School District

#### *Standards Writing Team*

Chris Alburn, Instructor, Elk Grove Unified School District  
Debra Crane, Instructor, Galt Joint Union High School District  
Chris Schlesselman, Instructor, Sacramento City Unified School District  
Barbara Worden, Instructor, Liberty Union High School District

#### *Common Core Alignment Team*

Curtis Earle, Instructor, Los Angeles Unified School District  
Jeff Kamansky, Instructor, Oceanside Unified School District  
Sheryl Roccoforte, Instructor, Oceanside Unified School District  
Zach Ronnenberg, Instructor, Davis Joint Unified School District  
Frank Zuidema, Instructor, Oceanside Unified School District



**Table of Contents**  
**Fashion and Interior Design**

<b>Sector Description</b> .....	<b>1</b>
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	6
Pathway Standards.....	7
A. Fashion Design and Merchandising Pathway .....	7
B. Interior Design Pathway .....	11
C. Personal Services Pathway.....	15
Academic Alignment Matrix.....	19
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>



## **Fashion and Interior Design**

### ***Sector Description***

The Fashion and Interior Design sector provides students with the academic and technical preparation necessary to pursue high-skill, high-demand careers in these related and growing industries. The sector encompasses three distinct career pathways: Fashion Design and Merchandising, Interior Design, and Personal Services. The standards are designed to integrate academic and career technical concepts. The anchor standards include Consumer and Family Studies comprehensive technical knowledge and skills that prepare students for learning in the pathways. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates hands-on projects, work-based instruction, and leadership development such as that offered through FHA-HERO, the California affiliate of Family, Career and Community Leaders of America (FCCLA). Standards in this sector are designed to prepare students for technical training, postsecondary education, and entry to a career.

## **Fashion and Interior Design Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Fashion and Interior Design academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Fashion and Interior Design sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Recognize the use of style guides in industry.
- 2.3 Identify barriers to accurate and appropriate communication.
- 2.4 Interpret verbal and nonverbal communications and respond appropriately.
- 2.5 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.6 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.7 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Fashion and Interior Design sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Fashion and Interior Design sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Fashion and Interior Design sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

### **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Fashion and Interior Design sector workplace environment and community settings.

(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Fashion and Interior Design sector.

### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, federal, and international regulatory agencies and nongovernmental entities, as well as laws and regulations, related to the Fashion and Interior Design industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Fashion and Interior Design sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.

- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Fashion and Interior Design sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the career technical student organization (such as FHA-HERO, the California Affiliate of FCCLA). (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations (such as FHA-HERO) and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Fashion and Interior Design sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Fashion and Interior Design sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

**This section is specific to the foundational knowledge and skills required for Consumer and Family Studies.**

- 10.1 Interpret and explain terminology and practices specific to the Fashion and Interior Design sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Fashion and Interior Design sector.
- 10.3 Construct projects and products specific to the Fashion and Interior Design sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Explore how apparel and interior fashions meet social, physical, and psychological needs of individuals and families.
- 10.6 Demonstrate an understanding of the elements and principles of design and color theory as they apply to the selection of apparel, furnishings, and housing.

- 10.7 Compare and contrast the historical and cultural influences on apparel, furnishings, and housing.
- 10.8 Explore and experiment with different textile fibers, fabrics, and finishes used for apparel and furnishings.
- 10.9 Demonstrate how to construct, alter, and repair fashion and interior items and accessories through the use of basic construction techniques and equipment.
- 10.10 Analyze the principles of wardrobe planning and maintenance and the factors that influence a person's apparel budget.
- 10.11 Evaluate the factors that influence housing decisions.
- 10.12 Identify the factors influencing the selection and care of home furnishings, accessories, and equipment.
- 10.13 Assess the principles and factors that influence space planning and interior design, including universal access.
- 10.14 Explain how individuals apply strategies that enable them to manage personal and work responsibilities to enhance productivity in the workplace.
- 10.15 Assess the factors regarding the individual, the family, and the workplace that influence decisions related to apparel and housing at each stage of the life cycle.
- 10.16 Demonstrate an understanding of how knowledge, skills, attitudes, and behaviors learned in Consumer and Family Studies can be transferred to advanced training and education or careers in the Fashion and Interior Design sector.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Fashion and Interior Design anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings and through the career technical student organization (such as FHA-HERO, the California Affiliate of FCCLA).

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Fashion and Interior Design sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Fashion and Interior Design sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Fashion and Interior Design Pathway Standards**

### **A. Fashion Design and Merchandising Pathway**

The Fashion Design and Merchandising pathway focuses on the major aspects of the fashion industry and prepares students for careers and/or postsecondary education in this rapidly growing field. Students pursuing this career pathway have in-depth, hands-on experiences that focus on industry awareness, sustainable practices, elements and principles of design, history of fashion, fashion forecasting, textiles and textile products, product knowledge, apparel merchandising, and garment production.

Sample occupations associated with this pathway:

- ◆ Display or Sales Associate
- ◆ Merchandising Manager
- ◆ Fashion Designer

- A1.0 Understand various aspects of the fashion design, manufacturing, merchandising, and retail industry and the industry's role in local, state, national, and global economies.
- A1.1 Understand the different segments of the fashion industry from textile design to retail sales.
  - A1.2 Identify how the various segments of the industry contribute to local, state, national, and international economies.
  - A1.3 Understand how such resources as periodicals, mass media, trend reports, and the Internet are used in the industry.
  - A1.4 Compare major legislative, economic, and social trends that affect the industry.
  - A1.5 Research various professional organizations such as Fashion Group International (FGI) and National Retail Federation (NRF).
  - A1.6 Research postsecondary education options in the field of fashion design and merchandising.
- A2.0 Understand basic hiring practices, operational policies, procedures, and regulatory requirements in the fashion design, manufacturing, merchandising, and retail industry.
- A2.1 Identify what constitutes appropriate professional clothing, grooming, and personal hygiene for a variety of professions.
  - A2.2 Identify hiring practices within the industry.
  - A2.3 Analyze basic operational procedures for all aspects of the industry (e.g., quality control, inventory control, distribution, quick response marketing, production, and accounting).
  - A2.4 Create a product which assesses the importance of accurate and thorough documentation to various aspects of the industry.



- A3.0 Understand the principles of organizational management, including the roles and responsibilities of management and employees.
  - A3.1 Describe important management strategies, such as shared responsibilities and negotiation.
  - A3.2 Practice using common organizational procedures and tools, such as business plans, spreadsheets, recordkeeping, and communication with consumers.
  - A3.3 Compare and contrast the major outcomes of effective management, such as profitability, productivity, a positive work environment, and client satisfaction.
  - A3.4 Identify and list management titles and the role of each position in the overall operation of the company.
  - A3.5 Use the concepts and principles that lead to a healthy business with a positive company culture to begin creating a business plan.
  
- A4.0 Apply the elements and principles of design in various aspects of the fashion industry.
  - A4.1 Apply the elements and principles of design to various tasks within the fashion industry (e.g., textiles design, fashion design, graphic design, visual merchandising).
  - A4.2 Explain the fundamentals of trend forecasting.
  - A4.3 Integrate various types of technology in the design process.
  - A4.4 Master skills to create presentation boards.
  - A4.5 Create a portfolio to showcase design ideas and mastery.
  
- A5.0 Understand how the history of social, cultural, political, economic, and technological changes influence fashion.
  - A5.1 Analyze how fashion and design have been influenced by politics, society, economics, culture, and aesthetics.
  - A5.2 Compare how textiles and design have evolved throughout history.
  - A5.3 Define the ways in which economies, mass production, labor unions, globalization, and technology affect the fashion industry.
  - A5.4 Create a product describing fashion cycles and the adaptation of historical fashions to current trends.
  
- A6.0 Understand the characteristics, production, and maintenance of textiles and the use of sustainable practices.
  - A6.1 Identify general characteristics and maintenance of various fibers, fabrics, and finishes.
  - A6.2 Compare textile manufacturing methods for producing fabrics that are woven, nonwoven, and knit.
  - A6.3 Analyze principals of standard print design (e.g., abstract and geometric) and color designs (e.g., tone-on-tone, positive/negative, and monotone).
  - A6.4 Integrate the skills and procedures necessary to create and produce textile products.
  - A6.5 Research how technology is used to create various textiles.

- A6.6 Evaluate how copyright, trademark, and patent laws affect textile design and production.
- A6.7 Compile textile industry standards that demonstrate sustainable practices.
- A7.0 Understand how trends, color, and societal forecasting are used in the fashion industry.
  - A7.1 Identify the resources available to the fashion industry that provide information on fashion trends, color, and societal trend forecasting.
  - A7.2 Research trends that influence fashion and interior design.
  - A7.3 Apply trend forecasting as it relates to fashion design, textile design, product development, and merchandising.
- A8.0 Understand the principles and techniques used in fashion design and product development and manufacturing.
  - A8.1 Know the basic process of manufacturing garments.
  - A8.2 Identify equipment, tools, supplies, and software to construct or manufacture garments.
  - A8.3 Illustrate how the manufacturing process relates to the cost of producing garments.
  - A8.4 Evaluate the effects of global sourcing on garment production.
  - A8.5 Formulate cost sheets for garments, including manufacturer's costs, markup, and profit margin.
  - A8.6 Sketch a fashion design on the nine-head figure.
  - A8.7 Define flat patternmaking and draping techniques.
  - A8.8 Recognize pattern specifications for global production.
  - A8.9 Experiment with draping using various fabrics.
  - A8.10 Distinguish how technology is used in patternmaking, grading, and marking.
  - A8.11 Evaluate first-sample garments made from first patterns and make necessary adjustments.
- A.9.0 Understand the skills and procedures necessary for sales, marketing, and branding in the fashion industry.
  - A9.1 Define basic procedures for sales, exchanges, and returns.
  - A9.2 Identify the factors that contribute to quality customer relations, service, and sales.
  - A9.3 Analyze customer buying motives.
  - A9.4 Apply effective sales, marketing techniques, and presentation skills.
  - A9.5 Assess strategies for helping customers select merchandise and recommend related products and services appropriate to their needs.
  - A9.6 Explain how technology can be used to provide customer service.
  - A9.7 Define the concept of branding and identify successful examples.
- A10.0 Understand visual merchandising and product styling.
  - A10.1 Explain the characteristics of effective interior and exterior retail displays.

- A10.2 Understand the theory and practice of merchandise placement on a sales floor.
  - A10.3 Construct store displays by using various fixtures (e.g., mannequins, shadow boxes, wall and tabletop displays, and props) to convey specific messages (e.g., a store's image, a specific manufacturer's label, a color or fabric story, or a specific event).
  - A10.4 Demonstrate understanding of methods of visual merchandising and styling as it relates to selling on all types of media by creating a marketing plan.
- 
- A11.0 Understand the current laws, work site policies, and systems for inventory control and loss prevention.
    - A11.1 Describe the procedures involved in receiving, inspecting, and marking merchandise and distributing it to the selling floor.
    - A11.2 Explain the role of inter-store transfers in the general distribution of goods.
    - A11.3 Understand the current laws that affect inventories.
    - A11.4 Compare common inventory loss points and strategies for loss prevention.
    - A11.5 Analyze how loss prevention affects all profits.
- 
- A12.0 Understand important aspects of the beauty industry.
    - A12.1 Identify and list various careers in the beauty industry.
    - A12.2 Compare how cosmetic products are made.
    - A12.3 Compare how products are regulated.
    - A12.4 Explain the training required for selling beauty products.
    - A12.5 Research various techniques for marketing beauty products.
    - A12.6 Create a product which demonstrates the principles of packaging beauty products.

## **Fashion and Interior Design Pathway Standards**

### **B. Interior Design Pathway**

The Interior Design pathway is designed to prepare students for careers and/or postsecondary education in this rapidly growing field. Students pursuing this career pathway study the principles and elements of design along with presentation skills. They gain knowledge of materials and products, including but not limited to furnishings, fabrics, fixtures and treatments, sourcing products, space planning, specifications, and interior systems. Students will also be exposed to state-of-the-industry, computer-aided design and the emerging field of sustainability.

Sample occupations associated with this pathway:

- ◆ Set Decorator
- ◆ Certified Kitchen and Bath Specialist
- ◆ Interior Designer

- B1.0 Understand the complexity of the interior design industry and learn and apply aspects of design that pertain to residential, commercial, and mobile interior design.
- B1.1 Identify and list various career areas within the interior design field, including home furnishings; retail; furniture design; accessory design; and residential, commercial, and mobile design.
  - B1.2 Understand how the industry functions, knowledge of materials/resources, and effective business practices.
  - B1.3 Identify how the various segments of the industry contribute to local, state, national, and global economies.
  - B1.4 Understand how resources such as periodicals, mass media, and the Internet are used in the industry.
  - B1.5 Compare the major legislative, economic, and social trends that have an impact on the industry.
  - B1.6 Research various professional organizations such as American Society of Interior Designers (ASID) and National Kitchen and Bath Association (NKBA).
  - B1.7 Research postsecondary education options in the field of interior design.
- B2.0 Understand key operational procedures and laws in the industry pertaining to design, production, and construction.
- B2.1 Identify how various factors affect budgets and profits.
  - B2.2 Recognize various types of liability, insurance policies, service agreements, contracts, and the need to comply with codes.
  - B2.3 State the purpose of regulatory agencies and the function of tax forms and resale numbers.
  - B2.4 Explain how designers determine their fees for services and materials.

- B2.5 Understand how designers and industry professionals keep appropriate records, write correspondence, and use forms to manage accounts and workflow.
- B2.6 Plan and organize work schedules with a timeline showing the stages from consultation through installation.
  
- B3.0 Understand and apply the elements and principles of design to various aspects of the interior design industry.
  - B3.1 Create an environment using the elements and principles of design for designing, marketing, and merchandising of interior design products.
  - B3.2 Understand the concept of universal design and relate it to the industry.
  - B3.3 Explain the fundamentals of trend forecasting.
  - B3.4 Integrate various types of technology in the design process.
  
- B4.0 Understand the main principles of sales and marketing in the interior design and furnishings industry.
  - B4.1 Identify factors that contribute to quality customer relations, service, and retail sales.
  - B4.2 Analyze customers' buying motives.
  - B4.3 Compare and contrast sales and marketing techniques for their effectiveness.
  - B4.4 Assess strategies for helping customers select merchandise and recommend related products and services appropriate to their needs.
  - B4.5 Explain how technology can be used to provide customer service.
  - B4.6 Define basic policies and procedures for sales, exchanges, and returns.
  
- B5.0 Understand and apply important aspects of design, space planning, and know the characteristics of interior systems.
  - B5.1 Understand the importance of clients' needs to the development of a design concept.
  - B5.2 Understand the measurements of interior spaces and how to determine square footage.
  - B5.3 Interpret all types of blueprints, including symbols for plumbing, electrical, and heating/air.
  - B5.4 Understand the traffic flow and product/furniture placement requirements for an interior design project.
  - B5.5 Create scale-drawings, elevations, renderings, and sample boards.
  - B5.6 Analyze space needs on the basis of clients' specifications.
  - B5.7 Understand the concept of universal design as it applies to people with and without disabilities and research the compliance requirements of the American with Disabilities Act.
  - B5.8 Master presentation skills necessary to sell design concepts to a potential client.

- B6.0 Understand the selection of lighting, window, wall, and floor treatments for residential, commercial, and mobile interiors.
  - B6.1 Recognize a variety of styles, construction, materials, hardware, and their functions and the need to comply with industry codes.
  - B6.2 Describe the function, appearance, installation, maintenance of primary types of lighting, window treatments, floor, and wall coverings.
  - B6.3 Understand the procedures for tracking and following through on work orders.
  - B6.4 Research the process for installing lighting, window, wall, and floor treatments, including measuring.
  - B6.5 Estimate costs of materials, fabrication, and installation.
  
- B7.0 Understand the selection of furniture, upholstery, slipcovers, and accessories for residential, commercial, and mobile interiors.
  - B7.1 Define procedures, processes, and labels used for the production of furniture, coverings, and accessories that meet industry standards and codes.
  - B7.2 Identify the primary types of woods, fillers, materials, finishes, and frames.
  - B7.3 Label the primary types of fabrics, trims, and finishes for various furniture, coverings, and accessories.
  - B7.4 Evaluate how ergonomic and anthropometric concepts assist clients in the selection and adaptation of furnishings.
  - B7.5 Research appropriate furnishings by evaluating the quality, source, function, and vendors' attributes.
  - B7.6 Outline schedules for completing work and installing appliances and cabinetry.
  
- B8.0 Understand the fabrication of treatments for windows, walls, floors, and furnishings.
  - B8.1 Identify the appropriate tools and supplies needed for production and fabrication of window, wall, and floor treatments and coverings.
  - B8.2 Name the construction skills and techniques that meet industry standards.
  - B8.3 Understand the steps, procedures, and processes necessary for the production of window coverings, furnishings, and accessories.
  - B8.4 Interpret and complete orders by using accepted production methods.
  
- B9.0 Understand the history and events that have influenced the design of furnishings and interiors.
  - B9.1 Identify basic furniture styles and interiors from historical periods.
  - B9.2 Recognize the characteristics of furnishings that typify various periods and architectural styles throughout history.
  - B9.3 Analyze recurring historical designs in today's furnishings.
  - B9.4 Research how furnishings from a particular period in history were influenced by political, social, economic, and aesthetic conditions.

- B9.5 Create a product that distinguishes how prosperity, mass production, and technology throughout history are related to the economics of the furnishings segment of the industry.
- B10.0 Understand the characteristics and maintenance of textiles and their applications to interior design products.
  - B10.1 Identify general characteristics and maintenance of various fibers, fabrics, and finishes.
  - B10.2 Name various uses of textiles in interior design products.
  - B10.3 Compare the application of various fabric types to a variety of interior products.
  - B10.4 Research color and design trends for textiles.
  - B10.5 Compare textile manufacturing methods for producing fabrics that are woven, nonwoven, and knit.
  - B10.6 Analyze principals of standard print design (e.g., abstract and geometric) and color designs (e.g., tone-on-tone, positive/negative, and monotone).
  - B10.7 Integrate the skills and procedures necessary to create and produce textile products.
  - B10.8 Research how technology is used to create various characteristics in textiles.
  - B10.9 Design a product describing how copyright, trademark, and patent laws affect textile design and production.
- B11.0 Understand sustainable practices in the interior design field which includes: recyclable materials/products, efficient energy products and usage, sustainable construction principles, asset liquidation principles, transportation, and disposal of harmful chemicals/products.
  - B11.1 Compile textile industry practices that demonstrate sustainability.
  - B11.2 Compare environmentally friendly and sustainable design concepts that reflect federal guidelines and voluntary standards, such as Leadership in Energy and Environmental Design (LEED).
  - B11.3 Research sustainable products.
  - B11.4 Research lighting, water, waste disposal, and other energies to determine the best options for the client that demonstrates sustainable practices.
  - B11.5 Explain how organizations such as Leadership in Energy and Environmental Design (LEED) promote sustainable practices.
  - B11.6 Analyze government incentives for sustainable practices to benefit the client.
  - B11.7 Identify characteristics of sustainable fibers and acquire knowledge about what elements contribute to a sustainable fiber.

### **C. Personal Services Pathway**

Students who follow the Personal Services pathway develop the essential concepts, knowledge, principles, and skills to be successful in the career opportunities in this industry. Careers or subjects in this field include barbering, cosmetology, electrology, esthetics, advanced esthetics, makeup artistry, and manicuring, with the emphasis on client consultation, health/safety, service/treatment protocols, product/equipment knowledge, marketing/promotion, management, and business practices.

Sample occupations associated with this pathway:

- ◆ Barber
- ◆ Esthetician
- ◆ Hair Stylist
- ◆ Makeup Artist
- ◆ Manicurist

C1.0 Identify the importance of state board licensing, rules and regulations for the beauty industry.

C1.1 Define the state board licensing requirements and procedures that currently exist in California.

C1.2 List the state board rules and regulations that currently exist in California.

C1.3 Identify the state board officials to contact when professionals have comments, concerns, or complaints regarding state board rules, regulations, policies or procedures in California.

C1.4 State the purposes of having a governing or licensing board over the beauty industry in California.

C1.5 Access information regarding the Barbering and Cosmetology Board meetings, agendas, and minutes in California.

C2.0 Recognize the different communication skills that are necessary to be successful in the personal service career pathways of the beauty industry.

C2.1 Describe the different types of communication skills that must be used when pursuing a career in the beauty industry.

C2.2 List the ways that communication skills can enhance a career in the beauty industry.

C2.3 Describe the communications skills that are essential to being successful in the beauty industry.

C2.4 Define the differences between body language, written, oral, and listening communication skills.

C2.5 Identify the reasons why people skills, critical thinking, and soft skills are an important component of being successful in the beauty industry.

C3.0 Explain the importance of following the federal and state health and safety regulations, Occupational Safety and Health Administration (OSHA) regulations, infection control practices for the beauty industry.



- C3.1 Classify the different health and safety regulations for the industry from the federal, state, and local levels.
  - C3.2 Locate all Material Safety Data Sheets (MSDS) for chemicals and products.
  - C3.3 Discuss the purposes of knowing OSHA regulations.
  - C3.4 Distinguish the differences of the various infection control practices to protect the consumer as well as the professional.
  - C3.5 Review the various business and industry companies that provide equipment and products for infection control practices for quality and safety.
- C4.0 Describe importance of keeping up with new trends, technologies, product development, new equipment, and services for clients.
- C4.1 Identify the need for professionals to continue with their education and training.
  - C4.2 Recognize which trends, technologies, products, equipment and services that will increase success.
  - C4.3 Explain the benefits of keeping up with the trends, technologies and new products for treatment plans.
  - C4.4 Review new trends, technologies, product development, equipment, and services with a benefit/cost analysis perspective.
- C5.0 Demonstrate the key concepts and principles to designing and performing services and treatment plans for clients.
- C5.1 Apply consistent concepts and principles in designing a service or treatment plan for each client.
  - C5.2 Practice ethical and moral leadership when performing services or treatment plans with/on clients at all times.
  - C5.3 Use professional respect, courtesy, and demeanor at all times when working with clients and other professionals.
  - C5.4 Illustrate the purpose of having a thorough client consultation and record system of services or treatment plans performed for clients.
  - C5.5 Modify the service or treatment plan accordingly as the goals of the client change or become achieved in the services provided.
- C6.0 Employ the leadership and business management practices and cultural proficiencies that would lead to success in the beauty industry.
- C6.1 Discover various methods to develop cultural proficiencies for a successful career.
  - C6.2 Prepare to be a successful leader by practicing positive leadership and business management skills.
  - C6.3 Operate as an ethical and responsible leader on a daily.
  - C6.4 Prepare and train new personnel in the salons, spas, or other beauty industry careers with integrity, ethics, and professionalism at all times.

- C7.0 Differentiate the types of business ownership and the advantages/disadvantages of owning and/or managing a business.
  - D7.1 Identify successful mentors in the personal service career pathways to help become successful.
  - D7.2 Categorize the advantages and disadvantages of being a business owner.
  - D7.3 Examine the pros and cons of managing a business.
  - D7.4 Compare and contrast the components that make up a good business plan.
  - D7.5 Model positive attributes about work.
  
- C8.0 Analyze the clients' needs, abilities, purpose, and challenges to obtaining their goals with services and treatment.
  - C8.1 Identify the appropriate tools, products, and supplies that are needed to help the client reach their treatment plan goals.
  - C8.2 Select the proper products and equipment to be used at home or in professional treatments to achieve the client's needs and goals.
  - C8.3 Outline an at-home protocol for clients to use daily to assist in achieving their personal goals in the beauty services or treatment plans performed.
  - C8.4 Illustrate the purpose of having a well-designed client consultation form for services and treatment plans.
  - C8.5 Diagram a service or treatment plan protocol for the client's needs, goals, and challenges to follow at home and with professional services.
  
- C9.0 Explain the legal, ethical, scope of practice, and financial responsibilities that exist in the beauty industry.
  - C9.1 Collect information on the scope of practice from other states to ensure that the industry is staying up on new trends and technology that should be available for trained and licensed professionals to offer their clients in California.
  - C9.2 Comply with all local, state and federal laws, rules, and regulations that affect the beauty industry at all times.
    - C9.3 Construct a training manual or protocol on legal, ethical, scope of practice, and financial responsibilities.
    - C9.4 Prepare for all of the possible legal, ethical, and financial responsibilities that exist in the beauty industry in California.
  
- C10.0 Synthesize the treatment protocols of clients to assess, re-evaluate, and change the services or treatment plans to reach their goals.
  - C10.1 Revise or modify treatment protocols for clients as needed based on re-evaluating their needs, goals, or achievements during services or treatment plans offered.
  - C10.2 Generate professional treatment protocols to ensure the best possible outcomes for clients during services or treatments performed.
  - C10.3 Create a treatment plan for each client individually to achieve their needs and goals of services or treatments being offered.

- C10.4 Describe training all staff and personnel on the importance of assessing, re-evaluating, and changing the services or treatment plans offered to clients.
  - C10.5 Prepare a treatment protocol or client consultation form that is inclusive of helping the client obtain their needs and goals, and eliminating as many challenges for them as possible.
- 
- C11.0 Evaluate the various equipment, supplies, products, and distributors, and manufacturers, and that represent the beauty industry.
    - C11.1 Explain the rationale used when buying new technology, equipment or products to use in services or treatment plans for clients.
    - C11.2 Interpret the rules and regulations that govern the personal service career pathways sector to limit your liability on services or treatment plans offered to clients.
    - C11.3 Appraise the value and worth of all equipment and products that are on the market for the beauty industry today.
    - C11.4 Compare and contrast all distributors, manufacturers, and suppliers for the goods that they are promoting.
    - C11.5 Discriminate reputable distributors, manufacturers, and suppliers from those which are not as professional or reliable with their products/equipment.
- 
- C12.0 Assess the current state, federal and international scope of practice, rules and regulations required of professionals in the beauty industry.
    - C12.1 Describe the current state, federal and international scope of practice for the various careers in personal services.
    - C12.2 Interpret existing laws and regulations to make proposal to state legislative members and state board officials on the scope of practice for the various career fields within the beauty industry.
    - C12.3 Evaluate the current rules and regulations of California to propose new ideas or changes to the beauty industry to make it better for the future.
    - C12.4 Justify rationale for changes in the personal services career pathway of the beauty industry to keep up with the market trends and needs of the population at-large.
    - C12.5 Support the need for state, federal, and international governing agencies to work together more to make the personal service career pathways a more seamless transition.

## Academic Alignment Matrix

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
<b>ENGLISH LANGUAGE ARTS</b>			
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C5.0, C8.0, C9.0, C10.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B9.0, B10.0, B11.0	C3.0, C7.0, C9.0, C12.0
11-12.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0 A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B9.0, B10.0, B11.0	C12.0
11-12.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.			C3.0, C12.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C8.0, C9.0, C10.0, C11.0, C12.0
<b>Reading Standards for Informational Text – RSIT (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0 B7.0, B8.0, B9.0, B10.0, B11.0	

FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B9.0, B10.0, B11.0	
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B9.0, B10.0, B11.0	
11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B9.0, B10.0, B11.0	C12.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B9.0, B10.0, B11.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
<b>Reading Standards for Literacy in History/Social Studies – RHSS (Standard Area, Grade Level, Standard #)</b>			
11-12.3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.	A1.0, A5.0, A7.0	B1.0, B9.0	C9.0
11-12.5. Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.	A1.0, A5.0, A7.0	B1.0, B9.0	
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.	A1.0, A5.0, A7.0	B1.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
11-12.9 Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.	A1.0, A5.0, A7.0	B1.0, B9.0	
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST (Standard Area, Grade Level, Standard #)</b>			
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A2.0, A3.0, A4.0, A6.0, A8.0 A9.0, A11.0	B2.0, B3.0, B4.0, B5.0, B6.0 B7.0, B8.0, B10.0, B11.0	
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A2.0, A3.0, A4.0, A6.0 A8.0, A9.0, A11.0	B2.0, B3.0, B4.0, B5.0, B6.0, B7.0 B8.0, B10.0, B11.0	C3.0, C4.0, C12.0
11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A2.0, A3.0, A4.0, A6.0 A8.0, A9.0, A11.0	B2.0, B3.0, B4.0, B5.0, B6.0 B7.0, B8.0, B10.0, B11.0	C1.0, C9.0, C12.0
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A2.0, A3.0, A4.0, A6.0 A8.0, A9.0, A11.0	B2.0, B3.0, B4.0, B5.0, B6.0 B7.0, B8.0, B10.0, B11.0	C7.0, C10.0, C12.0
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A2.0, A3.0, A4.0, A6.0 A8.0, A9.0, A11.0	B2.0, B3.0, B4.0, B5.0 B6.0, B7.0, B8.0, B10.0, B11.0	C3.0, C4.0, C9.0, C12.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.  a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s),	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0 A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
<p>counterclaims, reasons, and evidence.</p> <p>b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.</p> <p>c. Use specific rhetorical devices to support assertions (e.g., appeal to logic through reasoning; appeal to emotion or ethical belief; relate a personal anecdote. Case study or analogy).</p> <p>d. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the argument presented.</p>			
<p>11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>a. Introduce a topic or thesis statement; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or</p>	<p>A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0</p>	<p>B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0</p>	<p>C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0</p>

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
<p>other information and examples appropriate to the audience's knowledge of the topic.</p> <p>c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.</p> <p>d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p>			
11-12.3. Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C5.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C5.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C5.0, C8.0



FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C4.0, C10.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience: integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A1.0, A4.0	B1.0, B3.0	C1.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C1.0, C4.0, C6.0
11-12.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C4.0, C9.0
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments focused on discipline-specific content.	A1.0, A2.0, A3.0, A4.0, A5.0 A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	C4.0
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A1.0, A2.0, A3.0, A4.0, A5.0 A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	
11-12.3. Incorporate narrative elements effectively into arguments and informative/explanatory texts.	A1.0, A2.0, A3.0, A4.0, A5.0 A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.			C5.0, C10.0

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0 A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0	
<b>MATHEMATICS</b>			
<b>Algebra – A-CED – Creating Equations</b>			
<i>Create equations that describe numbers or relationships</i>			
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.  1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	A1.0, A3.0, A5.0, A7.0	B3.0, B8.0, B11.0	
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A3.0, A5.0, A7.0	B3.0, B8.0	C3.0, C5.0, C8.0

FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A3.0, A5.0, A7.0	B3.0, B8.0	C3.0, C6.0, C8.0, C9.0, C10.0
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>			
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>			
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	A8.0, A9.0	B2.0, B4.0	C3.0, C4.0, C5.0, C8.0, C10.0
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A8.0, A9.0	B2.0, B4.0	C3.0, C4.0, C5.0, C8.0, C10.0
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>			
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	A3.0	B7.0, B8.0, B9.0, B10.0	C4.0, C5.0, C8.0, C10.0
<b>Geometry – G-CO – Congruence</b>			
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	A8.0, A9.0, A10.0	B10.0, B11.0	C4.0, C5.0, C8.0, C10.0
<i>Make geometric construction</i>			
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a	A4.0, A8.0, A9.0, A10.0	B3.0, B5.0, B6.0, B8.0, B10.0, B11.0	C4.0, C5.0, C8.0, C10.0

FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.			
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>			
<i>Visualize relationships between two-dimensional and three-dimensional objects</i>			
4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three dimensional objects generated by rotations of two-dimensional objects.	A6.0	B1.0, B5.0, B6.0, B7.0, B8.0, B10.0	C4.0, C5.0, C8.0, C10.0
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	A6.0	B1.0, B5.0, B6.0, B7.0, B8.0, B10.0	C4.0, C5.0, C8.0, C10.0
<b>Geometry – G-MG – Modeling with Geometry</b>			
Apply geometric concepts in modeling situations			
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder.	A2.0, A3.0, A6.0	B1.0, B2.0, B5.0, B6.0, B7.0	C4.0, C5.0, C8.0, C10.0
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A2.0, A3.0, A6.0	B1.0, B2.0, B5.0, B6.0, B7.0	C1.0, C3.0, C4.0, C5.0, C8.0, C10.0
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A2.0, A3.0, A6.0	B1.0, B2.0 B5.0, B6.0, B7.0, B8.0	C4.0, C5.0, C8.0, C10.0

FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
<b>Number and Quantities – N-Q – Number and Quantities</b>			
<i>Reason quantitatively and use units to solve problems</i>			
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A9.0, A11.0	B4.0, B11.0	C4.0, C5.0, C8.0, C10.0
2. Define appropriate quantities for the purpose of descriptive modeling.	A9.0, A11.0	B4.0, B11.0	C1.0, C3.0, C4.0, C5.0, C8.0, C10.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A9.0, A11.0	B4.0, B11.0	C3.0, C4.0, C5.0, C8.0, C10.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>			
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>			
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A2.0, A7.0, A9.0	B.2.0, B4.0, B11.0	C1.0, C6.0, C7.0, C9.0, C11.0, C12.0
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>			
<i>Understand independence and conditional probability and use them to interpret data</i>			

FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
<p>2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.</p> <p>3. Understand the conditional probability of A given B as <math>P(A \text{ and } B)/P(B)</math>, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.</p>	A2.0, A7.0, A9.0	B2.0, B4.0, B11.0	C1.0, C3.0, C4.0, C5.0, C8.0, C9.0, C10.0
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>			
<i>Use probability to evaluate outcomes of decisions</i>			
<p>5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.</p> <p style="padding-left: 40px;">b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.</p> <p>6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).</p>	A2.0, A7.0, A9.0	B2.0, B4.0, B11.0	C1.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0

FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
<b>SCIENCE</b>			
<b>Scientific and Engineering Practices – SEP</b>			
1. Asking questions (for science) and defining problems (for engineering)	A5.0, A7.0	B1.0	C3.0, C4.0, C5.0, C10.0, C11.0
2. Developing and using models	A10.0, A11.0		C3.0, C4.0, C5.0, C10.0, C11.0
3. Planning and carrying out investigations	A1.0, A4.0	B1.0, B7.0, B10.0	C1.0, C3.0, C6.0, C9.0, C10.0, C11.0
4. Analyzing and interpreting data	A9.0	B4.0, B7.0	
5. Using mathematics and computational thinking	A1.0, A2.0, A3.0, A4.0, A5.0, A7.0, A8.0, A11.0, A12.0	B1.0, B2.0, B5.0, B6.0, B7.0	
6. Constructing explanations (for science) and designing solutions (for engineering)	A8.0	B5.0, B6.0, B7.0	
8. Obtaining, evaluating, and communicating information	A1.0, A9.0	B1.0, B4.0	
<b>Crosscutting Concept – CC</b>			
1. Patterns	A6.0, A8.0, A10.0	B1.0, B3.0, B4.0, B5.0, B6.0, B10.0	
2. Cause and effect: Mechanism and explanation	A3.0, A10.0	B1.0, B4.0, B7.0, B11.0	
3. Scale, proportion, and quantity	A2.0, A4.0, A6.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0	

FASHION AND INTERIOR DESIGN	PATHWAYS		
	A. Fashion Design and Merchandising	B. Interior Design	C. Personal Services
4. Systems and system models	A2.0, A6.0	B1.0, B4.0, B5.0	
5. Energy and matter: Flows, cycles, and conservation	A6.0	B1.0, B4.0, B6.0, B11.0	
6. Structure and function	A4.0, A6.0	B1.0, B3.0, B4.0, B5.0, B6.0, B7.0, B10.0	
7. Stability and change	A4.0, A6.0	B1.0, B3.0, B4.0	
<b>Physical Sciences – PS</b>			
PS1: Matter and Its Interactions			
PS1.A: Structure and Properties of Matter	A6.0, A8.0	B3.0, B7.0, B10.0	C4.0, C5.0
PS1.B: Chemical Reactions	A6.0	B7.0, B10.0	3.0, C4.0, C5.0
PS2: Motion and Stability: Forces and Interactions			
PS2.A: Forces and Motion			C4.0, C5.0, C8.0, C10.0
PS2.B: Types of interactions			C4.0, C5.0, C8.0, C10.0
PS2.C: Stability and Instability in Physical Systems		B3.0, B6.0, B7.0	C4.0, C5.0, C8.0, C10.0
PS3.D: Energy in Chemical Processes and Everyday Life			C3.0, C4.0, C5.0, C8.0, C10.0
PS3: Energy			
PS3.B: Conservation of Energy and Energy Transfer		B7.0, B11.0	C1.0, C3.0, C4.0, C5.0, C8.0, C10.0
PS3.D: Energy in Chemical Processes and Everyday Life	A6.0	B3.0, B11.0	C1.0, C4.0, C5.0, C8.0, C10.0



<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
PS4: Waves and Their Applications in Technologies for Information Transfer			
PS4.A: Wave Properties		B10.0	C1.0, C3.0, C4.0, C5.0, C8.0, C10.0
PS4.B: Electromagnetic Radiation			C1.0, C3.0, C4.0, C5.0, C8.0, C10.0
PS4.C: Information Technologies and Instrumentation	A2.0, A3.0, A4.0, A6.0, A9.0, A12.0	B1.0, B2.0, B4.0, B8.0, B10.0	C4.0, C5.0, C9.0, C10.0
<b>Life Sciences – LS</b>			
LS1: From Molecules to Organisms: Structures and Processes			
LS1.A: Structure and Function		B10.0, B11.0	C5.0, C8.0, C10.0
LS1.B: Growth and Development of Organisms		B10.0, B11.0	
LS1.C: Organization for Matter and Energy Flow in Organisms		B10.0, B11.0	C5.0, C8.0, C10.0
LS1.D: Information Processing		B1.0	
LS2: Ecosystems: Interactions, Energy, and Dynamics			
LS2.A: Interdependent Relationships in Ecosystems	A6.0	B9.0, B10.0, B11.0	
LS2.C: Ecosystems Dynamics, Functioning, and Resilience		B9.0, B10.0, B11.0	
LS2.D: Social Interactions and Group Behavior		B9.0, B10.0, B11.0	C2.0, C5.0, C6.0, C8.0, C10.0
LS4: Biological Evolution: Unity and Diversity			
LS4.D: Biodiversity and Humans		B1.0, B4.0	C4.0, C8.0

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
<b>Earth and Space Sciences – ESS</b>			
ESS2: Earth's Systems			
ESS2.A: Earth Materials and Systems		B10.0, B11.0	
ESS2.C: The Roles of Water in Earth's Surface Processes		B10.0, B11.0	
ESS2.D: Weather and Climate		B10.0, B11.0	
ESS3: Earth and Human Activity			
ESS3.A: Natural Resources		B10.0, B11.0	C4.0, C10.0, C11.0
ESS3.B: Natural Hazards		B1.0	C3.0
ESS3.C: Human Impacts on Earth Systems	A5.0, A6.0	B9.0, B11.0	C4.0, C10.0, C11.0
ESS3.D: Global Climate Change	A1.0, A6.0	B10.0, B11.0	
<b>Engineering, Technology, and the Applications of Science – ETS</b>			
ETS1: Engineering Design			
ETS1.A: Defining and Delimiting an Engineering Problem	A4.0, A8.0, A10.0	B3.0, B5.0, B6.0	
ETS1.B: Developing Possible Solutions	A4.0, A8.0	B3.0	
ETS1.C: Optimizing the Design Solution	A4.0, A6.0, A8.0	B3.0	
ETS2: Links Among Engineering, Technology, Science, and Society			
ETS2.A: Interdependence of Science, Engineering, and Technology	A8.0, A12.0	B5.0, B8.0	

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A1.0, A5.0, A6.0, A8.0, A12.0	B1.0, B2.0, B5.0, B6.0, B9.0, B10.0	
<b>HISTORY/SOCIAL SCIENCE</b>			
<b>Principles of American Democracy and Economics – AD</b>			
12.1 Students explain the fundamental principles and moral values of American democracy as expressed in the U.S. Constitution and other essential documents of American democracy.	A1.0, A11.0	B2.0	
12.5 Students summarize landmark U.S. Supreme Court interpretations of the Constitution and its amendments.	A5.0	B5.0, B9.0	
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.			C1.0, C3.0, C9.0
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.	A11.0	B2.0	
<b>Principles of Economics – PE</b>			
12.1 Students understand common economic terms and concepts and economic reasoning.	A1.0, A2.0, A6.0, A7.0, A9.0, A10.0, A12.0	B1.0, B2.0, B4.0, B6.0, B7.0, B8.0, B10.0, B11.0	C2.0, C3.0, C5.0
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.		B11.0	
12.2 Students analyze the elements of America's market economy in a global setting.	A1.0, A2.0, A3.0, A6.0, A7.0, A9.0, A10.0, A12.0	B1.0, B2.0, B4.0, B6.0, B7.0, B8.0, B11.0	C3.0, C4.0, C5.0

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.	A1.0, A2.0		C4.0, C5.0, C6.0, C7.0, C8.0
12.3 Students analyze the influence of the federal government on the American economy.	A1.0, A2.0, A6.0, A7.0, A9.0, A10.0, A12.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0	C1.0, C3.0, C8.0, C9.0, C10.0, C11.0, C12.0
12.3.3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.	A1.0, A2.0		
12.4 Students analyze the elements of the U.S. labor market in a global setting.	A1.0, A2.0, A6.0, A7.0, A9.0, A10.0, A11.0, A12.0	B1.0, B2.0, B4.0, B6.0, B7.0, B8.0, B9.0	
12.4.1. Understand the operations of the labor market, including the circumstances surrounding the establishment of principal American labor unions, procedures that unions use to gain benefits for their members, the effects of unionization, the mini-mum wage, and unemployment insurance.	A1.0, A2.0, A5.0		C3.0
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.	A1.0, A2.0		
12.5 Students analyze the aggregate economic behavior of the U.S. economy.	A5.0	B9.0	
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.	A1.0, A2.0, A6.0, A9.0, A10.0, A12.0	B1.0, B2.0, B4.0, B6.0, B7.0, B8.0, B9.0	

<b>FASHION AND INTERIOR DESIGN</b>	<b>PATHWAYS</b>		
	<b>A. Fashion Design and Merchandising</b>	<b>B. Interior Design</b>	<b>C. Personal Services</b>
<b>U.S. History and Geography – US</b>			
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.	A2.0, A5.0, A6.0, A8.0, A11.0	B2.0	
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.	A1.0, A8.0	B1.0, B4.0, B6.0, B7.0, B8.0, B9.0, B10.0	
11.7 Students analyze America's participation in World War II.	A5.0	B9.0	
11.8 Students analyze the economic boom and social transformation of post-World War II America.	A2.0, A3.0, A5.0, A6.0	B2.0, B4.0, B6.0, B7.0, B9.0, B10.0, B11.0	C1.0
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.	A1.0, A3.0, A4.0, A5.0, A6.0, A8.0, A11.0, A12.0	B3.0, B11.0	
11.11.5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.	A11.0	B2.0	
<b>World History, Culture, and Geography – WH</b>			
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.	A5.0, A6.0, A8.0	B9.0	C1.0, C2.0, C3.0, C7.0
10.6 Students analyze the effects of the First World War.	A5.0	B9.0	
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0, A5.0	B9.0	

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Fashion and Interior Design**

Bob Heuvel, Administrator, California Department of Education  
Melissa Webb, Education Consultant, California Department of Education

#### *Standards Review Team*

Wendy Bendoni, Fashion Director, Woodbury University  
Sherry D. Davis, NCEA Certified and Master Esthetician and Instructor, Golden West College  
Katie Dickinson, Buyer, A.J. Wright  
Kerry Doll, Instructor, Fountain Valley High School  
Victoria Estridge, Executive Director, Fashion Institute of Design and Merchandising  
Dian Torres, Cosmetology Dean, Blake Austin College  
Carol Tsushima, Instructor, Colton–Redlands–Yucaipa Regional Occupational Program (ROP)

#### *Standards Writing Team*

Sherry D. Davis, NCEA Certified and Master Esthetician and Instructor, Golden West College  
Kerry Doll, Instructor, Fountain Valley High School  
Victoria Estridge, Executive Director, Fashion Institute of Design and Merchandising  
Stacy Robison, Coordinator, Instructional Programs, Coastline ROP  
Dian Torres, Cosmetology Dean, Blake Austin College

#### *Common Core Alignment Team*

Rachelle Barkus, Instructor, Modesto City Schools  
Kent Braithwaite, Instructor, Conejo Valley Unified School District  
Tim Cook, Instructor, Pomona Unified School District  
Debbie Hawks, Instructor, Pasadena Unified School District  
Simon Moore, Instructor, Coachella Valley Unified School District  
Ashley Sarver, Instructor, School for Independent Learners

**Table of Contents**  
**Health Science and Medical Technology**

Sector Description ..... 1

Knowledge and Performance Anchor Standards ..... 2

    1.0 Academics ..... 2

    2.0 Communications ..... 2

    3.0 Career Planning and Management ..... 2

    4.0 Technology ..... 3

    5.0 Problem Solving and Critical Thinking ..... 3

    6.0 Health and Safety ..... 4

    7.0 Responsibility and Flexibility ..... 4

    8.0 Ethics and Legal Responsibilities ..... 4

    9.0 Leadership and Teamwork ..... 5

    10.0 Technical Knowledge and Skills ..... 5

    11.0 Demonstration and Application..... 6

Pathway Standards ..... 7

    A. Biotechnology Pathway ..... 7

    B. Patient Care Pathway ..... 11

    C. Health Care Administrative Services Pathway ..... 15

    D. Health Care Operational Support Services Pathway..... 20

    E. Public and Community Health Pathway ..... 24

    F. Mental and Behavioral Health Pathway ..... 28

Academic Alignment Matrix..... 32

Appendix: CTE Model Curriculum Standards Contributors**Error! Bookmark not defined.**

    References ..... 55



# Health Science and Medical Technology

## *Sector Description*

The standards in this sector represent the academic and technical skills and knowledge students need to pursue a full range of career opportunities in health science and medical technology, from entry level to management as well as technical and professional career specialties. The standards describe what workers need to know and be able to do to contribute to the delivery of safe and effective health care. The six career pathways are grouped into functions that have a common purpose and require similar attributes. The pathways are Biotechnology, Patient Care, Health Care Administrative Services, Health Care Operational Support Services, Public and Community Health, and Mental and Behavioral Health. Standards for each career path build on and continue the anchor standards with more complexity, rigor, and career specificity.



## **Health Science and Medical Technology Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Health Science and Medical Technology academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Health Science and Medical Technology sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

(Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.
- 2.7 Recognize major word parts of medical terminology including roots, prefixes and suffixes.
- 2.8 Understand and use correct medical terminology for common pathologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

(Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.

- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Health Science and Medical Technology sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Health Science and Medical Technology sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.
- 5.5 Know how to apply mathematical computations related to health care procedures (metric and household, conversions and measurements).
- 5.6 Read, interpret, and extract information from documents.

## **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Health Science and Medical Technology sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Identify and follow ecological practices applicable to the health care setting (i.e., recycling, energy efficiency, environmentally preferable chemical use, waste disposal, and water conservation).
- 6.8 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Health Science and Medical Technology sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Health Science and Medical Technology sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Health Science and Medical Technology industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Health Science and Medical Technology sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Health Science and Medical Technology sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the Cal-HOSA career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Health Science and Medical Technology sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Health Science and Medical Technology sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Health Science and Medical Technology sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Health Science and Medical Technology sector.
- 10.3 Construct projects and products specific to the Health Science and Medical Technology sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Complete certification in emergency care as appropriate (cardiopulmonary resuscitation [CPR], automated external defibrillator [AED], first aid).

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Health Science and Medical Technology anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings and through the Cal-HOSA career technical student organization.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Health Science and Medical Technology sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Health Science and Medical Technology sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Health Science and Medical Technology Pathway Standards**

### **A. Biotechnology Pathway**

The standards for the applications of the Biotechnology pathway relate to occupations and functions relevant for understanding and solving biomedical problems and creating products to improve the quality of human life. The standards represent knowledge and skills necessary to succeed in diverse careers in this pathway.

Sample occupations associated with this pathway:

- ◆ Clinical Trials Research Coordinator
- ◆ Forensic Pathologist
- ◆ Biostatistician
- ◆ Geneticist Lab Assistant

- A1.0 Define and assess biotechnology and recognize the diverse applications and impact on society.
- A1.1 Use data to explain how biotechnology fields such as pharmaceuticals, agriculture, diagnostics, industrial products, instrumentation, and research and development are impacting human life.
  - A1.2 Describe the use of model organisms in biotechnology research and manufacturing.
  - A1.3 Recognize the role of innovation in creation of emerging biotechnology careers, including those in nanotechnology, biofuels, and forensics.
  - A1.4 Research and identify public misunderstandings related to biotechnology and discern the source of these misunderstandings.
  - A1.5 Evaluate the impact of biotechnological applications on both developing and industrial societies, including legal and judicial practices.
  - A1.6 Explore and outline the various science and non-science fields and careers associated with biotechnology.
- A2.0 Understand the ethical, moral, legal, and cultural issues related to the use of biotechnology research and product development
- A2.1 Know the relationship between morality and ethics in the development of biotechnology health care products.
  - A2.2 Know the difference between personal, professional, and organizational ethics.
  - A2.3 Understand the necessity for accurate documentation and record keeping.
  - A2.4 Understand the critical need for ethical policies and procedures for institutions engaged in biotechnology research and product development.
  - A2.5 Describe the dilemma of health care costs related to advancements in biotechnology and public access to treatments
  - A2.6 Prepare a presentation comparing the benefits and harm that can be the result of biotechnology innovations in both the research and application phases and which course of action will result in the best outcomes.

- A3.0 Demonstrate competencies in the fundamentals of molecular cell biology, including deoxyribonucleic acid (DNA) and proteins and standard techniques for their purification and manipulation.
  - A3.1 Define and describe the structure and function of DNA ribonucleic acid (RNA) and proteins, explain the consequences of DNA mutations on proteins.
  - A3.2 Describe enzyme structure and function, diagram the impact of enzymes and catalysis on reaction rates, and recognize the emerging role of enzymes in replacing industrial chemicals.
  - A3.3 Employ standard techniques of DNA extraction, purification, restriction digests, bacterial cell culture, and agarose gel electrophoresis and document and evaluate results.
  - A3.4 Employ standard protein techniques, including antibody production, enzyme assays, spectrophotometry, gel electrophoresis, and chromatography and document and evaluate results.
  - A3.5 Predict outcomes of DNA and protein separation protocols.
  
- A4.0 Recognize basic concepts in cell biology and become familiar with the laboratory tools used for their analysis.
  - A4.1 List and describe the structure and function of cellular organelle.
  - A4.2 Describe conditions that promote cell growth under aseptic conditions in the laboratory and workplace.
  - A4.3 Use various methods to monitor the growth of cell cultures.
  - A4.4 Explain the basic concepts of cell growth and reproduction, DNA replication, mitosis, meiosis, and protein synthesis.
  - A4.5 Discuss the structure and function of the macromolecules that compose cells, including carbohydrates, lipids, DNA, RNA, and protein molecules.
  - A4.6 Distinguish between prokaryotic cells, eukaryotic cells, and viruses.
  - A4.7 Conduct indicator tests for the common macromolecules of the cell.
  
- A5.0 Integrate computer skills into program components.
  - A5.1 Use the Internet and World Wide Web to collect and share scientific information.
  - A5.2 Use a variety of methods, including literature searches in libraries, computer databases, and online for gathering background information, making observations, and collecting and organizing data.
  - A5.3 Compile labs (results, tables, graphs) in a legal scientific notebook and/or an Internet site or Web page.
  
- A6.0 Implement use of the metric system, orders of magnitude, and the pH scale in preparation of reagents, analysis of data, and graphing.
  - A6.1 Apply knowledge of symbols, algebra, and statistics to graphical data presentation.
  - A6.2 Prepare solutions based on both percent and weight composition to demonstrate proficiency in use of mechanical and digital microbalances.

- A6.3 Calculate and prepare solutions of various molarity; calculate and prepare buffers of various pH; and prepare serial dilutions.
- A6.4 Create data tables and graphs using Excel for the purpose of collecting and analyzing data.
- A7.0 Understand the function of regulatory agencies for the biotechnology industry and the lasting impact of routine laboratory and communication practices on product development and manufacturing.
  - A7.1 Identify agencies at the local, state, and federal levels.
  - A7.2 Be aware of the role of agencies in promoting patient safety, quality control, and entrepreneurship.
  - A7.3 Describe intellectual property.
  - A7.4 Understand a patent and use online resources to search a patent database.
  - A7.5 Demonstrate accurate record keeping and follow good laboratory practice (GLP) for lab notebooks.
  - A7.6 Articulate issues of ethical concern, including plagiarism, copyrights, trademarks, and patents and use online data resources and searchable databases to investigate a copyright, trademark, or patent.
- A8.0 Follow sustainable and safe practices with high regard for quality control.
  - A8.1 Follow written protocols and oral directions to perform a variety of laboratory and technical tasks.
  - A8.2 Recognize laboratory safety hazards using safe practices to avoid accidents.
  - A8.3 Locate and use Material Safety Data Sheets (MSDS).
  - A8.4 Outline the appropriate responses to a laboratory accident including identification of location and use of emergency equipment.
  - A8.5 Practice laboratory and personal safety including the location and use of emergency equipment (personal protective equipment, no food or drink, no open-toe shoes).
  - A8.6 Properly and safely use and monitor a variety of scientific equipment, including pH meters, microscopes, spectrophotometers, pipets, micropipets, and balances.
  - A8.7 Determine which equipment is appropriate to use for a given task and the units of measurement used.
  - A8.8 Perform specimen collection, label samples, and prepare samples for testing.
  - A8.9 Handle, transport, and store samples safely.
- A9.0 Understand that manufacturing represents inter-connectedness between science and production.
  - A9.1 Describe the major steps of a product's move through a company's product pipeline.
  - A9.2 Identify several products obtained through recombinant DNA technology.



- A9.3 Outline the steps in production and delivery of a product made through recombinant DNA technology.
- A9.4 Cite examples of plant parts or extracts used as pharmaceuticals.
- A9.5 Use the Internet to find information about traditional pharmaceuticals, herbal remedies, and recombinant pharmaceuticals.
- A9.6 Evaluate the impact of robotics and automation on aseptic processes.
- A9.7 Design a flow chart describing the steps for creating a new drug from hypothesis to distribution

## Health Science and Medical Technology Pathway Standards

### **B. Patient Care Pathway**

The standards for the Patient Care pathway apply to occupations or functions involved in the prevention, treatment, and management of illness and the preservation of mental and physical well-being through the services offered by the medical and allied health professions. The standards specify the knowledge and skills needed by professional and technical personnel pursuing careers in this pathway.

Sample occupations associated with this pathway:

- ◆ Kinesiotherapist
- ◆ Nurse Anesthetist
- ◆ Respiratory Therapist
- ◆ Radiologic Technician
- ◆ Dental Hygienist

**B1.0** Recognize the integrated systems approach to health care delivery services: prevention, diagnosis, pathology, and treatment

B1.1 Know relationship and use of an integrated health care delivery system.

B1.2 Understand the range between prevention, diagnosis, pathology, and treatment procedures.

B1.3 Understand the significance of nontraditional approaches to health care in relationship to delivery systems.

B1.4 Illustrate the value of preventive and early intervention in relationship to health care practices.

B1.5 Describe the importance of reimbursement systems in relationship to the delivery of patient care.

**B2.0** Understand the basic structure and function of the human body and relate normal function to common disorders.

B2.1 Know basic human body structure and function in relationship to specific care between prevention, diagnosis, pathology, and treatment.

B2.2 Describe basic stages of growth and development.

B2.3 Recognize common disease and disorders of the human body.

B2.4 Compare normal function of the human body to the diagnosis and treatment of disease and disorders.

**B3.0** Know how to apply mathematical computations used in health care delivery system.

B3.1 Apply mathematical computations related to health care procedures (metric and household, conversions and measurements).

B3.2 Analyze diagrams, charts, graphs, and tables to interpret health care results

B3.3 Record time using the 24-hour clock.

- B4.0 Recognize and practice components of an intake assessment relevant to patient care.
  - B4.1 Conduct basic interview to acquire new knowledge (e.g., medical and family histories).
  - B4.2 Identify and summarize major life events as they impact health care practices and patient outcomes.
  - B4.3 Observe patient actions, interests, and behaviors while documenting responses.
  - B4.4 Collect and synthesize information or data about the patient's symptoms and vital signs.
  - B4.5 Evaluate information gathered and connect patient data to appropriate system of care.
  
- B5.0 Know the definition, spelling, pronunciation, and use of appropriate terminology in the health care setting.
  - B5.1 Use medical terminology in patient care appropriate to communicate information and observations.
  - B5.2 Accurately spell and define occupationally specific terms related to health care.
  - B5.3 Use roots, prefixes, and suffixes to communicate information.
  - B5.4 Use medical abbreviations to communicate information.
  - B5.5 Know the basic structure of medical terms.
  - B5.6 Demonstrate the correct pronunciation of medical terms.
  - B5.7 Practice word building medical terminology skills.
  
- B6.0 Communicate procedures and goals to patients using various communication strategies to respond to questions and concerns.
  - B6.1 Observe and document the ability of patients to comprehend and understand procedures and determine how to adjust communication techniques.
  - B6.2 Use active listening skills (e.g., reflection, restatement, and clarification) and communication techniques to gather information from the patient.
  - B6.3 Formulate appropriate responses to address the patients concerns and questions in a positive manner.
  - B6.4 Employ sensitivity and withhold bias when communicating with patients
  - B6.5 Report patient's progress and response to treatment goals.
  - B6.6 Maintain written guidelines of the Health Insurance Portability and Accountability Act (HIPAA) in all communications.
  
- B7.0 Apply observation techniques to detect changes in the health status of patients.
  - B7.1 Demonstrate observation techniques.
  - B7.2 Differentiate between normal and abnormal patient health status.
  - B7.3 Document the patient findings and report information appropriately.
  - B7.4 Plan basic care procedures within the scope of practice to assist with patient comfort.

- B8.0 Demonstrate the principles of body mechanics as they apply to the positioning, transferring, and transporting of patients.
  - B8.1 Explain the principles of body mechanics.
  - B8.2 Determine appropriate equipment for transportation and transfer, including the modification of equipment and techniques to accommodate the health status of the patient.
  - B8.3 Demonstrate appropriate transport and transfer methods to accommodate the health status of the patient.
  - B8.4 Evaluate equipment for possible hazards.
  - B8.5 Integrate proper body mechanics, ergonomics, safety equipment, and techniques to prevent personal injury to patients and clients.
  
- B9.0 Implement wellness strategies for the prevention of injury and disease
  - B9.1 Know and implement practices to prevent injury and protect health for self and others.
  - B9.2 Determine effective health and wellness routines for health care workers (i.e., stress management, hygiene, diet, rest, and drug use).
  - B9.3 Identify practices to prevent injuries and protect health, for self and others (i.e., seatbelts, helmets, and body mechanics).
  - B9.4 Know how to access available wellness services (i.e., screening, exams, and immunizations).
  - B9.5 Identify alternative/complementary health practices as used for injury and disease prevention.
  - B9.6 Explore consequences of not utilizing available wellness services and behaviors that prevent injury and illness
  
- B10.0 Comply with protocols and preventative health practices necessary to maintain a safe and healthy environment for patients, health care workers, coworkers, and self within the health care setting.
  - B10.1 Describe the infection control cycle with consideration of the various types of microorganisms.
  - B10.2 Demonstrate use of facility policies and procedures of infection control while performing patient care.
  - B10.3 Evaluate potential causes and methods of transmitting infections and how to apply standard precautionary guidelines.
  - B10.4 Demonstrate the use of appropriate personal protective equipment (PPE).
  - B10.5 Practice proper hand hygiene.
  - B10.6 Use various manual and mechanical decontamination and sterilization techniques and procedures.
  - B10.7 Document and analyze sanitation and infection control procedures.
  
- B11.0 Comply with hazardous waste disposal policies and procedures, including documentation, to ensure that regulated waste is handled, packaged, stored, and disposed of in accordance with federal, state, and local regulations.
  - B11.1 Describe basic emergency procedures used to respond to a hazardous spill.

- B11.2 Explain how waste is handled, packaged, stored, and disposed of in accordance with federal, state, and local regulations including hazardous chemicals, biohazards, and radioactive materials.
  - B11.3 Adhere to the health care setting's waste management program (e.g., recycling and reduction of regulated medical, solid, hazardous, chemical, and radioactive waste materials).
  - B11.4 Apply protective practices and procedure for airborne and blood-borne pathogens for equipment and facilities and identify unsafe conditions for corrective action.
- B12.0 Adhere to the roles and responsibilities, within the scope of practice, that contribute to the design and implementation of treatment planning
- B12.1 Understand scope of practice and related skills within prevention, diagnosis, pathology, and treatment occupations.
  - B12.2 Describe the various roles and responsibilities of health care workers as team members in an integrated health care delivery system
  - B12.3 Demonstrate the knowledge and delivery of specific skills and procedures as outlined within the scope of practice appropriate for patient care in prevention, diagnosis, pathology, and treatment.
  - B12.4 Follow appropriate guidelines for implementation of various procedures.
- B13.0 Research factors that define cultural differences between and among different ethnic, racial, and cultural groups and special populations.
- B13.1 Utilize culturally appropriate community resources.
  - B13.2 Recognize complementary and alternative medicine as practiced within various cultures
  - B13.3 Develop ethnographic skills, by location and information retrieval, carefully observe social behavior, and manage stress and time.
  - B13.4 Ask questions and explore aspects of global significance.
  - B13.5 Analyze data using relevant concepts.
  - B13.6 Know when and how to incorporate trained interpreters to facilitate communication and improve patient outcomes

## Health Science and Medical Technology Pathway Standards

### **C. Health Care Administrative Services Pathway**

Health care administrative workers include site administrators, managers, attorneys, receptionists, secretaries, billing and coding specialists, health informatics technicians, accountants, managers, and other knowledge workers that support the process of patient care. Health care administrative workers are the invisible backbone of health care; without appropriately skilled workers in these fields, health care systems simply could not function.

Sample occupations associated with this pathway:

- ◆ Clinical Data Specialist
- ◆ Ethicist
- ◆ Medical Illustrator
- ◆ Health Care Administrator

C1.0 Understand health care systems as the organization of people, institutions, funding, and resources as well as the broad scope of operations in which health care services are delivered to meet the health needs of target populations.

C1.1 Understand the specific roles and responsibilities of health care workers, including the health care administrative role of leadership for individuals and the organization within a variety of health care delivery systems.

C1.2 Recognize the resources necessary for a health system (e.g., financial, health informatics, diagnostic equipment, pharmaceuticals, and other therapeutic resources).

C1.3 Recognize the different general methods of funding health care (e.g., out-of-pocket payments, health insurance, government funding, charities).

C1.4 Recognize major specific payment systems (e.g., Medicare, Medicaid, Workers Compensation).

C1.5 Recognize the varied vital roles that health care administrative workers serve in the health care process.

C1.6 Understand the full process of health care delivery (e.g., from patient illness or injury to recovery).

C1.7 Understand common U.S. models for structuring health care funding (e.g., Health Maintenance Organizations [HMOs], Preferred Provider Organization [PPOs], Managed Care Organization [MCOs], and Independent Physician Association [IPAs]).

C1.8 Diagram a selected health care organization.

C2.0 Understand the various health care provider and support roles in patient care as an integrated, comprehensive health care system, to offer the very best options for treatment of patients.

C2.1 Recognize health care identifiers (e.g., National Provider Indicator [NPI], Drug Enforcement Administration [DEA] numbers, and Clinical Laboratory Improvement Amendments [CLIA] numbers).

- C2.2 Describe common medical record documentation formats (e.g., Simple Object Access Protocols [SOAP] notes, admission notes).
  - C2.3 Understand the major forms of health care interventions (e.g., preventive, curative, palliative).
  - C2.4 Understand the difference between different patient care provider and support roles (e.g., health care administrator, clinical data specialist, health informatics technician, and billing and coding specialist).
- C3.0 Understand the overarching concepts of economic and financial management systems, system and information management, and the latest innovations in health care as they affect health care delivery
- C3.1 Understand the basics of business principles, systems thinking, and business management.
  - C3.2 Understand operational planning and management tools for performance and quality improvement.
  - C3.3 Understand development of financial statements, statement generation, reimbursement systems, costing process, measurement, and control.
  - C3.4 Execute financial mathematics, e.g., time value of money calculations, capital budgeting, return on investment, and project risk analyses.
  - C3.5 Perform differential reimbursement calculations by payers (e.g., Medicare/Medicaid, self-pay, managed care) and describe the major principles of health insurance.
  - C3.6 Understand and explain economic evaluation (e.g., cost benefit/cost effectiveness analysis).
- C4.0 Know the role and relationship of public policies and community engagement on the health care delivery system.
- C4.1 Understand community needs and values and the role of external relations (e.g., demographic/population contexts for development and management of health care services).
  - C4.2 Comprehend and explain the legal and regulatory environment for health services.
  - C4.3 Recognize and explain quantity of health care services.
  - C4.4 Analyze public policy context and choices relating to specific health care delivery systems.
- C5.0 Understand and maintain standards of excellence, professional, ethical, and moral conduct required in management of personnel and policy within the health care delivery system.
- C5.1 Understand the alignment of personal and organizational conduct management with ethical and professional standards.
  - C5.2 Know the organizational responsibility to the patient and community and a commitment to lifelong learning and improvement.
  - C5.3 Practice the philosophy of respect for life and the need for a balance of benefit over harm resulting from any intervention.

- C6.0 Understand the dynamics of human relations, self-management, organizational, and professional leadership skills necessary within the health care administrative system.
  - C6.1 Identify leadership skills and explain their value to an organization.
  - C6.2 Understand image building and public relations techniques.
  - C6.3 Know and assess decision-making skills.
  - C6.4 Demonstrate effective teamwork and critical analysis applying conflict-resolution techniques.
  - C6.5 Examine the value of leadership skills, self-initiation, and confidence through personal reflection.
  - C6.6 Demonstrate parliamentary procedure skills through team activities.
  - C6.7 Describe human resource management and its importance to the successful operation of an organization.
  
- C7.0 Follow the model of medical safety practices and processes that can help prevent system medication errors and understand the consequences of mistakes.
  - C7.1 Recognize the major consequences mistakes in health care may cause (e.g., deaths, lawsuits).
  - C7.2 Recognize the critical nature of accurate and complete documentation (e.g., medical allergies, conflicting prescriptions).
  - C7.3 Identify patients accurately using appropriate strategies (e.g., continual verification).
  - C7.4 Delineate the process for assessing information required by patients, staff, and the community to determine the best course of action.
  
- C8.0 Understand the resources, routes and flow of information within the health care system and participate in the design and implementation of effective systems or processes.
  - C8.1 Describe an effective health care information system, including resources, routes, and flow of information.
  - C8.2 Enter information within the parameters of the information system. (e.g., entering appropriate data types in the appropriate fields).
  - C8.3 Follow security guidelines to protect patient data.
  - C8.4 Evaluate the effectiveness of health information systems and determine improvement strategies.
  
- C9.0 Use an electronic health care patient information system to optimize the acquisition, storage, retrieval, and use of information in health and biomedicine.
  - C9.1 File records using various methodologies (e.g., alphabetically, by patient record number).
  - C9.2 Enter information within the parameters of the information system. (e.g., entering appropriate data types in the appropriate fields).
  - C9.3 Archive and purge documents following policies and regulatory guidelines.
  - C9.4 Compose a rationale that compares and contrasts the relative advantages and disadvantages of paper vs. electronic records.



- C9.5 Distinguish which type of documents must have hard copies retained, and which may be stored only in digital form.
- C10.0 Understand common file formats for document and medical imaging, digitizing paper records, and storing medical images.
  - C10.1 Understand basic document and medical imaging concepts (e.g., resolution, color-depth, compression).
  - C10.2 Understand common file formats for document and medical imaging (e.g., tagged image file format [TIFF], joint photographic experts group [JPEG], 2000).
  - C10.3 Demonstrate how to scan paper records.
  - C10.4 Calculate the approximate storage needs for digitized records and images.
  - C10.5 Attach digitized records and medical images to patient records.
- C11.0 Know how to schedule and manage appointments for providers.
  - C11.1 Understand prioritizing methods (e.g., first-come, first-served; emergency appointments; types of procedures).
  - C11.2 Recognize the logistical challenges of appointments (e.g., quality of care vs. cost of care).
  - C11.3 Manage provider general schedules (e.g., what days and times providers are available).
  - C11.4 Understand how to schedule patient appointments for providers.
  - C11.5 Explain how to communicate the status of an appointment to the provider.
- C12.0 Understand how to use health information effectively.
  - C12.1 Recognize the major uses of health information (e.g., patient care, billing, research).
  - C12.2 Determine which data components are necessary for the successful completion of tasks.
  - C12.3 Formulate and report information clearly and concisely.
  - C12.4 Disseminate information to various audiences.
- C13.0 Understand the need to communicate health/medical information accurately and within legal/regulatory bounds across the organization.
  - C13.1 Determine which communication methods patients have approved (e.g., e-mail, phone, voicemails).
  - C13.2 Determine who has been approved for receiving patient communications beyond the patient (e.g., family members, lawyers).
  - C13.3 Communicate with patients compassionately, accurately and effectively.
  - C13.4 Use information technology for mass communications (e.g., mail merge, e-mail, auto-dialers).
- C14.0 Understand how to transfer information to third-parties.
  - C14.1 Recognize the types of third parties that may need patient information (e.g., specialists, pharmacies, insurance companies).

- C14.2 Understand the laws and regulations regarding the transfer of information to a third party (e.g., when a company is a covered entity, when a business agreement is required).
- C14.3 Use various technologies to transmit information securely (e.g., fax, electronic and postal mail).
- C15.0 Code health information and bill payers using industry standard methods of classification of diseases, current procedural terminology, and common health care procedure coding system.
  - C15.1 Understand the basic concepts of accrual-based accounting (e.g., accounts payable, accounts receivable, credits, debits).
  - C15.2 Understand medical record documentation (e.g., chart notes, injections, medications, lab reports).
  - C15.3 Synthesize required information from a medical record and other medical documents for a variety of purposes upon regulatory or legal request.
  - C15.4 Translate code services (e.g., diagnostic procedures, surgeries) using industry standard methods (e.g., International Classification of Diseases-ninth Ed. [ICD-9], Current Procedural Terminology-fourth Ed. [CPT-4], Healthcare Common Procedure Coding System [HCPCS]).
  - C15.5 Demonstrate how to bill third-party payers (e.g., insurance companies, Medicare).
  - C15.6 Receive and process information from third-party payers (e.g., Explanation of Benefits [EOB], Remittance Advice).
  - C15.7 Audit and analyze coding done by others to determine proper billing.
- C16.0 Use a systematic method of continual process improvement.
  - C16.1 Learn new knowledge and skills regularly (e.g., on-the-job-training [OJT], continuing education).
  - C16.2 Discover new knowledge through primary research methodologies (e.g., experiments, surveys, data analysis).

## **Health Science and Medical Technology Pathway Standards**

### **D. Health Care Operational Support Services Pathway**

The standards for the Operational Support Services pathway apply to occupations or job functions necessary to provide an environment and support systems for the delivery of health care. Careers could include central supply, facility maintenance, food services, interior decorating, housekeeping, biomedical engineering, epidemiology, social worker, biomedical technician and others.

Sample occupations associated with this pathway:

- ◆ Clinical Simulator Technician
- ◆ Central Service Technician
- ◆ Hospital Management Engineer
- ◆ Materials Manager

D1.0 Describe the process for monitoring clients' expectations by using plans to promote satisfaction and measurement tools to ensure sufficiency of products and delivery of services.

D1.1 Understand the responsibilities of their roles and perform their tasks safely by using appropriate guidelines.

D1.2 Know how to provide support to standardization, consolidation, and re-engineering processes.

D1.3 Explain the importance of coordinating intradepartmental activities, including event planning and logistics, with outside agencies and contractors.

D1.4 Evaluate and determine a process operational systems improvement.

D2.0 Assess basic operating procedures of support services.

D2.1 Identify activities that require coordination between various departments.

D2.2 Implement purchasing and procurement techniques.

D2.3 Develop a preventative maintenance program for equipment and services.

D2.4 Explain staffing needs and productivity.

D2.5 Develop reporting mechanisms for measuring productivity.

D2.6 Investigate systems and procedures that minimize customer cost of ordering, and storing and using supplies, services, and equipment.

D2.7 Integrate infection control standards with design and construction activities.

D2.8 Discuss the relationships among organization structures, policies, procedures, and quality assurance.

D3.0 Comply with legal regulations and facility standards for design, construction, maintenance, and improvement of health care facilities and environments.

D3.1 Recognize physical, procedural, and electronic barriers.

D3.2 Describe the process for evaluating compliance with corporate, legal, regulatory, and accreditation standards, ethics, and codes.

- D3.3 Adhere to the federal, state, and local regulations that apply to accreditation, design, and construction of a health care facility.
  - D3.4 Use appropriate action to maintain a facility in good repair (e.g., report, make recommendations, or repair).
  - D3.5 Analyze the therapeutic and functional aspects of color, decor, and furnishings as well as the process for coordinating facility furnishings and finishes in accordance with appropriate safety codes.
  - D3.6 Evaluate how risk management can apply to support services functions.
- D4.0 Comply with protocols and practices necessary to maintain a clean and healthy work environment.
- D4.1 Demonstrate the use of appropriate personal protective equipment (PPE).
  - D4.2 Practice proper hand hygiene.
  - D4.3 Use various manual and mechanical decontamination and sterilization techniques and procedures.
  - D4.4 Evaluate potential causes and methods of transmitting infections and how to apply standard precautionary guidelines.
  - D4.5 Document and analyze sanitation and infection control procedures.
  - D4.6 Describe the care needed when handling chemicals.
  - D4.7 Describe basic emergency procedures used to respond to a hazardous spill.
  - D4.8 Explain how waste is handled, packaged, stored, and disposed of in accordance with federal, state, and local regulations, including hazardous chemicals, biohazards, and radioactive materials.
  - D4.9 Comply with hazardous waste disposal policies and procedures, including documentation, to ensure that regulated waste is handled, packaged, stored, and disposed of in accordance with federal, state, and local regulations.
  - D4.10 Implement a waste management program, including the recycling and reduction of regulated medical, solid, hazardous, chemical, and radioactive waste materials.
  - D4.11 Demonstrate protection from blood-borne pathogens and identify unsafe conditions for corrective action.
- D5.0 Use principles and techniques of resource management to make appropriate decisions.
- D5.1 Identify components of a comprehensive training program for health care employees, including safety, infection control, handling of hazardous materials, and use of equipment.
  - D5.2 Follow procedures and processes for the selection, acquisition, distribution, and maintenance of equipment and understand preventive maintenance for buildings and equipment.
  - D5.3 Demonstrate the process for developing inventory-reduction targets to achieve the financial goals of health care organizations.
  - D5.4 Use distribution strategies and systems to ensure the optimal flow of materials.

- D5.5 Understand a department's labor distribution reports to ensure the proper allocation of resources for projects and operations.
- D5.6 Evaluate competitive pricing, terms, and service levels to support product recommendations.
- D6.0 Collect and distribute essential patient information to appropriate team members.
  - D6.1 Recognize and report unusual or unsafe environmental conditions.
  - D6.2 Recognize ethical conflicts related to assessment practices (e.g., labeling, confidentiality).
  - D6.3 Document actions according to the facility's protocol and regulatory guidelines.
  - D6.4 Maintain confidentiality according to the facility's protocol as well as the Health Insurance Portability and Accountability Act (HIPAA).
- D7.0 Assess and maintain materials for quality management.
  - D7.1 Describe risk management strategies.
  - D7.2 Describe the use of calibration.
  - D7.3 Use appropriate inventory and control systems to purchase materials, supplies, and capital equipment.
  - D7.4 Perform quality control activities using manuals and following directions appropriately.
  - D7.5 Maintain equipment (e.g., imaging, laboratory).
  - D7.6 Send, receive, and distribute material for services.
  - D7.7 Organize inventory, purchase orders, and products.
  - D7.8 Inspect facilities to ensure compliance with standards, regulations, and codes.
  - D7.9 Assess procedures and processes to select, acquire, and maintain inventory.
  - D7.10 Evaluate cost effectiveness of alternative methods for inventory control.
  - D7.11 Discuss policies and procedures to monitor, distribute, and consume materials.
- D8.0 Demonstrate handling and storage of materials, supplies, and equipment.
  - D8.1 Describe and implement a program to purchase materials, supplies, and capital equipment with allocated resources.
  - D8.2 Use appropriate safety equipment.
  - D8.3 Explain inventory control.
  - D8.4 Demonstrate appropriate inventory control systems (e.g., distribution, consumption, intentional loss of materials or supplies).
  - D8.5 Demonstrate proper care in handling and storage of sterile and non-sterile items.
- D9.0 Analyze the business structure of supply and service management.
  - D9.1 Describe the components of a purchasing agreement.
  - D9.2 Describe the supply chain process.
  - D9.3 Explain bids and quotes for supply and service selection.

- D9.4 Explain competitive pricing.
  - D9.5 Assess integration of resource functions.
  - D9.6 Assess purchasing and procurement techniques that improve quality and supply.
  - D9.7 Utilize technology and translate how it supports the supply chain process.
  - D9.8 Discuss the cost benefits of supply and service selection.
  - D9.9 Analyze the impact of timely order placement and supplier performance.
- D10.0 Demonstrate the ability to prepare, assemble, and deliver a nutritious, high-quality meal for the clients they serve.
- D10.1 Prepare a food tray with the appropriate utensils and food items as prescribed to meet dietary requirements.
  - D10.2 Deliver trays to the specified area of the health care facility.
  - D10.3 Using National Health Occupations Students of America (HOSA) Nursing Assisting guidelines, prepare the patient for a meal.
  - D10.4 Using state and federal standards for examining food temperatures, follow guidelines for inspecting the safety of food.
- D11.0 Demonstrate and use the correct transport equipment.
- D11.1 Assess the protocol for transporting a patient to surgery versus a patient to radiology.
  - D11.2 Practice proper body mechanics and safety measures while transferring a patient from an emergency room to the assigned room and document results of the transfer.
  - D11.3 Demonstrate and recite procedures about safe patient transport for interdepartmental transfers or upon discharge.
- D12.0 Understand the need for an effective emergency preparedness plan.
- D12.1 Describe different types of emergency preparedness plans (e.g., homeland security, natural disaster, pandemic, crisis planning).
  - D12.2 Explain emergency procedures for staff, including supplies needed in the event of an internal or external disaster.
  - D12.3 Participate in educational and training programs related to emergency preparedness planning.
  - D12.4 Assess the Emergency Preparedness Plan.

## **Health Science and Medical Technology Pathway Standards**

### **E. Public and Community Health Pathway**

The standards for the Public and Community Health pathway apply to occupations or functions involved primarily in environmental health, community health and health education, epidemiology, disaster management, and geriatrics. The standards specify the knowledge and skills needed by professionals pursuing careers in this pathway.

Sample occupations associated with this pathway:

- ◆ Community Health Worker
- ◆ Epidemiologist
- ◆ Health Educator
- ◆ Advocate
- ◆ Environmentalist

- E1.0 Understand the context and scope of public health on improving health and quality of life in personal, community, and the global population.
- E1.1 Understand written text about the history, philosophy, services, and careers in public health.
  - E1.2 Describe the environmental, behavioral, biological, and socio-economic factors as well as access, quality, intervention and cost of medical care that are central to communities and the population.
  - E1.3 Identify the roles and responsibilities of public health in addressing populations, health disparity, and disaster prevention and management.
  - E1.4 Explain how public health can utilize health information and health communications to improve the health of populations.
  - E1.5 Explain how public health can utilize social and behavioral interventions to improve the health of populations.
  - E1.6 Explain how public health can utilize health policy and law to improve the health of populations.
  - E1.7 Explain how public health assesses the options for intervention to improve the health of a population.
  - E1.8 Explain the impact of the environment and communicable diseases on the health of populations.
  - E1.9 Compare the scope of current public health policies with past practices.
  - E1.10 Defend health decisions, individual rights, and social responsibilities.
- E2.0 Design, promote, and implement community health programs which result in health-positive behaviors among all individuals, families, groups in a community, and the global environment.
- E2.1 Know public policies that have an impact on people's health.
  - E2.2 Identify and document factors influencing people's health status through a strong grounding in social and behavioral theory.
  - E2.3 Understand various strategies to improve the health status of individuals and the community.

- E2.4 Understand the many health disparities barriers to access among underserved communities.
  - E2.5 Develop specific competencies for work in underserved and/or linguistically isolated communities.
  - E2.6 Demonstrate competency in working with diverse cultures and communities.
  - E2.7 Demonstrate ways in which enhancing and maintaining personal health and well-being are established.
  - E2.8 Explain fiscal and organizational resources to ensure optimal health programs and service delivery in communities.
  - E2.9 Expand health knowledge to provide information and referrals and advocacy on a range of health topics more effectively.
  - E2.10 Conduct outreach and health education at community sites with various cultural groups.
  - E2.11 Evaluate the process and outcome of community-based health education programs.
  - E2.12 Research the social, cultural, and behavioral factors influencing health outcomes.
- E3.0 Examine gerontology and its social implications using a life-span perspective that focuses on older adults' needs/concerns along life's continuum in various environments.
- E3.1 Understand how the demographics of the older population affect various aspects of our society.
  - E3.2 Recognize the contributions that aging persons make to their communities.
  - E3.3 Define the life course perspective and describe how age, gender, race, and ethnicity influence the life course.
  - E3.4 Identify a range of available services for elders in most communities.
  - E3.5 Understand health disparities among older adults and their impact on society.
  - E3.6 Understand the role of service providers and the use of community recreation and health services in their involvement with older persons.
  - E3.7 Understand common threats to loss of independence: falls, medication management, and lifestyle.
  - E3.8 Advocate for technology to enhance older adults' function, independence, and safety.
  - E3.9 Assess how policies, regulations, and programs differentially impact older adults and their caregivers, particularly among historically disadvantaged populations
  - E3.10 Differentiate between normal changes in functioning due to aging and pathological changes leading to disease.
  - E3.11 Analyze the impact of an aging society on the nation's health care system.



- E4.0 Promote the protection, sustainability, and enhancement of the overall environmental quality of life.
  - E4.1 Identify the various environmental factors that affect a community's health and safety such as water quality, air quality, food supply, industrial hygiene, and solid and hazardous waste disposal.
  - E4.2 Identify human health hazards that may cause sickness or impaired health/well-being.
  - E4.3 Identify the carriers or vectors that promote the transfer of these agents from the environment to the human.
  - E4.4 Interpret the principles of environmental health practices.
  - E4.5 Summarize health conditions that are caused or aggravated by environmental conditions.
  - E4.6 Discuss emerging global environmental health problems.
  - E4.7 Analyze current legislation and regulation regarding environmental issues.
  - E4.8 Explore approaches to control major environmental health problems.
  
- E5.0 Predict and evaluate rates, risk factors, and health status indicators of morbidity and mortality, disease determinants, and causation.
  - E5.1 Describe the historical roots of epidemiological thinking and its contribution to the evolution of the scientific method.
  - E5.2 Describe the basic epidemiological concepts of rates, causation, and public health surveillance.
  - E5.3 Generate hypotheses of patterns of disease and injuries regarding person, place, and time.
  - E5.4 Research data regarding disease or injuries, including rates, risk factors, disease determinants, and causation of morbidity and mortality.
  - E5.5 Explore the effects of disease, injury, and violence on longevity and quality of life.
  - E5.6 Evaluate methods to prevent, detect, cure, and minimize disease, injury, and violence in the population.
  
- E6.0 Integrate knowledge and skills necessary as a member of a Community Emergency Response Team (CERT) to demonstrate the response required to meet your community's immediate needs in emergencies or disasters.
  - E6.1 Describe the roles and responsibilities of a member of a Community Emergency Response Team (CERT) in immediate response.
  - E6.2 Describe potential hazards and their effect on the community.
  - E6.3 Describe prevention strategies in homes, workplaces, and communities.
  - E6.4 Identify planning and size-up requirements for potential search and rescue situations.
  - E6.5 Explain how the community has a role in disaster preparedness and response.
  - E6.6 Demonstrate preparation strategies to improve the quality of life for a person or community.
  - E6.7 Employ basic assessment, triage, and treatment as defined by CERT protocols under simulated disaster conditions.

- E6.8 Demonstrate working as a team, applying safe techniques for debris removal, and victim extrication.
- E6.9 Describe the post-disaster emotional environment and the steps that rescuers can take to relieve their own stressors and trauma and those of disaster survivors.

## **Health Science and Medical Technology Pathway Standards**

### **F. Mental and Behavioral Health Pathway**

The standards for mental and behavioral health relate to occupations that assist clients on their journey toward better health. Collaborating with other departments as members of interdisciplinary teams of mental health professionals, such as psychiatrists, psychologists, registered nurses, and other disciplines, they assist with delivery of appropriate, quality treatment to patients with behavioral health concerns, psychological crises, and other biopsychological problems.

Sample occupations associated with this pathway:

- ◆ Mental Health Therapist
- ◆ Outreach Coordinator
- ◆ Psychologist
- ◆ Psychiatric Technician
- ◆ Mental Health Researcher

F1.0 Recognize and interpret principles of community engagement.

- F1.1 Identify and describe prevention and early intervention barriers to mental health care.
- F1.2 Define the psycho-education approach and describe how it is used as a tool to help consumers and their families learn more about managing their mental illness.
- F1.3 Define the principles of community engagement and how they apply to community-based participatory research.
- F1.4 Use and apply community-based participatory research methods to increase community participation and resources.
- F1.5 Develop and explore basic outreach approaches that can be successful in increasing awareness about mental health services.
- F1.6 Research and organize community resources that promote community wellness.
- F1.7 Advocate community inclusion and social roles such as; supported housing, employment, education, parenting, citizenship, and anti-stigma.

F2.0 Demonstrate the ability to build relationships by communicating empathy.

- F2.1 Describe the elements of active listening.
- F2.2 Demonstrate active listening by connecting new knowledge or experiences with prior knowledge and problem solving.
- F2.3 Differentiate between giving advice and active listening by constructing real-life examples.
- F2.4 Build strong verbal knowledge to frame language in ways that increase engagement.
- F2.5 Recognize complex language semantics and make appropriate adaptations for the community being served.

- F2.6 Build on communication by using motivational interviewing as an engagement tool.
- F3.0 Develop and employ collaboration skills that engage others and build trust.
  - F3.1 Define collaboration in a mental health context and build on prior knowledge by recalling collaborative experiences.
  - F3.2 Employ aspects of collaborative leadership that enhances decision making and consensus building.
  - F3.3 Explore and practice collaborative methods for working with special populations to increase their community capacity.
  - F3.4 Design innovative strategies to monitor and evaluate engagement.
- F4.0 Recognize and differentiate between the stages of mental health recovery.
  - F4.1 Define four stages of mental health recovery (hope, empowerment, self-responsibility, and meaningful role in life) and demonstrate impact on complex mental health problems.
  - F4.2 Demonstrate the ability to formulate goals related to each of the four stages of recovery using a multiple-step process of goal setting.
  - F4.3 Compare and contrast a psychosocial rehabilitation and recovery model that supports each individual's potential for recovery verses a medical model that views abnormal behavior as the result of physical problems and should be treated medically.
  - F4.4 Integrate and apply four stages of recovery by designing a recovery plan based on goals that require real-world scenarios.
  - F4.5 Assess the implementation of the recovery plan and formulate alternative approaches to reach desired outcomes.
  - F4.6 Advocate for hope and respect, and believe that all individuals have the capacity for learning and growth.
  - F4.7 Examine ways in which one's recovery from mental illness can be measured.
- F5.0 Communicate and practice leadership and accountability behaviors.
  - F5.1 Identify strategies to work under pressure and cope with stress.
  - F5.2 Develop a basic understanding of various leadership styles that promote positive change in mental health services.
  - F5.3 Compare and contrast different leadership styles and accountability in mental health.
  - F5.4 Construct multiple steps to solve complex problems using real-world scenarios in mental health services.
- F6.0 Analyze and interpret elements of positive psychology (e.g., hope, resilience, strengths, creativity, community building, and supportive spirituality).
  - F6.1 Recall the recovery model and communicate how positive psychology impacts a mental health consumer's recovery.
  - F6.2 Interpret key terms from the positive psychology perspective in relationship to holistic wellness.

- F6.3 Assess the impact of positive psychology's elements on risk reduction and integrated primary care.
- F6.4 Build on the discovered strengths and capabilities of individuals.
- F7.0 Formulate and implement quality care and treatment plans.
  - F7.1 Define and describe practices that help individuals improve the quality of all aspects of their lives, including social, occupational, educational, spiritual, and financial.
  - F7.2 Identify and provide evidence for an effective collaborative approach in mental health recovery that is inclusive of the individual in need.
  - F7.3 Practice promoting health and wellness, encouraging individuals to develop and use individualized wellness plans.
  - F7.4 Design a treatment plan that addresses the unique needs of individuals, consistent with their values, hopes and aspirations.
  - F7.5 Adhere to consistent documentation of implemented interventions and progress.
- F8.0 Synthesize, understand, and predict the impact of mental health disparities across consumer populations.
  - F8.1 Define mental health disparities.
  - F8.2 Organize and summarize knowledge on the impact of mental health disparities among different populations.
  - F8.3 Analyze causes for mental health disparities using current research methods and literature.
  - F8.4 Synthesize research articles related to mental health disparities and produce a statement problem on what causes such disparities.
- F9.0 Design a practice model of a personal support network by utilizing prior knowledge of recovery concepts and using natural supports within communities.
  - F9.1 Identify community-based self-help/peer support groups.
  - F9.2 Communicate with self-help/peer support groups in the community and generate information about their specific functions and responsibilities to the community they serve.
  - F9.3 Compare and contrast self-help/peer support groups to determine strengths and gaps in service delivery.
  - F9.4 Design a practice self-help/peer support group model that fills in the identified gaps and builds on the identified strengths.
  - F9.5 Examine the role that natural supports such as spiritual organizations, community centers, and other community-related resources play in an individual's mental health recovery.
- F10.0 Formulate an argument and predict how electronic health records can transform quality of care and promote a green economy.
  - F10.1 Access and become familiar with basic electronic health records functions.
  - F10.2 Analyze the effect of electronic health records on the quality of care and a green economy.

- F10.3 List and describe at least five ways that electronic health records will advance a green economy.
- F10.4 Distinguish between Interoperability at the local primary care level and interoperability with statewide mental health systems in using electronic health records.
  
- F11.0 Recognize and respect the various cultures of a community and other factors that indicate it's diversity in all aspects of communicating, designing, and implementing patient care.
  - F11.1 Identify and understand the patterns of communication including the use of languages.
  - F11.2 Communicate and listen effectively across cultures and all levels of care.
  - F11.3 Demonstrate appropriate judgment on when and how to use trained interpreters.
  - F11.4 Research factors that define cultural differences between and among different ethnic, racial, and special populations.
  - F11.5 Illustrate how to incorporate culturally appropriate community resources.
  - F11.6 Design and execute an ethnographic approach focusing on information retrieval, observing social behavior, managing stress and time, ask questions, explore aspects of global significance, and analyze data using relevant concepts.
  
- F12.0 Evaluate the purpose and components of a treatment plan related to the consumer's health status.
  - F12.1 Understand the roles of a patient advocate to ensure treatment quality and resources.
  - F12.2 Explain the components of a treatment plan.
  - F12.3 Select appropriate equipment and instruments in accord with the treatment plan.
  - F12.4 Adhere to the roles and responsibilities, within scope of practice, that contribute to the design and implementation of a treatment plan.
  - F12.5 Prioritize and organize work in accordance with the patients' treatment plans.
  - F12.6 Determine the resources available for the effective implementation of treatment plans for patients.
  
- F13.0 Identify and apply leadership styles in personal growth and development.
  - F13.1 Develop goal setting that leads to professional and career growth.
  - F13.2 Participate in student leadership and skill development activities such as California Health Occupations Students of America (Cal-HOSA).
  - F13.3 Employ self-regulation strategies that include self-monitoring and self-evaluation in approaching new and challenging tasks.
  - F13.4 Build and employ self-confidence to empower self and others.
  - F13.5 Refine and upgrade technical and clinical skills.
  - F13.6 Create and design a working portfolio that will be used for interviews for both postsecondary and employment acceptance.

## Academic Alignment Matrix

<b>HEALTH SCIENCE AND MEDICAL TECHNOLOGY</b>	<b>PATHWAYS</b>					
	<b>A. Biotechnology</b>	<b>B. Patient Care</b>	<b>C. Health Care Administrative Services</b>	<b>D. Health Care Operational Support Services</b>	<b>E. Public and Community Health</b>	<b>F. Mental and Behavioral Health</b>
<b>ENGLISH LANGUAGE ARTS</b>						
<b>Language Standards – LS – (Standard Area, Grade Level, Standard #)</b>						
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A3.0, A6.0, A7.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0, B11.0, B12.0	B2.0, B4.0, B6.0, B7.0, B8.0, B9.0, B11.0, B12.0, B13.0		E1.0, E4.0	F1.0, F2.0, F7.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.		B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B10.0, B11.0, B12.0	C2.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0, C12.0, C13.0		E1.0, E2.0	F1.0, F2.0, F7.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A3.0, A7.0, A8.0	B1.0, B2.0, B4.0, B6.0, B13.0	C1.0, C2.0, C4.0, C5.0, C6.0, C7.0, C8.0, C11.0, C13.0		E1.0, E2.0	F1.0, F2.0, F11.0
11-12.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A6.0, A7.0	B1.0, B2.0, B4.0, B5.0, B6.0, B11.0, B13.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C12.0, C15.0		E1.0	F1.0, F4.0, F7.0, F9.0
11-12.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.		B4.0, B5.0, B6.0, B8.0, B10.0, B13.0	C4.0, C5.0, C6.0		E1.0	F1.0, F4.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A3.0, A5.0, A6.0, A7.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0, B10.0, B11.0, B12.0, B13.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0, C14.0, C15.0, C16.0	D1.0	E1.0, E2.0, E5.0, E6.0	F1.0, F3.0, F4.0, F10.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
Reading Standards for Information Text – RSIT – (Standard Area, Grade Level, Standard #)						
11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.			C1.0, C2.0, C4.0, C6.0		E1.0, E2.0, E4.0	F2.0, F4.0, F7.0
11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A2.0, A3.0, A5.0, A6.0, A7.0	B1.0, B2.0, B5.0, B9.0, B10.0, B12.0, B13.0	C1.0, C2.0, C4.0, C6.0	D6.0	E1.0, E4.0, E5.0	F4.0, F6.0, F8.0, F10.0, F11.0
11-12.5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.	A1.0, A5.0		C6.0			
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A7.0, A8.0, A9.0	B3.0, B7.0, B10.0, B13.0	C1.0, C2.0, C3.0, C4.0, C6.0	D2.0, D3.0, D9.0, D10.0, D12.0	E3.0	F4.0
11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., <i>The Federalist</i> , presidential addresses).	A1.0, A2.0	B1.0, B4.0, B5.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C13.0	D3.0, D6.0		
11-12.9 Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including the Declaration of Independence, the preamble to the Constitution, the Bill of Rights, and Lincoln’s Second Inaugural Address) for their themes, purpose, and rhetorical features.			C1.0, C2.0, C3.0, C4.0, C10.0, C12.0, C13.0			
11-12.10 By the end of grade 11, read and comprehend literary nonfiction in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A7.0, A9.0	B1.0, B2.0, B13.0	C1.0, C3.0, C4.0, C6.0	D3.0, D4.0, D5.0, D7.0, D12.0		



<b>HEALTH SCIENCE AND MEDICAL TECHNOLOGY</b>	<b>PATHWAYS</b>					
	<b>A. Biotechnology</b>	<b>B. Patient Care</b>	<b>C. Health Care Administrative Services</b>	<b>D. Health Care Operational Support Services</b>	<b>E. Public and Community Health</b>	<b>F. Mental and Behavioral Health</b>
<b>RLST – Reading Standards for Literacy in Science and Technical Subjects (Standard Area, Grade Level, Standard #)</b>						
11-12.1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes to any gaps or inconsistencies in the account.	A1.0, A2.0, A3.0, A4.0	B2.0, B5.0, B13.0	C1.0, C2.0, C3.0, C4.0, C6.0	D3.0, D4.0	E1.0	
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A1.0, A2.0, A3.0, A4.0, A7.0, A9.0	B13.0	C2.0, C3.0, C4.0, C6.0	D1.0, D2.0, D3.0, D4.0, D6.0, D7.0, D8.0, D9.0, D12.0		
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A3.0, A4.0, A5.0, A6.0, A8.0, A9.0	B8.0, B10.0, B11.0	C3.0, C9.0, C15.0	D1.0, D2.0, D3.0, D4.0, D5.0, D7.0, D8.0, D9.0, D10.0, D12.0	E6.0	F4.0, F5.0, F9.0
11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A3.0, A4.0, A5.0, A6.0, A8.0, A9.0	B1.0, B4.0, B5.0, B6.0, B11.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0, C13.0, C15.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D10.0, D11.0, D12.0	E3.0	F6.0
11-12.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.	A1.0, A7.0, A9.0	B1.0	C1.0, C4.0, C6.0			F4.0, F7.0
11-12.6. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.	A2.0, A7.0	B6.0	C4.0, C8.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D12.0	E2.0, E3.0, E5.0	F4.0, F6.0, F7.0, F9.0
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A3.0, A4.0, A5.0, A6.0, A9.0	B4.0	C1.0, C3.0, C4.0, C6.0, C8.0	D2.0, D3.0, D4.0, D7.0, D9.0, D12.0	E1.0, E3.0, E4.0, E5.0	F1.0, F4.0, F5.0, E10.0
11-12.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	A1.0, A2.0, A3.0, A4.0, A6.0, A9.0	B5.0	C3.0, C4.0, C6.0	D1.0, D2.0, D3.0, D4.0, D5.0, D7.0, D9.0, D12.0	E2.0, E3.0, E4.0, E5.0	F1.0, F4.0, F11.0
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A1.0, A2.0, A3.0, A4.0, A6.0, A9.0	B1.0, B2.0, B9.0, B13.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C13.0	D2.0, D3.0, D4.0, D7.0, D9.0, D12.0	E3.0, E4.0, E5.0	F1.0, F5.0, F8.0, F11.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
Writing Standards – WS – (Standard Area, Grade Level, Standard #)						
<p>11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>a. Introduce a topic or thesis statement; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.</p> <p>c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.</p> <p>d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p>	A1.0, A2.0, A7.0, A9.0	B1.0, B2.0, B10.0, B11.0, B12.0, B13.0	C4.0, C6.0, C7.0, C8.0, C9.0	D1.0, D3.0, D6.0, D7.0, D8.0, D9.0, D12.0	E1.0, E2.0, E3.0	F1.0, F2.0, F4.0, F6.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A7.0, A9.0	B1.0, B2.0, B6.0, B7.0, B10.0, B11.0, B12.0, B13.0	C2.0, C4.0, C6.0, C7.0, C8.0, C9.0, C10.0, C12.0	D3.0, D4.0, D6.0, D12.0	E2.0, E3.0, E5.0	F7.0, F8.0, F11.0, F12.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A5.0, A9.0	B10.0, B12.0	C6.0, C7.0, C9.0, C11.0	D7.0, D9.0	E3.0, E5.0	F8.0, F10.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A4.0, A5.0, A7.0, A9.0	B11.0, B13.0	C2.0, C4.0, C6.0, C8.0	D1.0, D4.0, D5.0, D7.0, D9.0, D12.0	E2.0, E4.0, E5.0	F1.0, F4.0, F8.0, F11.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A2.0, A7.0, A9.0	B6.0, B9.0, B10.0, B11.0, B12.0, B13.0	C2.0, C4.0, C6.0, C8.0	D3.0, D12.0	E3.0, E5.0	F1.0, F2.0, F8.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A7.0, A9.0	B13.0	C4.0, C6.0	D2.0, D3.0, D4.0, D12.0	E3.0, E4.0, E5.0	F1.0, F4.0, F6.0
<b>WHSST – Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects</b>						
11-12.1. Write arguments focused on discipline-specific content.	A2.0, A3.0, A4.0, A6.0		C1.0, C2.0, C4.0, C6.0, C8.0, C9.0	D4.0, D5.0, D7.0, D9.0	E1.0, E2.0, E5.0	F1.0, F3.0, F4.0, F10.0
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A1.0, A2.0, A7.0, A9.0	B1.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C7.0	D1.0, D2.0, D3.0, D4.0, D6.0, D7.0, D8.0, D9.0, D12.0	E2.0, E5.0, E6.0	F1.0, F7.0, F12.0
11-12.3. Incorporate narrative elements effectively into arguments and informative/explanatory texts.	A1.0, A2.0, A3.0, A7.0, A9.0	B13.0	C1.0, C7.0	D1.0, D2.0, D3.0, D4.0, D6.0, D7.0, D8.0, D9.0, D12.0	E2.0, E5.0, E6.0	F4.0, F6.0, F8.0, F10.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A7.0, A9.0	B1.0, B2.0, B4.0, B6.0, B7.0, B10.0, B11.0, B12.0, B13.0	C1.0, C2.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0, C12.0	D1.0, D3.0, D4.0, D6.0, D8.0, D9.0, D12.0	E2.0, E3.0, E5.0	F4.0, F7.0, F8.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.		B13.0	C4.0, C6.0, C7.0, C9.0, C12.0		E2.0, E3.0	F4.0, F7.0, F8.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A5.0, A7.0, A9.0	B1.0, B2.0, B10.0, B11.0, B12.0, B13.0	C1.0, C2.0, C7.0, C9.0, C10, C12.0	D7.0, D9.0	E3.0, E5.0	F10.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A9.0	B13.0		D2.0, D5.0, D12.0	E2.0, E4.0, E5.0	F1.0, F3.0, F8.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	A1.0, A2.0, A7.0, A9.0	B9.0, B10.0, B11.0, B12.0, B13.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C12.0, C13.0, C14.0, C15.0, C16.0	D2.0, D3.0, D4.0, D12.0	E3.0, E5.0	F1.0, F3.0, F8.0, F9.0
11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.	A1.0, A2.0, A9.0	B9.0, B10.0, B11.0, B12.0, B13.0	C5.0, C16.0	D2.0, D3.0, D4.0, D12.0	E3.0, E4.0, E5.0	F1.0, F8.0
11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	A4.0, A9.0	B7.0, B10.0, B13.0	C9.0		E2.0, E3.0, E5.0	F4.0, F6.0, F7.0
<b>MATHEMATICS</b>						
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>						
<i>Interpret the structure of expressions</i>						
1. Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret <math>P(1+r)^t</math> as the product of <math>P</math> and a factor not depending on <math>P</math>.</i>	A1.0, A3.0, A6.0	B3.0	C3.0	D9.0	E3.0	F7.0, F10.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
<i>Write expressions in equivalent forms to solve problems</i>						
4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.	A6.0			D2.0, D5.0, D7.0, D8.0, D9.0		
<b>Algebra – A-CED – Creating Equations</b>						
<i>Create equations that describe numbers or relationships</i>						
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	A1.0, A2.0, A3.0, A6.0		C10.0			
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A1.0, A2.0, A3.0, A6.0			D2.0, D5.0, D7.0, D9.0		
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A1.0, A2.0, A3.0, A6.0	B3.0	C3.0	D5.0, D7.0, D8.0, D9.0		
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .	A3.0, A6.0					
<b>Algebra – A-APR – Arithmetic with Polynomials and Rational Expressions</b>						
<i>Perform arithmetic operations on polynomials</i>						
1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication: add, subtract, and multiply polynomials, and divide polynomials by monomials. Solve problems in and out of context. (Common Core Standard A-APR-11)	A1.0, A3.0, A6.0	B3.0		D5.0, D7.0, D8.0		
5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of $x$ and $y$ for a positive integer $n$ , where $x$ and $y$ are any numbers, with coefficients determined for example by Pascal's Triangle.	A1.0					

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$ , where $a(x)$ , $b(x)$ , $q(x)$ , and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$ , using inspection, long division, or, for the more complicated examples, a computer algebra system.	A6.0					
7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.	A1.0, A3.0, A6.0			D5.0, D7.0, D8.0		
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>						
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>						
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	A1.0, A3.0, A6.0	B3.0				
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A1.0, A2.0, A3.0					
<i>Solve equations and inequalities in one variable</i>						
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. 3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)	A1.0, A2.0, A3.0, A6.0	B3.0	C3.0	D5.0, D7.0		
<i>Solve systems of equations</i>						
5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	A1.0, A2.0, A3.0					
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	A1.0, A3.0, A6.0					
8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.	A3.0, A6.0					

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
<i>Represent and solve equations and inequalities graphically</i>						
10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	A1.0, A2.0, A3.0, A6.0	B3.0	C3.0		E2.0, E5.0	F7.0, F8.0, F12.0
11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	A1.0, A2.0, A3.0, A6.0					
12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	A1.0, A6.0					
<b>Functions – F-IF – Interpreting Functions</b>						
<i>Understand the concept of a function and use function notation</i>						
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .	A1.0, A3.0, A6.0	B3.0	C3.0	D2.0, D7.0, D9.0	E2.0, E3.0, E5.0	F6.0, F7.0, F8.0, F12.0
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	A1.0, A3.0, A6.0	B3.0	C3.0	D2.0, D7.0, D9.0		
<i>Interpret functions that arise in applications in terms of the context</i>						
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A1.0, A2.0, A3.0, A6.0	B3.0	C3.0	D2.0, D7.0, D9.0	E1.0, E2.0, E3.0, E4.0, E5.0	F6.0, F7.0, F8.0, F12.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.	A1.0, A3.0, A6.0	B3.0	C3.0	D5.0, D7.0, D9.0		F6.0, F7.0, F8.0, F12.0
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A1.0, A2.0, A3.0, A6.0	B3.0	C3.0	D2.0, D5.0, D7.0, D9.0	E1.0, E2.0, E3.0, E4.0, E5.0	F7.0, F8.0, F12.0
<i>Analyze functions using different representations</i>						
7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. <ul style="list-style-type: none"> <li>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</li> <li>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</li> <li>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</li> <li>d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</li> <li>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</li> </ul>	A1.0, A2.0, A3.0, A6.0					
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. <ul style="list-style-type: none"> <li>a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</li> </ul>	A6.0					
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	A1.0, A3.0, A6.0	B3.0	C3.0		E3.0, E4.0, E5.0	F6.0, F7.0, F8.0, F12.0
10. Demonstrate an understanding of functions and equations defined parametrically and graph them. (CA Standard Math Analysis - 7.0)	A1.0, A6.0					



HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
<b>Functions – F-BF – Building Functions</b>						
<i>Build a function that models a relationship between two quantities</i>						
<p>1. Write a function that describes a relationship between two quantities.</p> <p>a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> <p>b. Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</i></p> <p>c. (+) Compose functions. For example, if <math>T(y)</math> is the temperature in the atmosphere as a function of height, and <math>h(t)</math> is the height of a weather balloon as a function of time, then <math>T(h(t))</math> is the temperature at the location of the weather balloon as a function of time.</p>	A3.0, A6.0			D5.0, D7.0, D9.0	E4.0, E5.0	F6.0, F7.0, F8.0, F12.0
<i>Build new functions from existing functions</i>						
<p>3. Identify the effect on the graph of replacing <math>f(x)</math> by <math>f(x) + k</math>, <math>k f(x)</math>, <math>f(kx)</math>, and <math>f(x + k)</math> for specific values of <math>k</math> (both positive and negative); find the value of <math>k</math> given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.</p> <p>3.1 Solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions. (CA Standard Algebra II - 24.0)</p>	A1.0				E4.0, E5.0	F6.0, F7.0, F8.0, F12.0
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>						
<p>1. Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</p> <p>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p>	A1.0, A3.0, A6.0	B3.0	C3.0			

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.						
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	A3.0, A6.0		C3.0			
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	A1.0	B3.0	C3.0		E4.0, E5.0	F6.0, F7.0, F8.0, F12.0
<i>Interpret expressions for functions in terms of the situation they model</i>						
5. Interpret the parameters in a linear or exponential function in terms of a context.	A1.0, A3.0, A6.0		C3.0			
6. Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity. (CA Standard Algebra 1- 23.0)	A6.0		C3.0			
<b>Number and Quantity – N-Q – Quantities</b>						
<i>Reason quantitatively and use units to solve problems</i>						
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A1.0, A3.0, A6.0, A8.0	B3.0	C3.0	D5.0, D7.0, D9.0	E1.0, E2.0, E5.0	F6.0, F7.0, F8.0, F12.0
2. Define appropriate quantities for the purpose of descriptive modeling.	A1.0, A3.0, A6.0, A8.0	B3.0	C3.0	D7.0	E1.0, E2.0, E4.0, E5.0	F7.0, F8.0, F11.0, F12.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A1.0, A3.0, A6.0, A8.0	B3.0	C3.0	D7.0	E2.0, E4.0, E5.0	F7.0, F8.0, F11.0, F12.0
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>						
<i>Understand and evaluate random processes underlying statistical experiments</i>						
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A1.0, A5.0, A6.0	B3.0, B9.0, B13.0		D5.0	E1.0, E2.0, E5.0	F1.0, F7.0, F8.0, F11.0, F12.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model? <i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>	A1.0, A5.0, A6.0	B3.0, B9.0, B13.0			E5.0	F8.0
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A1.0, A3.0, A5.0	B3.0, B9.0, B13.0	C3.0		E4.0, E5.0	F1.0, F6.0, F8.0, F11.0
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A1.0, A3.0, A4.0, A5.0, A6.0	B3.0, B9.0, B13.0	C3.0		E5.0	F6.0, F8.0
6. Evaluate reports based on data.	A1.0, A3.0, A5.0, A6.0, A9.0	B1.0, B3.0, B9.0, B13.0	C1.0, C3.0, C4.0	D5.0, D7.0, D9.0	E1.0, E2.0, E3.0, E4.0, E5.0	F4.0, F6.0, F8.0, F11.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>						
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>						
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A9.0	B1.0, B3.0	C3.0		E1.0, E2.0, E3.0, E4.0, E5.0	F3.0, F4.0, F6.0, F8.0, F11.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A1.0, A6.0		C3.0		E3.0, E5.0	F6.0, F8.0
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A1.0, A6.0		C3.0		E3.0, E5.0	F6.0, F8.0
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A1.0			D5.0, D7.0, D9.0	E3.0, E5.0	F6.0, F8.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>						
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	A1.0, A6.0	B3.0	C3.0	D5.0, D7.0, D9.0	E3.0, E5.0	F6.0, F8.0
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	A1.0, A4.0, A6.0			D5.0, D7.0, D9.0	E3.0, E5.0	F6.0, F8.0
<i>Interpret linear models</i>						
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	A1.0, A2.0, A3.0, A6.0, A9.0	B1.0, B3.0	C3.0	D2.0, D5.0, D7.0, D8.0, D9.0	E1.0, 2.0, E3.0, E4.0, E5.0	F6.0, F8.0
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.	A6.0		C3.0		E3.0, E5.0	F6.0, F8.0
9. Distinguish between correlation and causation.	A1.0, A3.0, A6.0	B3.0	C3.0	D5.0, D7.0, D8.0, D9.0	E3.0, E5.0	F6.0, F8.0
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>						
<i>Understand independence and conditional probability and use them to interpret data</i>						
1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	A1.0					

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>						
<i>Calculate expected values and use them to solve problems</i>						
1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.	A1.0, A3.0, A6.0					
<i>Use probability to evaluate outcomes of decisions</i>						
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant. b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	A1.0			D12.0	E1.0, E5.0	F6.0, F8.0
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	A1.0					
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	A1.0		C3.0	D12.0	E1.0, E5.0	
<b>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</b>						
7.0 Students demonstrate an understanding of the standard distributions (normal, binomial, and exponential) and can use the distributions to solve for events in problems in which the distribution belongs to those families.	A1.0					
10.0 Students know the definitions of the mean, median, and mode of distribution of data and can compute each of them in particular situations.	A1.0, A6.0				E1.0, E2.0, E3.0, E4.0, E5.0	F4.0, F7.0, F8.0, F9.0, F11.0, F12.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
<b>SCIENCE</b>						
<b>Physical Sciences – PS</b>						
PS1: Matter and Its Interactions						
PS1.A: Structure and Properties of Matter	A6.0, A8.0, A9.0	B10.0		D10.0, D12.0	E6.0	
PS1.B: Chemical Reactions	A6.0, A9.0	B10.0, B11.0		D4.0	E4.0, E6.0	
PS2: Motion and Stability: Forces and Interactions						
PS2.A: Forces and Motion		B8.0, B9.0		D5.0, D11.0, D12.0	E4.0, E6.0	
PS2.C: Stability and Instability in Physical Systems		B8.0, B9.0		D5.0, D11.0	E4.0	F1.0, F9.0
PS3: Energy						
PS3.A: Definitions of Energy					E6.0	
PS3.C: Relationship Between Energy and Forces		B8.0			E6.0	
PS3.D: Energy in Chemical Processes and Everyday Life	A3.0			D12.0	E4.0, E6.0	
PS4: Waves and Their Applications in Technologies for Information Transfer						
PS4.B: Electromagnetic Radiation		B9.0				
PS4.C: Information Technologies and Instrumentation	A7.0		C8.0, C9.0, C10.0, C12.0, C14.0			F10.0
<b>Life Sciences – LS</b>						
LS1: From Molecules to Organisms: Structures and Processes						
LS1.A: Structure and Function	A1.0, A3.0, A4.0,			D4.0	E5.0	F1.0, F4.0
LS1.B: Growth and Development of Organisms	A4.0, A9.0	B2.0, B10.0		D4.0, D10.0		
LS1.C: Organization for Matter and Energy Flow in Organisms	A1.0, A3.0	B2.0				
LS1.D: Information Processing	A1.0, A3.0, A4.0					F10.0, F11.0
LS2: Ecosystems: Interactions, Energy, and Dynamics						
LS2.A: Interdependent Relationships in Ecosystems	A1.0				E5.0	
LS2.C: Ecosystems Dynamics, Functioning, and Resilience					E2.0, E4.0, E5.0	F1.0
LS2.D: Social Interactions and Group Behavior					E2.0	F1.0, F2.0, F3.0, F7.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
LS3: Heredity: Inheritance and Variation of Traits						
LS3.A: Inheritance of Traits	A3.0				E1.0, E3.0, E5.0	
LS3.B: Variation of Traits	A3.0, A9.0				E1.0, E3.0, E5.0	F8.0
LS4: Biological Evolution: Unity and Diversity						
LS4.A: Evidence of Common Ancestry and Diversity					E1.0, E2.0, E3.0, E5.0	F1.0, F11.0
LS4.B: Natural Selection					E1.0, E2.0, E5.0	
LS4.C: Adaptation	A4.0					
LS4.D: Biodiversity and Humans	A4.0					
<b>Earth and Space Sciences – ESS</b>						
ESS3: Earth and Human Activity ESS3.A: Natural Resources ESS3.B: Natural Hazards ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change	A9.0			D12.0	E4.0	
<b>Engineering, Technology, and the Applications of Science – ETS</b>						
ETS1: Engineering Design ETS1.A: Defining and Delimiting an Engineering Problem ETS1.B: Developing Possible Solutions ETS1.C: Optimizing the Design Solution	A9.30			D1.0, D2.0, D5.0, D9.0, D12.0		
ETS2: Links Among Engineering, Technology, Science, and Society ETS2.A: Interdependence of Science, Engineering, and Technology ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A5.0, A9.0	B1.0, B5.0, B8.0	C3.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0	D2.0, D4.0, D7.0, D12.0		

<b>HEALTH SCIENCE AND MEDICAL TECHNOLOGY</b>	<b>PATHWAYS</b>					
	<b>A. Biotechnology</b>	<b>B. Patient Care</b>	<b>C. Health Care Administrative Services</b>	<b>D. Health Care Operational Support Services</b>	<b>E. Public and Community Health</b>	<b>F. Mental and Behavioral Health</b>
<b>HISTORY/SOCIAL SCIENCE</b>						
<b>Principles of American Democracy and Economics – AD</b>						
12.2 Students evaluate and take and defend positions on the scope and limits of rights and obligations as democratic citizens, the relationships among them, and how they are secured.					E1.0	
12.2.1. Discuss the meaning and importance of each of the rights guaranteed under the Bill of Rights and how each is secured (e.g., freedom of religion, speech, press, assembly, petition, privacy).		B6.0			E1.0	
12.2.5. Describe the reciprocity between rights and obligations; that is, why enjoyment of one's rights entails respect for the rights of others.		B13.0			E1.0	
12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their interdependence, and the meaning and importance of those values and principles for a free society.					E1.0, E2.0, E3.0, E4.0	F1.0, F3.0, F7.0, F11.0
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.	A1.0	B1.0	C1.0, C2.0	D3.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0, E7.0, E8.0	
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.	A7.0		C1.0, C2.0, C4.0		E1.0, E2.0	
12.7.6. Compare the processes of lawmaking at each of the three levels of government, including the role of lobbying and the media.			C2.0			
<b>Principles of Economics – PE</b>						
12.1 Students understand common economic terms and concepts and economic reasoning.						
12.1.1. Examine the causal relationship between scarcity and the need for choices.				C3.0		



HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.			C3.0			
12.1.5. Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).			C3.0			
12.2 Students analyze the elements of America's market economy in a global setting.						
12.2.1. Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.				C3.0		
12.2.2. Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.				C3.0, D9.0		
12.2.3. Explain the roles of property rights, competition, and profit in a market economy.	A7.0					
12.2.4. Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.	A7.0					
12.2.5. Understand the process by which competition among buyers and sellers determines a market price.	A7.0			D1.0, D5.0, D9.0		
12.2.6. Describe the effect of price controls on buyers and sellers.	A7.0					
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.	A7.0					
12.3 Students analyze the influence of the federal government on the American economy.						
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.	A7.0					
12.3.2. Identify the factors that may cause the costs of government actions to outweigh the benefits.	A7.0		C1.0, C2.0			
12.4 Students analyze the elements of the U.S. labor market in a global setting.						

<b>HEALTH SCIENCE AND MEDICAL TECHNOLOGY</b>	<b>PATHWAYS</b>					
	<b>A. Biotechnology</b>	<b>B. Patient Care</b>	<b>C. Health Care Administrative Services</b>	<b>D. Health Care Operational Support Services</b>	<b>E. Public and Community Health</b>	<b>F. Mental and Behavioral Health</b>
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.	A1.0	B12.0	C1.0			
12.4.3. Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.	A1.0	B12.0	C1.0, C2.0, C3.0	D1.0	E1.0	F1.0
12.5 Students analyze the aggregate economic behavior of the U.S. economy.						
12.5.2. Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, inflation or deflation rate, and a rate of economic growth.		B12.0				
<b>U.S. History and Geography – US</b>						
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.						
11.2.1. Know the effects of industrialization on living and working conditions, including the portrayal of working conditions and food safety in Upton Sinclair's <i>The Jungle</i> .					E4.0, E5.0	
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.						
11.5.7. Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.	A1.0, A9.0					
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.						
11.11.3. Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.	A1.0	B12.0	C1.0	D1.0	E1.0	F1.0
11.11.6. Analyze the persistence of poverty and how different analyses of this issue influence welfare reform, health insurance reform, and other social policies.	A2.0, A7.0	B1.0	C1.0, C4.0	D3.0	E1.0, E2.0	F8.0

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
11.11.7. Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.	A1.0, A2.0	B1.0, B12.0	C1.0,C2.0, C3.0	D3.0	E1.0, E2.0, E3.0	
<b>Chronological and Spatial Reasoning – CSR</b>						
1. Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.	A1.0, A2.0				E1.0, E2.0, E3.0, E4.0, E5.0	F1.0
2. Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.	A1.0, A2.0				E1.0, E2.0, E3.0, E4.0, E5.0	
3. Students use a variety of maps and documents to interpret human movement, including major patterns of domestic and international migration, changing environmental preferences and settlement patterns, the frictions that develop between population groups, and the diffusion of ideas, technological innovations, and goods.	A1.0, A2.0				E2.0, E3.0, E4.0, E5.0	
<b>Historical Research, Evidence, and Point of View – HR</b>						
1. Students distinguish valid arguments from fallacious arguments in historical interpretations.	A1.0, A2.0					
2. Students identify bias and prejudice in historical interpretations.	A1.0, A2.0					
3. Students evaluate major debates among historians concerning alternative interpretations of the past, including an analysis of authors' use of evidence and the distinctions between sound generalizations and misleading oversimplifications.	A1.0, A2.0					

HEALTH SCIENCE AND MEDICAL TECHNOLOGY	PATHWAYS					
	A. Biotechnology	B. Patient Care	C. Health Care Administrative Services	D. Health Care Operational Support Services	E. Public and Community Health	F. Mental and Behavioral Health
4. Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A9.0	B4.0, B6.0, B7.0			E5.0	
<b>Historical Interpretation – HI</b>						
1. Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.	A1.0, A2.0, A3.0, A7.0,					
2. Students recognize the complexity of historical causes and effects, including the limitations on determining cause and effect.	A1.0, A2.0,					
3. Students interpret past events and issues within the context in which an event unfolded rather than solely in terms of present-day norms and values.	A1.0, A2.0, A3.0, A7.0,	B4.0				
4. Students understand the meaning, implication, and impact of historical events and recognize that events could have taken other directions.	A1.0, A2.0, A3.0, A7.0,					
5. Students analyze human modifications of landscapes and examine the resulting environmental policy issues.						
6. Students conduct cost-benefit analyses and apply basic economic indicators to analyze the aggregate economic behavior of the U.S. economy.			C3.0, C5.0	D5.0, D9.0	E1.0, E2.0, E3.0, E4.0, E5.0, E6.0	

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Health Science and Medical Technology**

Lloyd McCabe, Administrator, California Department of Education  
Cindy Beck, Education Consultant, California Department of Education

#### *Standards Review Team*

Carla Cherry, Director, Kern Resource Center  
Jim DeKloe, Professor, Solano Community College  
Sheryl Denker, Senior Program Advisor, BayBio  
Diane Garcia, Instructor/Clinical Coordinator, City College of San Francisco  
Janet Hoff Kneier, Program Manager, Grossmont–Cuyamaca Community College  
Moreen Lane, Senior Policy Analyst, California Workforce Investment Board  
Dee Niedringhaus, Administrator, Instructional Programs, North Orange County  
Regional Occupational Program  
Andrea Perry, Program Administrator, Cedars–Sinai Health Systems  
Kathy Ruble, School to Career Coordinator, Manteca Unified School District  
Patricia Twyman, Consultant, Health Science Education

#### *Standards Writing Team*

Sheryl Denker, Senior Program Advisor, BayBio  
Dr. Gustavo Loera, Director of Educational Research and Development,  
Mental Health America of Los Angeles  
Dee Niedringhaus, Administrator, Instructional Programs, North Orange County  
Regional Occupational Program  
Jacob Walker, Instructor, Adult Education, Twin Rivers School District

#### *Common Core Alignment Team*

Debbie Curtin, Instructor, Pasadena Unified School District  
Monte Ekott, Instructor, Norwalk–La Mirada Unified School District  
Debbie Foley, Instructor, Oceanside High School  
Elizabeth Gonzalez, Instructor, Norwalk–La Mirada Unified School District  
James Maynard, Instructor, Norwalk–La Mirada Unified School District  
John Noonan, Instructor, Coachella Valley Unified School District  
Scott Tarlton, Instructor, Westminster High School  
Mark Viss, Instructor, Modesto City Schools  
Darrel Wildt, Instructor, San Joaquin County Office of Education

## References

- Brody, William R. 2007. "Health Care '08: What's Promised/What's Possible?" Presented to the National Press Club, Washington, DC. <http://web.jhu.edu/old/president/speeches/2007/health.html> (accessed December 21, 2012).
- Brown, J. Kirk. 2011. *Biotechnology: A Laboratory Skills Course*. Hercules, CA: Bio-Rad Laboratories. <http://www.bio-rad.com/>.
- Daugherty, Ellyn. 2012. *Biotechnology: Science for the New Millennium*. St. Paul, MN: EMC Publishing.
- Gawande, Atul. 2010. *The Checklist Manifesto: How to Get Things Right*. New York: Metropolitan Books.
- Geboers, H., W. van den Bosch, H. van den Hoogen, H. Mookink, P. van Montfort, and H. Oltheten. 1999. "A Model for Continuous Quality Improvement in Small Scale Practices." *Quality in Health Care* 8 (1999): 43–48.
- Langley, G. J., R. Moen, K. M. Nolan, C. L. Norman, and L. P. Provost. 2009. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. San Francisco: Jossey-Bass.
- Musgrove, P., A. Creese, A. Preker, C. Baeza, A. Anell, and T. Prentice. 2000. *The World Health Report—Health Systems: Improving Performance*. <http://www.who.int/whr/2000/en/> (accessed January 2, 2013).
- Reid, T. R. 2010. *The Healing of America: A Global Quest for Better, Cheaper, and Fairer Health Care*. New York: Penguin Books.
- World Health Organization. 2006. *Working Together for Health: The World Health Report 2006*. [http://www.who.int/whr/2006/whr06\\_en.pdf](http://www.who.int/whr/2006/whr06_en.pdf) (accessed December 21, 2012).

## Table of Contents

### Hospitality, Tourism, and Recreation

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	6
Pathway Standards.....	7
A. Food Science, Dietetics, and Nutrition Pathway.....	7
B. Food Service and Hospitality Pathway .....	10
C. Hospitality, Tourism, and Recreation Pathway.....	15
Academic Alignment Matrix.....	20
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>
References .....	40



## Hospitality, Tourism, and Recreation *Sector Description*

The Hospitality, Tourism, and Recreation sector provides students with the academic and technical preparation necessary to pursue high-skill, high-demand careers in these related and growing industries. The sector encompasses three distinct, yet interrelated, career pathways: Food Science, Dietetics, and Nutrition; Food Service and Hospitality; and Hospitality, Tourism, and Recreation. The standards are designed to integrate academic and career technical concepts. The anchor standards include Consumer and Family Studies comprehensive technical knowledge and skills that prepare students for learning in the pathways. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates hands-on projects, work-based instruction, and leadership development such as that offered through FHA-HERO, the California affiliate of Family, Career and Community Leaders of America (FCCLA). Standards in this sector are designed to prepare students for technical training, postsecondary education, and entry to a career.



## **Hospitality, Tourism, and Recreation Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Hospitality, Tourism, and Recreation academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Hospitality, Tourism, and Recreation sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the Hospitality, Tourism, and Recreation sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Hospitality, Tourism, and Recreation, using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Hospitality, Tourism, and Recreation sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Hospitality, Tourism, and Recreation sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Hospitality, Tourism, and Recreation sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Hospitality, Tourism, and Recreation industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Hospitality, Tourism, and Recreation sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.

- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Hospitality, Tourism, and Recreation sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the career technical student organization (FHA-HERO, the California Affiliate of FCCLA). (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations (such as FHA-HERO) and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Hospitality, Tourism, and Recreation sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Hospitality, Tourism, and Recreation sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

**This section is specific to the foundational knowledge and skills required for Consumer and Family Studies.**

- 10.1 Interpret and explain terminology and practices specific to the Hospitality, Tourism, and Recreation sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Hospitality, Tourism, and Recreation sector.
- 10.3 Construct projects and products specific to the Hospitality, Tourism, and Recreation sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Define the principles of nutrition and their relationship to good health through the life cycle.
- 10.6 Define and identify the basic principles of food safety and sanitation and the proper techniques for preparing and serving food.

- 10.7 Apply the principles of food purchasing, food preparation, and meal management in a variety of settings.
- 10.8 Describe commonly accepted food customs as well as table setting, meal service, and etiquette practices of the United States and other cultures.
- 10.9 Identify the aspects of science related to food preparation, product development, and nutrition.
- 10.10 Describe food production, processing, and distribution methods and the relationship of those techniques to consumer food supply and nutrition.
- 10.11 Explain how to select, safely use, and efficiently care for facilities and equipment related to food product development, food preparation, dining, lodging, tourism, and recreation.
- 10.12 Assess the individual, family, and workplace factors that influence decisions related to health, leisure, and recreation at each stage of the life cycle and quality of life.
- 10.13 Explain how individuals apply strategies that enable them to manage personal, family, and work responsibilities to enhance productivity.
- 10.14 Demonstrate an understanding of how knowledge, skills, attitudes, and behaviors learned in Consumer and Family Studies can be transferred to advanced education and training or careers in Hospitality, Tourism, and Recreation.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Hospitality, Tourism, and Recreation anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings, and through the career technical student organization (FHA-HERO, the California Affiliate of FCCLA).

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Hospitality, Tourism, and Recreation sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Hospitality, Tourism, and Recreation sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## Hospitality, Tourism, and Recreation Pathway Standards

### A. Food Science, Dietetics, and Nutrition Pathway

The Food Science, Dietetics, and Nutrition pathway focuses on three specializations centered on the science of food and its relationship to the health and well-being of individuals. Students pursuing this career pathway learn about industry awareness; food safety and sanitation; workforce and organizational management; food, fitness, and wellness; nutritional requirements and processes; food chemistry and technology; research and product development; and marketing and public relations.

Sample occupations associated with this pathway:

- ◆ Food Demonstrator
- ◆ Certified Fitness Nutritionist
- ◆ Nutritionist
- ◆ Registered Dietitians

A1.0 Demonstrate an understanding of key aspects of the food science, dietetics, and nutrition industry and the role of the industry in the local, state, national, and global economies.

A1.1 Define and compare core elements of the food science, dietetics, and nutrition industry from the supporting industries and regulatory agencies.

A1.2 Evaluate the contributions of the various segments of the industry to local, state, national, and international economies.

A1.3 Create a product depicting the different requirements and standards for employees in the industry, including education, training, licensures, and certifications.

A2.0 Identify important workforce and organizational management concepts.

A2.1 Find information on the primary business procedures for food science, dietetics, and nutrition organizations.

A2.2 Explain the differences and importance of the main elements in day-to-day operational procedures at various types of food-related facilities.

A2.3 Evaluate important management strategies for planning, decision making, shared responsibility, and negotiations.

A3.0 Demonstrate the application of primary standards and regulations for safe food handling and sanitation practices.

A3.1 Practice industry-recommended standards for personal grooming and hygiene.

A3.2 Interpret safe and sanitary food-handling procedures as set forth by local, state, and federal health and safety codes, including reporting and dealing with violations of the food safety code.

A3.3 Produce a product that integrates the use of procedures for preventing the spread of food-borne pathogens and illness, allergens, cross-contacts, and contaminants.

- A4.0 Recognize the relationship of basic nutritional principles and concepts to the physical and emotional well-being of individuals.
  - A4.1 Understand the relationship of emotional, psychological, and physiological needs to food intake and natural hunger cues.
  - A4.2 Analyze appropriate nutrient intake, diet, and energy expenditure for individuals of different ages and with different dietary and health needs.
  - A4.3 Illustrate the anatomical structure and functions of the digestive system, including the biochemical processes involved in digestion, absorption, metabolism, energy balance, and food-drug interactions.
  - A4.4 Formulate recommended diets for different dietary and health needs.
  
- A5.0 Demonstrate an understanding of the correlation of food and fitness to wellness.
  - A5.1 Explain how research-based, recognized dietary guidelines relate to nutrition, fitness, and overall wellness.
  - A5.2 Interpret nutritional information needed to implement and sustain change in behavior and lifestyle management.
  - A5.3 Analyze popular diets for recommendations that are consistent with, or contrary to, approved dietary guidelines.
  - A5.4 Analyze nutrient density as it relates to food quality and dietary choices for individual nutrition, fitness, and wellness goals.
  - A5.5 Provide examples of how social and cultural norms and barriers relate to the implementation of nutrition, fitness, and wellness changes.
  
- A6.0 Identify the basics of community collaborative opportunities and methods of outreach in the field of nutrition, fitness, and wellness.
  - A6.1 Classify the available community services, agencies, and outreach programs that provide nutrition, fitness, and wellness information and services.
  - A6.2 Understand the differences in services and outreach methods of community organizations that provide nutrition, fitness, and wellness information and services.
  - A6.3 Provide examples of the influence of cultural health-related practices and food preferences on the nutrition, fitness, and wellness of individuals.
  
- A7.0 Explain the basic principles of managing and operating food service outreach programs.
  - A7.1 Identify the types of community-based and institutional programs that provide food and nutrition outreach services.
  - A7.2 Summarize the factors that affect the management and operation of a food service outreach program.
  - A7.3 Explain the training needs of an effective food service outreach staff.
  
- A8.0 Interpret the basic principles of chemistry and physics related to changes in foods and food products during preparation, processing, and preservation.
  - A8.1 Recognize terminology, methods, and equipment used in the food science and technology industry.

- A8.2 Practice safe laboratory and equipment use and maintenance procedures.
  - A8.3 Understand important chemical and physical changes that occur during food preparation.
  - A8.4 Conduct scientific experiments using the scientific method.
  - A8.5 Document experiments and maintain laboratory records.
- A9.0 Demonstrate an understanding of the basic principles of research and development, food analysis, and sensory evaluation in the field of food science and technology.
- A9.1 Understand the purpose, importance, and basic procedures of sensory evaluation experiments.
  - A9.2 Explain quality control, assurance standards, and the procedures for each used in research and development.
  - A9.3 Analyze research implications on food trends, value-added processing, genetic engineering, and irradiation.
  - A9.4 Prepare and test formulas for developing new food products.
  - A9.5 Test food products by using controls, variables, and random sampling.
  - A9.6 Create a product that explores global, logistical, ecological, and economic impacts of food production and packaging methods, including genetic engineering.
- A10.0 Describe the fundamental concepts of marketing and public relations used in the dissemination of information about food science, dietetics, and nutrition.
- A10.1 Explain the differences between public relations, advertising, and provision of accurate information to consumers.
  - A10.2 Understand the methods and importance of communicating accurate information to consumers about nutrition, food safety, and food products.
  - A10.3 Evaluate the psychological effects of market branding, subliminal messages, and advertising on consumer choices.
  - A10.4 Explain the use of technical reports in preparing and disseminating information.
  - A10.5 Compare and contrast the influence of consumer trends and expectations on product development and marketing.



## **Hospitality, Tourism, and Recreation Pathway Standards**

### **B. Food Service and Hospitality Pathway**

The Food Service and Hospitality pathway focuses on the key aspects of the industry. Students pursuing this career pathway have in-depth, hands-on experiences that emphasize industry awareness; sanitation and safe food handling; food and beverage production; nutrition; food service management; and customer service.

Sample occupations associated with this pathway:

- ◆ Food Expeditor
- ◆ Restaurant Manager
- ◆ Banquet and Catering Director
- ◆ Research Chef
- ◆ Executive Chef

- B1.0 Demonstrate an understanding of major aspects of the food service and hospitality industry and the role of the industry in local, state, national, and global economies.
- B1.1 Define and compare core elements of the food service and hospitality industry from various supporting industries.
  - B1.2 Understand how the various segments of the industry contribute to, and impact, local, state, national, and international economies, cultures, and the environment.
  - B1.3 Explain the relationship between industry trends and local, state, national, and international economic trends.
  - B1.4 Research the advantages and disadvantages of the working conditions of various careers in the food service and hospitality industry.
- B2.0 Demonstrate the basics of safe work habits, security, and emergency procedures required in food service and hospitality establishments.
- B2.1 Identify the causes, prevention, and treatment of common accidents and the reporting procedures involved.
  - B2.2 Practice the basic procedures for the safety of employees and guests, including the procedures for emergency situations.
  - B2.3 Understand the role of the California Occupational Safety and Health Administration, the Environmental Protection Agency, and other agencies in regulating practices in the food service and hospitality industry.
  - B2.4 Understand the source and purpose of information in the Material Safety Data Sheets (MSDS) and know the proper use of personal protective equipment (PPE).
- B3.0 Interpret the basic principles of sanitation and safe food handling.
- B3.1 Employ the standards of personal grooming and hygiene required by local, state, and federal health and safety codes.

- B3.2 Understand basic local, state, and federal sanitation regulations as they pertain to food production and service.
  - B3.3 Explain the types of food contamination, the potential causes, including cross-contamination, and methods of prevention.
  - B3.4 Practice safe and sanitary procedures in all food handling, including food receiving, storage, production, service, and cleanup.
  - B3.5 Understand the essential principles of Hazard Analysis Critical Control Points, including the use of flowcharts.
  - B3.6 Understand the purpose and process of required industry certification (e.g., ServSafe, California Food Handlers Card).
- B4.0 Analyze the basics of food service and hospitality management.
- B4.1 Understand the responsibilities of management, such as ensuring safe work practices and conditions and complying with important laws and regulations that affect employment, such as wage and hour laws, tenant status, and accommodation of minors.
  - B4.2 Understand the importance of specific human resource practices and procedures that address workplace diversity, harassment, personal safety, and discrimination.
  - B4.3 Interpret the differences in goals and organizational management of various food service businesses.
  - B4.4 Understand the relationship of effective management and business procedures to important outcomes, such as profitability, productivity, workplace atmosphere, consumer and guest satisfaction, and business growth.
  - B4.5 Design and interpret business plans including: the mission, vision, target market, location, financing, and the community and ecological context of the business.
- B5.0 Demonstrate an understanding of the basics of systems operations and the importance of maintaining facilities, equipment, tools, and supplies.
- B5.1 Apply the procedures for cleaning and maintaining facilities and equipment and the importance of preventive maintenance and the use of nontoxic and less toxic materials.
  - B5.2 Recognize the types of materials and supplies used in the maintenance of facilities, including the identification of the hazardous environmental and physical properties of chemicals and the use of Material Safety Data Sheets (MSDS).
  - B5.3 Practice the procedures for maintaining inventories: ordering food, equipment, and supplies; and storing and restocking supplies.
  - B5.4 Understand the relationship between facilities management and profit and loss, including the costs of resource consumption, breakage, theft, supplies use, and decisions for repairs or replacement.
  - B5.5 Understand how various departments in a food service facility contribute to the economic success of a business.
  - B5.6 Prioritize tasks and plan work schedules based on budget and personnel.

- B6.0 Illustrate and apply the basics of food preparation and safety and sanitation in professional and institutional kitchens.
  - B6.1 Use, maintain, and store the tools, utensils, equipment, and appliances safely and appropriately for preparing a variety of food items.
  - B6.2 Apply the principle of *mise en place*, including the placement and order of use of ingredients, equipment, tools, and supplies.
  - B6.3 Prepare food by using the correct terminology, food safety, techniques, and procedures specified in recipes and formulas.
  - B6.4 Plan and follow a food production schedule, including timing and prioritizing of tasks and activities.
  - B6.5 Evaluate the qualities and properties of food items and ingredients used in food preparation.
  - B6.6 Design plating techniques, including accurate portioning and aesthetic presentation skills.
  - B6.7 Develop a food preparation plan using forecasting and cross-utilization of products to maximize profit and eliminate waste.
  
- B7.0 Illustrate and apply the basics of baking, pastry, and dessert preparation and safety and sanitation in professional and institutional kitchens.
  - B7.1 Use, maintain, and store the tools, utensils, equipment, and appliances safely and appropriately for preparing, serving, and storing baked goods, pastries, and desserts.
  - B7.2 Apply the principle of *mise en place*, including the placement and order of use of the ingredients, equipment, tools, and supplies unique to baking and pastry production.
  - B7.3 Produce baked goods, pastries, and desserts by using the correct terminology, food safety, techniques, procedures, and various finishing techniques.
  - B7.4 Evaluate the qualities and properties of food items and ingredients used for baked goods, pastries, and desserts.
  - B7.5 Understand packaging and merchandising techniques to feature seasonal and standard bakery products.
  - B7.6 Develop a plan using forecasting and cross-utilization of products to maximize profit and eliminate waste.
  
- B8.0 Apply the knowledge and skills essential for effective customer service.
  - B8.1 Analyze the importance of customer service to the success of the food service establishment.
  - B8.2 Demonstrate the concept of exceptional customer service and know ways of anticipating the needs and desires of customers to exceed their expectations.
  - B8.3 Recognize common customer complaints and the service solutions for preventing or resolving complaints.
  - B8.4 Understand the roles of management and employees in effectively meeting the needs of culturally, generationally diverse, special needs customers.

- B8.5 Interact with customers in a positive, responsive, and professional manner.
- B9.0 Apply the basic procedures and skills needed for food and beverage service.
  - B9.1 Differentiate the required duties of various positions, including those of the host/hostess, wait staff, bus person, and others related to opening, closing, change-of-shift, and preparatory work.
  - B9.2 Apply the concept of *mise en place* in relation to food and beverage service.
  - B9.3 Practice safe, efficient, and proper procedures for setting, serving, maintaining, and busing tables.
  - B9.4 Practice proper techniques for customer service, including greeting, seating, presenting and explaining menu items, and taking customer orders.
  - B9.5 Integrate appropriate, effective, and efficient techniques for writing food and beverage orders, relaying orders to the kitchen, coordinating and assembling food orders, and preparing and presenting checks to customers.
  - B9.6 Apply procedures for handling cash transactions, converting currency, and identifying counterfeit currency.
  - B9.7 Apply the procedures for handling noncash transactions including: credit cards, debit cards, ATM cards, money orders, personal checks, coupons, discounts, and online transactions.
  - B9.8 Conduct all financial transactions in an accurate, professional, and ethical manner, including gratuities.
  - B9.9 Produce a product that identifies and explains the impact of theft on the food service and hospitality industry.
- B10.0 Demonstrate and apply basic nutritional concepts in meal planning and food preparation.
  - B10.1 Apply basic nutritional principles and know how to use food preparation techniques that conserve nutrients.
  - B10.2 Interpret nutritional or ingredient information from food labels and fact sheets and analyze menu items to meet the dietary needs of individuals.
  - B10.3 Create nutritious, creative, and profitable menus in accord with availability and demand.
- B11.0 Demonstrate an understanding of the basic processes of costing and cost analysis in food and beverage production and service.
  - B11.1 Understand the customer's perception of value and its relationship to profit and loss.
  - B11.2 Understand the components of a profit and loss statement emphasizing food and labor costs.
  - B11.3 Utilize the practices of reduce, reuse, and recycle to maximize profits.
  - B11.4 Understand the importance and structure of standardized systems, such as the Uniform System of Accounts for Restaurants.

- B11.5 Evaluate the importance of the menu as the primary source of revenue generation and cost control.
- B11.6 Calculate recipe costs and pricing per portion and compare the cost per cover to the theoretical cost.
- B12.0 Describe the fundamentals of successful sales and marketing methods.
  - B12.1 Recognize methods to develop and maintain long-term customer relations.
  - B12.2 Identify the major market segments of the industry and understand how marketing principles and procedures can be applied to target audiences.
  - B12.3 Understand basic marketing principles for maximizing revenue based on supply and demand and competition.
  - B12.4 Understand the value of advertising, public relations, social networking, and community involvement.
  - B12.5 Research the various types of entrepreneurial opportunities in the food service industry.
  - B12.6 Design marketing strategies, including branding, bench marking, and promotional selling and upgrading and their effect on profits.

## **Hospitality, Tourism, and Recreation Pathway Standards**

### **C. Hospitality, Tourism, and Recreation Pathway**

The Hospitality, Tourism, and Recreation pathway integrates various facets of the hospitality industry: lodging, travel, and tourism; event planning; theme parks, attractions, and exhibitions; and recreation. Students engaged in this pathway have broad experiences related to the specific industry segments, including: industry awareness; organizational management; customer service; sales and marketing; facilities management; lodging; travel destinations; and reservations, ticketing, and itineraries.

Sample occupations associated with this pathway:

- ◆ Guest Services Agent
- ◆ Director of Conference Services
- ◆ Certified Meeting/Event Planner
- ◆ Theme Park Director

C1.0 Demonstrate an understanding of the major aspects of the hospitality, tourism, and recreation industry (i.e. lodging, travel, and tourism; event planning; theme parks, attractions, and exhibitions; and recreation) and the industry's role in local, state, national, and global economies.

C1.1 Define and compare core elements of the hospitality, tourism, and recreation industry from those of various supporting industries.

C1.2 Analyze the working conditions of various careers in the hospitality, tourism, and recreation industry.

C1.3 Analyze the impact and contributions of various segments of the industry on local, state, national, and international economies and cultures, and the environment.

C1.4 Compare and contrast the relationship between industry trends and local, state, national, and international economic trends.

C2.0 Analyze the basic elements of workforce and organizational management, including the roles and responsibilities of effective management and employees in the industry.

C2.1 Interpret how the mission and goals of a business affect operations in the hospitality, tourism, and recreation industry.

C2.2 Understand the importance of specific human resource practices and procedures that address workplace diversity, harassment, personal safety, and discrimination.

C2.3 Explain common safety, security, and emergency policies and procedures used in the hospitality, tourism, and recreation industry to protect guests, visitors, and employees, such as safe work practices and conditions, confidentiality of customer information, control of keys, infectious disease control, first aid procedures, and emergency training.

- C2.4 Analyze the relationship of management techniques and appropriate business procedures, such as spreadsheets for payroll and inventories, tools for budgeting, recordkeeping, and corresponding to key outcomes: profitability, productivity, positive work environment, consumer and client satisfaction, business growth, business plans, corporate social responsibility, and environmental stewardship.
- C2.5 Create a product which explains the impact of main laws and regulations that affect accommodations and practices, including the requirements of the California Occupational Safety and Health Administration and the Americans with Disabilities Act, wage and hour laws, tenant status, and accommodation of minors.
- C3.0 Apply the knowledge and skills essential for effective guest services in the hospitality, tourism, and recreation industry sector.
  - C3.1 Analyze the importance of guest services to the success of the industry.
  - C3.2 Demonstrate the concept of exceptional guest service.
  - C3.3 Anticipate the needs, desires, and interests of guests in order to exceed their expectations by implementing total quality management practices (TQM).
  - C3.4 Recognize common guest complaints and the service solutions for preventing or resolving them.
  - C3.5 Understand the roles of management and employees in effectively meeting the needs of culturally and generationally diverse guests and special needs customers.
  - C3.6 Interact with guests in a positive, responsive, and professional manner.
- C4.0 Describe the fundamentals of successful sales and marketing methods.
  - C4.1 Recognize ways of developing and maintaining long-term guest relationships.
  - C4.2 Identify the major market segments of the hospitality, tourism, and recreation industry.
  - C4.3 Understand basic marketing principles for maximizing revenue based on supply and demand and competition.
  - C4.4 Understand the value of advertising, public relations, social networking, and community involvement.
  - C4.5 Analyze marketing strategies, including promotional selling and upgrading, and their effect on profits.
  - C4.6 Analyze the way in which basic marketing principles and procedures can be applied to targeting an audience, including: branding, bench marking, and promotional selling and upgrading and their effect on profits.
- C5.0 Demonstrate an understanding of the basics of systems operations and the importance of maintaining facilities, equipment, tools, and supplies.
  - C5.1 Apply the procedures for cleaning, maintaining, and repairing facilities and equipment and the importance of preventive maintenance.

- C5.2 Recognize the types of materials and supplies used in the maintenance of facilities, including the identification of the hazardous properties of chemicals and the use of Material Safety Data Sheets (MSDS).
  - C5.3 Practice procedures for maintaining inventories, requisitioning equipment and tools, and storing and restocking supplies.
  - C5.4 Understand the relationship between facilities management and profit and loss, including the costs of resource consumption, breakage, theft, supplies use, and decisions for repairs or replacement.
  - C5.5 Analyze work to be completed, prioritize tasks, and prepare a schedule to meet facility and personnel needs within an allotted budget.
  - C5.6 Understand how essential departments in a hospitality, tourism, and recreation business contribute to economic success.
- C6.0 Implement procedures for common types of financial transactions.
    - C6.1 Apply procedures for handling cash transactions, such as balancing cash, handling cash control, converting currency, and identifying counterfeit currency.
    - C6.2 Apply the procedures for handling noncash transactions: credit cards, debit cards, ATM cards, money orders, personal checks, coupons, discounts, and online transactions.
    - C6.3 Conduct all financial transactions in an accurate, professional, and ethical manner.
    - C6.4 Produce a product that identifies and explains the impact of identity theft on the hospitality, tourism, and recreation industry.
- C7.0 Demonstrate an understanding of the essential aspects of the lodging industry.
    - C7.1 Distinguish between the segments of the lodging industry, such as motels, limited service, full service resorts, all suites, extended-stay hotels, convention hotels, boutique hotels, and bed and breakfast facilities.
    - C7.2 Differentiate the required duties of various positions, including those of front desk and other service providers in relation to the functions of the business: checking guests in and out, greeting, assessing needs, delivering services, and closing the transaction.
    - C7.3 Understand the internal hierarchy and departmental interrelationships of lodging establishments.
    - C7.4 Compare the types of food service offered at various lodging facilities.
- C8.0 Interpret the basics of global and domestic physical and cultural geography in relation to the hospitality, tourism, and recreation industry.
    - C8.1 Understand fundamental ways in which physical geography, culture, and politics, affect local economies and world travel and tourism.
    - C8.2 Create a product using types of basic information that international travelers need, including physical geography, time zones, International Date Line, rights and responsibilities, laws, insurance, emergency services, and customs.



- C9.0 Apply the basic processes of making reservations, ticketing, and developing travel itineraries.
  - C9.1 Interpret the costs and other travel considerations involved in creating itineraries to meet client needs, including types of travel, types of fares, basic fare codes, costs, penalty charges, and types of accommodations.
  - C9.2 Evaluate important travel information, including insurance needs, vehicle rentals, passports, visas, and health documents, as well as how to plan specialty tour packages to fit client needs.
  - C9.3 Classify the characteristics and configurations of common air and rail carriers, cruise ships, and attractions, including the most frequently used codes and terminology for ports of travel.
  - C9.4 Understand the basic purpose, function, and operation of various travel systems and authorities, including the Airline Reporting Corporation, the Federal Aviation Administration, the major centralized reservation systems, and the Computerized Reservation System.
  - C9.5 Research the role and importance of online reservation services to marketing and profitability.
  
- C10.0 Explain the fundamental purpose and basic organizational structure of a variety of theme parks, attractions, and exhibitions.
  - C10.1 Understand how the various internal departments of theme parks, attractions, or exhibitions interrelate and support each other.
  - C10.2 Understand the internal hierarchy and departmental relationships of theme parks, attractions, or exhibitions.
  - C10.3 Analyze the ways in which the purposes of various industries; entertainment, education, and community relations affect their financial structure.
  - C10.4 Compare the purposes, implications, and strategies of special promotions, such as season passes, multiple-day visits, retail items, and discount coupons.
  
- C11.0 Illustrate the fundamentals of planning events for a diverse clientele.
  - C11.1 Explain the purposes and target audiences of various venues.
  - C11.2 Demonstrate the essential procedures for planning, promoting, publicizing, coordinating, and evaluating a program or event.
  - C11.3 Understand how to establish business relationships with a variety of locations, food suppliers, and other vendors.
  - C11.4 Demonstrate procedures for setting up facilities, equipment, and supplies
  - C11.5 Develop schedules, registration tools, event materials, and programs.
  - C11.6 Plan special events (e.g., meetings, trade shows, fairs, conferences) based on specific themes, budgets, agendas, space and security needs, and itineraries.

- C12.0 Demonstrate an understanding of the value of recreation and the fundamentals of recreational facilities and services.
- C12.1 Recognize the variety of parklands, wilderness areas, and waterways available for recreation.
- C12.2 Explain the outdoor recreational opportunities that promote physical and mental health.
- C12.3 Understand how the needs of various clients may be met through appropriate outdoor recreational activities, outdoor experiences, special tours, and environmentally responsible education.
- C12.4 Evaluate the requirements of outdoor recreational businesses, including benefits, risks, required skills, and costs.
- C12.5 Explore the departments, functions, and restrictions of public and private parks and recreational facilities and the outdoor recreational programs they offer.
- C12.6 Create a product describing the types of insurance, licenses, and permits needed for the operation and management of various popular outdoor activities.

## Academic Alignment Matrix

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
<b>ENGLISH LANGUAGE ARTS</b>			
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0

HOSPITALITY, TOURISM, AND RECREATION	PATHWAYS		
	A. Food Science, Dietetics and Nutrition	B. Food Service and Hospitality	C. Hospitality, Tourism and Recreation
<b>Reading Standards for Information Text – RSIT (Standard Area, Grade Level, Standard #)</b>			
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST(Standard Area, Grade Level, Standard #)</b>			
11-12.1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes to any gaps or inconsistencies in the account.	A1.0, A4.0, A8.0, A9.0		
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A2.0, A3.0, A4.0, A5.0, A8.0, A9.0	B2.0, B3.0, B5.0, B6.0, B7.0, B9.0, B10.0, B11.0, B12.0	C1.0, C4.0, C5.0, C6.0, C9.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A2.0, A3.0, A4.0, A5.0, A8.0, A9.0	B2.0, B3.0, B5.0, B6.0, B7.0, B9.0, B10.0, B11.0, B12.0	C1.0, C4.0, C5.0, C6.0, C9.0
11-12.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	A8.0, A9.0		
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
11-12.3 Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.	A1.0, A2.0, A3.0, A5.0, A6.0,A7.0, A9.0, A10.0	B1.0, B3.0, B4.0, B5.0, B10.0, B12.0	C1.0, C2.0, C4.0, C5.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C3.0, C6.0, C8.0, C9.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A4.0, A5.0, A8.0, A9.0	B6.0, B7.0	C3.0, C6.0, C8.0, C9.0, C11.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0		
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A4.0, A5.0, A6.0, A8.0, A9.0, A10.0	B1.0, B4.0, B12.0	C1.0, C3.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments focused on discipline-specific content.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A4.0, A5.0, A8.0, A9.0	B6.0, B7.0	C3.0, C6.0, C8.0, C9.0, C11.0

HOSPITALITY, TOURISM, AND RECREATION	PATHWAYS		
	A. Food Science, Dietetics and Nutrition	B. Food Service and Hospitality	C. Hospitality, Tourism and Recreation
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0		
11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.	A1.0, A2.0, A4.0, A5.0, A6.0, A8.0, A9.0	B1.0, B4.0, B12.0	C1.0, C3.0, C8.0, C9.0, C10.0, C11.0, C12.0
11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
<b>MATHEMATICS</b>			
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>			
<i>Interpret the structure of expressions</i>			
1. Interpret expressions that represent a quantity in terms of its context. <p>a. Interpret parts of an expression, such as terms, factors, and coefficients.</p> <p>b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret <math>P(1+r)^t</math> as the product of P and a factor not depending on P.</p>	A4.0	B10.0, B11.0	
<b>Algebra – A-CED – Creating Equations</b>			
<i>Create equations that describe numbers or relationships</i>			



HOSPITALITY, TOURISM, AND RECREATION	PATHWAYS		
	A. Food Science, Dietetics and Nutrition	B. Food Service and Hospitality	C. Hospitality, Tourism and Recreation
<p>1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.</p> <p>1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)</p>	A4.0	B5.0	C5.0
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A4.0	B5.0, B11.0, B12.0	C5.0
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A4.0	B4.0, B5.0, B6.0, B7.0	C5.0
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .	A4.0	B11.0	
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>			
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>			
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	A4.0	B5.0	C4.0
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A4.0, A5.0	B4.0, B5.0, B6.0, B7.0, B9.0	C5.0, C6.0, C7.0, C9.0, C11.0, C12.0
<i>Solve equations and inequalities in one variable</i>			

HOSPITALITY, TOURISM, AND RECREATION	PATHWAYS		
	A. Food Science, Dietetics and Nutrition	B. Food Service and Hospitality	C. Hospitality, Tourism and Recreation
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.  3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)		B10.0, B11.0, B12.0	
<i>Solve systems of equations</i>			
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.		B5.0	C4.0, C5.0
<b>Functions – F-IF – Interpreting Functions</b>			
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A1.0, A4.0, A10.0	B1.0, B4.0, B5.0, B11.0, B12.0	C1.0, C4.0, C5.0, C8.0, C10.0
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A1.0, A4.0, A10.0	B1.0, B4.0, B5.0, 11.0, B12.0	C1.0, C4.0, C5.0, C8.0, C9.0, C10.0
<b>Geometry – G-CO – Congruence</b>			
<i>Make geometric constructions</i>			
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.		B6.0, B7.0	

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
<b>Geometry – G-MG – Modeling with Geometry</b>			
<i>Apply geometric concepts in modeling situations</i>			
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).		B6.0, B7.0	
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A5.0		
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)		B6.0, B7.0	
<b>Geometry – N-Q – Quantities</b>			
<i>Reason quantitatively and use units to solve problems</i>			
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A5.0	B4.0	C1.0
2. Define appropriate quantities for the purpose of descriptive modeling.	A1.0	B1.0, B4.0	C1.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A5.0	B4.0	
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>			
<i>Understand and evaluate random processes underlying statistical experiments</i>			
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A1.0, A5.0, A6.0, A9.0	B1.0, B4.0	C1.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>			
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A9.0	B4.0	C8.0
6. Evaluate reports based on data.	A1.0, A6.0, A9.0	B1.0	C1.0, C8.0, C9.0, C10.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>			
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A8.0	B9.0	C4.0, C6.0
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>			
<i>Understand independence and conditional probability and use them to interpret data</i>			
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.			C9.0
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.	A4.0, A6.0		

HOSPITALITY, TOURISM, AND RECREATION	PATHWAYS		
	A. Food Science, Dietetics and Nutrition	B. Food Service and Hospitality	C. Hospitality, Tourism and Recreation
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>			
<i>Use probability to evaluate outcomes of decisions</i>			
<p>5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.</p> <p>a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.</p> <p>b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.</p>		B10.0, B11.0	C8.0, C9.0
<b>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</b>			
10.0 Students know the definitions of the mean, median, and mode of distribution of data and can compute each of them in particular situations.	A1.0, A5.0, A6.0, A9.0, A10.0	B1.0, B11.0	C4.0, C8.0
<b>SCIENCE</b>			
<b>Scientific and Engineering Practices – SEP</b>			
1. Asking questions (for science) and defining problems (for engineering)	A8.0, A9.0		
2. Developing and using models	A8.0, A9.0		
3. Planning and carrying out investigations	A8.0, A9.0		
4. Analyzing and interpreting data	A8.0, A9.0		
5. Using mathematics and computational thinking	A8.0, A9.0		

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
6. Constructing explanations (for science) and designing solutions (for engineering)	A8.0, A9.0		
7. Engaging in argument from evidence	A8.0, A9.0		
8. Obtaining, evaluating, and communicating information	A8.0, A9.0		
<b>Crosscutting Concept – CC</b>			
1. Patterns		B5.0, B6.0, B7.0	
3. Scale, proportion, and quantity	A8.0, A9.0	B6.0, B7.0	
6. Structure and function	A8.0, A9.0	B6.0, B7.0	
7. Stability and change	A8.0, A9.0	B6.0, B7.0	
<b>Physical Sciences – PS</b>			
PS1: Matter and Its Interactions			
PS1.A: Structure and Properties of Matter	A8.0, A9.0	B6.0, B7.0, B10.0	C5.0
PS1.B: Chemical Reactions	A4.0, A5.0, A8.0, A9.0	B3.0, B6.0, B7.0	
PS2: Motion and Stability: Forces and Interactions			
PS2.C: Stability and Instability in Physical Systems		B7.0	
PS3: Energy			
PS3.A: Definitions of Energy	A8.0		
PS3.B: Conservation of Energy and Energy Transfer	A3.0, A8.0		

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
PS3.C: Relationship Between Energy and Forces	A8.0		
PS3.D: Energy in Chemical Processes and Everyday Life	A1.0, A4.0, A5.0, A8.0	B1.0, B3.0, B9.0	
<b>Life Sciences – LS</b>			
LS1: From Molecules to Organisms: Structures and Processes			
LS1.A: Structure and Function	A1.0, A8.0, A9.0		
LS1.B: Growth and Development of Organisms	A3.0, A8.0, A9.0	B3.0, B6.0, B7.0	
LS1.D: Information Processing	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0, A9.0, A10.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0, B11.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0, C12.0
LS2: Ecosystems: Interactions, Energy, and Dynamics			
LS2.A: Interdependent Relationships in Ecosystems	A5.0		
LS3: Heredity: Inheritance and Variation of Traits			
LS3.B: Variation of Traits	A9.0		
<b>Earth and Space Sciences – ESS</b>			
ESS3: Earth and Human Activity			
ESS3.A: Natural Resources	A3.0, A9.0	B2.0, B3.0, B11.0	C2.0, C8.0, C11.0
ESS3.B: Natural Hazards			
ESS3.C: Human Impacts on Earth Systems			

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
ESS3.D: Global Climate Change			
<b>HISTORY/SOCIAL SCIENCE</b>			
<b>Principles of American Democracy and Economics – AD</b>			
12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their interdependence, and the meaning and importance of those values and principles for a free society.			
12.3.1. Explain how civil society provides opportunities for individuals to associate for social, cultural, religious, economic, and political purposes.	A2.0	B1.0, B8.0	C2.0, C8.0, C12.0
<b>Principles of Economics – PE</b>			
12.1 Students understand common economic terms and concepts and economic reasoning.	A1.0	B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.1.1. Examine the causal relationship between scarcity and the need for choices.	A1.0	B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.	A1.0	B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.2 Students analyze the elements of America's market economy in a global setting.	A1.0	B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.2.2. Discuss the effects of changes in supply and or demand on the relative scarcity, price, and quantity of particular products.	A1.0	B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.2.4. Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.		B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.2.5. Understand the process by which competition among buyers and sellers determines a market price.		B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.2.6. Describe the effect of price controls on buyers and sellers.		B1.0, B11.0, B12.0	C1.0, C4.0, C8.0



<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.		B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.2.10. Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.		B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.3 Students analyze the influence of the federal government on the American economy.			
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.	A1.0, A10.0	B1.0, B11.0, B12.0	C1.0, C4.0, C8.0
12.3.3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.	A2.0		
12.4 Students analyze the elements of the U.S. labor market in a global setting.			
12.4.1. Understand the operations of the labor market, including the circumstances surrounding the establishment of principal American labor unions, procedures that unions use to gain benefits for their members, the effects of unionization, the mini-mum wage, and unemployment insurance.	A2.0	B2.0, B4.0, B5.0, B8.0, B9.0	C2.0, C3.0, C7.0
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.	A1.0, A2.0, A10.0	B2.0, B4.0, B5.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C7.0, C9.0, C11.0, C12.0
12.4.3. Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.	A2.0	B2.0, B4.0, B5.0, B8.0, B9.0	C2.0
12.4.4. Explain the effects of international mobility of capital and labor on the U.S. economy.	A2.0	B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.	C2.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
12.5 Students analyze the aggregate economic behavior of the U.S. economy.			
12.5.1. Distinguish between nominal and real data.	A3.0, A4.0		
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.		B1.0	
12.6.3. Understand the changing role of international political borders and territorial sovereignty in a global economy.			C1.0
12.6.4. Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.			C1.0
<b>U.S. History and Geography – US</b>			
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.			
11.2.1. Know the effects of industrialization on living and working conditions, including the portrayal of working conditions and food safety in Upton Sinclair's <i>The Jungle</i>	A3.0, A8.0	B1.0, B2.0, B3.0, B6.0, B7.0	
11.2.2. Describe the changing landscape, including the growth of cities linked by industry and trade, and the development of cities divided according to race, ethnicity, and class.			C1.0
11.2.5. Describe the reciprocity between rights and obligations; that is, why enjoyment of one's rights entails respect for the rights of others.		B1.0	
11.2.6. Trace the economic development of the United States and its emergence as a major industrial power, including its gains from trade and the advantages of its physical geography.	A1.0		

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.			
11.5.7. Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.	A4.0	B1.0, B5.0, B12.0	C1.0, C4.0, C5.0, C6.0
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.			
11.6.3 Discuss the human toll of the Depression, natural disasters, and unwise agricultural practices and their effects on the depopulation of rural regions and on political movements of the left and right, with particular attention to the Dust Bowl refugees and their social and economic impacts in California.	A4.0, A5.0, A6.0, A7.0	B1.0, B5.0, B11.0	C1.0, C8.0
11.8 Students analyze the economic boom and social transformation of post-World War II America.			
11.8.1. Trace the growth of service sector, white collar, and professional sector jobs in business and government.	A1.0, A7.0	B4.0, B8.0, B12.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C11.0
11.8.2 Describe the significance of Mexican immigration and its relationship to the agricultural economy, especially in California.	A2.0	B1.0, B4.0	C1.0, C2.0, C8.0
11.8.6. Discuss the diverse environmental regions of North America, their relationship to local economies, and the origins and prospects of environmental problems in those regions.	A1.0, A9.0	B1.0, B5.0	C1.0
11.8.7. Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural Technology.	A8.0, A9.0, A10.0	B1.0, B9.0, B12.0	C1.0, C9.0
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.	A2.0, A6.0	B1.0	C1.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
11.11.3. Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.	A2.0	B1.0	C1.0
11.11.5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.			C10.0, C12.0
11.11.6. Analyze the persistence of poverty and how different analyses of this issue influence welfare reform, health insurance reform, and other social policies.	A6.0		
11.11.7. Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.	A1.0, A2.0, A6.0, A7.0	B1.0, B4.0	C8.0
<b>World History, Culture, and Geography – WH</b>			
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.			
10.3.2. Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).	A8.0	B1.0	
10.3.3. Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.	A4.0		
10.3.4. Trace the evolution of work and labor, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.	A2.9	B5.0	C2.0
10.3.5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.	A1.0, A7.0	B1.0	C5.0
10.3.6. Analyze the emergence of capitalism as a dominant economic pattern and the responses to it, including Utopianism, Social Democracy, Socialism, and Communism.		B11.0, B12.0	C1.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
10.6 Students analyze the effects of the First World War.			
10.6.2. Describe the effects of the war and resulting peace treaties on population movement, the international economy, and shifts in the geographic and political borders of Europe and the Middle East.			C1.0, C3.0, C8.0, C9.0, C11.0
10.10 Students analyze instances of nation-building in the contemporary world in at least two of the following regions or countries: the Middle East, Africa, Mexico and other parts of Latin America, and China.			
10.10.1. Understand the challenges in the regions, including their geopolitical, cultural, military, and economic significance and the international relationships in which they are involved.			C1.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0
10.10.2. Describe the recent history of the regions, including political divisions and systems, key leaders, religious issues, natural features, resources, and population patterns.			C1.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0
10.10.3. Discuss the important trends in the regions today and whether they appear to serve the cause of individual freedom and democracy.			C1.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0	B1.0	C1.0
<b>Chronological and Spatial Reasoning – CSR</b>			
2. Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.	A8.0	B4.0	C1.0, C3.0

<b>HOSPITALITY, TOURISM, AND RECREATION</b>	<b>PATHWAYS</b>		
	<b>A. Food Science, Dietetics and Nutrition</b>	<b>B. Food Service and Hospitality</b>	<b>C. Hospitality, Tourism and Recreation</b>
3. Students use a variety of maps and documents to interpret human movement, including major patterns of domestic and international migration, changing environmental preferences and settlement patterns, the frictions that develop between population groups and the diffusion of ideas, technological innovations, and goods.		B1.0	C1.0
4. Students relate current events to the physical and human characteristics of places and regions.		B1.0, B2.0	C10.0, C11.0, C12.0

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Hospitality, Tourism, and Recreation**

Bob Heuvel, Administrator, California Department of Education  
Tanya Wright, Education Consultant, California Department of Education

#### *Standards Review Team*

Liz Aschenbrenner, Instructor, Manteca Unified School District  
John Britto, Chef, Pretty Food  
Sandy Coulter, Instructor, San Juan Unified School District  
Robert Hartman, Program Coordinator, California State University, Pomona  
Kuulei Moreno, Instructor, Wheatland High School

#### *Standards Writing Team*

Carol Bertotto, Instructor, Rialto Unified School District  
Sherry D. Davis, NCEA Certified and Master Esthetician and Instructor, Golden  
West College  
Kelly Villarreal, Instructor, Santa Clara Unified School District

#### *Common Core Alignment Team*

Liz Aschenbrenner, Instructor, Manteca Unified School District  
Carol Bertotto, Instructor, Rialto Unified School District  
Monte Ekott, Instructor, Norwalk–La Mirada Unified School District  
Elizabeth Gonzalez, Instructor, Norwalk–La Mirada Unified School District  
James Maynard, Instructor, Norwalk–La Mirada Unified School District  
John Noonan, Instructor, Coachella Valley Unified School District  
Scott Tarlton, Instructor, Westminster High School  
Kelly Villarreal, Instructor, Santa Clara Unified School District  
Mark Viss, Instructor, Modesto City Schools  
Darrel Wildt, Instructor, San Joaquin County Office of Education

### **References**

Academy of Nutrition and Dietetics. 2012. <http://www.eatright.org/public/> (accessed December 21, 2012).

American Culinary Federation. 2008. <http://www.acfchefs.org/> (accessed December 21, 2012).

- American Hotel and Lodging Educational Institute. 2012. <http://www.ahlei.org/> (accessed December 21, 2012).
- California Community Colleges. 2011. "Family and Consumer Sciences." <http://www.cccfcs.com/> (accessed December 21, 2012).
- California Restaurant Association. 2012. <http://www.calrest.org/> (accessed December 21, 2012).
- California Travel Industry Association. 2012. <http://www.caltia.com/> (accessed December 21, 2012).
- Institute of Food Technologies. 2011. <http://www.ift.org/> (accessed December 21, 2012).
- International Council on Hotel, Restaurant, and Institutional Education. <http://www.chrie.org/> (accessed December 21, 2012).
- International Trade Administration, Office of Travel and Tourism Industries. 2011. <http://tinet.ita.doc.gov/> (accessed December 21, 2012).
- National Association of State Directors of Career Technical Education Consortium (NASDCTEc). 2012. <http://www.careertech.org/> (accessed December 21, 2012).
- National Recreation and Park Association. 2012. <http://www.nrpa.org/> (December 21, 2012)
- National Restaurant Association. 2012. <http://www.restaurant.org/> (accessed December 21, 2012).
- Research Chefs Association. 2011. <http://www.researchchefs.org/> (accessed December 21, 2012).
- School Nutrition Association. 2012. <http://www.asfsa.org/> (accessed December 21, 2012).
- Society for Nutrition Education and Behavior. 2012. <http://www.sne.org/> (accessed December 21, 2012).



## Table of Contents

### Information and Communication Technologies

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	4
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	5
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	6
11.0 Demonstration and Application.....	6
Pathway Standards.....	8
A. Information Support and Services Pathway .....	8
B. Networking Pathway .....	11
C. Software and Systems Development Pathway.....	14
D. Games and Simulation Pathway .....	18
Academic Alignment Matrix.....	21
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>
References .....	36



# Information and Communication Technologies

## *Sector Description*

Information and Communication Technologies (ICT) have expanded the need for employees who can understand, manage, and support all rapidly emerging, evolving, and converging computer, software, networking, telecommunications, Internet, programming, and information systems. Essential skills for careers in the ICT sector include understanding systems that support the management and flow of data, the ability to work well and communicate clearly with people, and the ability to manage projects efficiently. The ICT sector meets national criteria for high demand, high wages, and high skills and provides students with excellent opportunities for interesting work and good pay. More than 70 percent of jobs in this sector will require a bachelor's degree or higher by 2018.

## **Information and Communication Technologies Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Information and Communication Technologies academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Information and Communication Technologies sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

(Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.
- 2.7 Use technical writing and communication skills to work effectively with diverse groups of people.
- 2.8 Understand the principles of a customer-oriented service approach to users.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

(Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.

- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the Information and Communication Technologies sector workplace environment.

(Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ technology based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Information and Communication Technologies sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.
- 5.5 Use a logical and structured approach to isolate and identify the source of problems and to resolve problems.
- 5.6 Know the available resources for identifying and resolving problems.
- 5.7 Work out problems iteratively and recursively.
- 5.8 Create and use algorithms and solve problems.

- 5.9 Deconstruct large problems into components to solve.
- 5.10 Use multiple layers of abstraction.
- 5.11 Understand the concept of base systems, including binary and hexadecimal.
- 5.12 Apply the concepts of Boolean logic to decision making and searching.

## **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Information and Communication Technologies sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).
- 6.8 Maintain a safe and healthful working environment.
- 6.9 Dispose of e-waste properly, understanding the health, environmental, and legal risks of improper disposal.
- 6.10 Act conscientiously regarding the use of natural resources (e.g., paper, ink, etc.)
- 6.11 Conserve energy while computing (e.g., turn off equipment at night, power-saving settings, etc.)

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Information and Communication Technologies sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.

- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Information and Communication Technologies sector.

### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Information and Communication Technologies industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Information and Communication Technologies sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Information and Communication Technologies sector laws and practices.
- 8.8 Identify legal and ethical issues that have proliferated with increased technology adoption, including hacking, scamming, and breach of privacy.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution such as those practiced in the Future Business Leaders of America and SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.

- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Information and Communication Technologies sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Information and Communication Technologies sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Information and Communication Technologies sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Information and Communication Technologies sector.
- 10.3 Construct projects and products specific to the Information and Communication Technologies sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Understand the major software and hardware components of a computer and a network and how they relate to each other.
- 10.6 Understand data sizes of various types of information (text, pictures, sound, video, etc.) and data capacity of various forms of media.
- 10.7 Understand the SI (metric) prefixes commonly used in computing including, at least, kilo, mega, giga, and tera.
- 10.8 Understand security concepts including authorization, rights, and encryption.
- 10.9 Use common industry-standard software and their applications including word processing, spreadsheets, databases, and multimedia software.
- 10.10 Manage files in a hierarchical system.
- 10.11 Know multiple ways in which to transfer information and resources (e.g., text, data, sound, video, still images) between software programs and systems.
- 10.12 Know appropriate search procedures for different types of information, sources, and queries.
- 10.13 Evaluate the accuracy, relevance, and comprehensiveness of retrieved information.
- 10.14 Analyze the effectiveness of online information resources to support collaborative tasks, research, publications, communications, and increased productivity.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Information and Communication Technologies anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through career technical student organizations such as Future Business Leaders of America and SkillsUSA.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Information and Communication Technologies sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Information and Communication Technologies sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.



## **Information and Communication Technologies Pathway Standards**

### **A. Information Support and Services Pathway**

Students in the Information Support and Services pathway prepare for careers that involve the implementation of computer services and software, support of multimedia products and services, provision of technical assistance, creation of technical documentation, and the administration and management of information and communication systems. Mastery of information and communication technologies is the foundation for all successful business organizations today. Persons with expertise in information and communication technologies support and services are in high demand for a variety of positions in business and industry.

Sample occupations associated with this pathway:

- ◆ Computer and Information Systems Manager
- ◆ Computer User Support Specialist
- ◆ Database Administrator
- ◆ Document Management Specialist
- ◆ Business Intelligence Analyst

A1.0 Describe the role of information and communication technologies in organizations.

A1.1 Describe how technology is integrated into business processes.

A1.2 Identify common organizational, technical, and financial risks associated with the implementation and use of information and communication systems.

A1.3 Model business processes using tools such as organization charts, flowcharts, and timelines.

A1.4 Analyze and design business processes in a cycle of continual improvement.

A2.0 Acquire, install, and implement software and systems.

A2.1 Identify and list the criteria and processes for evaluating the functions of information systems.

A2.2 Investigate, evaluate, select, and use major types of software, services, and vendors.

A2.3 Install software and setup hardware.

A2.4 Define and use appropriate naming conventions and file management strategies.

- A3.0 Access and transmit information in a networked environment.
  - A3.1 Identify and apply multiple ways to transfer information and resources (e.g., text, data, audio, video, still images) between software programs and systems.
  - A3.2 Validate and cite Internet resources.
  - A3.3 Recognize where processes are running in a networked environment (e.g., client access, remote access).
  - A3.4 Identify and describe the layered nature of computing and networking such as the Open Systems Interconnect (OSI) model.
  - A3.5 Use multiple online search techniques and resources to acquire information.
  - A3.6 Describe and contrast the differences between various Internet protocols: hypertext transfer protocol (http), hypertext transfer protocol secure (https), file transfer protocol (ftp), simple mail transfer protocol (smtp).
  
- A4.0 Administer and maintain software and systems.
  - A4.1 Use different systems and associated utilities to perform such functions as file management, backup and recovery, and execution of programs.
  - A4.2 Use a command line interface.
  - A4.3 Automate common tasks using macros or scripting.
  - A4.4 Evaluate the systems-development life cycle and develop appropriate plans to maintain a given system after assessing its impact on resources and total cost of ownership (TCO).
  
- A5.0 Identify requirements for maintaining secure network systems.
  - A5.1 Follow laws, regulatory guidelines, policies, and procedures to ensure the security and integrity of information systems.
  - A5.2 Identify potential attack vectors and security threats.
  - A5.3 Take preventative measures to reduce security risks (e.g., strong passwords, avoid social engineering ploys, limit account permissions).
  - A5.4 Use security software and hardware to protect systems from attack and alert of potential threats, anti-malware software, and firewalls.
  
- A6.0 Diagnose and solve software, hardware, networking, and security problems.
  - A6.1 Use available resources to identify and resolve problems using knowledge bases, forums, and manuals.
  - A6.2 Use a logical and structured approach to isolate and identify the source of problems and to resolve problems.
  - A6.3 Use specific problem solving strategies appropriate to troubleshooting, eliminating possibilities, or guess and check.
  - A6.4 Evaluate support needs for different data and systems configurations.

- A6.5 Evaluate solution methods recognizing the trade-offs of troubleshooting vs. reloading, reimaging, or restoring to factory defaults using a sandbox environment.
  - A6.6 Distinguish types of symptoms and which component's issue could exhibit those symptoms: the user, hardware, network, or software.
  - A6.7 Diagram the underlying processes of a system that are likely involved in a problem.
- A7.0 Support and train users on various software, hardware, and network systems.
- A7.1 Recognize the scope of duties ICT support staff have and tiered levels of support.
  - A7.2 Describe and apply the principles of a customer-oriented service approach to supporting users.
  - A7.3 Use technical writing and communication skills to work effectively with diverse groups of people, including users with less technical abilities.
  - A7.4 Document technical support provided such as using a ticketing system.
  - A7.5 Train users to assist them in being self-supporting: formal classes, one-on-one interactions, and process and how-to guides.
- A8.0 Manage and implement information, technology, and communication projects.
- A8.1 Develop the purpose and scope of a project.
  - A8.2 Acquire, use, and manage necessary internal and external resources when supporting various organizational systems.
  - A8.3 Use various tools to manage projects involving the development of information and communication systems.
  - A8.4 Analyze business problems by using functional and cost-benefit perspectives.
  - A8.5 Design, develop, implement, and monitor a project by creating and integrating technologies.
  - A8.6 Use a systematic method of continual improvement; plan, do, check, act (PDCA), total quality (TQ), or Six Sigma.

## **Information and Communication Technologies Pathway Standards**

### **B. Networking Pathway**

Students in the Networking pathway prepare for careers that involve network analysis, planning, and implementation, including the design, installation, maintenance, and management of network systems. The successful establishment, maintenance, and securing of information and communication technologies infrastructure is critical to the success of every twenty-first century organization. Employment continues to grow for persons with expertise in networking.

Sample occupations associated with this pathway:

- ◆ Computer Security Specialist
- ◆ Network Technician
- ◆ Network Engineer
- ◆ Network Administrator
- ◆ Telecommunication Specialist

- B1.0 Identify and describe the principles of networking and the technologies, models, and protocols used in a network.
- B1.1 Define the terminology used in the design, assembly, configuration, and implementation of networks.
  - B1.2 List the fundamental elements of the major networking models established by the industry standards of recognized organizations: the Open System Interconnect (OSI) or transmission-control/Internet protocol (TCP/IP) models.
  - B1.3 Identify and explain how data, voice, and video/communications are carried through the most common network media.
  - B1.4 List the characteristics, advantages, and disadvantages of the various networking presentation functions, data formatting, data encryption, and data compression.
  - B1.5 Explain the characteristics of networking hardware and applications and the methods to deploy them.
  - B1.6 Design and document data/communication systems networks.
- B2.0 Identify, describe, and implement network media and physical topologies.
- B2.1 Use appropriate wiring and wireless standards and plan, install, and maintain media (copper, fiber, and wireless) for a variety of network systems.
  - B2.2 Demonstrate standard procedures and practices for safely using tools and working safely around the electrical environment in various networking systems.

- B2.3 Test and maintain wired and wireless network communications components and systems.
- B3.0 Install, configure, and differentiate between common network devices.
  - B3.1 Identify and describe the functions of various network devices, including network connectivity hardware.
  - B3.2 Describe the differences between various network environments: peer-to-peer, client-server, thin client, virtualized, internetworks, intranets, and extranets.
  - B3.3 Distinguish between the topologies and protocols of local area networks and those of wide area networks.
  - B3.4 Confirm operating parameters, apply test procedures, make necessary adjustments, and assemble the components of a network system or subsystem.
  - B3.5 Configure the major addressing and routing protocols used in networking.
  - B3.6 Implement a functional wired and wireless network, including the installation and configuration of components, software, and plug-ins.
  - B3.7 Evaluate, select, and deploy a variety of network architectures, information and communication technologies, and protocols.
- B4.0 Demonstrate proper network administration and management skills.
  - B4.1 Identify and use network tools to troubleshoot and verify network availability and performance.
  - B4.2 Identify common customer policies and procedures, including those for management of incidents.
  - B4.3 Identify the implications of major protocols and international standards and their impact on network management.
  - B4.4 Apply appropriate technologies to improve network performance for data, voice, and video transmission.
  - B4.5 Apply the proper security patches, updates, and procedures necessary to maintain and support a network.
  - B4.6 Use common help-desk tools and resources, such as incident tracking, knowledge database, and staffing to administer and manage a network.
  - B4.7 Apply known effective methods of disseminating information and instruction to users.
  - B4.8 Use project management skills and tools for managing and maintaining various types of networks.
  - B4.9 Analyze network system interdependencies and constraints.

- B5.0 Demonstrate how to communicate and interpret information clearly in industry-standard visual and written formats.
  - B5.1 Classify and use various electronic components, symbols, abbreviations, and media common to network topology diagrams.
  - B5.2 Interpret, organize, and communicate complex network diagrams by using information collected from detailed drawings.
  
- B6.0 Use and assess network communication applications and infrastructure.
  - B6.1 Identify and document the appropriate uses of networking services, products, and applications.
  - B6.2 Evaluate the features of communications software products in terms of their appropriateness to organizational tasks.
  - B6.3 Configure compatible systems across various platforms and types of media.
  
- B7.0 Analyze a customer's organizational needs and requirements to identify networking needs.
  - B7.1 Describe the effective management of human, financial, and communications resources from the standpoints of the user and the provider.
  - B7.2 Diagram physical and logical layouts of networks that support information and communication technologies.
  - B7.3 Evaluate emerging products, services, and business models in relation to the creation, setup, and management of networks that support information and communication technologies.
  - B7.4 Evaluate, create, and process voice, video, and data transmissions.
  
- B8.0 Identify security threats to a network and describe general methods to mitigate those threats.
  - B8.1 Identify and define common network security threats: hackers, crackers, viruses, worms, and Trojan horses.
  - B8.2 Describe the importance of classifying appropriate monitoring devices and procedures for quick identification and prevention of security violations.
  - B8.3 List the policies and procedures for routine administration, such as user agreement, incident reporting, and recovery for users.
  - B8.4 Identify common potential risks and entrance points, including internal and external risks, and the tools used to neutralize them: firewalls; monitoring; and antivirus, spyware, and spam protection.
  - B8.5 Identify and apply common techniques for disaster prevention and recovery.

## Information and Communication Technologies Pathway Standards

### C. Software and Systems Development Pathway

Students in the Software and Systems Development pathway prepare for careers related to computer science that involve the design, development, implementation, maintenance, and management of systems that rely on software programs to satisfy the operational needs of modern business organizations. Persons with expertise in systems development and programming are critical to support operations like electronic commerce, medical records management, retail sales and inventory management, digital entertainment, and use of energy.

Sample occupations associated with this pathway:

- ◆ Computer Programmer
- ◆ Software Developer/Applications
- ◆ Information Security Analyst
- ◆ Web Developer
- ◆ E-Business/E-Commerce Specialist

C1.0 Identify and apply the systems development process.

- C1.1 Identify the phases of the systems development life cycle, including analysis, design, programming, testing, implementation, maintenance, and improvement.
- C1.2 Identify and describe models of systems development, systems development life cycle (SDLC), and agile computing.
- C1.3 Identify and describe how specifications and requirements are developed for new and existing software applications.
- C1.4 Work as a member of, and within the scope and boundaries of, a development project team.
- C1.5 Track development project milestones using the concept of versions.
- C1.6 Diagram processes using flowcharts and the Unified Modeling Language.

C2.0 Define and analyze systems and software requirements.

- C2.1 Describe the major purposes and benefits of development, including automation, improving productivity, modeling and analysis, and entertainment.
- C2.2 Recognize and prevent unintended consequences of development work: programming errors, security issues, health and environmental risks, and privacy concerns.
- C2.3 Develop strategies that target the specific needs and desires of the customer.
- C2.4 Analyze customers' needs for development.

- C2.5 Determine and document the requirements and alternative solutions to fulfill the customers' needs.
- C3.0 Create effective interfaces between humans and technology.
  - C3.1 Describe and apply the basic process of input, processing, and output.
  - C3.2 Design effective and intuitive interfaces using knowledge of cognitive, physical, and social interactions.
  - C3.3 Support methods of accessibility for all potential users, including users with disabilities and non-English speaking users.
- C4.0 Develop software using programming languages.
  - C4.1 Identify and describe the abstraction level of programming languages from low-level, hardware-based languages to high-level, interpreted, Web-based languages.
  - C4.2 Describe the interaction and integration of programming languages and protocols such as how client-side programming can work with server-side programming to use a query language to access a database.
  - C4.3 Identify and use different authoring tools and integrated development environments (IDEs).
  - C4.4 Identify and apply data types and encoding.
  - C4.5 Demonstrate awareness of various programming paradigms, including procedural, object oriented, event-driven, and multithreaded programming.
  - C4.6 Use proper programming language syntax.
  - C4.7 Use various data structures, arrays, objects, files, and databases.
  - C4.8 Use object oriented programming concepts, properties, methods, and inheritance.
  - C4.9 Create programs using control structures, procedures, functions, parameters, variables, error recovery, and recursion.
  - C4.10 Create and know the comparative advantages of various queue, sorting, and searching algorithms.
  - C4.11 Document development work for various audiences, such as comments for other programmers, and manuals for users.
- C5.0 Test, debug, and improve software development work.
  - C5.1 Identify the characteristics of reliable, effective, and efficient products.
  - C5.2 Describe the ways in which specification changes and technological advances can require the modification of programs.
  - C5.3 Use strategies to optimize code for improved performance.
  - C5.4 Test software and projects.
  - C5.5 Evaluate results against initial requirements.
  - C5.6 Debug software as part of the quality assurance process.



- C6.0 Integrate a variety of media into development projects.
  - C6.1 Identify the basic design elements necessary to produce effective print, video, audio, and interactive media.
  - C6.2 Describe the various encoding methods of media and trade-offs: vector graphics vs. bitmaps, and bit depth.
  - C6.3 Use media design and editing software: keyframe animation, drawing software, image editors, and three-dimensional design.
  - C6.4 Develop a presentation or other multimedia project: video, game, or interactive Web sites, from storyboard to production.
  - C6.5 Analyze the use of media to determine the appropriate file format and level of compression.
  - C6.6 Integrate media into a full project using appropriate tools.
  - C6.7 Create and/or capture professional-quality media, images, documents, audio, and video clips.
  
- C7.0 Develop Web and online projects.
  - C7.1 Identify the hardware (server) and software required for Web hosting and other services.
  - C7.2 Describe the full process of online content delivery, registering domain names, setting up hosting, and setting up e-mail addresses.
  - C7.3 Attract Web-site visitors through search engine optimization using various strategies like keywords and meta-tags.
  - C7.4 Enable e-commerce capabilities to sell products, create a shopping cart, and handle credit card transactions.
  - C7.5 Create an online project, Web-based business, and e-portfolio.
  - C7.6 Optimize fast delivery and retrieval of online content such as Web pages.
  
- C8.0 Develop databases.
  - C8.1 Describe the critical function of databases in modern organizations.
  - C8.2 Identify and use the basic structures of databases, fields, records, tables, and views.
  - C8.3 Identify and explain the types of relationships between tables (one-to-one, one-to-many, many-to-many) and use methods to establish these relationships, including primary keys, foreign keys, and indexes.
  - C8.4 Use data modeling techniques to create databases based upon business needs.
  - C8.5 Use queries to extract and manipulate data (select queries, action queries).
  - C8.6 Develop databases that are properly normalized using appropriate schemas.

- C8.7 Export and import data to and from other applications and a database recognizing the limitations and challenges inherent in the process.
- C8.8 Analyze and display data to assist with decision making using methods like cross tabulations, graphs, and charts.
- C9.0 Develop software for a variety of devices, including robotics.
  - C9.1 Demonstrate awareness of the applications of device development work, including personalized computing, robotics, and smart appliances.
  - C9.2 Install equipment, assemble hardware, and perform tests using appropriate tools and technology.
  - C9.3 Use hardware to gain input, process information, and take action.
  - C9.4 Apply the concepts of embedded programming, including digital logic, machine-level representation of data, and memory-system organization.
  - C9.5 Program a micro-controller for a device or robot.
- C10.0 Develop intelligent computing.
  - C10.1 Describe models of intelligent behavior and what distinguishes humans from machines.
  - C10.2 Describe the major areas of intelligent computing, including perception, proximity, processing, and control.
  - C10.3 Know artificial intelligence methods such as neural networks, Bayesian inferences, fuzzy logic, and finite state machines.
  - C10.4 Implement artificial intelligent behavior through various methods: mathematical modeling, reinforcement learning, and probabilistic analysis.

## Information and Communication Technologies Pathway Standards

### D. Games and Simulation Pathway

Students in the Game and Simulation pathway learn relevant technical knowledge and skills to prepare for further education and careers such as Game/Simulation Designer, Game Programmer, and Game Software Developer. Game and simulation design requires that students have a solid foundational understanding of game design, hardware, graphics, and animation. Persons with expertise in game and simulation design have had practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, essential programming techniques, working with a team, and implementation issues.

Sample occupations associated with this pathway:

- ◆ Game/Simulation Designer
- ◆ Game Programmer
- ◆ Game Software Developer
- ◆ Game Producer
- ◆ Multimedia Artist and Animator

- D1.0 Identify and describe critical game and simulation studies, the resulting societal impact, and the management, industry, and career requirements.
- D1.1 Categorize the different gaming genres and gaming systems.
  - D1.2 Describe the historical significance of electronic and nonelectronic games.
  - D1.3 Describe the role of play in human culture.
  - D1.4 Describe the psychological impact of games on individuals and groups.
  - D1.5 Describe the business model commonly used in the game development industry.
  - D1.6 Examine and categorize the significant processes in the production of interactive games.
  - D1.7 Identify the core tasks and challenges that face a game or simulation design team.
  - D1.8 Describe legal issues that affect games, developers and players.
  - D1.9 Describe the impact of the game and simulation industry on the economy.
- D2.0 Demonstrate an understanding of game and simulation analysis, design, standard documentation, and development tools.
- D2.1 Demonstrate an understanding of the vocabulary for discussing games and play by listing and describing the general procedure and requirements of game and simulation design.
  - D2.2 Describe the game development life cycle.
  - D2.3 Develop a game design document or blueprint.

- D2.4 Understand the general principles of storytelling and the use of storyboarding in game design.
  - D2.5 Know how to use tools and software commonly used in game/simulation development and become familiar with popular game tools and different gaming engines.
  - D2.6 Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
  - D2.7 Describe the complex interaction between games and players and the role it plays in the popularity of a game.
  - D2.8 Experience the methods used to create and sustain player immersion.
  - D2.9 Demonstrate an understanding of interface design, hardware constraints on games, including processors and I/O devices, and nonhardware constraints.
  - D2.10 Make informed decisions about game physics: how the game world works, how the players interact with the game world, and how the players interact with one another.
- 
- D3.0 Create a working game or simulation individually or as part of a team.
    - D3.1 Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
    - D3.2 Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
    - D3.3 Using simple game development tools, create a game or simulation.
    - D3.4 Present the game or simulation.
- 
- D4.0 Identify, describe, and implement standard game/simulation strategy and rules of play.
    - D4.1 Understand strategic outlining in game designs.
    - D4.2 Know elements of puzzle design.
    - D4.3 Use key strategic considerations in game design.
    - D4.4 Understand the process of creating and designing player actions.
    - D4.5 Create and design the game flow as it relates to story and plot.
    - D4.6 Assess common principles and procedures in game flow design.
    - D4.7 Describe rule creation elements of player challenge.
- 
- D5.0 Integrate music, sound, art, and animation as it applies to the environmental design of the game/simulation.
    - D5.1 Understand the methodologies for integrating digital media into a game or simulation.

- D5.2 Identify commonly used art and animation production tools in the game design industry.
- D5.3 Understand the general concepts of environmental design.
- D5.4 Describe how environmental design is used in conjunction with game level design.
  
- D6.0 Explain the role and principles of event modeling and interface design and apply those principles in a game/simulation design and project.
  - D6.1 Define the meaning of simulation and pertinent issues facing game designers.
  - D6.2 Describe applied event modeling as it relates to game design.
  - D6.3 Identify and describe the basic Human Computer Interface (HCI) design principles.
  - D6.4 Apply the “eight golden rules” of interface design.
  - D6.5 Understand the use of inventory systems in game design.
  
- D7.0 Acquire and apply appropriate programming skills for rendering a single player or multiuser game or simulation project, including program control, conditional branching, memory management, scorekeeping, timed event strategies, and implementation issues.
  - D7.1 Identify functions of information processing and describe basic network terminology and network security and demonstrate an understanding of operating systems, environments, and platforms.
  - D7.2 Plan program design and evaluate assigned game programming tasks.
  - D7.3 Code and test programs.
  - D7.4 Create and maintain documentation and perform program maintenance.
  - D7.5 Implement enhanced program structures.
  - D7.6 Implement multimedia programming.
  
- D8.0 Acquire and apply appropriate artificial intelligence (AI) techniques used by the game development industry.
  - D8.1 Describe AI and how it relates to game and simulation design and development.
  - D8.2 Design, program, and implement intelligent agents for action games.
  - D8.3 Use AI techniques, like finite state machines, to produce the illusion of intelligence in the behavior of nonplayer characters (NPCs).
  - D8.4 Create intelligently designed games that would educate as well as engage the players.

## Academic Alignment Matrix

<b>INFORMATION AND COMMUNICATION TECHNOLOGIES</b>	<b>PATHWAYS</b>			
	<b>A. Information Support and Services</b>	<b>B. Networking</b>	<b>C. Software and Systems Development</b>	<b>D. Games and Simulation</b>
<b>ENGLISH LANGUAGE ARTS</b>				
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0
11-12.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0
11-12.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0
<b>Reading Standards for Information Text – RSIT (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	A5.0, A6.0, A7.0	B1.0, B5.0	C2.0, C4.0	D3.0
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A1.0, A5.0, A6.0, A7.0	B1.0, B5.0	C2.0, C4.0	D3.0

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A4.0, A5.0, A6.0, A7.0	B4.0, B1.0, B5.0	C2.0, C4.0	D3.0
11-12.5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.		B1.0, B5.0, B8.0	C2.0, C4.0	D3.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A3.0, A8.0	B1.0, B2.0, B4.0, B5.0, B7.0	C1.0, C2.0	D3.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>				
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	A7.0		C2.0, C4.0, C5.0, C10.0	D2.0, D3.0
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A7.0	B1.0, B2.0, B3.0	C1.0, C2.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0	D2.0, D3.0
11-12.3 Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.	A8.0, A7.0	B4.0	C2.0, C4.0, C6.0	D2.0, D3.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A3.0, A7.0	B1.0, B2.0, B3.0, B4.0	C2.0, C4.0, C6.0	D2.0, D3.0, D7.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A7.0	B1.0, B2.0, B3.0, B4.0, B7.0	C2.0, C4.0, C6.0	D2.0, D3.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A4.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0	C2.0, C4.0, C6.0	D2.0, D3.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A6.0, A8.0	B1.0, B2.0, B3.0, B4.0, B8.0	C2.0	D1.0, D3.0

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A1.0, A3.0, A5.0, A6.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B8.0	C2.0, C4.0	D1.0, D2.0, D3.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A6.0, A7.0, A8.0, A10.0		C2.0, C4.0, C6.0	D1.0, D2.0, D3.0
<b>MATHEMATICS</b>				
<b>Algebra – A-CED – Creating Equations</b>				
<i>Create equations that describe numbers or relationships</i>				
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.  1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	A8.0	B4.0, B7.0	C4.0, C6.0	D3.0, D4.0, D5.0, D6.0, D7.0
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A4.0, A8.0	B4.0, B7.0	C4.0, C6.0	D3.0, D4.0, D5.0, D6.0, D7.0
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A4.0, A8.0	B4.0, B7.0	C4.0, C6.0	D3.0, D4.0, D5.0, D6.0, D7.0
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .	A8.0	B4.0, B7.0	C4.0, C6.0	D3.0, D4.0, D5.0, D6.0, D7.0



INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>				
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>				
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	A8.0	B4.0, B7.0	C4.0, C6.0	D3.0, D4.0, D5.0, D6.0, D7.0
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A8.0	B4.0, B7.0	C4.0, C6.0	D3.0, D4.0, D5.0, D6.0, D7.0
<b>Functions – F-IF – Interpreting Functions</b>				
<i>Understand the concept of a function and use function notation</i>				
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .	A4.0, A8.0	B4.0, B7.0	C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	A4.0, A8.0	B4.0, B7.0	C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$ , $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$ .	A8.0	B4.0, B7.0	C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
<i>Interpret functions that arise in applications in terms of the context</i>				
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A4.0, A8.0	B4.0, B7.0	C1.0, C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.	A4.0, A8.0	B4.0, B7.0	C1.0, C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A4.0, A8.0	B4.0, B7.0	C1.0, C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
<i>Analyze functions using different representations</i>				
7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. <p>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</p> <p>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</p> <p>d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</p> <p>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</p>	A8.0	B4.0, B7.0	C1.0, C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. <p>a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as <math>y = (1.02)^t</math>, <math>y = (0.97)^t</math>, <math>y = (1.01)^{12t}</math>, <math>y = (1.2)^{t/10}</math>, and</p>	A8.0	B4.0, B7.0	C1.0, C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
classify them as representing exponential growth or decay.				
9. Compare properties of <i>two</i> functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	A8.0	B4.0, B7.0	C1.0, C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
10. Demonstrate an understanding of functions and equations defined parametrically and graph them. (CA Standard Math Analysis - 7.0)	A8.0	B4.0, B7.0	C1.0, C4.0, C6.0, C10.0	D3.0, D4.0, D5.0, D6.0, D7.0
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>				
<i>Interpret expressions for functions in terms of the situation they model</i>				
5. Interpret the parameters in a linear or exponential function in terms of a context.	A8.0	B4.0, B7.0	C4.0, C5.0, C6.0	D3.0, D4.0, D5.0, D6.0, D7.0
6. Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity. (CA Standard Algebra 1- 23.0)			C4.0, C6.0,	D3.0, D4.0, D5.0, D6.0, D7.0
<b>Geometry – C – Circles</b>				
<i>Find arc lengths and areas of sectors of circles</i>				
5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.			C2.0, C4.0, C9.0	
<b>Geometry – G-CO – Congruence</b>				
<i>Understand congruence in terms of rigid motions</i>				
6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.			C2.0, C4.0, C9.0	
7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.			C4.0, C9.0	

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.			C4.0, C9.0	
<i>Make geometric constructions</i>				
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.			C2.0, C4.0	
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>				
<i>Explain volume formulas and use them to solve problems</i>				
1. Give an informal argument for the formulas for the circumference of a Circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.			C4.0, C10.0	
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.			C4.0, C10.0	
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.			C4.0, C10.0	
<i>Visualize relationships between two-dimensional and three-dimensional objects</i>				
4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three dimensional objects generated by rotations of two-dimensional objects.			C3.0, C5.0, C10.0	
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.			C4.0	

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
<b>Geometry – G-GPE – Expressing Geometric Properties with Equations</b>				
<i>Use coordinates to prove simple geometric theorems algebraically</i>				
4. Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the Origin and containing the point $(0, 2)$ .			C2.0, C4.0, C6.0, C9.0	D3.0, D4.0, D5.0, D6.0, D7.0
5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).			C2.0, C4.0, C6.0, C9.0	D3.0, D4.0, D5.0, D6.0, D7.0
6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.			C2.0, C4.0, C6.0, C9.0	D3.0, D4.0, D5.0, D6.0, D7.0
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.			C2.0, C4.0, C6.0, C9.0	D3.0, D4.0, D5.0, D6.0, D7.0
<b>Geometry – G-MG – Modeling with Geometry</b>				
<i>Apply geometric concepts in modeling situations</i>				
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	A3.0, A8.0	B1.0, B2.0, B3.0	C1.0, C2.0, C4.0, C5.0, C6.0, C9.0, C10.0	D2.0, D3.0, D4.0, D5.0, D6.0, D7.0
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).				D2.0, D3.0, D4.0, D5.0, D6.0, D7.0
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A3.0, A8.0		C1.0, C2.0, C4.0, C5.0, C9.0, C10.0	D2.0, D3.0, D4.0, D5.0, D6.0, D7.0
<b>Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry</b>				
<i>Understand similarity in terms of similarity transformations</i>				

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
1. Verify experimentally the properties of dilations given by a center and a scale factor:  a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.  b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.			C2.0, C4.0, C9.0	
2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. 3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.			C2.0, C4.0, C9.0	
3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.			C4.0, C9.0	
<b>Numbers and Quantities – N-RN – The Real Number System</b>				
<i>Extend the properties of exponents to rational exponents</i>				
1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.	A8.0	B4.0, B7.0	C1.0, C4.0	D7.0
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.	A8.0	B4.0, B7.0	C1.0, C4.0	D7.0
<i>Use properties of rational and irrational numbers</i>				
3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.			C1.0, C7.0, C8.0	

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
<b>Numbers and Quantities – N-Q – Quantities</b>				
<i>Reason quantitatively and use units to solve problems</i>				
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A2.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0	C1.0, C4.0, C6.0	D2.0, D6.0
2. Define appropriate quantities for the purpose of descriptive modeling.	A2.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0	C1.0, C4.0, C6.0	D2.0, D6.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A2.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0	C1.0, C4.0, C6.0	D2.0, D6.0
<b>Numbers and Quantities – N-CN – Complex Number System</b>				
<i>Represent complex numbers and their operations on the complex plane</i>				
4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.			C4.0, C6.0, C10.0	D5.0, D7.0, D8.0
5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, $(-1 + -\sqrt{3}i) = 8$ because $(-1 + -\sqrt{3}i)$ has modulus 2 and argument $120^\circ$ .		B1.0, B2.0, B3.0	C4.0, C6.0, C10.0	D5.0, D7.0, D8.0
6. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.			C4.0, C6.0, C10.0	D5.0, D7.0, D8.0
<b>Number and Quantity – N-VM – Vector and Matrix Quantities</b>				
<i>Perform operations on matrices and use matrices in applications</i>				
6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.	A8.0	B4.0, B7.0	C4.0, C7.0, C8.0	D6.0, D7.0
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.	A8.0	B4.0, B7.0	C4.0, C7.0, C8.0	D6.0, D7.0

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.	A8.0	B4.0, B7.0	C4.0, C7.0, C8.0	D6.0, D7.0
9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	A8.0	B4.0, B7.0	C4.0, C7.0, C8.0	D6.0, D7.0
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.	A8.0	B4.0, B7.0	C4.0, C7.0, C8.0	D6.0, D7.0
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.	A8.0	B4.0, B7.0	C4.0, C6.0, C7.0, C8.0	D6.0, D7.0
12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.	A8.0	B4.0, B7.0	C4.0, C6.0, C7.0, C8.0	D6.0, D7.0
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>				
<i>Understand and evaluate random processes underlying statistical experiments</i>				
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A1.0, A8.0	B4.0, B6.0, B7.0	C2.0, C3.0, C4.0, C8.0	D1.0, D2.0, D4.0, D6.0, D7.0
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?	A8.0	B4.0, B6.0, B7.0	C2.0, C3.0, C4.0, C8.0	D2.0, D4.0, D6.0, D7.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>				
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A1.0, A2.0, A8.0	B4.0, B6.0, B7.0	C1.0, C2.0, C3.0, C4.0, C8.0	D1.0, D2.0, D4.0, D6.0, D7.0
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A1.0, A2.0, A8.0	B4.0, B6.0, B7.0	C1.0, C2.0, C3.0, C4.0, C8.0	D1.0, D2.0, D4.0, D6.0, D7.0



INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
6. Evaluate reports based on data.	A1.0, A2.0, A8.0	B4.0, B6.0, B7.0	C1.0, C2.0, C3.0, C4.0, C8.0	D1.0, D4.0, D6.0, D7.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>				
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>				
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A8.0	B4.0, B7.0	C2.0, C3.0, C4.0, C6.0, C8.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A8.0	B4.0, B7.0	C2.0, C3.0, C4.0, C6.0, C8.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A8.0	B4.0, B7.0	C2.0, C3.0, C4.0, C6.0, C8.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A8.0	B4.0, B7.0	C2.0, C3.0, C4.0, C6.0, C8.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>				
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	A8.0	B4.0, B7.0	C2.0, C3.0, C4.0, C6.0, C8.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or chooses a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	A8.0	B4.0, B7.0	C2.0, C3.0, C4.0, C6.0, C8.0	D1.0, D2.0, D4.0, D5.0, D6.0, D7.0
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>				
<i>Calculate expected values and use them to solve problems</i>				
1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0
<i>Use probability to evaluate outcomes of decisions</i>				
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.  a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.  b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D7.0, D8.0
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D7.0, D8.0
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0
<b>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</b>				
10. Students know the definitions of the mean, median and mode of distribution of data and can compute each of them in particular situations.	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0
15. Students are familiar with the notions of a statistic of a distribution of values. of the sampling distribution of a statistic. And of the variability of a statistic.	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0

INFORMATION AND COMMUNICATION TECHNOLOGIES	PATHWAYS			
	A. Information Support and Services	B. Networking	C. Software and Systems Development	D. Games and Simulation
16. Students know basic facts concerning the relation between the mean and the standard deviation of a sampling distribution and the mean and the standard deviation of the population distribution.	A3.0, A4.0, A7.0, A8.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0	C2.0, C4.0, C10.0	D1.0, D2.0, D7.0, D8.0
<b>SCIENCE</b>				
<b>Life Sciences – LS</b>				
LS1: From Molecules to Organisms: Structures and Processes				
LS1.A: Structure and Function	A3.0		C4.0, C10.0	D6.0, D7.0
LS1.B: Growth and Development of Organisms	A3.0		C4.0, C10.0	D6.0, D7.0
LS4: Biological Evolution: Unity and Diversity				
LS4.B: Natural Selection	A2.0		C4.0, C10.0	D6.0, D7.0
<b>HISTORY/SOCIAL SCIENCE</b>				
<b>Principles of American Democracy and Economics – AD</b>				
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.	A1.0, A5.0, A8.0	B7.0	C1.0, C2.0	D1.0
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.	A1.0, A5.0			D3.0, D12.0
12.8 Students evaluate and take and defend positions on the influence of the media on American political life.	A3.0	B1.0, B4.0, B7.0	C6.0	D1.0, D5.0
12.8.2. Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.	A1.0, A3.0	B1.0, B4.0, B7.0	C6.0	D1.0, D5.0
12.8.3. Explain how public officials use the media to communicate with the citizenry and to shape public opinion.	A1.0, A3.0	B1.0, B4.0, B7.0	C6.0	D1.0, D5.0

<b>INFORMATION AND COMMUNICATION TECHNOLOGIES</b>	<b>PATHWAYS</b>			
	<b>A. Information Support and Services</b>	<b>B. Networking</b>	<b>C. Software and Systems Development</b>	<b>D. Games and Simulation</b>
<b>U.S. History and Geography – US</b>				
11.8 Students analyze the economic boom and social transformation of post-World War II America.	A1.0, A8.0	B7.0	C1.0, C2.0	D1.0
11.8.7. Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.	A1.0, A8.0	B7.0	C1.0, C2.0	D1.0
<b>World History, Culture, and Geography – WH</b>				
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.	A1.0, A8.0		C1.0, C2.0	D1.0
10.3.5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.	A1.0, A6.0, A8.0	B7.0	C1.0, C2.0	D1.0
10.9 Students analyze the international developments in the post-World World War II world.	A1.0, A6.0, A8.0	B7.0	C1.0, C2.0, C6.0	D1.0
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0, A3.0, A8.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C4.0, C6.0, C10.0	D1.0

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Information and Communication Technologies**

Lloyd McCabe, Administrator, California Department of Education  
Gary Page, Education Consultant, California Department of Education

#### *Standards Review Team*

Kathleen Bailey, Instructor, Whittier Unified High School District  
Gail Chapman, Director, University of California, Los Angeles  
Bill Cullifer, Director, World Organization of Webmasters  
John Gerits, Marketing Manager, Insight Investments  
Richard Grotegut, Professor, Ohlone Community College  
Walter Hamilton, Instructor, Los Angeles Unified School District  
Eugene Lemon, Instructor, Ralph J. Bunche High School  
David Smith, Instructor, Orange Cove High School  
Jacob Walker, Instructor, Twin Rivers Unified School District  
Glen Warren, Instructor, Orange Unified School District

#### *Standards Writing Team*

Beth Cataldo, Coordinator, Multimedia Studies, City College of San Francisco  
Dennis Frezzo, Senior Manager, Cisco Networking Academy  
Richard Grotegut, Instructor, Ohlone Community College  
Ingrid Hu Dahl, Program Director, Next Gen Resources, Bay Area Video Coalition  
Jacob Martinez, Watsonville TEC (Tecnología-Educación-Comunidad)  
Matt Niemitz, Curriculum Manager, Adobe Systems, Inc.  
Lana Svieta, Owner and Game Developer, iPlaythings, LLC  
Jacob Walker, Instructor, Twin Rivers Unified School District

#### *Common Core Alignment Team*

Susan Beckenham, Instructor, Providence High School  
John Fleming, Instructor, Sacramento City Unified School District  
Yvette Fraga, Instructor, Los Angeles Unified School District  
Robert Guernsey, Instructor, Sacramento City Unified School District  
Kamilah Jackson, Instructor, Los Angeles Unified School District  
Linh Tran, Instructor, Sacramento City Unified School District

### **References**

College Board. 2010. "Computer Science A: Course Description."  
<http://apcentral.collegeboard.com/apc/public/repository/ap-computer-science-course-description.pdf> (accessed December 24, 2012).

CompTIA. 2012. "Get IT Certified." <http://certification.comptia.org/home.aspx> (accessed December 24, 2012).

*The Economist*. 2011. "Marathon Machine: Unskilled Workers Are Struggling to Keep Up with Technological Change." <http://www.economist.com/node/21538699> (accessed December 24, 2012).

Florida Department of Education. 2012. "2012–13 Information Technology Career Cluster Curriculum Frameworks." [http://www.fldoe.org/workforce/dwdframe/it\\_cluster\\_frame12.asp](http://www.fldoe.org/workforce/dwdframe/it_cluster_frame12.asp) (accessed December 24, 2012).

———. 2012. "Game/Simulation/Animation Advanced Applications." <http://www.fldoe.org/workforce/dwdframe/1213/it/rtf/8208400.rtf> (accessed December 24, 2012).

———. 2012. "Game/Simulation/Animation Audio/Video Effects." <http://www.fldoe.org/workforce/dwdframe/1213/it/rtf/8208200.rtf> (accessed December 24, 2012).

———. 2012. "Game/Simulation/Animation Programming." <http://www.fldoe.org/workforce/dwdframe/1213/it/rtf/8208300.rtf> (accessed December 24, 2012).

———. 2012. "Game/Simulation/Animation Visual Design." <http://www.fldoe.org/workforce/dwdframe/1213/it/rtf/8208100.rtf> (accessed December 24, 2012).

Goode, J., and G. Chapman. 2011. *Exploring Computer Science: A High-School Curriculum Exploring What Computer Science Is and What It Can Do*. Los Angeles: Computer Science Equity Alliance. <http://www.exploringcs.org/wp-content/uploads/2010/08/ExploringComputerScience-v4.0.pdf> (accessed December 24, 2012).

Johnson, K., T. Herr, and J. Kysh. 2004. *Crossing the River with Dogs: Problem Solving for College Students*. Emeryville, CA: Key College Publishing.

Reese, G. 2003. *Java Database Best Practices*. Sebastopol, CA: O'Reilly Media, Inc.

Sahami, M., and N. Parlante. 2012. CS4HS Workshop at Stanford University. Palo Alto, CA: Stanford University. <http://cs4hs.stanford.edu/> (accessed December 24, 2012).

Schedlbauer, M. 2010. *The Art of Business Process Modeling*. Sudbury, MA: The Cathris Group.

Tucker, A. (ed.), F. Deek, J. Jones, D. McCowan, C. Stephenson, and A. Verno. 2003. *A Model Curriculum for K–12 Computer Science: Final Report of the ACM K–12 Task Force Curriculum Committee*. New York: Association for Computing Machinery (ACM).

[http://csta.acm.org/ProfessionalDevelopment/sub/CSIT08Presentations/Frost\\_North\\_L1.pdf](http://csta.acm.org/ProfessionalDevelopment/sub/CSIT08Presentations/Frost_North_L1.pdf) (accessed December 24, 2012).

Walker, J. J. 2011. “Starting to Develop Best Known Practices for Writing Educational Content Standards.”

<http://jacobjwalker.effectiveeducation.org/blog/2011/10/22/starting-to-develop-best-known-practices-for-writing-educational-content-standards/> (accessed December 24, 2012).

## Table of Contents

### Manufacturing and Product Development

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	5
Pathway Standards.....	7
A. Graphic Production Technologies Pathway .....	7
B. Machining and Forming Technologies Pathway.....	10
C. Welding and Materials Joining Pathway.....	14
D. Product Innovation and Design Pathway .....	17
Academic Alignment Matrix.....	20
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>





# **Manufacturing and Product Development**

## ***Sector Description***

The Manufacturing and Product Development sector provides a foundation for secondary students in California in manufacturing processes and systems, including graphic design production, machine tooling and forming, welding and materials joining, and product innovation and design. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation in four pathways. The pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in manufacturing. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates hands-on, project-based, and work-based instruction. Standards in this sector are designed to prepare students for entry to a career, postsecondary education, or advanced technical training.

## **Manufacturing and Product Development Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Manufacturing and Product Development academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Manufacturing and Product Design sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the Manufacturing and Product Design sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Manufacturing and Product Design sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Manufacturing and Product Design sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Set up a work area, or shop, to avoid potential health concerns and safety hazards including but not limited to ergonomics, electrical (shock), wires (tripping), fumes (lung health), noise (hearing loss), fire (burns), and so forth, incorporating ergonomics.
- 6.5 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.6 Demonstrate how to prevent and respond to work-related accidents or injuries and emergencies.
- 6.7 Maintain a safe and healthful working environment.
- 6.8 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

### **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Manufacturing and Product Design sector workplace environment and community settings.

(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Manufacturing and Product Design sector.

### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Manufacturing and Product Development industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Manufacturing and Product Design sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.

- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Manufacturing and Product Design sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organizations. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Manufacturing and Product Design sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Manufacturing and Product Design sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Manufacturing and Product Design sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Manufacturing and Product Design sector.
- 10.3 Construct projects and products specific to the Manufacturing and Product Design sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Manufacturing and Product Design anchor standards, pathway standards, and performance indicators in

classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organizations.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Manufacturing and Product Design sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Manufacturing and Product Design sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Manufacturing and Product Development Pathway Standards**

### **A. Graphic Production Technologies Pathway**

The Graphic Design Technologies pathway provides students with an understanding of printing and manufacturing processes and systems common to careers in the graphic arts and printing technology industries. Representative topics include the principles of design composition, graphic design and layout, typography, image generation and file preparation, photography, digital imaging, prepress preparation, printing and screen printing technologies, binding and finishing processes, multimedia blending, and business and entrepreneurship principles.

Sample occupations associated with this pathway:

- ◆ Animator
- ◆ Commercial Photographer
- ◆ Digital/Graphic Artist
- ◆ Printing Press Operator
- ◆ Production Assistant

A1.0 Apply the basic graphic design principles to achieve effective visual communication.

A1.1 Identify the relationships between space, color, image, and content.

A1.2 Demonstrate the graphic design principles and the utilization of the grid system in applying those principles.

A1.3 Create a basic layout applying images, text, and typography.

A1.4 Create and choose font styles.

A2.0 Demonstrate an understanding of the psychology of color and color theory as it relates to visual communication.

A2.1 Understand the science of color spectrum and other aspects of color as it relates to hue, value, and chroma.

A2.2 Explain the differences between methods used to describe color, including cyan, magenta, yellow, black (CMYK) and red, green, blue (RGB).

A2.3 Produce a printed product in monotone and in multicolor.

A3.0 Apply graphic design software and desktop publishing as a means of creating effective communication.

A3.1 Differentiate between and operate Macintosh (MAC) and personal computer (PC) platforms for development.

A3.2 Apply desktop publishing and electronic imaging software principles and processes used to prepare graphic design products.

A3.3 Demonstrate how to produce single and multicolor images and know how to apply them across various types of printed products.

A3.4 Create a visually effective layout that communicates an intention using graphic software that integrates graphics, text, photographic imagery, and color.

- A3.5 Produce a printed product that demonstrates the application of graphic design principles and color theory using desktop publishing and electronic imaging software.
- A4.0 Demonstrate technical illustration and vector drawing skills.
  - A4.1 Create technical illustration and vector drawings.
  - A4.2 Convert and edit formats including: encapsulated postscript (eps), drawing (dwg), and portable document file (pdf).
- A5.0 Adhere to the prepress process and procedures required to reproduce single color and multicolor printing.
  - A5.1 Gain proficiency in applying the principles and processes used to prepare design work for the prepress phase of graphic design.
  - A5.2 Explain the differences in prepress for different output printing methods.
  - A5.3 Produce a printed product with the use of desktop publishing and electronic imaging software starting with the prepress phase through to reproduction.
- A6.0 Apply the processes and procedures involved in producing image files for the reproduction of single color and multicolor products.
  - A6.1 Identify the variables that affect the image transfer process for reproduction.
  - A6.2 Employ the process for creating image files that are appropriate for graphic design reproduction and specified printing requirements.
- A7.0 Develop a proficiency in applying the processes and procedures required for the reproduction of printed products and the image transfer process.
  - A7.1 Explain how various processes may be used to produce multiple-imaged copies.
  - A7.2 Identify the variables that affect the image transfer process.
  - A7.3 Produce a single-color and multicolor quality project applying the procedures and image transfer processes with a minimum of waste.
- A8.0 Understand various binding and finishing processes.
  - A8.1 Identify the variations, characteristics, and functions of binding and finishing operations in the production of printed products.
  - A8.2 Produce a bound and finished product such as a notepad, brochure, or booklet.
- A9.0 Demonstrate an understanding of the screen printing process.
  - A9.1 Identify the various applications of screen printing and the outcomes it produces.
  - A9.2 Identify materials and operations used in the screen printing process.
  - A9.3 Identify the variables that affect the image and results of the screening process.



- A9.4 Produce a screen printed product on various substrates using appropriate inks and procedures.
- A10.0 Understand the analog and digital photographic applications.
  - A10.1 Employ various photographic technology, processes, and materials used in graphic design.
  - A10.2 Identify the visual characteristics and differences between analog and digital outputs.
  - A10.3 Apply the principles of composition and lighting used in photography.
  - A10.4 Produce black-and-white and color images under natural and studio lighting conditions in both analog and digital output.
- A11.0 Apply various animation and motion graphic software to create dynamic visual communication outcomes.
  - A11.1 Explore and apply animated effects to the elements of design, which include text, color, and imagery.
  - A11.2 Produce a visually dynamic communication project that applies animated effects to various elements of the design.
- A12.0 Demonstrate a proficiency in digital video production and the postproduction process.
  - A12.1 Identify the functions involved in the preproduction, production, and postproduction phases of video production.
  - A12.2 Apply digital video technology processes and procedures used in producing a multimedia project.
  - A12.3 Produce a digital media project from a storyboard utilizing current production and postproduction technologies.
- A13.0 Understand and apply integrated graphic multimedia technologies, combining graphics, photographic imagery, motion graphics and animation, video, and special effects.
  - A13.1 Apply design strategies in selecting graphic multimedia technologies to produce dynamic effective visual communication.
  - A13.2 Practice the steps in producing an integrated graphic multimedia project designed to inform, teach, or sell.
  - A13.3 Produce an integrated graphic multimedia project.
- A14.0 Identify the different industries that utilize graphic design and identify other potential business opportunities for graphic design applications.
  - A14.1 Apply research methodologies and business and entrepreneurial principals to identify potential business opportunities to apply graphic and multimedia design.

## **Manufacturing and Product Development Pathway Standards**

### **B. Machining and Forming Technologies Pathway**

The Machine and Forming Technologies pathway provides students with an understanding of manufacturing processes and systems common to careers in machine tool and materials forming industries. Representative topics include: trade vocabulary; shop math; basic material identification; proper use of hand and machine tools; reading precision measuring tools within .001" and the interpretation of machined and formed-part prints; the cutting, shaping, fastening, and finishing of machined parts; fixtures: forging, molding (casting), cold forming, and shearing processes.

Sample occupations associated with this pathway:

- ◆ CAD/CAM Specialist
- ◆ CNC Machinist
- ◆ Manufacturing Engineer
- ◆ Materials/Supply Management Specialist
- ◆ Quality Assurance Technician

**B1.0** Validate that a provided part meets specifications from its engineering drawing by comparing specifications (geometric dimensioning and tolerancing) and by demonstrating proper technique using appropriate precision measuring tools.

**B1.1** Identify and describe how the isometric and the orthographic views and the tolerance, scale, and material from an engineering drawing are used with an actual part.

**B1.2** Demonstrate the correct use of precision measuring tools such as vernier and dial calipers, height gages, and micrometers utilizing both English and Metric systems.

**B1.3** Demonstrate the correct use of a gage block (set) to check a part or to calibrate the accuracy of other precision measuring tools.

**B1.4** Explain calibration, tolerancing, and conditions that cause parts to fall out of tolerance.

**B2.0** Describe and layout a project according to specifications or engineering drawings. Demonstrate proper technique with layout tools and work-holding devices such as: three- and four-jaw chucks, collet chucks, angle plates, sine bars, parallels, and v-blocks to machine a real part.

**B2.1** Describe and then contrast when to use work-holding fixtures, such as v-block, angle plate, toe clamp, vises, chucks, or custom fixtures.

**B2.2** Describe and demonstrate how to indicate a vice on a milling machine to "square up" a block on a mill using a micrometer and a precision square measure to confirm that the block is square.

**B2.3** Use a dividing head or turn table to demonstrate the proper procedure for indexing a part requiring flats, hex, or equally spaced geometry per print specifications.

- B2.4 Use a surface plate, surface gage, height gage, prick and center punches, scribe, layout dye, and other appropriate tools to locate hole centers, radii, and locations matching the specifications provided.
- B2.5 Describe and demonstrate the engine lathe by grinding a high speed tool bit focusing on the tool cutting geometry and tip radius, speeds and feeds for the materials being cut and using their tool bit and precision measuring tool, machine a part within specifications.
  
- B3.0 Research and compare the properties of two metals using two different material specifications and a process specification.
  - B3.1 Classify the difference between ferrous and nonferrous metals and contrast low-, medium-, and high-carbon steels by their common uses in industry.
  - B3.2 Describe both the alloys from their classification systems utilizing Unified Numbering System (UNS) or American Iron and Steel Institute-Society of Automotive Engineers (AISI-SAE) and explain how characteristics such as the Rockwell Hardness Test affect machining operations.
  - B3.3 Demonstrate how to calculate, then revise the calculations, for spindle speed and feed rate, for both alloy examples, for either a vertical mill or a lathe.
  
- B4.0 Demonstrate a cutoff saw operation(s) to produce a length of bar stock to specification.
  - B4.1 Using a length of bar stock and a process specification or drawing, cut a length of bar stock matching the cut list and demonstrate no sharp edges.
  - B4.2 Cut one steel bar and one aluminum plate determining the correct or optimal blade material (carbon steel, high speed, or bimetal), the proper sawtooth set to use for each, and explain why.
  
- B5.0 Demonstrate bending, shaping, other metal forming, and fabrication techniques, including processes such as basic hand filing, knurling on a lathe, forging metal shapes or objects, green sand casting, sheet metal machines, spot welding equipment or rivets, cold form bending with cold forming machinery or homemade devices, and shapes (tooling) to achieve a specific design specification.
  - B5.1 Discuss and demonstrate the wide variety of metal cutting hand files: materials, sizes, shapes, cuts, and tooth configurations.
  - B5.2 Describe and demonstrate the care and use of the common file which can be used to form radii on a variety of commercially available metals or those that have been casted or forged.
  - B5.3 Describe and demonstrate cold forming (i.e. knurling on a lathe).
  - B5.4 Describe and demonstrate the safe use of the open forge, anvil, and tooling to custom shape hot metal.
  - B5.5 Describe and demonstrate the process of making a pattern, mulling and chemistry of the green sand, the use of parting powder, and ramming the casting flasks.

- B5.6 Describe and demonstrate the safety procedures of heating and pouring the metal (aluminum, brass, or bronze) from a crucible furnace.
  - B5.7 Produce a cast part and finish to specifications.
  - B5.8 Describe and demonstrate the safe use of sheet metal shears, box and pan breaks, bar folders, spot welders, and riveting tools.
  - B5.9 Complete a layout project using a detailed set of sequential instructions to manufacture the project to plan specifications.
- B6.0 Identify and select the right grinding wheel; perform wheel dressing; and grind the provided part/material to the size and surface finish specifications provided.
- B6.1 Setup and safely operate pedestal and surface grinders.
  - B6.2 Recommend a choice of grinding wheels for a variety of conditions determining which ones are serviceable for use and selecting the right size, mounting, and dressing for grinding.
  - B6.3 Complete a part in semi-finished (oversize) state; square-up and finish the block to the tolerance for size, surface finish, and squareness specified by the plan or drawing.
- B7.0 Perform a series of routine boring operations from a set of specifications or a drawing and explain the selection of proper tools (drill, reamer, countersink, spot facer, counter bore, tap, and center drill) for each step of the process.
- B7.1 Setup and safely operate a drill press.
  - B7.2 Square-up and lay out a block according to provided drawing and/or specifications.
  - B7.3 Drill, tap, or ream holes according to specifications.
  - B7.4 Research the proper material machinability and tooling recommendations from trade resources such as 'Machinery's Handbook'; choose the correct tool and holder; and calculate the spindle rpm and the feed rate for holes.
  - B7.5 Perform secondary operations on each hole to specification including: reaming, countersinking, counter boring, tapping, and deburring.
  - B7.6 Use a pin gage or thread gage to validate each hole or that a tapped thread meets specifications.
- B8.0 Describe and demonstrate the machining of an external and internal taper, knurled part, and threaded and bored part on an engine lathe to plan specification or drawing to produce a part and measure each end diameter within tolerance.
- B8.1 Demonstrate proper cutting tool selection and speeds for an engine lathe.
  - B8.2 Setup and safely operate an engine lathe taper attachment or turning center.
  - B8.3 Produce a shoulder-bushing to the specification of the drawing provided.
- B9.0 Produce parts to specification using a boring head or angular cutting with a sine bar, a keyway, and pockets with a typical vertical mill.
- B9.1 Setup and safely operate a vertical milling machine.

- B9.2 Demonstrate proper cutting tool selection and speeds and demonstrate an efficient setup to minimize work-holding setups.
  - B9.3 Produce a part with keyway to specification demonstrating proper end mill selection, proper tool-path, and proper speeds.
  - B9.4 Mill an angular surface on a square block using a vice, sine bar, and gage blocks; measure angle to ensure it meets the specification.
- B10.0 Produce parts to specifications or drawings provided on a computer numerical controlled (CNC) mill or lathe. Demonstrate common functions or controls through manual input and through programmed (stored) input. Introduce basic G and M Code Programming focusing on the use of the Cartesian coordinate system and machine axis.
- B10.1 Discuss and demonstrate the setup and safe operation of a CNC turning or milling center: the setup of tools in tool holders; referencing the vice or chuck to the machine's control; and referencing the cutting tool to the machine's control.
  - B10.2 Demonstrate control panel commands to perform basic milling or turning commands for motion of the tool path along the coordinate axis.
  - B10.3 Convert a provided three-dimensional (3-D) or computer-aided design (CAD) data set to a set of machine instructions (G code) and then run the program producing the part to specifications provided.
  - B10.4 Demonstrate a tooling change and tool selection to complete a multistep process on a CNC milling or turning center.
  - B10.5 Produce a part with tight-radius pocket features by demonstrating proper cutting tool selection, proper tool-path, and proper speeds on a CNC milling machine.
- B11.0 Understand and defend the purposes and processes of inspection and quality control in machining and forming processes.
- B11.1 Identify and explain machining and forming imperfections and their Causes
  - B11.2 Identify and explain destructive and nondestructive examination practices.
  - B11.3 Describe the reasons for inspection and quality control in the manufacturing of machined and formed parts.
  - B11.4 Analyze and identify the steps to check for distortion, misalignment, and poor fit before and after and machining or forming a part.
  - B11.5 Perform continuous online quality control inspections of machined and formed parts.
  - B11.6 Evaluate and know how to troubleshoot performance problems of machined and formed parts.

## **Manufacturing and Product Development Pathway Standards**

### **C. Welding and Materials Joining Pathway**

The Welding and Materials Joining pathway provides students with an understanding of manufacturing processes and systems common to careers in welding and related industries. The following pathway standards are based on, but not limited to, well established American Welding Society (AWS) EG2.0 Guidelines for the Entry Level Welder. Representative topics include the interpretation and layout of welded and assembled-part prints, cutting, mechanical bonding, joining, cohesive bonding, adhesive bonding, and mechanical fastening.

Sample occupations associated with this pathway:

- ◆ Metal Fabricator
- ◆ Sales
- ◆ Welders, Cutters, and Fitters
- ◆ Welding Inspector
- ◆ Welding Engineer

C1.0 Interpret and demonstrate the planning and layout operations used in the welding processes.

C1.1 Use current information technology ideation and design process systems in the manufacturing of welded parts and products.

C1.2 Interpret scaled welding blueprints; gather design and materials information; perform calculations; and use the detail to plan, lay out, and produce parts or finished products.

C1.3 Analyze welding symbols on drawings, specifications, and welding procedure specifications.

C1.4 Critique the design parameters across welding processes to produce a welded part or product.

C2.0 Understand and demonstrate how materials can be processed through the use of welding tools and equipment.

C2.1 Introduce joint preparation methods and explain how to identify joint specifications.

C2.2 Use standard and new emerging welding tools and equipment, such as oxygen fuel cutting (OFC), plasma arc cutting (PAC), and carbon arc cutting (CAC) to cut materials for the purpose of completing a finished product that meets the standards of the AWS or a similar industry standard.

C2.3 Use welding tools and equipment such as oxy fuel welding (OFW), shielded metal arc welding (SMAW), gas metal arc welding (GMAW), flux-cored arc welding (FCAW), gas tungsten arc welding (GTAW), forge, and furnace to combine or join manufactured parts and products resulting in a finished product that meets the standards of the AWS or a similar industry standard.

- C2.4 Compare and contrast the physical qualities of various industrial materials and how these qualities affect the ability of the materials to be processed to produce useful welded parts and products.
- C3.0 Differentiate and apply various types of welding assembly processes.
  - C3.1 Use welding tools such as OFW, SMAW, GMAW, FCAW, GTAW, forge, and furnace and the equipment and assembly processes appropriate to the design criteria of a specific product to result in a finished part or product that meets the standards of the AWS or similar industry welding standards.
  - C3.2 Produce bonded industrial materials by using adhesive such as flow, pressure, and fusion welding.
  - C3.3 Compare and contrast existing material bonding methods with future innovative bonding processes.
- C4.0 Understand finishing processes and the differences between various types of finishing materials used in the manufacture of welded parts and products.
  - C4.1 Employ and explain the steps to be taken, and the choices to be made, in finishing welded materials.
  - C4.2 Apply the processes used for finishing welded materials.
  - C4.3 Assess how to select an appropriate finishing process to meet the design criteria of a specific welded product.
- C5.0 Understand and defend the purposes and processes of inspection and quality control in welding manufacturing processes.
  - C5.1 Identify and explain weld imperfections and their causes.
  - C5.2 Identify and explain destructive and nondestructive examination practices.
  - C5.3 Describe the reasons for inspection and quality control in the manufacturing of welded parts.
  - C5.4 Analyze and identify the steps to check for distortion, joint misalignment, and poor fit-up before and after welding.
  - C5.5 Perform continuous online quality control inspections of welded parts.
  - C5.6 Evaluate and know how to troubleshoot performance problems of welding systems.
- C6.0 Explore and understand various welding systems that require standard hand and machine tools.
  - C6.1 Select and use appropriate welding tools, equipment, and inspection devices to manufacture parts or products.
  - C6.2 Compare and contrast the various welding systems used in conventional manufacturing industries in order to select and use appropriate tools, equipment, and inspection devices.
  - C6.3 Research new and emerging welding systems and their effects on the standard hand and machine manufacturing industry.

- C7.0 Understand various automated welding systems, welding design for manufacturing, flexible manufacturing systems, and materials resource planning.
  - C7.1 Recognize materials and processes in relation to welding systems.
  - C7.2 Understand the importance of maintaining documentation for welding systems.
  - C7.3 Distinguish between welding processes involved in the following manufacturing systems: “just in time”, design for manufacturing, flexible manufacturing systems, and materials resource planning.
  - C7.4 Use computers to design and produce welded products, write numerical control programs, and control robots.
  - C7.5 Compare and contrast the ways in which emerging welding systems may be integrated into current manufacturing processes.
  
- C8.0 Understand various joining or combining processes, including welding processes used in manufacturing, maintenance, and repair.
  - C8.1 Recognize the importance of base metal preparation and joint fit-up and alignment.
  - C8.2 Analyze and be able to defend various welding processes used to complete a fabrication, an assembly, or a repair.
  - C8.3 Produce a completed fabrication, an assembly, or a repair by using appropriate joining and mechanical fastening techniques and processes.
  
- C9.0 Understand how a manufacturing company is organized and the elements of welding production management.
  - C9.1 Know how scheduling, quality control, accident prevention, and inventory control are used efficiently and appropriately in a welding production management system.
  - C9.2 Understand that a welding production management system includes planning, engineering, organizing, and controlling resources and manufacturing processes.
  - C9.3 Diagram corporate structures that affect welding production.



## **Manufacturing and Product Development Pathway Standards**

### **D. Product Innovation and Design Pathway**

The Product Innovation and Design pathway provides students with an understanding of the design and manufacturing technologies common to careers in the fields of product design and manufacturing. Representative topics include the product design and development process, the principles of design, computer aided design, fabrication and manufacturing processes, sustainability, and the principles of business, entrepreneurship, and global design.

Sample occupations associated with this pathway:

- ◆ Commercial/Industrial Designer
- ◆ CAD Designer
- ◆ Model Maker
- ◆ Product Developer
- ◆ Product Manager

- D1.0 Understand the basic product design and development process as it relates to the design of a product, line of products, system design, or services.
- D1.1 Identify the variations in the product design and development process as it relates to the designing of a product, product line, system design, or service.
- D1.2 Apply and identify the various phases of the product design development process to an existing product, product line, system design, or service.
- D2.0 Understand and apply research methodologies as a means to identify a need, problem, or opportunity for a new product, product line, system design, or service.
- D2.1 Employ research methodologies, using primary research and electronic reference materials, to gather information relevant to the topic or area of opportunity.
- D2.2 Organize information to identify and define an area of opportunity, need, or problem that can be resolved through design.
- D2.3 Identify potential design areas (e.g., product, product line, system design, or service) that would address the need, problem, or opportunity.
- D2.4 Research and identify the user demographic for the product, product line, system design, or service (local, national, global market).
- D3.0 Understand and apply various ideation techniques to develop ideas and concepts.
- D3.1 Apply ideation techniques to explore and produce multiple concepts.
- D3.2 Edit concepts and identify key idea(s) that solve the problem, fulfill a need, or address an opportunity.
- D3.3 Assess the environmental impact of the design solution and other sustainability issues and product life cycle considerations.

- D3.4 Synthesize information and experiment with nontraditional possibilities for innovative design solutions.
- D4.0 Apply various two-dimensional (2-D) graphic and/or three-dimensional (3-D) modeling techniques to development concept.
  - D4.1 Create a preliminary design of a product concept utilizing drawing, computer software (graphic or CAD), and/or conceptual model fabrication techniques.
  - D4.2 Identify materials, mechanisms, technologies, and other requirements (e.g., safety, manufacturing, sustainability) the concept may require.
  - D4.3 Analyze and assess the strengths and weaknesses in the design, function, ergonomics, features, and benefits and identify possible resolutions for improvement.
- D5.0 Develop the concept into a well-defined product for prototyping.
  - D5.1 Produce technical drawings and other specifications required for the prototyping or manufacturing of the product.
  - D5.2 Recognize the safety issues related to the reliability, functionality, and use of the product.
  - D5.3 Communicate and collaborate with fabricators, manufacturers, engineers, technologists, or other industry experts to review requirements and specifications and to validate the design.
- D6.0 Produce a prototype of a product.
  - D6.1 Build a looks-like, works-like prototype of the model using the appropriate fabrication, manufacturing, or reproduction techniques or technologies.
  - D6.2 Assess the outcome of the prototype product and analyze any issues that need redesigning or refining related to function, construction, or other factors.
  - D6.3 Resolve and/or redesign issues with a prototype.
- D7.0 Evaluate the prototype to determine if it meets the requirements and objectives.
  - D7.1 Create a performance criteria and a quality standard to measure and evaluate a prototype.
  - D7.2 Test the functionality and other features of the prototype against the performance criteria and quality standard and evaluate the results.
  - D7.3 Identify any redesigning or additional corrections required to improve the overall quality, look, and performance of the prototype model.
- D8.0 Understand and apply basic business and entrepreneurial principles and identify potential markets and/or other business opportunities for distribution of the product.
  - D8.1 Apply research methodologies to identify potential investors or business opportunities to market the product.
  - D8.2 Create a marketing plan for the product that includes: target consumer, price, product name, brand, and product positioning in the retail market.

- D9.0 Produce a package design concept for a product or line of products.
  - D9.1 Understand physical packaging construction and materials used; e. g., chipboard, cardboard, PVC, plastic blisters, etc. as it relates to protecting the product, costs, and logistic requirements.
  - D9.2 Understand and apply packaging graphic strategies that effectively communicate and influence the purchasing of the product.
  - D9.3 Create a packaging concept utilizing drawing computer software (graphic or CAD).
  - D9.4 Produce a physical package with graphics for the product.
  
- D10.0 Produce a presentation of the product, product line, system design, or service.
  - D10.1 Create a presentation of the design solution (e.g., product, product line, system design, or service) that effectively communicates its features and benefits.
  - D10.2 Integrate into the presentation a marketing plan that may include an advertisement, promotion, and packaging/retail strategy using one or more visual communication tools (e.g., graphics, multimedia).

## Academic Alignment Matrix

<b>MANUFACTURING AND PRODUCT DEVELOPMENT</b>	<b>PATHWAYS</b>			
	<b>A. Graphic Production Technologies</b>	<b>B. Machining and Forming Technologies</b>	<b>C. Welding and Materials Joining</b>	<b>D. Product Innovation and Design</b>
<b>ENGLISH LANGUAGE ARTS</b>				
<b>Language Standards – LS – (Standard Area, Grade Level, Standard #)</b>				
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A3.0, A13.0			D8.0, D10.0
<b>Reading Standards for Literature – RSL – (Standard Area, Grade Level, Standard #)</b>				
11-12.4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful.	A2.0, A5.0, A6.0, A8.0, A9.0, A12.0, A13.0, A14.0			
<b>Reading Standards for Informational Text – RSIT – (Standard Area, Grade Level, Standard #)</b>				
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A13.0	B2.0	C1.0	D4.0
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST – (Standard Area, Grade Level, Standard #)</b>				
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A3.0		C3.0, C4.0, C5.0	
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A9.0, A10.0, A12.0, A13.0, A14.0	B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D2.0, D3.0
11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A2.0, A5.0, A6.0, A8.0, A9.0, A12.0, A13.0, A14.0	B10.0	C1.0	D3.0

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
11-12.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.	A1.0	B6.0	C1.0	
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A13.0	B2.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0	D4.0
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A3.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0	D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0
<b>Writing Standards – WS – (Standard Area, Grade Level, Standard #)</b>				
11-12.3 Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.	A3.0	B1.0, B2.0		
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A11.0	B3.0		D10.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0	B3.0		D7.0, D9.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A3.0, A13.0	B3.0		D7.0, D9.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A3.0, A13.0	B3.0	C5.0	D7.0, D9.0
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST – (Standard Area, Grade Level, Standard #)</b>				
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A11.0			D8.0

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A14.0	B3.0		D7.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.		B3.0		D7.0, D9.0
11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.	B1.0	B3.0	C5.0, C9.0	D7.0, D9.0
<b>MATHEMATICS</b>				
<b>Algebra – A-CED – Creating Equations</b>				
<i>Create equations that describe numbers or relationships</i>				
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)			C1.0	D4.0
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	A1.0	B5.0		D4.0, D5.0, D9.0
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.				D2.0, D3.0
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .		B3.0, B7.0		

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>				
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>				
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.			C3.0, C4.0, C5.0	D2.0, D9.0
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.				D9.0
<i>Solve systems of equations</i>				
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.		B10.0		
9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 x 3 or greater).		B10.0		
<b>Functions – F-IF – Interpreting Functions</b>				
<i>Understand the concept of a function and use function notation</i>				
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .			C3.0, C4.0, C5.0	D2.0, D9.0
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.				D9.0
<i>Interpret functions that arise in applications in terms of the context</i>				
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.		B3.0		D4.0, D5.0, D7.0, D9.0

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>				
1. Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	A1.0, A2.0			
<b>Geometry – G-C – Circles</b>				
2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.		B9.0	C1.0	
<b>Geometry – G-CO – Congruence</b>				
<i>Experiment with transformations in the plane</i>				
1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.		B1.0, B2.0, B5.0	C1.0	
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).		B2.0, B5.0	C1.0	
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.		B1.0, B5.0	C1.0	
<i>Make geometric constructions</i>				



MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.		B2.0, B5.0	C1.0	D6.0
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>				
<i>Visualize relationships between two-dimensional and three-dimensional objects</i>				
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.			C1.0	D6.0
<b>Number and Quantity – N-Q – Quantities</b>				
<i>Reason quantitatively and use units to solve problems</i>				
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.		B10.0	C1.0	
2. Define appropriate quantities for the purpose of descriptive modeling.		B1.0	C8.0	D4.0, D5.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.		B1.0		D4.0, D5.0
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>				
<i>Understand and evaluate random processes underlying statistical experiments</i>				
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A6.0, A7.0			D1.0
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?				D1.0, D7.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>				
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A6.0, A7.0		C4.0	

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A7.0			
6. Evaluate reports based on data.		B7.0	C6.0	D2.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>				
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>				
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A9.0	B7.0	C1.0	D2.0
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>				
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	A2.0		C9.0	D7.0
<b>Calculus – C</b>				
4.0 Students demonstrate an understanding of the formal definition of the derivative of a function at a point and the notion of differentiability: 4.1 Students demonstrate an understanding of the derivative of a function as the slope of the tangent line to the graph of the function. 4.2 Students demonstrate an understanding of the interpretation of the derivative as an instantaneous rate of change. Students can use derivatives to solve a variety of problems from physics, chemistry, economics, and so forth that involve the rate of change of a function. 4.3 Students understand the relation between differentiability and continuity. 4.4 Students derive derivative formulas and use them to find the derivatives of algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic functions.			C7.0	
14.0 Students apply the definition of the integral to model problems in physics, economics, and so forth, obtaining results in terms of integrals.		B6.0, B10.0		
15.0 Students demonstrate knowledge and proof of the fundamental theorem of calculus and use it to interpret integrals as anti-derivatives.		B6.0, B10.0		
16.0 Students use definite integrals in problems involving area, velocity, acceleration, volume of a solid, area of a surface of revolution, length of a curve, and work.		B6.0, B10.0		

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
17.0 Students compute, by hand, the integrals of a wide variety of functions by using techniques of integration, such as substitution, integration by parts, and trigonometric substitution. They can also combine these techniques when appropriate.		B6.0, B10.0		
18.0 Students know the definitions and properties of inverse trigonometric functions and the expression of these functions as indefinite integrals.		B10.0		
19.0 Students compute, by hand, the integrals of rational functions by combining the techniques in standard 17.0 with the algebraic techniques of partial fractions and completing the square.		B10.0		
20.0 Students compute the integrals of trigonometric functions by using the techniques noted above.		B10.0		
<b>SCIENCE</b>				
<b>Scientific and Engineering Practices – SEP</b>				
1. Asking questions (for science) and defining problems (for engineering)	A1.0, A2.0, A7.0	B1.0, B3.0	C1.0, C6.0	D2.0, D3.0
2. Developing and using models	A2.0	B1.0, B3.0	C1.0	D4.0
3. Planning and carrying out investigations	A6.0, A7.0		C2.0, C3.0	D2.0, D7.0
4. Analyzing and interpreting data		B1.0, B3.0, B10.0	C1.0	D2.0, D4.0, D7.0
5. Using mathematics and computational thinking		B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B9.0, B10.0	C7.0	D4.0
6. Constructing explanations (for science) and designing solutions (for engineering)	A2.0, A5.0, A6.0, A7.0	B1.0, B2.0, B5.0	C1.0, C4.0	D5.0, D10.0
7. Engaging in argument from evidence	A3.0		C1.0, C6.0, C7.0	D2.0, D3.0, D10.0
8. Obtaining, evaluating, and communicating information	A1.0, A2.0, A3.0, A12.0, A13.0	B1.0	C1.0, C4.0, C5.0, C7.0, C9.0	D1.0, D2.0, D5.0, D8.0, D10.0
<b>Crosscutting Concept – CC</b>				
1. Patterns	A1.0, A8.0, A9.0, A11.0	B1.0, B5.0, B8.0, B9.0, B10.0	C.10, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C9.0	D1.0, D2.0, D3.0, D4.0, D10.0
2. Cause and effect: Mechanism and explanation	A2.0, A3.0, A11.0		C2.0, C3.0, C4.0	D7.0

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
3. Scale, proportion, and quantity	A1.0, A4.0, A11.0	B1.0, B10.0	C1.0, C9.0	D4.0
4. Systems and system models	A2.0			D1.0, D2.0
5. Energy and matter: Flows, cycles, and conservation			C2.0, C3.0	
6. Structure and function		B1.0, B3.0	C5.0	D4.0
7. Stability and change		B1.0, B3.0	C5.0	D4.0
<b>Physical Sciences – PS</b>				
PS1: Matter and Its Interactions				
PS1.A: Structure and Properties of Matter		B3.0	C2.0, C3.0	
PS1.B: Chemical Reactions			C2.0, C3.0	
PS3: Energy				
PS3.B: Conservation of Energy and Energy Transfer			C2.0, C3.0	
PS3.D: Energy in Chemical Processes and Everyday Life				D2.0, D3.0
<b>Earth and Space Sciences – ESS</b>				
ESS3: Earth and Human Activity				
ESS3.A: Natural Resources				
ESS3.B: Natural Hazards				
ESS3.C: Human Impacts on Earth Systems				
ESS3.D: Global Climate Change				
<b>Engineering, Technology, and the Applications of Science – ETS</b>				
ETS1: Engineering Design				
ETS1.A: Defining and Delimiting an Engineering Problem				
ETS1.B: Developing Possible Solutions				
ETS1.C: Optimizing the Design Solution				
ETS2: Links Among Engineering, Technology, Science, and Society				
ETS2.A: Interdependence of Science, Engineering, and Technology				
ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World				

MANUFACTURING AND PRODUCT DEVELOPMENT	PATHWAYS			
	A. Graphic Production Technologies	B. Machining and Forming Technologies	C. Welding and Materials Joining	D. Product Innovation and Design
<b>HISTORY/SOCIAL SCIENCE</b>				
<b>Principles of American Democracy and Economics – AD</b>				
12.8 Students evaluate and take and defend positions on the influence of the media on American political life.	A1.0			
<b>Principles of Economics – PE</b>				
12.2 Students analyze the elements of America's market economy in a global setting.	A14.0			D5.0, D6.0, D7.0, D8.0
12.4 Students analyze the elements of the U.S. labor market in a global setting.				D5.0, D6.0, D7.0, D8.0
<b>U.S. History and Geography – US</b>				
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.				D1.0, D2.0
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.				D5.0, D6.0, D7.0
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.				D5.0, D6.0, D7.0
11.7 Students analyze America's participation in World War II.				D5.0, D6.0, D7.0
<b>World History, Culture, and Geography – WH</b>				
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.				D1.0, D2.0
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0	B10.0	C6.0, C7.0	D4.0

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Manufacturing and Product Development**

Lloyd McCabe, Administrator, California Department of Education  
Michelle Oliveira, Education Consultant, California Department of Education

#### *Standards Review Team*

Dan Binsfield, Instructor, Kern High School District  
Kathy Colby, Vice President, Lakos Manufacturing  
Dick Herman, President, 101 Manufacturing  
Glenn Mattsson, President, Nussivo Engineering Consultants  
Mark McDowell, District Manager, Lincoln Electric  
Mike Morris, Instructor, Butte County Regional Occupational Program  
Robert Page, Productivity Center Manager, Sandvik Coromant  
Chuck Taber, District Manager, MPD  
Alan Urquhart, Owner, Alan Urquhart Photography and Design

#### *Standards Writing Team*

Dan Binsfield, Instructor, Kern High School District  
Dick Herman, President, 101 Manufacturing  
Lance Gunnensen, Instructor, Davis Joint Unified School District  
Mark Martin, Director, Center for Applied Competitive Technologies  
Glenn Mattsson, President, Nussivo Engineering Consultants  
Steve McAdam, Chair Product Design, Otis School of Design  
Mark McDowell, District Manager, Lincoln Electric  
Mike Morris, Instructor, Butte County Regional Occupational Program  
Dan Sunia, Instructor, Petaluma Joint Union High School District  
Jarred Tunison, Operations Manager, National Plastics  
Alan Urquhart, Owner, Alan Urquhart Photography and Design

#### *Common Core Alignment Team*

Autumn Chapman, Instructor, Oakland Unified School District  
Pamela Davis, Instructor, Sacramento City Unified School District  
Kristi Leonard, Instructor, Lake Tahoe Unified School District  
Marcia McAllister, Instructor, Sacramento City Unified School District  
Sofia Paez-Valdez, Instructor, Pasadena Unified School District  
Sherry Penaflor, Instructor, Coachella Valley Unified School District  
Zach Ronnenberg, Instructor, Davis Joint Unified School District  
Russell Wong, Instructor, Pasadena Unified School District

**Table of Contents**  
**Marketing, Sales, and Services**

Sector Description.....	1
Knowledge and Performance Anchor Standards.....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	6
Pathway Standards .....	7
A. Marketing Pathway.....	7
B. Professional Sales Pathway.....	11
C. Entrepreneurship/Self-Employment Pathway.....	13
Academic Alignment Matrix .....	16
Appendix: CTE Model Curriculum Standards Contributors.....	27
References .....	29



# Marketing, Sales, and Services

## *Sector Description*

The Marketing, Sales, and Services sector is designed to align career-path course work with current and projected employment opportunities. There is a basic business foundation in this sector: marketing and innovation are two major competitive issues for business today. Marketing includes the processes and techniques of identifying, promoting, and transferring products or services to consumers and is a function of almost every business. It exists within an environment of rapidly changing technology, interdependent nations and economies, and increasing demands for ethical and social responsibility.

The three pathways in this sector (Marketing, Professional Sales, and Entrepreneurship/Self-Employment) emphasize training to meet the growing need for marketing professionals with skills in communication, small business, self-employment, advertising, marketing strategies, product and service management, and promotion and selling concepts. These pathways provide a firm foundation for advanced education, entry to a career, and success in the global marketplace. All industry sectors include entrepreneurship and marketing, and therefore students in the Marketing, Sales, and Services sector have a variety of career options.



## **Marketing, Sales, and Services Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Marketing, Sales, and Services academic alignment matrix for identification of standards

### **2.0 Communications**

Acquire and accurately use Marketing, Sales, and Services sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.  
(Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.

- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Marketing, Sales, and Services sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Marketing, Sales, and Services sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Marketing, Sales, and Services sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate and adhere to Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment and practice risk management to ensure security and to prevent loss of property.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

## **7.0 Responsibility and Flexibility**

Initiate and participate in a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Marketing, Sales, and Services sector workplace environment and community settings.

(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Marketing, Sales, and Services sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Marketing, Sales, and Services industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Marketing, Sales, and Services sector workplace standards.
- 8.4 Demonstrate the importance of truthfulness, honesty, and quality in the Marketing, Sales, and Services sector.
- 8.5 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.6 Analyze organizational culture and practices within the workplace environment.

- 8.7 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.8 Conform to rules and regulations regarding sharing of confidential information, as determined by Marketing, Sales, and Services sector laws and practices.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the DECA career technical student organization (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Marketing, Sales, and Services sector issues and problems.

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Marketing, Sales, and Services sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Marketing, Sales, and Services sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Marketing, Sales, and Services sector.
- 10.3 Construct projects and products specific to the Marketing, Sales, and Services sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.
- 10.5 Integrate the marketing information management concepts, systems, and tools needed to obtain, evaluate, and disseminate information for use in making marketing decisions.
- 10.6 Employ the financial concepts used in making marketing decisions.

- 10.7 Assess the product and service management concepts and processes needed to obtain, develop, maintain, and improve a product or service mix in response to market opportunities.
- 10.8 Understand how promotion concepts and strategies including advertising, sales promotion, public relations, and personal selling, are used to communicate information about products, services, images, and ideas to achieve a desired outcome.
- 10.9 Illustrate the methods used to determine client needs and desires and respond with selling concepts including planned, personalized communication that influences purchase decisions and enhances future business opportunities.
- 10.10 Compare the distribution concepts and processes needed to move, store, locate, and transfer ownership of goods or services.
- 10.11 Apply the pricing concepts and strategies used to maximize return and meet customers' perceptions of value.
- 10.12 Identify city, county, and state certificates and licensures required to conduct business.
- 10.13 Identify the techniques and strategies used to foster positive, ongoing relationships with customers and the importance of customer service to the business' bottom line.
- 10.14 Employ the concepts, processes, and skills associated with identifying new ideas, opportunities, and methods and with creating or starting a new project or venture.
- 10.15 Communicate the economic principles and concepts fundamental to business operations and the importance of marketing in a global economy. (Economics)

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Marketing, Sales, and Services anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings, and through the DECA career technical student organization.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Marketing, Sales, and Services sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Marketing, Sales, and Services sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Marketing, Sales, and Services Pathway Standards**

### **A. Marketing Pathway**

Using both creative and systems processes, develop marketing concepts and principles and their practical application in marketing and management. Subject matter includes market research, economics, marketing budgets, creative development and design, and marketing foundations/functions with emphasis on public relations, advertising, branding, promotion, product/service management, pricing and distribution. Specialized programs of study in this field may include sports marketing, hospitality marketing, advertising or market research.

Sample occupations associated with this pathway:

- ◆ Advertising Account Representative
- ◆ Advertising Sales Manager
- ◆ Market Research Analyst
- ◆ Marketing Manager
- ◆ Public Relations Specialist

- A1.0 Demonstrate an understanding of business fundamentals, uses and application of technologies, communications, and basic management functions.
- A1.1 Describe current business and marketing trends.
  - A1.2 Describe tools, techniques, systems used to plan, staff, lead and organize in human resources.
  - A1.4 Explain the role of business and society.
  - A1.3 Compare and contrast advantages and disadvantages of business ownership.
  - A1.5 Evaluate governmental and trade regulations affecting business and marketing efforts.
  - A1.6 Explore ways technology impacts business competitiveness.
  - A1.7 Examine management styles and the role of management in marketing.
  - A1.8 Assess the importance of leadership and management in the multicultural environment.
  - A1.9 Use digital and graphic design in creation of advertising.
- A2.0 Demonstrate an understanding of basic economic concepts, economic systems, cost-profit relationships, economic indicators and trends, as well as international concepts.
- A2.1 Describe the nature of current economic problems and challenges.
  - A2.2 Explain the concept of economic resources.
  - A2.3 Explain the principles of supply and demand.
  - A2.4 Explain the role of profit as an incentive in a market economy.
  - A2.5 Determine forms of economic utility created by marketing activities.
  - A2.6 Determine factors affecting business risk.
  - A2.7 Examine the causal relationship between scarcity and choices.
  - A2.8 Distinguish between economic goods vs. services.

- A2.9 Explore the relationship of government and business.
- A2.10 Compare and contrast various economic systems.
- A2.11 Analyze the impact of organized labor and/or divisions of labor on productivity.
- A2.12 Measure current economic conditions.
- A2.13 Assess the impact of cultural and social environments on world trade and marketing.
- A3.0 Demonstrate the importance of legal, ethical and financial issues in business marketing decisions.
  - A3.1 Describe sources for financing businesses.
  - A3.2 Describe the use of technology in the financing function.
  - A3.3 Define the significance of ethical behavior in the workplace.
  - A3.4 Explain the nature and scope of financing.
  - A3.5 Identify and analyze the risks associated with obtaining business credit.
  - A3.6 Examine legal issues affecting business such as, trade, environmental, personnel, truth in advertising and workplace regulations.
  - A3.7 Analyze the critical relationships between the banking and marketing industries.
- A4.0 Implement the concepts, systems, and tools needed to gather, access, synthesize, evaluate, and disseminate information for use in making business marketing decisions.
  - A4.1 Identify considerations in planning and implementing marketing strategies.
  - A4.2 Demonstrate the role of technology in marketing information systems.
  - A4.3 Explain the nature of sales forecasting.
  - A4.4 Explain why beginning with quality market research is more likely to ensure success.
  - A4.5 Assess marketing information needs.
  - A4.6 Compare and contrast tools for conducting and analyzing marketing research.
  - A4.7 Analyze the role of ethics as it relates to marketing information management.
  - A4.8 Assess global trends and opportunities.
  - A4.9 Conduct competitive analysis.
  - A4.10 Set a marketing budget.
  - A4.11 Develop a marketing campaign and write a marketing plan.
- A5.0 Demonstrate an understanding of the nature and scope of the product/service management function, quality assurance, product mix, positioning, and other market product considerations.
  - A5.1 Explain the nature and scope of product/service management.
  - A5.2 Demonstrate an understanding of the importance of ensuring quality of products and services.
  - A5.3 Assess the needs of product/service management.
  - A5.4 Evaluate the types of product/service management.
  - A5.5 Evaluate the importance of the product mix.

- A5.6 Analyze factors marketers use to position products and businesses such as branding, packaging, labeling, legal considerations, product life cycle and management techniques for each level of the life cycle, purchasing functions.
  - A5.7 Analyze how creativity, compelling communication and design, positioning, and target marketing effectively reach customers.
- A6.0 Demonstrate an understanding of the concepts and processes needed to move, store, locate, and/or transfer ownership of goods and services.
- A6.1 Recognize the logistics of product delivery and importing and exporting products and services.
  - A6.2 Determine the uses of information systems in the order fulfillment process.
  - A6.3 Determine the effects of government regulations on stock handling techniques and warehousing.
  - A6.4 Explore the functions of the shipping and receiving process in the success of the distribution function.
  - A6.5 Explain the nature of channel member relationships.
  - A6.6 Evaluate legal and ethical considerations in the distribution process.
  - A6.7 Evaluate the types of inventory controls.
  - A6.8 Predict how customer service relationships can affect the distribution process.
- A7.0 Demonstrate an understanding of product and institutional promotion through: advertising, publicity/public relations, promotional sales, e-commerce, using product, services, images and ideas to achieve a desired outcome.
- A7.1 Describe the types of promotion.
  - A7.2 Recognize legal and ethical considerations in promotion.
  - A7.3 Understand important promotional strategies for communicating information about products, services, images, and ideas in an e-commerce environment.
  - A7.4 Explain the role of promotion.
  - A7.5 Explain the importance of public relations.
  - A7.6 Summarize the effectiveness of different types of advertising media.
  - A7.7 Coordinate activities in the promotional plan.
  - A7.8 Differentiate between publicity, public relations and advertising.
  - A7.9 Discern between the major types of sales promotion.
  - A7.10 Assess the importance of and differences between the creative processes and the management processes involved in marketing.
- A8.0 Demonstrate an understanding of the process of establishing and communicating the value or cost of goods and services, the nature and scope of pricing concepts, and the strategies and outcomes of pricing.
- A8.1 Understand the nature, scope and factors affecting the pricing function.
  - A8.2 Develop a foundational knowledge of pricing to understand its role in the marketing.



- A8.3 Explain the role of business ethics and legal considerations in pricing as well as the importance of a reputation for honesty in communication and for quality products.
- A8.4 Connect the use of technology in the pricing function.
- A8.5 Employ pricing strategies to determine prices.

## **Marketing, Sales, and Services Pathway Standards**

### **B. Professional Sales Pathway**

Develop knowledge and skills in the theory and practice of sales designed to provide a professional foundation to those involved in personal selling careers, including the fundamentals of personal selling with an emphasis on customer behavior, persuasive presentation of ideas, products and services, and developing sales goals.

Sample occupations associated with this pathway:

- ◆ Customer Service Representative
- ◆ Retail Salesperson
- ◆ Sales Manager
- ◆ Real Estate Broker
- ◆ Fashion buyer

- B1.0 Understand the interrelationships between economic and marketing concepts and selling.
- B1.1 Define the role of selling in the national economy.
  - B1.2 Determine economic indicators that affect selling.
  - B1.3 Evaluate the impact of the international economic climate and international trade on selling.
- B2.0 Analyze and evaluate legal, moral, and ethical issues affecting selling and sales management.
- B2.1 Identify legal aspects of sales contracts and warranties.
  - B2.2 Recognize legal aspects of standardization, grading, and labeling options.
  - B2.3 Understand legal aspects pertaining to advertising & pricing.
  - B2.4 Analyze ethical responsibilities in relationships with sales personnel, customer/clients, competitors, and vendors.
- B3.0 Analyze customer/client behavior in the selling process.
- B3.1 Define and predict buying motives in the customer's decision-making process.
  - B3.2 Differentiate between each stage of the customer buying process.
  - B3.3 Explain the importance of customer service and explain communication techniques.
  - B3.4 Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue.
  - B3.5 Resolve contradictions when possible.
  - B3.6 Determine what additional information and/or research is required to deepen the investigation or complete the task.
  - B3.7 Defend why quality customer service translates into a competitive edge in marketing efforts.

- B4.0 Understand the nature and scope of the functions associated with personal and business sales strategies, product knowledge, support activities, and management of selling techniques.
  - B4.1 Explain the main characteristics of a successful salesperson including; listening, verbal and written communication skills, product knowledge, customer connection, trust worthiness, and power of persuasion.
  - B4.2 Demonstrate steps of sales and techniques used in the selling process.
  - B4.3 Apply techniques used by salespeople to enhance selling potential and customer satisfaction.
  - B4.4 Compare and contrast selling strategies for wholesale and retail environments.
  - B4.5 Differentiate between each stage of the customer buying process.
  - B4.6 Obtain and analyze product and service information to facilitate the selling process.
  
- B5.0 Examine different types of sales pathways.
  - B5.1 Compare retail and wholesale sales methods.
  - B5.2 Discuss telemarketing sales techniques.
  - B5.3 Examine Internet sales.
  
- B6.0 Analyze the support activities of sales staff and management.
  - B6.1 Assess the responsibilities of building, training, and evaluating a sales staff.
  - B6.2 Examine methods of compensation for a sales staff.
  
- B7.0 Complete a strategic plan that includes establishing individual and company sales goals to guide the activities of the sales staff.
  - B7.1 Apply methods for motivating and evaluating sales staff.
  - B7.2 Practice various approaches for organizing a sales staff and leading a sales force to maximize effectiveness.
  - B7.3 Track sales figures, and prepare sales reports to analyze sales in relation to a sales plan.
  
- B8.0 Access and use marketing information to enhance sales opportunities and activities.
  - B8.1 Identify sources of demographic data for sales and business planning.
  - B8.2 Use personal sales information to guide business activities.
  - B8.3 Analyze and use data to identify potential customers and locations for business expansion.
  - B8.4 Track consumer spending trends, and analyze data to forecast sales, predict economic conditions, and guide business activities.
  - B8.5 Research consumers' needs and wants to identify product/service gaps and to develop, maintain and improve products and services.

## Marketing, Sales, and Services Pathway Standards

### C. Entrepreneurship/Self-Employment Pathway

Develop knowledge and skills common to entrepreneurs and entrepreneurship, including the human characteristics vital for entrepreneurial thinking in a twenty-first century global world. Entrepreneurial thinking may be applied to all industry sectors. The performance indicators provide business knowledge and skills required for entrepreneurs, as well as intangible skills and knowledge such as creativity and innovation skills.

Sample occupations associated with this pathway:

- ◆ Business Owner
- ◆ Consultant
- ◆ Insurance Broker
- ◆ Meeting/Event Planner
- ◆ Travel Agent

C1.0 Define the role the entrepreneur plays in the free-enterprise system.

C1.1 Understand the role and importance of entrepreneurship and small business in the economy.

C1.2 Understand the part government plays in the free-enterprise system and its impact on small businesses.

C1.3 Know how scarcity and allocation affect small businesses.

C1.4 Demonstrate the relationship between supply and demand and pricing and production.

C1.5 Evaluate the importance of economic measurements and the factors used to calculate it.

C1.6 Explore the impact of cultural and social environments on global trade.

C2.0 Analyze the development of successful personal entrepreneurial traits.

C2.1 Define and identify the following entrepreneurial characteristics: adaptability, competitiveness, confidence, discipline, perseverance, vision and risk taking.

C2.2 Analyze strengths and weaknesses of self in terms of entrepreneurial success.

C2.3 Deconstruct the reasons for success of key entrepreneurs.

C2.4 Explore the rationale of why, historically, the United States and California have been leaders in innovation and small business ventures.

C3.0 Understand the basic aspects of entrepreneurship.

C3.1 Know the risk management principles associated with small business ownership.

C3.2 Compare the different types of business ownership and the advantages and disadvantages of owning and managing a small business.

C3.3 Understand differentiation and creating a unique product/service.

- C3.4 Examine current trends that provide both domestic and global opportunities for entrepreneurs.
  - C3.5 Identify and analyze ethical and social responsibilities of a successful small business.
  - C3.6 Analyze a proposed business situation and its potential market.
  - C3.7 Compare and contrast starting a new business versus buying an existing business.
- C4.0 Develop creative and innovative thinking skills that apply to entrepreneurship and the products/services created.
- C4.1 Define terms to develop the creative process such as originality, flexibility, brain storming, modification, associative and metaphorical thinking.
  - C4.2 Develop creative thinking in order to stimulate curiosity and promote divergence.
  - C4.3 Defend why failure is an opportunity to learn and to understand that creativity and innovation is a long term and cyclical process of successes and mistakes.
  - C4.4 Explore recognized creative-minded individuals and their products and services.
  - C4.5 Defend why competitiveness depends on innovation.
  - C4.6 Create and design potential innovative twenty-first-century products and services.
- C5.0 Evaluate leadership styles and management functions for the small business.
- C5.1 Describe how cultural/ethnic/generational differences affect interpersonal interactions/communications within a business structure.
  - C5.2 Define the four management functions: planning, organizing, staffing, and controlling.
  - C5.3 Compare and contrast leadership styles and characteristics.
  - C5.4 Distinguish the roles of support staff, supervisors, and managers in achieving financial goals.
- C6.0 Demonstrate an understanding of the elements and purpose of business and strategic planning in entrepreneurship.
- C6.1 Identify and explain the components of a business plan.
  - C6.2 Define terms necessary for creating a business plan such as return on investment, target markets, and demographics.
  - C6.3 Conduct market research by using a variety of methods.
  - C6.4 Compare and contrast sample business plans, identifying strengths and weaknesses.
  - C6.5 Synthesize all elements into an original business plan.
- C7.0 Identify strategies for business startup and growth.
- C7.1 Identify mission and purpose.
  - C7.2 Identify factors for business expansion.
  - C7.3 Develop core values.

- C7.4 Develop a vision statement.
- C7.5 Evaluate advantages and disadvantages of business locations.
- C7.6 Assess barriers to startup.
- C7.7 Create an exit strategy.
  
- C8.0 Understand financial planning, reports, and projections.
  - C8.1 Identify startup costs.
  - C8.2 Understand the relationship between supply and demand and pricing and production.
  - C8.3 Research sources of capital.
  - C8.4 Formulate pricing strategies for goods and services for a small business.
  - C8.5 Project annual and monthly business income and expenses.
  - C8.6 Calculate financial projection sales, income, expenses, and taxes.
  - C8.7 Construct a financial plan.
  
- C9.0 Understand effective marketing of a small business.
  - C9.1 Identify target markets, competition, and customer profiles.
  - C9.2 Know the components of a promotional plan (e.g., advertising, public relations, sales promotion and how the plan is used to achieve a stated outcome.
  - C9.3 Identify the selling techniques used to aid customers and clients in making buying decisions.
  - C9.4 Understand how products and services are conceived, developed, maintained and improved.
  - C9.5 Use market research to develop strategies for marketing products or services in a small business.
  - C9.6 Create an effective marketing plan including current social media, viral marketing, and other technologies.
  
- C10.0 Identify and evaluate technology used by entrepreneurs.
  - C10.1 Examine the effect of technology in a small business for a multichannel approach.
  - C10.2 Explore technology related to global commerce—cultural differences, foreign currencies, and logistics.
  
- C11.0 Understand the role of human resources in a successful small business.
  - C11.1 Identify the role of human resources in selection, training, and evaluation of employees.
  - C11.2 Identify government regulations (federal, state, and local) that affect small business.
  - C11.3 Recognize various types of taxes that affect a small business.
  - C11.4 Understand policies and laws regarding harassment, nondiscrimination, and safety.
  - C11.5 Develop job descriptions.
  - C11.6 Plan compensation and benefit options.

## Academic Alignment Matrix

<b>MARKETING, SALES, AND SERVICES</b>	<b>PATHWAYS</b>		
	<b>A. Marketing</b>	<b>B. Professional Sales</b>	<b>C. Entrepreneurship and Self-Employment</b>
<b>ENGLISH LANGUAGE ARTS</b>			
<b>Language Standards – LS (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B3.0, B4.0, B5.0, B7.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C9.0, C11.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A4.0, A7.0	B7.0	C4.0, C6.0, C7.0, C9.0, C11.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A4.0, A7.0	B7.0	C9.0, C11.0
11-12.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A1.0, A5.0	B2.0, B3.0, B8.0	C5.0, C6.0
11-12.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	A4.0, A7.0	B7.0	C7.0, C9.0, C11.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B3.0, B4.0, B5.0, B7.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C9.0, C11.0
<b>Reading Standards for Information Text – RSIT (Standard Area, Grade Level, Standard #)</b>			
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0	B7.0	C1.0, C2.0, C4.0, C6.0, C9.0
11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A1.0, A3.0, A6.0, A7.0	B2.0, B7.0	C6.0, C11.0
11-12.5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.	A3.0, A7.0	B7.0	
11-12.6. Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.		B7.0	

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A6.0	B1.0, B2.0, B4.0, B5.0, B6.0, B8.0	C1.0, C2.0, C4.0, C6.0, C9.0, C10.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	A4.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C4.0, C6.0, C9.0, C10.0
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A1.0, A2.0, A3.0, A5.0, A7.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	C1.0, C2.0, C3.0, C5.0, C6.0, C7.0, C8.0, C11.0
11-12.3 Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.	A4.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0	
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0



MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments focused on discipline-specific content.	A2.0, A3.0, A4.0	B3.0	C2.0, C4.0
11-12.3. Incorporate narrative elements effectively into arguments and informative/explanatory texts.		B3.0	
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	A2.0, A4.0	B4.0, B7.0	C6.0, C7.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A4.0, A7.0	B4.0, B5.0, B8.0	C6.0, C8.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A3.0, A4.0		C3.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	A4.0	B2.0	
<b>MATHEMATICS</b>			
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>			
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>			
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.		B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.		B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<i>Represent and solve equations and inequalities graphically</i>			
10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).		B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.		B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.		B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<b>Functions – F-IF – Interpreting Functions</b>			
<i>Interpret functions that arise in applications in terms of the context</i>			
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B6.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<b>Geometry – G-MG – Modeling with Geometry</b>			
<i>Apply geometric concepts in modeling situations</i>			
1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	A2.0, A3.0, A5.0, A6.0, A7.0	B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)	A2.0, A3.0, A5.0, A6.0, A7.0		

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
<b>Number and Quantity – N-RN – The Real Number System</b>			
<i>Extend the properties of exponents to rational exponents</i>			
1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.	A2.0, A3.0, A5.0, A6.0, A7.0		C1.0, C3.0, C6.0, C8.0, C11.0
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0		C1.0, C3.0, C6.0, C8.0, C11.0
<b>Number and Quantity – N-Q – Quantities</b>			
<i>Reason quantitatively and use units to solve problems</i>			
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0		C1.0, C3.0, C4.0
2. Define appropriate quantities for the purpose of descriptive modeling.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0		C1.0, C2.0, C3.0, C6.0, C8.0, C9.0, C11.0
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0		
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>			
<i>Understand and evaluate random processes underlying statistical experiments</i>			
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>			

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
6. Evaluate reports based on data.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>			
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>			
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	A4.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
<p>6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</p> <p>a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.</p> <p>b. Informally assess the fit of a function by plotting and analyzing residuals.</p> <p>c. Fit a linear function for a scatter plot that suggests a linear association.</p>	A4.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<i>Interpret linear models</i>			
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	A1.0, A2.0, A4.0, A7.0, A8.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.	A1.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0
9. Distinguish between correlation and causation.	A1.0, A2.0	B1.0, B4.0, B5.0, B8.0	C1.0,
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>			
<i>Calculate expected values and use them to solve problems</i>			
1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<i>Use probability to evaluate outcomes of decisions</i>			
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant. b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B3.0, B4.0, B5.0, B7.0, B8.0	C1.0, C3.0, C4.0, C6.0, C7.0, C8.0, C9.0, C11.0
<b>SCIENCE</b>			
<b>Earth and Space Sciences – ESS</b>			
ESS3: Earth and Human Activity ESS3.A: Natural Resources ESS3.B: Natural Hazards ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change	A2.0, A4.0, A6.0	B1.0	C1.0, C3.0, C4.0, C7.0

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
<b>HISTORY/SOCIAL SCIENCE</b>			
<b>Principles of American Democracy and Economics – AD</b>			
12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their interdependence, and the meaning and importance of those values and principles for a free society.	A1.0, A2.0		C1.0, C2.0
12.3.1. Explain how civil society provides opportunities for individuals to associate for social, cultural, religious, economic, and political purposes.	A1.0, A2.0	B5.0, B10.0	C1.0, C2.0, C3.0
12.3.2. Explain how civil society makes it possible for people, individually or in association with others, to bring their influence to bear on government in ways other than voting and elections.	A1.0, A2.0		C1.0
12.6 Students evaluate issues regarding campaigns for national, state, and local elective offices.	A1.0, A2.0		C1.0, C3.0
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.			C1.0, C8.0
12.8 Students evaluate and take and defend positions on the influence of the media on American political life.	A2.0, A7.0		
<b>Principles of Economics – PE</b>			
12.1 Students understand common economic terms and concepts and economic reasoning.			
12.1.1. Examine the causal relationship between scarcity and the need for choices.	A2.0, A4.0, A5.0	B1.0, B5.0, B6.0, B7.0	C1.0, C3.0
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.	A2.0, A4.0, A5.0, A6.0	B1.0, B6.0	C5.0, C8.0
12.1.3. Identify the difference between monetary and non-monetary incentives and how changes in incentives cause changes in behavior.	A2.0, A5.0	B1.0	C4.0, C9.0
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.	A2.0		C1.0, C2.0, C3.0, C4.0, C9.0, C11.0
12.1.5. Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).	A2.0	B1.0	C1.0, C2.0, C3.0, C4.0, C9.0
12.2 Students analyze the elements of America's market economy in a global setting.			
12.2.1. Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.	A1.0, A2.0	B1.0, B3.0, B4.0	C8.0

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
12.2.2. Discuss the effects of changes in supply and or demand on the relative scarcity, price, and quantity of particular products.	A1.0, A2.0, A8.0	B1.0, B3.0, B4.0	C8.0
12.2.3. Explain the roles of property rights, competition, and profit in a market economy.	A1.0, A2.0, A5.0, A8.0	B1.0	C4.0, C9.0
12.2.4. Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.	A2.0, A8.0	B1.0, B3.0	C8.0
12.2.5. Understand the process by which competition among buyers and sellers determines a market price.	A2.0, A5.0, A6.0, A8.0	B1.0, B3.0	C8.0
12.2.6. Describe the effect of price controls on buyers and sellers.	A2.0, A8.0	B1.0, B4.0	C8.0, C9.0
12.2.7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.	A1.0, A4.0, A6.0, A8.0	B1.0, B3.0	C9.0
12.2.8. Explain the role of profit as the incentive to entrepreneurs in a market economy.		B1.0	C8.0
12.2.9. Describe the functions of the financial markets.	A3.0	B1.0	C4.0, C5.0, C6.0
12.2.10. Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.		B1.0	C7.0, C8.0
12.3 Students analyze the influence of the federal government on the American economy.			
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.	A2.0, A5.0	B1.0, B2.0	C1.0, C3.0, C4.0, C9.0
12.3.2. Identify the factors that may cause the costs of government actions to outweigh the benefits.	A1.0, A2.0	B1.0	C1.0, C3.0, C11.0
12.3.3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels			C8.0, C11.0
12.3.4. Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).			C11.0
12.4 Students analyze the elements of the U.S. labor market in a global setting.			
12.4.1. Understand the operations of the labor market, including the circumstances surrounding the establishment of principal American labor unions, procedures that unions use to gain benefits for their members, the effects of unionization, the minimum wage, and unemployment insurance.	A1.0, A2.0, A8.0	B2.0	C1.0, C3.0, C11.0
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.	A1.0	B6.0	C7.0, C8.0, C11.0



<b>MARKETING, SALES, AND SERVICES</b>	<b>PATHWAYS</b>		
	<b>A. Marketing</b>	<b>B. Professional Sales</b>	<b>C. Entrepreneurship and Self-Employment</b>
12.4.3. Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.		B6.0	C7.0, C8.0, C11.0
12.4.4. Explain the effects of international mobility of capital and labor on the U.S. economy.		B1.0, B8.0	C1.0, C3.0
12.5 Students analyze the aggregate economic behavior of the U.S. economy.	A1.0, A2.0, A3.0, A5.0		
12.5.1. Distinguish between nominal and real data.	A2.0, A3.0	B1.0	C7.0, C8.0
12.5.2. Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, inflation or deflation rate, and a rate of economic growth.	A1.0, A2.0, A5.0	B1.0	C7.0, C8.0, C11.0
12.5.3. Distinguish between short-term and long-term interest rates and explain their relative significance.	A2.0, A3.0	B1.0	C7.0, C8.0
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.	A2.0, A6.0		
12.6.1. Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.	A2.0	B1.0	
12.6.2. Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.	A2.0	B1.0	
12.6.3. Understand the changing role of international political borders and territorial sovereignty in a global economy.	A2.0	B1.0	
12.6.4. Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.	A2.0	B1.0	
<b>U.S. History and Geography – US</b>			
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.	A1.0		C1.0, C2.0
11.8 Students analyze the economic boom and social transformation of post-World War II America.	A1.0	B1.0	C1.0, C2.0, C5.0
11.9 Students analyze U.S. foreign policy since World War II.	A1.0, A2.0		C1.0

MARKETING, SALES, AND SERVICES	PATHWAYS		
	A. Marketing	B. Professional Sales	C. Entrepreneurship and Self-Employment
<b>World History, Culture, and Geography – WH</b>			
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.			
10.3.5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.	A1.0, A2.0	B1.0, B2.0	C1.0, C2.0, C3.0, C5.0
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A4.0	B1.0	C10.0
<b>Chronological and Spatial Reasoning – CSR</b>			
1. Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.	A1.0, A2.0	B1.0, B2.0	C1.0
2. Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.	A1.0, A2.0, A3.0, A4.0		C1.0
3. Students use a variety of maps and documents to interpret human movement, including major patterns of domestic and international migration, changing environmental preferences and settlement patterns, the frictions that develop between population groups, and the diffusion of ideas, technological innovations, and goods.	A1.0, A2.0, A3.0, A4.0, C6.0	B1.0	C1.0
4. Students relate current events to the physical and human characteristics of places and regions.	A1.0		
<b>Historical Research, Evidence, and Point of View – HR</b>			
1. Students distinguish valid arguments from fallacious arguments in historical interpretations.	A1.0		
4. Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.	A1.0		C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0, C11.0
<b>Historical Interpretation – HI</b>			
1. Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.	A1.0, A2.0		C2.0

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Marketing, Sales, and Services**

Lloyd McCabe, Administrator, California Department of Education  
Kay Ferrier, Education Consultant, California Department of Education

#### *Standards Review Team*

Laurie Andrews, Instructor, Amador Valley High School  
Polly Farina, CTE Instructional Support Specialist, Solano County Office of Education  
Denise Gregor, Instructor, San Francisco Unified School District  
Nancy Miller, Director of CTE, Santa Rosa City Schools  
Jeff Mueller, Instructor, Fremont Union High School District  
Brooks Ohlson, Director, International Trade Center, Los Rios Community College  
Carl Schmidt, Chair, Business Department, Fremont Union High School District  
Mary Whited, Coordinator, Regional Occupational Program, Merced County Office of Education

#### *Standards Writing Team*

Kelley Garcia, Marketing Coordinator, Yolo Credit Union  
Denise Gregor, Instructor, San Francisco Unified School District  
Marty Isozaki, President, InfoWave  
Vera L. Jacobson, Instructor, Carlmont High School District  
Jeff Jordan, President, Rescue Social Change Group  
Dennis Kercher, Sales, Kodak  
Myla Kovac, President, Field Dynamics Market Research  
Jerry McGee, Director, American Association of Advertising Agencies, Western Region  
Denise Spanek, Owner, Visage Studio  
Mary Whited, Coordinator, Regional Occupational Program, Merced County Office of Education

#### *Common Core Alignment Team*

Susan Beckenham, Instructor, Providence High School  
John Fleming, Instructor, Sacramento City Unified School District  
Yvette Fraga, Instructor, Los Angeles Unified School District  
Robert Guernsey, Instructor, Sacramento City Unified School District  
Kamilah Jackson, Instructor, Los Angeles Unified School District  
Linh Tran, Instructor, Sacramento City Unified School District

## References

- Arizona Department of Education, Career Technical Education. 2009. "Arizona CTE Career Preparation Standards & Measurement Criteria: Entrepreneurship." <http://www.azed.gov/career-technical-education/files/2011/10/entrepreneurship.pdf> (accessed December 24, 2012).
- . 2009. "Arizona CTE Career Preparation Standards & Measurement Criteria: Professional Sales and Marketing." <http://www.azed.gov/career-technical-education/files/2011/10/professionalsalesandmarketing.pdf> (accessed December 24, 2012).
- Nevada Department of Education. 2001. "Nevada Occupational Skills Standards: Marketing." Carson City, NV. <http://www.doe.nv.gov/>.
- North Dakota Department of Career and Technical Education. 2007. *North Dakota Marketing Education: Content Standards*. <http://www.nd.gov/cte/services/standards/docs/marketing-final-approved-Feb07.pdf> (accessed December 24, 2012).
- University of Idaho, College of Education. 2009. "Idaho Entrepreneurship Standards and Learning Indicators." [http://www.educ.uidaho.edu/standards/2009/ID\\_Bus\\_Standards/Entr.pdf](http://www.educ.uidaho.edu/standards/2009/ID_Bus_Standards/Entr.pdf) (accessed December 24, 2012).
- . 2009. "Idaho Marketing Standards and Learning Indicators."

## Table of Contents

### Public Services

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	5
Pathway Standards.....	7
A. Public Safety Pathway .....	7
B. Emergency Response Pathway .....	12
C. Legal Practices Pathway .....	17
Academic Alignment Matrix.....	23
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>
References .....	47



## Public Services

### *Sector Description*

A public service is one that is provided by government to its citizens, either directly or through the financing of another entity to provide that service. Careers in public service are unique because they center on challenging issues that define the public agenda and involve the provision of vital services to the public—from local to international levels. Public service professions offer many career opportunities, including the following career pathways: Public Safety, Emergency Response, and Legal Practices. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, skill preparation in the industry, and preparation for postsecondary education and training. Knowledge and skills are learned and applied within a sequential, standards-based pathway program that integrates classroom, laboratory, and project- and work-based instruction. Standards in this sector are designed to prepare students for technical training, postsecondary education, and entry-level employment.

## **Public Services Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Public Services academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Public Services sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Public Services sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Public Services sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Public Services sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.



- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Public Services sector workplace environment and community settings.  
(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Public Services sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Public Services industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Public Services sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Public Services sector laws and practices.

## **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the Cal-HOSA and SkillsUSA career technical student organizations. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Public Services sector issues and problems.

## **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Public Services sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Public Services sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Public Services sector.
- 10.3 Construct projects and products specific to the Public Services sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.

## **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Public Services anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings, and through the Cal-HOSA and SkillsUSA career technical student organizations.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Public Services sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Public Services sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## Public Services Pathway Standards

### A. Public Safety Pathway

The Public Safety pathway prepares students with a broad-based foundational knowledge in careers that involve public safety. The educational foundation will assist students who wish to pursue related professional training at the postsecondary level. Students will gain experience through classroom instruction, hands-on training, and community exercises. The evolving integration of state public safety organizations, their connections with federal and state intelligence and security agencies, interoperability and coordination of effort, and the shared mission to protect the public in a post-9/11 world are areas of emphasis for the pathway. The careers included in this pathway primarily address law enforcement services, homeland and cyber security services, and correctional services.

Sample occupations associated with this pathway:

- ◆ Animal Control Worker
- ◆ Correctional Officer/Probation Officer
- ◆ Law Enforcement Officer
- ◆ Loss Prevention Specialist
- ◆ Military Service

A1.0 Demonstrate an awareness of the personal, physical, and psychological qualities found in successful public safety job candidates, and recall critical types of decisions and outcomes which determine employability in public safety occupations.

- A.1.1 State the major types of occupations found in the Public Safety Pathway and the number of those occupations that require background-investigation security clearance and personal records free of disqualifying information.
- A1.2 Identify a range of personal choices and conduct that would disqualify an individual from public safety occupations, and describe ways to avoid such behaviors.
- A1.3 Recognize the extent and scope of a background investigation, what sorts of information is collected, and how it may impact the evaluation of a candidate for a position in a public safety occupation.
- A1.4 Know personal and ethical behaviors that demonstrate commitment to professional ethics and legal responsibilities.
- A1.5 Demonstrate strategies and requirements for individuals and organizations to employ to respond to unethical and illegal actions in a variety of workplace situations.
- A1.6 Understand the necessity of maintaining strong academic records, high levels of physical fitness, and positive personal history to successfully pursue a career in a public safety.
- A1.7 Understand the selection process for many public safety occupations that require certifications, reading and writing assessments,

- psychological evaluations, medical evaluations, and probationary periods.
- A1.8 Understand the importance of security and background checks, credit checks, and other assessments—including oral interviews and polygraph tests—that are required for some public safety occupations.
  - A1.9 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace settings.
  - A1.10 Understand how loyalty, duty, honor, integrity, selfless service, and personal courage play an important role in many public safety occupations.
  - A1.11 Understand how to interact with others in ways that demonstrate respect for persons, property, individual lifestyle choices, and cultural differences.
  - A1.12 Compile a personal portfolio specific to the expectations for employment in a public safety career.
- A2.0 Describe the history, shared mission, and roles of public safety agencies and professionals at the national, state, and local government levels.
- A2.1 Recognize issues particular to policing and other public safety occupations, including accountability, codes of ethical conduct, jurisdiction, and civil rights of individuals.
  - A2.2 Describe the public safety agency role in saving lives, protecting lives and property, reducing the vulnerability of critical infrastructure, identifying key resources, and maintaining order.
  - A2.3 Describe public safety agency roles in preventing terrorism, enhancing security, managing border security, securing cyberspace, and preparing for and responding to emergencies and disasters.
  - A2.4 Identify the major public safety agencies at the international, national, state, and local levels, as well as scenarios (including response to catastrophic events with multiple casualties) that call for a referral to a higher-level agency or collaboration with other public safety agencies.
  - A2.5 Analyze information to make prompt, effective, and appropriate decisions.
  - A2.6 Use conflict-resolution and anger-management skills and procedures to resolve problems.
  - A2.7 Apply critical-thinking skills to manage emergency response situations.
  - A2.8 Survey the history of public safety agencies in the United States and their influence on the current systems.
  - A2.9 Analyze and evaluate ideas, proposals, and solutions to problems.
  - A2.10 Create a scenario that includes a potential threat from terrorism, a hostage situation, or danger at a school site, describing who should respond and actions that should be taken.

- A3.0 Demonstrate an understanding of the appropriate level of nutrition, fitness, and agility required by the public safety career fields.
  - A3.1 Understand the need for physical fitness and proper nutrition in the public safety career areas.
  - A3.2 Recognize the different physical agility assessments required for entrance into a public safety career and understand the skills and techniques necessary for success in agility testing.
  - A3.3 Design and implement a personal plan for achieving and maintaining an acceptable level of agility and a lifetime fitness mindset.
  
- A4.0 Employ active listening, concise reporting, and familiarity with professional equipment to communicate effectively.
  - A4.1 Know the basic techniques and methods of active listening to obtain and clarify information in oral communications.
  - A4.2 Demonstrate effective methods of communicating with the public with a variety of techniques, such as command presence, active listening, and empathy; projecting a professional tone of voice; paraphrasing; and the proper use of nonverbal body language.
  - A4.3 Demonstrate the use of clear, concise, and legible entries based on experience and observation to prepare and submit required reports.
  - A4.4 Understand the professional use of a variety of communication methods and equipment.
  - A4.5 Practice public safety verbal communication techniques that can be used when interacting with difficult individuals.
  - A4.6 Narrate a sequence of events consistent with agency reporting formats.
  - A4.7 Convey information and ideas from primary and secondary sources accurately and coherently, consistent with agency report-writing formats.
  
- A5.0 Understand the laws, ordinances, regulations, and organizational policies that guide public safety career fields.
  - A5.1 Describe how federal, state, and local laws and regulations affect public safety operations.
  - A5.2 Explain the importance of individual liberties and civil rights provided in the Constitution and how public safety workers should safeguard these rights when interacting with the public.
  - A5.3 Prepare a chart showing the organizational chain of command and other administrative systems to assign tasks and responsibilities for maximum effectiveness.
  
- A6.0 Know the skills and equipment needed to deal with various types of situations found in public safety occupations (e.g., working with special populations, responding to emergencies, and assisting with incidents).
  - A6.1 Know the principles of emergency communications management and the importance of technological interoperability for information sharing among public safety agencies and for effective public address/warning systems.

- A6.2 Identify the skills required to deal effectively with emergency situations.
  - A6.3 Become familiar with personal safety procedures to meet prescribed regulations and situations.
  - A6.4 List the key elements of an action plan.
  - A6.5 Understand the safety and health issues related to serving persons with disabilities.
  - A6.6 Demonstrate the techniques for restraining individuals without violating their individual rights or jeopardizing safety.
  - A6.7 Practice basic emergency lifesaving techniques in order to apply those skills as needed in emergencies.
  - A6.8 Implement procedures for emergency response and know the requirements for handling hazardous materials—in normal and emergency situations—to avoid health and environmental risks (e.g., airborne and blood-borne pathogens, contamination).
  - A6.9 Explain the management of crisis negotiations to promote the safety of individuals and the public.
  - A6.10 Apply appropriate problem-solving strategies and critical-thinking skills to work-related issues and tasks.
- A7.0 Demonstrate an understanding of the major elements and career opportunities within the United States Department of Defense (DOD), including the Army, Navy, Marine Corps, Air Force, and Coast Guard.
- A7.1 Describe the mission and role of the DOD and the individual armed services.
  - A7.2 Understand the chain of command within organizations of the DOD.
  - A7.3 Understand the initial entry assessments of physical, educational, and legal for military recruitment and levels of service.
  - A7.4 Describe the structure and composition of the DOD.
  - A7.5 Understand and adhere to the following personal attributes within the DOD: leadership, teamwork, fitness, honor, integrity, respect, selfless service, and personal courage.
  - A7.6 Describe the need for, and the responsibilities of, the following functions within the DOD: armored security, maritime security and welfare, air superiority, space operations, and cyber security.
  - A7.7 Understand the role and structure of federal agencies and national organizations.
- A8.0 Demonstrate an understanding of the functions and career opportunities within the U.S. Department of Homeland Security (DHS).
- A8.1 Describe the mission, roles, and responsibilities of the U.S. Department of Homeland Security.
  - A8.2 Assess the local, state, national, and global perspectives on homeland security and the implications of protecting the public from natural and man-made threats to public safety.

- A8.3 Recognize the impact of the September 11, 2001, terror attacks on the security and intelligence community structure and the resulting emphasis placed on coordination and cooperation between public safety agencies.
  - A8.4 Identify the current global and national issues and policies concerning terrorism and homeland security.
  - A8.5 List the various techniques and methods of infrastructure and facilities protection.
  - A8.6 Understand the role of cyber-security professionals within the homeland defense community and the methods and techniques used to combat public and private cyber attacks.
  - A8.7 Survey the roles, functions, and interdependency among local, federal, and international law enforcement, intelligence, and military agencies.
  - A8.8 Analyze the various elements of emergency preparedness, including emergency response and recovery, within the context of homeland security.
- A9.0 Demonstrate an understanding of the functions of the U.S. Foreign Service.
- A9.1 Describe the primary mission of the U.S. Department of State and the role of the Foreign Service within that Department.
  - A9.2 Describe the primary mission and role of the Foreign Service.
  - A9.3 Describe the roles and responsibilities of different career tracks within the Foreign Service: Consular Officers, Economic Officers, Management Officers, Political Officers, and Public Diplomacy Officers.
  - A9.4 Research the history of the Foreign Service and describe how its careers have evolved and how the Foreign Service has impacted the United States and other societies.
  - A9.5 Describe the countries and settings in which Foreign Service Officers serve.
  - A9.6 Understand the potential impact of assignments to “hardship posts” and dangerous posts on life and family choices.



## **Public Services Pathway Standards**

### **B. Emergency Response Pathway**

The Emergency Response pathway encompasses standards for designing student coursework in preparation for a number of careers in this field. The standards provide the foundation for further professional education and training at a postsecondary level, leading to certification and employment. By mastering these standards, students gain critical knowledge and skills through classroom and job-site experiences, simulations, and other learning modalities. Careers in this pathway include those in fire services, emergency medical services, wildland services, and emergency management.

Sample occupations associated with this pathway:

- ◆ Firefighter I, Firefighter II, Wildland Firefighter
- ◆ Emergency Medical Technician (EMT)
- ◆ Fire Prevention Technician
- ◆ Emergency Response Dispatcher
- ◆ Fire Management Officer

**B1.0** Analyze the characteristics of different career fields within the Emergency Response pathway to develop a perspective on the nature of the work, entry-level requirements, career options, and expectations.

- B1.1** Understand the responsibilities, requirements, and advancement opportunities in emergency response careers.
- B1.2** List the standards for emergency response employee qualifications, training, and certification.
- B1.3** Outline a realistic program of study (education plan) based on career choice, job-entry requirements, and personal commitment.
- B1.4** Describe the roles and responsibilities of emergency response agencies.
- B1.5** Summarize the laws, regulations, and organizational protocols that define the guidelines governing selected emergency agencies and services.

**B2.0** Understand the processes by which emergency management organizations and emergency managers exert command and control over an emergency response and recovery operation.

- B2.1** Describe the mechanisms by which emergency management stakeholder agencies and resources are coordinated for mutual aid.
- B2.2** Understand the importance of an organized Command and Control System to provide for interoperability, efficiency, and effectiveness.
- B2.3** Understand the core set of basic concepts, principles, terminology, and technologies of emergency response management.
- B2.4** Recognize multiagency coordination; unified command, training, identification and management of resources; qualification and certification; and the collection, tracking, evaluation, and dissemination of information.
- B2.5** Describe the principles and responsibilities of the Incident Command System (ICS) and the National Incident Management System (NIMS).

- B2.6 Review a simulated local hazard mitigation plan based on a potential hazard to the community, and describe the appropriate response.
  - B2.7 Design an emergency plan for an earthquake in a major metropolitan area that has shut off access from all directions.
- B3.0 Demonstrate necessary leadership qualities, team concepts, and personal integrity for emergency response personnel.
- B3.1 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in emergency services.
  - B3.2 Understand the characteristics and benefits of teamwork, leadership, and citizenship in community and workplace settings.
  - B3.3 Employ active listening, concise reporting, and familiarity with emergency response communication equipment to interact efficiently and effectively.
  - B3.4 Describe emergency response techniques and methods of active listening to obtain and clarify information in oral communications.
  - B3.5 Demonstrate a variety of appropriate and effective methods of communicating with the public, including techniques such as professional demeanor, active listening, empathy, projecting a confident tone of voice, paraphrasing, and the proper use of nonverbal body language.
  - B3.6 Adhere to Health Insurance Portability and Accountability Act (HIPAA) regulations and agency guidelines regarding public and media communications.
  - B3.7 Use appropriate terminology in clear, concise, and legible report entries when preparing and submitting required reports.
  - B3.8 Use and maintain a variety of communication equipment, understanding the importance of using current and up-to-date technology and communication equipment.
  - B3.9 Practice verbal and nonverbal emergency terminology and communication techniques to be used when interacting with emergency response personnel in a variety of emergency situations.
  - B3.10 Gather information and ideas from primary and secondary sources accurately and coherently.
- B4.0 Execute safety procedures and protocols associated with local, state, and federal regulations in order to effectively and safely conduct duties within fire and emergency services.
- B4.1 Describe the basic elements of safety and survival for emergency response personnel.
  - B4.2 Know and use the appropriate personal protective equipment (PPE) required for emergency services duties.
  - B4.3 Know how to establish situational awareness, identify hazards, and assess personal, team, or environmental risks.

- B4.4 Understand and adhere to comprehensive and systematic risk management strategies to reduce injury and fatalities for self, team, and community.
  - B4.5 Demonstrate strategies to identify and eliminate hazards.
  - B4.6 Complete certification in emergency care as appropriate—for example, cardiopulmonary resuscitation (CPR), automated external defibrillator (AED), and first aid.
- B5.0 Develop the level of nutrition, fitness, strength, agility, and psychological health and well-being required for safely working in emergency response career fields.
- B5.1 Understand that physical fitness and proper nutrition are needed to perform the duties of emergency response personnel.
  - B5.2 Recognize the different physical strength and agility assessments required for entrance into emergency response employment.
  - B5.3 Apply the skills and techniques necessary for success in strength and agility testing.
  - B5.4 Design and implement a personal plan for achieving and maintaining an acceptable level of nutrition, strength and agility, and a lifetime fitness mindset.
  - B5.5 Recognize and understand the importance of maintaining psychological health and well-being in emergency response occupations.
- B6.0 Understand the roles of federal, state, and local agencies in catastrophic event planning, preparation, response, and recovery.
- B6.1 Describe steps for each potential catastrophic event.
  - B6.2 Analyze the history and outcomes of catastrophic events and the appropriate emergency responses.
  - B6.3 Review a hazard mitigation plan to reduce death and injury for potential man-made and natural hazards.
  - B6.4 Prepare an emergency preparedness and response plan that includes the roles of emergency response personnel for a potential catastrophic event in the community.
  - B6.5 Recognize the importance and variety of recovery strategies to support individuals and communities impacted by a catastrophic event.
- B7.0 Research and define what is considered to be hazardous materials incidents and threats.
- B7.1 Describe commonly encountered hazardous materials.
  - B7.2 Describe the hazardous materials labeling system and identify definitions associated with various hazardous materials.
  - B7.3 Describe the type of damage and injury that can occur if hazardous materials are handled improperly.
  - B7.4 Explain the steps taken, including appropriate personnel and safety measures, for a hazardous-material release.

- B7.5 Research and report on the most common incidents involving hazardous materials.
  
- B8.0 Understand the fundamental mission of fire services occupations and the responsibility to preserve life and property, promote public safety, and reduce fire deaths.
  - B8.1 Understand the history, organization, and operation of fire services.
  - B8.2 Describe the skills and knowledge necessary for an entry-level firefighter to safely perform the tasks required of the job.
  - B8.3 Explain the fundamentals and scientific principles of fire behavior, combustible materials, extinguishing agents, hazardous and toxic materials, forms of energy, and fire prevention/suppression techniques for all types of fires and conditions.
  - B8.4 Demonstrate the operation of fire protection equipment and systems.
  - B8.5 Demonstrate the skills necessary to perform fire suppression and basic rescue operations using firefighting techniques and rescue equipment.
  - B8.6 Identify structural characteristics of building construction types as they relate to fire protection and suppression, and recognize the signs and causes of potential building collapse and other hazards.
  - B8.7 Apply principles of proper body mechanics, including ergonomics, equipment use, and techniques to prevent personal injury.
  - B8.8 Participate in public education aimed at reducing loss of life and property, through programs and activities on fire prevention and safety as well as other injury-prevention education.
  
- B9.0 Demonstrate the immediate basic life support and interim medical care for a sick, injured, or compromised person until advanced medical care is provided or transport is initiated.
  - B9.1 Understand and use medical terminology and related knowledge of anatomy, physiology, diseases, diagnoses, pharmacology, therapeutics, and common abbreviations necessary for emergency medical services.
  - B9.2 Know the common acronyms used in fire and emergency services.
  - B9.3 Perform technical skill and equipment use required for emergency response occupations—for example, airway, oxygen, and ventilation procedures; suction; bleeding control; shock management; cardiac arrest management; immobilization techniques; traction; splinting; transport; defibrillation; and wound management.
  - B9.4 Follow instructions for immediate care procedure as transmitted by an emergency medical dispatcher during transport.
  - B9.5 Demonstrate administration of a limited number of drugs appropriate to the scope of practice.
  - B9.6 Manage an incident scene as the first responder, using emergency response skills appropriate to training and certification.
  - B9.7 Execute protocols in emergency management response when working with an on-scene accident.

- B9.8 Demonstrate the ability to assess the nature and extent of an illness or injury to establish and prioritize medical response.
- B9.9 Communicate with treatment-center staff to arrange reception of victims and to get instructions for further treatment.
- B9.10 Demonstrate the ability to receive and provide patient-care information to other medical providers.
- B9.11 Describe the function of emergency vehicles, use of medical and communication equipment, and the necessity of maintaining inventory as required for emergency services practices and procedures.
- B10.0 Analyze and describe the functions and responsibilities of federal, state, and local wildland services.
  - B10.1 Describe wildland firefighter safety and survival preparations.
  - B10.2 Explain the role of fire personnel in wildland fires, structure fires, auto accidents, medical aid, swift-water rescue, civil disturbances, search and rescue operations, hazardous material spills, train wrecks, floods, and earthquakes.
  - B10.3 Describe fire prevention and planning procedures to save wildland structures during a forest fire.
  - B10.4 Assess the value of the resource management program, including the impact on timber, watershed, wildlife, and recreation.
  - B10.5 Create a state map showing the locations of wildland lookouts, and describe the lookouts' purpose and staffing.
  - B10.6 Evaluate the importance of the fire suppression aviation program.
  - B10.7 Recognize factors that influence the start and spread of wildland fires.
  - B10.8 Describe and evaluate the importance of the various types of equipment used to control and/or extinguish wildland fires.
  - B10.9 Build a plan describing processes and procedures to follow prior to, during, and after a wildfire event.

## Public Services Pathway Standards

### C. Legal Practices Pathway

The Legal Practices pathway prepares students with a broad-based foundation of knowledge pertaining to the various types of law and of legal practice and provides a foundation of basic skills necessary at all levels in the legal professions.

Sample occupations associated with this pathway:

- ◆ Paralegal
- ◆ Court Reporter
- ◆ Law Librarian
- ◆ Legal Researcher
- ◆ Lawyer

- C1.0 Demonstrate an understanding of the state and federal justice system, the Rule of Law, and the environment/practice settings for legal professionals.
- C1.1 Describe the different levels of federal courts and their jurisdictions.
  - C1.2 Identify the primary legal practice settings (e.g., private firms, government and public-sector entities, corporate counsel, and public interest practice), and explain the nature and scope of each practice area.
  - C1.3 Identify, by practice area, the types of clients served and related legal needs and issues.
  - C1.4 Become familiar with educational and experiential requirements needed to establish and maintain successful careers in each practice area.
  - C1.5 Explain the court system of the State of California, including the different types of state courts and their jurisdictions.
  - C1.6 Become familiar with the concept of equal access to justice.
  - C1.7 Present and defend the case for diversity in the legal professions.
  - C1.8 Contrast the fundamental features of civil, criminal, and administrative law.
- C2.0 Demonstrate an understanding and ability to utilize legal research and writing.
- C2.1 List the basic steps in legal research, including the legal publications most commonly used in the practice of law.
  - C2.2 Explain the importance and purpose of legal research.
  - C2.3 Explain the difference between legal publications, treatises, and other legal writings.
  - C2.4 Demonstrate a working knowledge of the legal research system by writing a short memorandum on a given question of law and explaining the steps taken to find sources and reach conclusions.
  - C2.5 Demonstrate the ability to use a uniform system of citing cases for updating and cross-referencing cases.
  - C2.6 Demonstrate the ability to locate and update legal authority using computer-assisted legal research tools.

- C2.7 Demonstrate how to analogize or distinguish the facts and law of one case from the facts of a given legal problem.
  - C2.8 Demonstrate how to “brief” a case.
  - C2.9 Discuss the term “authority” as it is used in legal writing, and explain the hierarchy of authority and the difference between mandatory and persuasive authority.
  - C2.10 Discuss the purpose of a legal memorandum, brief or points, and authorities to a particular audience (how the memorandum may vary in emphasis and style, depending on the audience).
  - C2.11 Discuss case law, how it is made, its component parts, and how to use cases to resolve a legal problem.
  - C2.12 Contrast case law with statutory law and explain how to interpret statutes using intrinsic and extrinsic sources.
  - C2.13 Create a hypothetical case and identify the applicable statutory, regulatory, and case law.
  - C2.14 Prepare a legal brief to represent the defendant in the hypothetical case.
- C3.0 Demonstrate an understanding of tort law and concepts and their application to factual situations.
- C3.1 Define the tort concept of civil wrong and apply the concept to factual situations with persons, property, and defenses of an intentional tort.
  - C3.2 Describe the tort of negligence and the elements of negligence (e.g., “reasonable person,” *res ipsa loquitur*, proximate cause).
  - C3.3 Describe defenses to negligence actions, including strict and product liability.
- C4.0 Demonstrate knowledge of constitutional law, criminal law, immigration law, and related concepts, as well as their application to factual situations.
- C4.1 Discuss the United States Constitution, including its philosophical underpinnings and structure.
  - C4.2 Analyze the Fourteenth Amendment, particularly (1) the Due Process Clause and Substantive Due Process, as contrasted with Procedural Due Process; and (2) the Equal Protection Clause.
  - C4.3 Discuss and define terms and concepts of criminal law, including the theory of criminal law (*Malum in se* and *Malum prohibitum*) and the evolving nature of criminal law (e.g., the legal definition of a viable human being).
  - C4.4 Describe types and elements of crimes against persons and property, overlapping crimes against people and their property, and inchoate crimes.
  - C4.5 Discuss each stage in a criminal proceeding, from investigation to disposition (e.g., arrest, prosecution of crimes, and defenses of criminal prosecution) and post-conviction procedure.
  - C4.6 Research court data regarding annual statewide numbers of criminal proceedings and demographics of defendants; discuss disproportionate minority contact.

- C4.7 Discuss the concept of implicit bias and the impact it has on the criminal and civil justice systems.
  - C4.8 Define a variety of legal terms and concepts related to immigration law.
  - C4.9 Describe the various types of immigration visas.
  - C4.10 Explain the process and basis for political asylum.
  - C4.11 Prepare a chart displaying the process for applying for citizenship, including a display of the average number of immigrants who apply each year and the percentage of successful applicants.
- C5.0 Demonstrate a familiarity with fundamental principles of contract law (including the uniform commercial code) and fundamentals of consumer protection law.
- C5.1 Recognize the differences between void and voidable contracts.
  - C5.2 Recognize various types of contracts, such as adhesion, bilateral, unilateral, implied, and express.
  - C5.3 Identify emerging business practices that may result in consumer fraud or deception.
  - C5.4 Identify ways by which the Internet and social media can be used to inform consumers and address deceptive business practices.
  - C5.5 Describe the elements of a contract, including contract terminology.
  - C5.6 Explain the Statute of Frauds.
  - C5.7 Explain the Parole Evidence Rule.
  - C5.8 Interpret contract rules and expectations, including specific performance, breach of contract, remedies for breach of contract, third-party beneficiary, and requirements for modifications.
  - C5.9 Analyze deceptive business practices, including false advertising, “bait and switch” sales practices, and truth-in-lending disclosure requirements.
  - C5.10 Prepare a sample of a false advertisement.
- C6.0 Demonstrate knowledge of property law and its application to property transactions, estate planning and probate administration, and housing law, including landlord/tenant and fair housing laws.
- C6.1 Distinguish personal property from real property.
  - C6.2 Define a variety of terms associated with real estate transactions.
  - C6.3 Discuss real property concepts, including but not limited to the types of estates that can be conveyed under California law.
  - C6.4 Contrast the basic responsibilities of the lawyer and the real estate broker in the conveyance of real property, from the sales or option contract to the recording of the deed.
  - C6.5 Describe the basic requirements of a contract for sale of real property.
  - C6.6 Discuss the purpose of title insurance, a title search, and how the “search” is made.
  - C6.7 Explain how “recording” is accomplished and the importance of recording a deed, mortgage, or other real estate documents.
  - C6.8 Explain the most common forms of limitations on real property use, such as covenants, easements, zoning laws, and land-use regulations.



- C6.9 Explain at least two types of encumbrances that can be placed against real property.
  - C6.10 Describe the steps and procedures in a typical real estate closing.
  - C6.11 Compare a variety of real property documents, such as a lease, a promissory note, an option contract, and an agreement for deed or a mortgage, and be able to prepare at least one.
  - C6.12 Define a variety of terms and concepts associated with wills, trusts, and probate administration.
  - C6.13 Define a simple Inter Vivos, and a Testamentary trust.
  - C6.14 Compare and contrast a trust and a will, including advantages and disadvantages for each.
  - C6.15 Explain the general procedures of the probate process.
  - C6.16 Explain the purposes of wills and codicils.
  - C6.17 Create a personal will, following legal guidelines.
  - C6.18 Identify the types of discrimination that renters and home buyers might face.
  - C6.19 Understand the basic rights and responsibilities of both landlords and tenants.
  - C6.20 Explain the basic procedures, claims, and responses in an unlawful detainer case.
- C7.0 Understand the fundamental principles of the law of business organizations.
    - C7.1 Define a variety of terms associated with business organizations.
    - C7.2 Describe the procedures necessary to form, modify, and dissolve various types of business organizations.
    - C7.3 Compare the major advantages and disadvantages of the various types of business organizations.
    - C7.4 Discuss the rights, duties, and liabilities of the owners, officers, directors, and employees of various types of business organizations.
    - C7.5 Discuss the nature of the agency relationship, including the duties and liabilities of the principal, the agent, and third parties.
- C8.0 Recognize the importance of laws and procedures related to intellectual property.
    - C8.1 Explore emerging issues of law related to personal access to, and use of, technology.
    - C8.2 Describe the economic barriers to equal public access to technology and legal strategies for overcoming them.
    - C8.3 Demonstrate an appreciation for balancing the First Amendment right to free speech vs. the interest of parents, schools, and the government regulating social media because of concerns about privacy, online bullying, defamation/slander, and harassment.
    - C8.4 Discuss how social media can be used by governments or individuals to suppress or enhance freedom of expressions.
    - C8.5 Understand the definition of “intellectual property”: the legal concept that certain types of creations—musical, literary, and artistic works; discoveries and inventions; and words, phrases, symbols, and designs—

- are types of property “owned” by their creators and cannot be copied or used without the permission of the creators.
- C8.6 Explain the ways in which creative rights can be compromised, such as plagiarism and “sampling.”
  - C8.7 Identify emerging issues of law related to infringement of intellectual property and discuss how personal access to, and use of, technology makes intellectual property infringement easier.
- C9.0 Demonstrate a general understanding of all phases of trial practice and procedure, as well as knowledge of and ability to perform litigation techniques and procedures.
- C9.1 Define a variety of terms associated with litigation and trial practice.
  - C9.2 Describe the typical steps in jury and nonjury civil trials, from pretrial through the appeal.
  - C9.3 Explain the sequence and basic contents of pleadings.
  - C9.4 List and briefly explain six causes of action in civil cases.
  - C9.5 Explain the basic concept of the Statute of Limitations.
  - C9.6 Discuss the basic rules of procedure and evidence code.
  - C9.7 Describe how evidence and exhibits are organized for trial.
  - C9.8 Describe the purpose and contents of a trial notebook.
  - C9.9 Describe the techniques for asking questions and list the basic points for good listening.
  - C9.10 Describe the purpose of background investigations and analysis.
  - C9.11 List the sources of information for conducting background investigations.
  - C9.12 Describe how the results of background investigation and analysis can be presented to the attorney.
  - C9.13 Discuss the evaluation and use of evidence.
  - C9.14 Describe the role of a jury in a criminal case versus a civil case in state court proceedings.
  - C9.15 Understand the importance of the jury in relation to fairness and due process.
  - C9.16 Understand the purpose and process of jury *voir dire* and how it determines the makeup of the jury panel.
  - C9.17 Describe the judge’s role, the role of the prosecutor, and that of the defense attorney.
  - C9.18 Create a hypothetical case and describe why you would or would not like to participate as a juror on that case.
- C10.0 Demonstrate an understanding of the ethical and professional standards of the legal professions and knowledge of management techniques and procedures.
- C10.1 Define a variety of legal terms and concepts related to professionalism and the unauthorized practice of law.
  - C10.2 Explain how judges, lawyers, and paralegal personnel function in our legal system.
  - C10.3 Understand the roles and responsibilities that lawyers (including judges) have in our society.

- C10.4 Describe alternative methods for resolving ethical dilemmas within the legal environment.
- C10.5 Define a variety of terms and concepts related to law-office management and structure.
- C10.6 List and discuss techniques for improving the confidence that clients will have in the personnel of the law office.
- C10.7 Describe how client files are opened, maintained, and closed.
- C10.8 List the advantages of data management and microcomputer skills in a law office.
- C10.9 List, discuss, and apply the rules of ethics in the legal profession, with special emphasis on client confidentiality.
- C10.10 Discuss what constitutes legal malpractice, and illustrate the discussion with examples of malpractice.
- C10.11 Discuss the various aspects of fee setting in the law office, including fixed fees, minimum fees, contingent fees, retainers, payment schedules, and billing practice.

## Academic Alignment Matrix

<b>PUBLIC SERVICES</b>	<b>Pathways</b>		
	<b>A. Public Safety</b>	<b>B. Emergency Response</b>	<b>C. Legal Practices</b>
<b>ENGLISH LANGUAGE ARTS</b>			
<b>Language Standards – LS – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0	B1.0, B2.0, B3.0, B4.0, B6.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.	A1.0, A2.0, A3.0, A4.0, A 5.0	B1.0, B2.0, B3.0, B4.0, B6.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0, C8.0, C9.0, C10.0
11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	A1.0, A 2.0, A 3.0, A 4.0, A 5.0	B1.0, B2.0, B3.0, B4.0, B6.0, B8.0,	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11–12 reading and content</i> , choosing flexibly from a range of strategies.	A 5.0	B1.0, B2.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.			C1.0, C2.0, C5.0, C6.0
11-12.6. Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	A 1.0, A 2.0, A 3.0, A 5.0, A 6.0	B1.0, B2.0, B3.0, B4.0, B6.0, B8.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
<b>Reading Standards for Literature – RSL – (Standard Area, Grade Level, Standard #)</b>			
11-12.2. Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.	A 1.0, A 2.0, A 3.0, A 4.0, A 5.0, A 6.0, A 7.0	B1.0, B2.0	C2.0, C3.0, C5.0, C6.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11-12.3. Analyze the impact of the author’s choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters/archetypes are introduced and developed).			
11-12.4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful.		B2.0, B3.0, B4.0	C2.0, C5.0, C6.0
<b>Reading Standards for Information Text – RSIT – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B8.0, B10.0	C2.0, C3.0, C4.0, C5.0, C6.0
11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0
11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines <i>faction</i> in <i>Federalist</i> No. 10). (See grade 11/12 Language standards 4-6 on page 46 for additional expectations.)	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
11-12.6. Determine an author’s point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0	C2.0
11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C10.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., <i>The Federalist</i> , presidential addresses).	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0		C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C10.0
11-12.9 Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including the Declaration of Independence, the preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purpose, and rhetorical features.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0		C1.0, C2.0, C3.0, C4.0, C10.0
11-12.10 By the end of grade 11, read and comprehend literary nonfiction in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0		C1.0, C2.0, C3.0, C4.0
<b>Reading Standards for Literacy in History/Social Studies – RHSS – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.	A3.0	B1.0, B2.0, B3.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B2.0, B3.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11-12.5. Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.6. Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.8. Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.			
11-12.9 Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.	A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.10. By the end of grade 12, read and comprehend history/social studies texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0		C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST – (Standard Area, Grade Level, Standard #)</b>			
11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B2.0, B3.0, B8.0, B9.0, B10.0	
11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A2.0, A3.0, A5.0, A6.0, A7.0		
11-12-4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	A5.0, A6.0, A7.0	B2.0, B3.0	

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11-12.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B2.0, B3.0, B10.0	
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B10.0	
11-12.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	A2.0, A3.0, A6.0, A7.0	B2.0, B3.0	
11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B8.0, B9.0, B10.0	
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0	
<b>Writing Standards – WS – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. <ul style="list-style-type: none"> <li>a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.</li> <li>b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.</li> <li>c. Use specific rhetorical devices to support assertions (e.g., appeal to logic through reasoning; appeal to emotion or ethical belief; relate a personal anecdote. Case study or analogy).</li> <li>d. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</li> <li>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</li> </ul>	A2.0, A3.0	B1.0, B2.0, B3.0, B5.0, B6.0, B8.0, B9.0, B10.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C10.0



PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
f. Provide a concluding statement or section that follows from and supports the argument presented.			
11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a. Introduce a topic or thesis statement; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).	A1.0, A4.0, A7.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B8.0, B9.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.3 Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.	A5.0	B2.0, B3.0	
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A1.0	B1.0, B2.0, B3.0, B5.0, B6.0, B8.0, B9.0, B10.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.		B1.0, B2.0, B3.0, B5.0, B6.0, B8.0, B9.0, B10.0	
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A3.0, A5.0, A7.0	B3.0, B6.0	

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A3.0, A5.0, A7.0	B2.0, B3.0, B5.0, B6.0, B10.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.	A3.0, A5.0, A7.0	B2.0, B3.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0	C1.0, C2.0, C10.0
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.	A5.0, A7.0	B6.0	C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.		B2.0, B3.0	
<b>Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST – (Standard Area, Grade Level, Standard #)</b>			
11-12.1. Write arguments focused on discipline-specific content.	A3.0 B2.0, B3.0, B4.0, B5.0	B2.0, B3.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 B7.0,	B1.0, B2.0, B3.0, B5.0, B6.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.3. Incorporate narrative elements effectively into arguments and informative/explanatory texts.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 B7.0,	B5.0	C2.0, C9.0, C10.0
11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate tot task, purpose, and audience.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0 B7.0,	B1.0, B2.0, B3.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.		B1.0, B2.0, B3.0, B5.0, B6.0, B7.0, B8.0, B9.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A2.0, A3.0	B2.0, B3.0, B5.0, B6.0, B7.0, B10.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	A2.0, A3.0, A5.0, B7.0,		C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.			C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.			
<b>MATHEMATICS</b>			
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>			
<i>Interpret the structure of expressions</i>			
1. Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret <math>P(1+r)^n</math> as the product of P and a factor not depending on P.</i>			C4.0
<i>Write expressions in equivalent forms to solve problems</i>			

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
<b>Algebra – A-CED – Creating Equations</b>			
<i>Create equations that describe numbers or relationships</i>			
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)		B2.0, B6.0	C10.0
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		B2.0, B6.0	C4.0
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.		B2.0, B6.0	
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .		B2.0, B6.0, B8.0	
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>			
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>			
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.		B2.0, B6.0, B8.0	
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.		B8.0	
<i>Solve equations and inequalities in one variable</i>			
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. 3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)		B2.0, B6.0, B7.0, B8.0, B9.0, B10.0	C10.0
<i>Solve systems of equations</i>			
5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.			

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.			C4.0
<b>Functions – F-IF – Interpreting Functions</b>			
<i>Understand the concept of a function and use function notation</i>			
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .		B2.0, B6.0, B10.0	
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.		B2.0, B6.0, B10.0	C2.0, C4.0
<i>Interpret functions that arise in applications in terms of the context</i>			
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.		B2.0, B6.0, B7.0, B8.0, B10.0	C4.0
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.		B2.0, B6.0, B7.0, B8.0, B10.0	C4.0
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.		B2.0, B6.0, B7.0, B8.0, B10.0	
<b>Geometry – G-CO – Congruence</b>			
<i>Experiment with transformations in the plane</i>			
1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	A2.0, A9.0	B2.0, B6.0, B7.0, B8.0, B9.0, B10.0	
<b>Geometry – G-GMD – Geometric Measurement and Dimensions</b>			
<i>Visualize relationships between two-dimensional and three-dimensional objects</i>			
1. Give an informal argument for the formulas for the circumference of a Circle, area of a circle, volume of a cylinder, pyramid, and cone. use dissection arguments, Cavalieri's principle, and informal limit arguments.		B2.0, B6.0, B7.0, B8.0, B9.0, B10.0	

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.		B2.0, B6.0, B7.0, B8.0, B9.0, B10.0	
5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.		B2.0, B6.0, B9.0, B10.0	
<b>Geometry – G-GPE – Expressing Geometric Properties with Equations</b>			
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	A2.0, A9.0	B2.0, B6.0, B7.0, B8.0, B10.0	
<b>Geometry – G-MG – Modeling with Geometry</b>			
<i>Apply geometric concepts in modeling situations</i>			
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	A2.0	B6.0, B8.0, B9.0, B10.0	
<b>Number and Quantity – N-Q – Quantities</b>			
<i>Reason quantitatively and use units to solve problems</i>			
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	A2.0, A8.0, A9.0	B2.0, B6.0, B7.0, B8.0, B9.0, B10.0	
2. Define appropriate quantities for the purpose of descriptive modeling.	A2.0, A8.0, A9.0	B2.0, B6.0, B7.0, B8.0, B9.0, B10.0	
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	A2.0, A7.0, A8.0, A9.0	B2.0, B6.0, B7.0, B8.0, B9.0, B10.0	
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>			
<i>Understand and evaluate random processes underlying statistical experiments</i>			
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A2.0, A7.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	C4.0
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?	A8.0, A9.0	B2.0, B6.0, B10.0	C4.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>			
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A2.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A2.0		
6. Evaluate reports based on data.	A2.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	C4.0, C8.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>			
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A1.0, A7.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	C4.0, C8.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A1.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	C4.0, C8.0
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A1.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	C4.0, C8.0
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A1.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	C4.0, C8.0
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>			
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.			C4.0
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.			C4.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
<i>Interpret linear models</i>			
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.			C4.0
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.			C4.0
9. Distinguish between correlation and causation.			C4.0
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>			
<i>Understand independence and conditional probability and use them to interpret data</i>			
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.			C4.0
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>			
<i>Calculate expected values and use them to solve problems</i>			
1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.		B2.0, B6.0, B10.0	
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.		B2.0, B6.0, B10.0	
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.		B2.0, B6.0, B10.0	
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?		B2.0, B6.0, B10.0	



PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
<i>Use probability to evaluate outcomes of decisions</i>			
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant. b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	A2.0, A8.0, A9.0	B2.0, B4.0, B6.0, B10.0	
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	A2.0,		
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	A2.0, A8.0, A9.0	B2.0, B4.0, B6.0, B10.0	C4.0, C10.0
<b>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</b>			
10.0 Students know the definitions of the mean, median and mode of distribution of data and can compute each of them in particular situations.	A2.0, A7.0, A8.0, A9.0	B2.0, B6.0, B7.0, B10.0	
<b>SCIENCE</b>			
<b>Scientific and Engineering Practices – SEP</b>			
7. Engaging in argument from evidence	A2.0		C2.0
8. Obtaining, evaluating, and communicating information	A2.0		C2.0
<b>Physical Sciences – PS</b>			
PS1: Matter and Its Interactions			
PS1.A: Structure and Properties of Matter	A4.0, A7.0	B7.0	
PS1.B: Chemical Reactions	A1.0, A4.0	B7.0	

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
PS2: Motion and Stability: Forces and Interactions			
PS2.A: Forces and Motion	A4.0, A7.0		
PS2.B: Types of interactions			
PS2.C: Stability and Instability in Physical Systems	A2.0, A3.0, A7.0	B8.0	
PS3: Energy			
PS3.C: Relationship Between Energy and Forces	A7.0	B8.0	
PS3.D: Energy in Chemical Processes and Everyday Life	A1.0, A4.0, A7.0		
PS4: Waves and Their Applications in Technologies for Information Transfer			
PS4.C: Information Technologies and Instrumentation	A1.0, A3.0, A5.0		
<b>Life Sciences – LS</b>			
LS1: From Molecules to Organisms: Structures and Processes			
LS1.A: Structure and Function	A6.0, A2.0	B4.0, B5.0, B9.0	
LS1.B: Growth and Development of Organisms	A6.0, A4.0	B4.0, B5.0, B9.0	
LS1.C: Organization for Matter and Energy Flow in Organisms		B4.0, B5.0, B9.0	
LS1.D: Information Processing	A5.0		
LS2: Ecosystems: Interactions, Energy, and Dynamics			
LS2.A: Interdependent Relationships in Ecosystems	A3.0, A6.0		
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	A1.0		
LS2.D: Social Interactions and Group Behavior	A7.0		
<b>Engineering, Technology, and the Applications of Science – ETS</b>			
ETS1: Engineering Design			
ETS1.A: Defining and Delimiting an Engineering Problem	A3.0, A7.0		
ETS1.B: Developing Possible Solutions			
ETS1.C: Optimizing the Design Solution			
<b>HISTORY/SOCIAL SCIENCE</b>			
<b>Principles of American Democracy and Economics – AD</b>			
12.1 Students explain the fundamental principles and moral values of American democracy as expressed in the U.S. Constitution and other essential documents of American democracy			

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
12.1.1. Analyze the influence of ancient Greek, Roman, English, and leading European political thinkers such as John Locke, Charles-Louis Montesquieu, Niccolo Machiavelli, and William Blackstone on the development of American government.			C4.0
12.1.2. Discuss the character of American democracy and its promise and perils as articulated by Alexis de Tocqueville.	A2.0		C4.0
12.1.3. Explain how the U.S. Constitution reflects a balance between the classical republican concern with promotion of the public good and the classical liberal concern with protecting individual rights; and discuss how the basic premises of liberal constitutionalism and democracy are joined in the Declaration of Independence as "self-evident truths."	A5.0,		C1.0, C4.0, C4.0
12.1.5. Describe the systems of separated and shared powers, the role of organized interests (Federalist Paper Number 10), checks and balances (Federalist Paper Number 51), the importance of an independent judiciary (Federalist Paper Number 78), enumerated powers, rule of law, federalism, and civilian control of the military.			C4.0
12.1.6. Understand that the Bill of Rights limits the powers of the federal government and state governments.	A5.0, A3.0, A6.0		C1.0, C4.0
12.2 Students evaluate and take and defend positions on the scope and limits of rights and obligations as democratic citizens, the relationships among them, and how they are secured.	A3.0, A6.0		
12.2.1. Discuss the meaning and importance of each of the rights guaranteed under the Bill of Rights and how each is secured (e.g., freedom of religion, speech, press, assembly, petition, privacy).	A5.0		C1.0, C4.0, C8.0 C4.0, C9.0
12.2.2. Explain how economic rights are secured and their importance to the individual and to society (e.g., the right to acquire, use, transfer, and dispose of property; right to choose one's work; right to join or not join labor unions; copyright and patent).			C4.0, C4.0, C9.0
12.2.3. Discuss the individual's legal obligations to obey the law, serve as a juror, and pay taxes.	A1.0		C4.0, C4.0, C9.0
12.2.4. Understand the obligations of civic-mindedness, including voting, being informed on civic issues, volunteering and performing public service, and serving in the military or alternative service.	A1.0		C4.0, C9.0
12.2.5. Describe the reciprocity between rights and obligations; that is, why enjoyment of one's rights entails respect for the rights of others.	A1.0		C4.0, C9.0
12.2.6. Explain how one becomes a citizen of the United States, including the process of naturalization (e.g., literacy, language, and other requirements).	A1.0		C4.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their Interdependence, and the meaning and importance of those values and principles for a free society.			C4.0, C5.0, C8.0
12.3.3. Discuss the historical role of religion and religious diversity.	A1.0		
12.4 Students analyze the unique roles and responsibilities of the three branches of government as established by the U.S. Constitution.	A1.0		
12.4.1. Discuss Article I of the Constitution as it relates to the legislative branch, including eligibility for office and lengths of terms of representatives and senators; election to office; the roles of the House and Senate in impeachment proceedings; the role of the vice president; the enumerated legislative powers; and the process by which a bill becomes a law.	A6.0		C1.0, C4.0, C1.0, C4.0, C6.0, C7.0
12.4.3. Identify their current representatives in the legislative branch of the national government.			C1.0, C4.0
12.4.4. Discuss Article II of the Constitution as it relates to the executive branch, including eligibility for office and length of term, election to and removal from office, the oath of office, and the enumerated executive powers.	A3.0		C1.0, C4.0
12.4.5. Discuss Article III of the Constitution as it relates to judicial power, including the length of terms of judges and the jurisdiction of the Supreme Court.	A6.0		C1.0, C4.0
12.5 Students summarize landmark U.S. Supreme Court interpretations of the Constitution and its amendments.			C2.0, C4.0, C8.0, C9.0
12.5.1. Explain how civil society provides opportunities for individuals to associate for social, cultural, religious, economic, and political purposes.	A3.0, A6.0		C2.0, C4.0, C8.0, C9.0
12.5.4. Explain the controversies that have resulted over changing interpretations of civil rights, including those in Plessy v. Ferguson, Brown v. Board of Education, Miranda v. Arizona, Regents of the University of California v. Bakke, Adarand Constructors, Inc. v. Pena, and United States v. Virginia (VMI).	A2.0, A3.0		C2.0, C4.0, C8.0, C9.0
12.6 Students evaluate issues regarding campaigns for national, state, and local elective offices.			
12.6.3. Evaluate the roles of polls, campaign advertising, and the controversies over campaign funding.	A1.0		C8.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
12.6.4. Describe the means that citizens use to participate in the political process (e.g., voting, campaigning, lobbying, filing a legal challenge, demonstrating, petitioning, picketing, running for political office).			C8.0
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.	A2.0, A3.0, A6.0		
12.7.1. Explain how conflicts between levels of government and branches of government are resolved			C1.0, C4.0
12.7.2. Identify the major responsibilities and sources of revenue for state and local governments.		B6.0	C1.0, C4.0
12.7.3. Discuss reserved powers and concurrent powers of state governments.	A2.0, A5.0		C1.0, C4.0
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.	A2.0, A5.0, A8.0	B6.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0, C9.0, C10.0
12.7.6. Compare the processes of lawmaking at each of the three levels of government, including the role of lobbying and the media.	A2.0		C1.0, C4.0,
12.7.7. Identify the organization and jurisdiction of federal, state, and local (e.g., California) courts and the interrelationships among them.	A7.0, A8.0		C1.0, C4.0, C9.0
12.8 Students evaluate and take and defend positions on the influence of the media on American political life.			
12.8.1. Discuss the meaning and importance of a free and responsible press.	A3.0, A5.0, A7.0		C8.0
12.8.2. Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.			C8.0
12.8.3. Explain how public officials use the media to communicate with the citizenry and to shape public opinion.	A5.0		C8.0
12.9 Students analyze the origins, characteristics, and development of different political systems across time, with emphasis on the quest for political democracy, its advances, and its obstacles.	A3.0		C1.0, C4.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
<b>Principles of Economics – PE</b>			
12.1 Students understand common economic terms and concepts and economic reasoning.			
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.			C6.0
12.3 Students analyze the influence of the federal government on the American economy.			
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.	A1.0, A2.0, A3.0, A6.0		C4.0
12.3.2. Identify the factors that may cause the costs of government actions to outweigh the benefits.	A3.0, A6.0		
12.3.3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.	A3.0, A6.0		
12.3.4. Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).			
12.4 Students analyze the elements of the U.S. labor market in a global setting.			
12.4.1. Understand the operations of the labor market, including the circumstances surrounding the establishment of principal American labor unions, procedures that unions use to gain benefits for their members, the effects of unionization, the mini-mum wage, and unemployment insurance.	A7.0		
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.	A7.0		
12.4.3. Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.	A7.0		
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States Borders			
12.6.3. Understand the changing role of international political borders and territorial sovereignty in a global economy.	A3.0, A7.0		

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
<b>U.S. History and Geography – US</b>			
11.1 Students analyze the significant events in the founding of the nation and its attempts to realize the philosophy of government described in the Declaration of Independence.			
11.1.1. Describe the Enlightenment and the rise of democratic ideas as the context in which the nation was founded.			C1.0
11.1.2. Analyze the ideological origins of the American Revolution, the Founding Fathers' philosophy of divinely bestowed unalienable natural rights, the debates on the drafting and ratification of the Constitution, and the addition of the Bill of Rights.	A3.0, A6.0		C1.0, C4.0
11.1.3. Understand the history of the Constitution after 1787 with emphasis on federal versus state authority and growing democratization.	A3.0, A6.0		C1.0, C4.0
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe			
11.2.2. Describe the changing landscape, including the growth of cities linked by industry and trade, and the development of cities divided according to race, ethnicity, and class.	A1.0, A2.0		C4.0
11.2.9. Understand the effect of political programs and activities of the Progressives (e.g., federal regulation of railroad transport, Children's Bureau, the Sixteenth Amendment, Theodore Roosevelt, Hiram Johnson).	A2.0		
11.3 Students analyze the role religion played in the founding of America, its lasting moral, social, and political impacts, and issues regarding religious liberty.			
11.3.4. Discuss the expanding religious pluralism in the United States and California that resulted from large-scale immigration in the twentieth century.	A1.0		
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.			C2.0
11.5.1. Discuss the policies of Presidents Warren Harding, Calvin Coolidge, and Herbert Hoover.			C2.0, C4.0
11.5.2. Analyze the international and domestic events, interests, and philosophies that prompted attacks on civil liberties, including the Palmer Raids, Marcus Garvey's "back-to-Africa" movement, the Ku Klux Klan, and immigration quotas and the responses of organizations such as the American Civil Liberties Union, the National Association for the Advancement of Colored People, and the Anti-Defamation League to those attacks.			C4.0
11.5.3. Examine the passage of the Eighteenth Amendment to the Constitution and the Volstead Act (Prohibition).			C4.0

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11.5.4. Analyze the passage of the Nineteenth Amendment and the changing role of women in society.	A6.0		C4.0
11.5.5. Describe the Harlem Renaissance and new trends in literature, music, and art, with special attention to the work of writers (e.g., Zora Neale Hurston, Langston Hughes).	A1.0		
11.5.7. Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.	A2.0		
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.			
11.6.4. Analyze the effects of and the controversies arising from New Deal economic policies and the expanded role of the federal government in society and the economy since the 1930s (e.g., Works Progress Administration, Social Security, National Labor Relations Board, farm programs, regional development policies, and energy development projects such as the Tennessee Valley Authority, California Central Valley Project, and Bonneville Dam).			C4.0
11.7 Students analyze America's participation in World War II.			
11.7.1. Examine the origins of American involvement in the war, with an emphasis on the events that precipitated the attack on Pearl Harbor.	A2.0, A3.0, A7.0		
11.7.5. Discuss the constitutional issues and impact of events on the U.S. home front, including the internment of Japanese Americans (e.g., Fred Korematsu v. United States of America) and the restrictions on German and Italian resident aliens; the response of the administration to Hitler's atrocities against Jews and other groups; the roles of women in military production; and the roles and growing political demands of African American.	A1.0, A3.0		C4.0
11.7.7. Discuss the decision to drop atomic bombs and the consequences of the decision (Hiroshima and Nagasaki).	A2.0, A3.0, A7.0		
11.8 Students analyze the economic boom and social transformation of post-World War II America.			
11.8.2. Describe the significance of Mexican immigration and its relationship to the agricultural economy, especially in California.	A1.0		C4.0
11.9 Student analyze U.S. foreign policy since World War II			
11.9.7. Examine relations between the United States and Mexico in the twentieth century, including key economic, political, immigration, and environmental issues.	A3.0, A7.0		C4.0



PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
11.10 Students analyze the development of federal civil rights and voting rights.	A1.0, A6.0		
11.10.6. Analyze the passage and effects of civil rights and voting rights legislation (e.g., 1964 Civil Rights Act, Voting Rights Act of 1965) and the Twenty-Fourth Amendment, with an emphasis on equality of access to education and to the political process.			C4.0
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.			
11.11.1. Discuss the reasons for the nation's changing immigration policy, with emphasis on how the Immigration Act of 1965 and successor acts have transformed American society.	A1.0, A3.0		C4.0
11.11.3. Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.	A1.0, A6.0		C4.0
11.11.5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.	A1.0		C4.0
11.11.6. Analyze the persistence of poverty and how different analyses of this issue influence welfare reform, health insurance reform, and other social policies.	A1.0		C4.0
11.11.7. Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.	A3.0		C4.0
<b>World History, Culture, and Geography – WH</b>			
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.			
10.3.1. Analyze why England was the first country to industrialize.	A1.0, A2.0		
10.3.2. Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).	A1.0, A2.0		
10.3.3. Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.	A1.0, A2.0		

PUBLIC SERVICES	Pathways		
	A. Public Safety	B. Emergency Response	C. Legal Practices
10.3.4. Trace the evolution of work and labor, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.	A1.0, A2.0		
10.3.5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.	A1.0, A2.0		
10.3.6. Analyze the emergence of capitalism as a dominant economic pattern and the responses to it, including Utopianism, Social Democracy, Socialism, and Communism.	A1.0, A2.0		
10.3.7. Describe the emergence of Romanticism in art and literature (e.g., the poetry of William Blake and William Wordsworth), social criticism (e.g., the novels of Charles Dickens), and the move away from Classicism in Europe.	A1.0, A2.0		
10.10 Students analyze instances of nation-building in the contemporary world in at least two of the following regions or countries: the Middle East, Africa, Mexico and other parts of Latin America, and China.			
10.10.1. Understand the challenges in the regions, including their geopolitical, cultural, military, and economic significance and the international relationships in which they are involved.	A2.0, A3.0, A6.0		
10.10.2. Describe the recent history of the regions, including political divisions and systems, key leaders, religious issues, natural features, resources, and population patterns.	A2.0, A3.0, A6.0		
10.10.3. Discuss the important trends in the regions today and whether they appear to serve the cause of individual freedom and democracy.	A2.0, A3.0, A6.0		
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0, A2.0, A3.0, A6.0, A7.0		

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Public Services**

Lloyd McCabe, Administrator, California Department of Education  
Cindy Beck, Education Consultant, California Department of Education

#### *Standards Review Team*

Jane Artega, Fire Mitigation and Education Specialist, Bureau of Land Management  
Mike Beaber, Deputy Director, California Department of Corrections and Rehabilitation  
Ina Bendich, Director, Excel High School  
Paul Bestolarides, Chief of Training and Professional Development, California Department of Corrections and Rehabilitation  
Al Brondolo, Teacher, Mariposa County High School  
Keith E. Clement, Professor, California State University, Fresno  
Randy Collins, Director, Fire Technology, Santa Rosa Junior College  
Greg Comella, Human Resources Specialist, Bureau of Land Management  
Chris Costamagna, Battalion Chief, Sacramento Fire Department  
Art Cota, Retired, California Office of the State Fire Marshall  
Brent Dickinson, Fire Tech Teacher, Napa County Regional Occupational Program  
Michael Dickinson, School Superintendent, San Bernardino City Unified School District  
Joy Gibson Taylor, Recruitment Specialist, Bureau of Land Management  
Guy Hall, Teacher, Mariposa County High School  
Bill Hartley, Teacher, Chawanake Unified School District  
Regina Hartley, Teacher, Chawanake Unified School District  
Pam Hildebrandt, Teacher, Fresno County Office of Education  
Michael Hooper, Bureau Chief, California Commission on Peace Officer Standards and Training  
William V. Karns, Vice Chancellor, Education and Technology, Los Rios Community College  
Gary Kirby, Coordinator, Fresno County Regional Occupational Program  
Greg Kyritsis, Law Enforcement Consultant, California Commission on Peace Officers Standards and Training  
Gustavo Loera, Director, Mental Health America of Los Angeles  
Terrel Marshall, Sacramento Police Department  
Mike McColm, Fire Science Teacher, Clovis Unified School District  
Tara Naisbitt, California Department of Corrections and Rehabilitation  
Tom E. Navickas, National Partnership for Careers in Law, Public Safety, Corrections and Security  
Craig Ogino, Chula Vista Police and San Bernardino Sheriff's Department  
Anthony Risner, Teacher, Yosemite High School

David Saltzer, Attorney, Saddleback Valley Unified School District  
Nikki Siecks, Consultant  
Dan Throgmorton, Associate Vice Chancellor, Workforce and Economic  
Development, Los Rios Community College District  
Al Tweltridge, Consultant, Fire Fighter Joint Apprenticeship Committee  
Glenn D. White, Deputy SCSO Director, Administration of Justice, College of the  
Siskiyou  
Mark Zamora, Teacher, Fresno Unified School District

### *Standards Writing Team*

Ina Bendich, Director, Excel High School  
Judy Johnson, Executive Director Emeritus, State Bar of California  
Patricia Lee, Special Assistant for Diversity and Bar Relations, Office of Access and  
Fairness Programs, State Bar of California  
Chris Mathias, Director, University of California, Berkeley  
Kathy Toy, Lead Administrator, Public Safety Academy, San Bernardino

### *Common Core Alignment Team*

Monte Ekott, Instructor, Norwalk–La Mirada Unified School District  
Elizabeth Gonzalez, Instructor, Norwalk–La Mirada Unified School District  
James Maynard, Instructor, Norwalk–La Mirada Unified School District  
John Noonan, Instructor, Coachella Valley Unified School District  
Scott Tarlton, Instructor, Westminster High School  
Kelly Villarreal, Instructor, Santa Clara Unified School District  
Mark Viss, Instructor, Modesto City Schools  
Darrel Wildt, Instructor, San Joaquin County Office of Education

## **References**

- Council on Social Work Education. 2010. *Educational Policy and Accreditation Standards*.  
Alexandria, VA. <http://www.cswe.org/File.aspx?id=13780> (accessed December 24,  
2012).
- . 2012. “Accreditation.” <http://www.cswe.org/Accreditation.aspx> (accessed December  
24, 2012).
- California Department of Forestry and Fire Protection. 2009. “CAL FIRE Firefighter  
Training.” <http://osfm.fire.ca.gov/training/training.php> (accessed January 2, 2013).
- California Emergency Management Agency. 2011. “Standardized Emergency  
Management System.” <http://www.calema.ca.gov> (accessed December 24, 2012).

## Table of Contents

### Transportation

Sector Description .....	1
Knowledge and Performance Anchor Standards .....	2
1.0 Academics .....	2
2.0 Communications .....	2
3.0 Career Planning and Management .....	2
4.0 Technology .....	3
5.0 Problem Solving and Critical Thinking .....	3
6.0 Health and Safety .....	3
7.0 Responsibility and Flexibility .....	4
8.0 Ethics and Legal Responsibilities .....	4
9.0 Leadership and Teamwork .....	5
10.0 Technical Knowledge and Skills .....	5
11.0 Demonstration and Application.....	5
Pathway Standards.....	7
A. Operations Pathway.....	7
B. Structural Repair and Refinishing Pathway.....	10
C. Systems Diagnostics and Service Pathway .....	13
Academic Alignment Matrix.....	17
Appendix: CTE Model Curriculum Standards Contributors	<b>Error! Bookmark not defined.</b>



## **Transportation**

### ***Sector Description***

This sector is designed to provide a foundation in transportation services for all industrial technology education students in California. There are eight focus areas that fall under the Transportation sector, each with different career opportunities. The focus areas are On-Road; Off-Road; Stationary; Rail; Water/Sea; Air; Space; and Small Engines and Specialty Equipment.

The pathways in the Transportation sector emphasize real-world, occupationally relevant experiences of significant scope and depth in three areas: Operations, Structural Repair and Refinishing, and Systems Diagnostics and Service. The standards are designed to integrate academic and technical preparation and focus on career awareness, career exploration, and skill preparation in the three pathways. Integral components include classroom, laboratory, and hands-on contextual learning; project- and work-based instruction; and leadership development. The standards in this sector prepare students for continued training, postsecondary education, and entry to a career.

## **Transportation Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Transportation academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Transportation sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Transportation sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.
- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Transportation sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Transportation sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.



- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

## **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Transportation sector workplace environment and community settings.  
(Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Transportation sector.

## **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Transportation industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Transportation sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Transportation sector laws and practices.

## **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Transportation sector issues and problems.

## **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Transportation sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)

- 10.1 Interpret and explain terminology and practices specific to the Transportation sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Transportation sector.
- 10.3 Construct projects and products specific to the Transportation sector requirements and expectations.
- 10.4 Collaborate with industry experts for specific technical knowledge and skills.

## **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Transportation anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organization.

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Transportation sector program of study.

- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors as appropriate to the Transportation sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

## **Transportation Pathway Standards**

### **A. Operations Pathway**

The Operations pathway prepares students for postsecondary employment and education in a variety of career opportunities in the transportation industry, including but not limited to harbors, ports, warehousing, marine applications, airplanes, trains, vehicles, and specialty equipment.

Sample occupations associated with this pathway:

- ◆ Warehouse Worker/Dispatcher
- ◆ Production, Planning, and Expediting Clerk
- ◆ Storage, Warehouse, and Distribution Manager
- ◆ Container Crane Operator
- ◆ Inspectors and Planners

A1.0 Evaluate and assess all aspects of facilities and facility planning for efficient and effective processing/handling of people, goods, and services in the transportation industry (housing, storage, maintenance, parts).

A1.1 Recognize the importance of space and location of equipment.

A1.2 Define and understand highway, rail, harbor, port, and airport controls.

A1.3 Identify where to place equipment for effective and efficient processing.

A1.4 Explain the difference between office area and processing areas.

A1.5 Design a/an processing center/office/shop.

A2.0 Describe and identify tools, techniques, and systems used to plan, staff, lead, and organize human resources as it relates to the transportation sector.

A2.1 Define the role of management and the responsibility and importance that are required to hold or maintain a position.

A2.2 Describe the production and use of industry-generated documents, records, and forms as well as related management skills used in the transportation industries.

A2.3 Understand work-related systems of the transportation industries.

A2.4 Maintain accurate records as applicable.

A2.5 Understand how guidelines, rules, regulations, and laws control transportation-industry practices and how they are overseen by local, state, federal, and international agencies.

A2.6 Explore career paths and opportunities within the transportation industry.

A2.7 Analyze asset acquisition and procurement needs.

A2.8 Research the various types of communication systems needed.

A3.0 Demonstrate an understanding of the concepts and processes needed to move, store/house, locate, and/or transfer people, goods, and services.

A3.1 Identify and understand transportation options such as rail, air, road, and sea.

A3.2 Define the different types of process controls available.

- A3.3 Describe hazardous and nonhazardous materials handling.
  - A3.4 Understand process controls, from planning to completion.
  - A3.5 Determine the uses of information systems in the order fulfillment process.
  - A3.6 Determine the effects of government regulations on stock handling techniques and warehousing.
  - A3.7 Explore the functions of the shipping and receiving process in the success of the distribution function.
  - A3.8 Evaluate types of inventory controls.
- A4.0 Demonstrate an understanding of business fundamentals, uses and application of technologies, communications, and basic management functions.
- A4.1 Describe current business and marketing trends.
  - A4.2 Identify and analyze the risks associated with obtaining business credit.
  - A4.3 Identify considerations in planning and implementing marketing/business strategies.
  - A4.4 Identify target audience for specific marketing and sales needs.
  - A4.5 Identify the legal aspects of sales contracts and warranties.
  - A4.6 Explain the nature of sales forecasting and marketing needs.
  - A4.7 Understand the practices of acceptable customer relations services.
  - A4.8 Compare and contrast advantages and disadvantages of business ownership.
- A5.0 Analyze and evaluate the design advantages and disadvantages of transportation-industry systems and the effects of those systems on people and the environment.
- A5.1 Identify environmental conditions that would impact various aspects of the transportation industry.
  - A5.2 Identify steps necessary to design a specific mode of transportation using aerodynamics.
  - A5.3 Research the effects of ergonomics on the health and safety of workers and customers.
  - A5.4 Create a model of a vehicle (train, airplane, railroad, car) incorporating ergonomics and aerodynamics in the design.
- A6.0 Demonstrate safety practices pertaining to the transportation industry, including requirements of the Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), Air Quality Management Districts (AQMDs), and other regulatory agencies.
- A6.1 Extract information from Material Safety Data Sheets (MSDS) pertaining to chemicals used in the workplace.
  - A6.2 Locate regulatory information and manufacturer recalls.
  - A6.3 Conform to federal, state, and local regulations and manufacturers' specifications when handling, storing, and disposing of chemicals and equipment, including necessary certifications.
  - A6.4 Adhere to ergonomic and environmental safety regulations in the workplace.

- A6.5 Participate in compliance training activities and exercises.
- A6.6 Determine the safe and correct application and use for chemicals used in the transportation industry.
- A7.0 Describe and identify the infrastructures required and used in the transportation industry.
  - A7.1 Identify the infrastructure needed to move people, goods, and equipment from one location to another (highways, bridges, waterways, railways).
  - A7.2 Recognize the need for traffic signals, signs, and markings.
  - A7.3 Define fueling infrastructure needed to move vehicles, equipment, goods, and services from one location to another.
  - A7.4 Explain the importance of infrastructure in transporting vehicles, goods, and/or equipment in our everyday lives.
  - A7.5 Evaluate the need to safely move fluids from one location to another.

## **Transportation Pathway Standards**

### **B. Structural Repair and Refinishing Pathway**

The Structural Repair and Refinishing pathway prepares students for postsecondary education and employment in the transportation industry, including but not limited to body and frame straightening, estimating, painting, and refinishing (included but not limited to airplanes, trains, vehicles, and equipment).

Sample occupations associated with this pathway:

- ◆ Estimator
- ◆ Claims Adjuster
- ◆ Technician
- ◆ Insurance Company/Manufacturer's Representative
- ◆ Investigator/Inspector

- B1.0 Students practice personal and occupational safety and understand the environmental effects of collision repair and refinishing practices.
- B1.1 Describe industry environmental conservation practices and their applications.
  - B1.2 Practice the safe handling and storage of chemicals and hazardous wastes as required by the Occupational Safety and Health Administration (OSHA), Air Resources Board (ARB), Air Quality Management Districts (AQMDs), and other regulatory agencies.
  - B1.3 Understand the generation of waste products and other environmentally destructive substances.
  - B1.4 Use appropriate materials and repair technologies.
  - B1.5 Understand the environmental implications of using new and emerging materials, resources, and technologies.
  - B1.6 Demonstrate the safety practices applied when servicing vehicle-body electronics and other vehicle systems.
- B2.0 Practice the safe and appropriate use of tools, equipment, and work processes.
- B2.1 Understand how certain tools and equipment are used to perform maintenance and repair operations.
  - B2.2 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).
- B3.0 Apply measurement systems and the mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.
- B3.1 Use industry-standard measurement scales, devices, and systems to perform design, fabrication, diagnostic, maintenance, and repair procedures.

- B3.2 Use technical vocabulary, technical reports and manuals, electronic systems, and related technical data resources, as appropriate, to determine repairs and estimates.
- B3.3 Demonstrate the different types of welding and heat processes used in repair processes and procedures.
- B3.4 Understand the mathematical functions associated with collision repair and refinishing.
  
- B4.0 Apply scientific principles in relation to chemical, mechanical, and physical functions and in relation to industry and manufacturer standards.
  - B4.1 Identify and understand the physical and chemical characteristics of metals, plastics, and other materials.
  - B4.2 Describe the basic terms, characteristics, and concepts of physical and chemical processes.
  - B4.3 Apply the principles of mechanical, electrical, hydraulic, and pneumatic power in relation to collision repair and refinishing.
  - B4.4 Practice the principles of electricity and electronics.
  - B4.5 Understand body and frame construction.
  - B4.6 Know the importance of calibration processes, systems, and techniques in using various measurement and testing devices.
  
- B5.0 Perform and document repair procedures in accordance with manufacturer recommendations and industry standards.
  - B5.1 Explain and practice the recommended procedures and practices of various manufacturers.
  - B5.2 Use reference books and materials, technical service bulletins, and other related documents to determine repairs and rate of pay.
  - B5.3 Document repair procedures accurately as required by the Bureau of Automotive Repair and other regulatory agencies.
  
- B6.0 Demonstrate basic business practices.
  - B6.1 Know the laws and regulations applicable to the recordkeeping and handling of hazardous materials.
  - B6.2 Use and understand work-related systems.
  - B6.3 Practice and understand the importance of, and procedures for, maintaining accurate records.
  - B6.4 Discuss and apply the concept and application of accepted ethical business practices.
  - B6.5 Use and understand the concept and application of acceptable customer relations services.
  
- B7.0 Understand structural and nonstructural analysis and damage repair.
  - B7.1 Perform frame inspection and repair.
  - B7.2 Demonstrate applications, installations, and removal of fixed and moveable glass and hardware.
  - B7.3 Demonstrate the principles of metal welding and cutting.



- B7.4 Prepare and analyze vehicles for repair.
- B7.5 Perform outer body panel repairs, replacements, and adjustments.
- B7.6 Prepare vehicles for metal finishing and body filling.
  
- B8.0 Demonstrate an understanding of mechanical and electrical components in relation to industry and manufacturer standards.
  - B8.1 Identify and communicate the operation of drivetrain, fuel, intake, and exhaust systems.
  - B8.2 Perform steering and suspension analysis and repairs.
  - B8.3 Perform electrical repairs.
  - B8.4 Perform brake analysis and repairs.
  - B8.5 Perform heating, air-conditioning, and cooling system repairs.
  - B8.6 Explain and demonstrate the operation of restraint systems.
  
- B9.0 Demonstrate the concepts, principles, and practices of painting and refinishing.
  - B9.1 Identify, use, and repair plastics and adhesives.
  - B9.2 Prepare surfaces for painting and finishing.
  - B9.3 Practice operation of spray guns and related equipment.
  - B9.4 Practice mixing, matching, and applying paint.
  - B9.5 Prepare vehicles for final detail.
  - B9.6 Analyze the causes and cures of paint defects.

## **Transportation Pathway Standards**

### **C. Systems Diagnostics and Service Pathway**

The Systems Diagnostics and Service pathway prepares students for postsecondary education and employment in the transportation industry, which includes but is not limited to motor vehicles, rail systems, marine applications, and small-engine and specialty equipment.

Sample occupations associated with this pathway:

- ◆ Service Technician/Maintenance Worker/Shop Foreman
- ◆ Technical Writer
- ◆ Dispatcher
- ◆ Engineer
- ◆ Investigator/Inspector

C1.0 Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.

C1.1 Know and understand common environmental conservation practices and their applications.

C1.2 Practice the safe handling and storage of chemicals and hazardous wastes in accordance with Material Safety Data Sheets (MSDS) and the requirements of local, state, and federal regulatory agencies.

C1.3 Understand the way in which waste gasses, emissions, and other environmentally destructive substances are generated and the effects of these substances on the environment.

C1.4 Use appropriate personal protective equipment and safety practices.

C1.5 Evaluate the advantages and disadvantages of existing, new, and emerging systems and the effects of those systems on the environment.

C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.

C2.1 Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices.

C2.2 Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.

C2.3 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).

C2.4 Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.

- C2.5 Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.
  - C2.6 Demonstrate how to access technical reports, manuals, electronic retrieval systems, and related technical data resources.
  - C2.7 Test and analyze the elements of precision measuring using standard and metric systems.
- C3.0 Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.
- C3.1 Describe the operating principles of internal and/or external combustion engines.
  - C3.2 Describe the function and principles of air-conditioning and heating systems.
  - C3.3 Describe the basic principles of pneumatic and hydraulic power and their applications.
  - C3.4 Describe the applications of alternative power sources.
  - C3.5 Practice the basic principles of electricity, electronics and electrical power generation, and distribution systems.
  - C3.6 Explain the principles of converting energy from one form to another.
  - C3.7 Perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and malfunctions.
- C4.0 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.
- C4.1 Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules.
  - C4.2 Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Safety and Health Administration [OSHA], and the California Air Resources Board [ARB]).
  - C4.3 Use reference books, technical service bulletins, and other documents and materials related to the service industry available in print and through electronic retrieval systems to accurately diagnose and repair systems, equipment, and vehicles.
  - C4.4 Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations.
- C5.0 Apply and understand appropriate business practices.
- C5.1 Identify work-related systems common to the transportation service industry.
  - C5.2 Know the laws and regulations applicable to recordkeeping and the appropriate handling and disposal of hazardous materials.
  - C5.3 Explain the importance of and the procedures for maintaining accurate records (e.g., business licenses, repair orders, billing and tax records).

- C5.4 Practice the concept and application of accepted ethical business practices.
  - C5.5 Practice the concept and application of acceptable customer relations practices.
  - C5.6 Recognize, analyze, and evaluate the need for maintenance of components and systems and the conditions under which service and maintenance are required.
- C6.0 Demonstrate the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems.
- C6.1 Perform general engine maintenance, diagnosis, service, and repair in accordance with portable national industry standards, such as the National Automotive Technicians Education Foundation and the Equipment and Engine Training Council.
  - C6.2 Maintain, diagnose, service, and repair lubrication and cooling systems.
  - C6.3 Practice how to maintain, diagnose, and repair computerized engine control systems and other engine-related systems.
  - C6.4 Maintain, diagnose, service, and repair ignition, electronic, and computerized engine controls and fuel management systems.
- C7.0 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.
- C7.1 Practice maintenance, diagnosis, and repair of electrical systems.
  - C7.2 Maintain, diagnose, repair, and service batteries.
  - C7.3 Demonstrate maintenance, diagnosis, service, and repair of starting and charging systems.
  - C7.4 Diagnose, service, and repair lighting systems.
  - C7.5 Diagnose, service, and repair heating and air-conditioning systems and components.
  - C7.6 Diagnose, service, and repair horns, wipers/washers, and other accessories.
  - C7.7 Perform necessary procedures to maintain, diagnose, service, and repair vehicle electrical and electronic systems and malfunctions.
- C8.0 Demonstrate the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with national industry standards.
- C8.1 Describe how to maintain, diagnose, service, and repair hydraulic and power assist systems.
  - C8.2 Describe the function and operation of automatic and manual transmissions and transaxles.
  - C8.3 Diagnose, service, and repair disc brakes, drum brakes, antilock brakes, and other brake systems as developed.
  - C8.4 Diagnose, service, and repair steering and suspension systems.
  - C8.5 Interpret tire and rim sizing to select appropriate wheels and tires for vehicles.

C8.6 Maintain, diagnose, service, and repair under-vehicle systems and malfunctions.

## Academic Alignment Matrix

<b>TRANSPORTATION</b>	<b>PATHWAYS</b>		
	<b>A. Operations</b>	<b>B. Structural Repair and Refinishing</b>	<b>C. Systems Diagnostics and Service</b>
<b>ENGLISH LANGUAGE ARTS</b>			
<b>Reading Standards for Literacy in Science and Technical Subjects – RLST (Standard Area, Grade Level, Standard #)</b>			
11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	A6.0	B1.0, B2.0, B3.0, B4.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C5.0
11-12.10 By the end of grade 12 read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C6.0, C7.0, C8.0
<b>Writing Standards – WS (Standard Area, Grade Level, Standard #)</b>			
11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	A5.0	B5.0	C5.0
11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	A7.0	B5.0	C5.0
11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	A3.0, A4.0,	B5.0	C4.0
11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	A1.0, A3.0 A4.0	B2.0, B3.0, B5.0, B6.0, B8.0, B9.0	C6.0, C7.0
11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.	A1.0, A2.0		C8.0
11-12.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	A1.0	B5.0	C4.0
<b>MATHEMATICS</b>			
<b>Algebra – A-SSE – Seeing Structure in Expressions</b>			
<i>Interpret the structure of expressions</i>			
1. Interpret expressions that represent a quantity in terms of its context. <ul style="list-style-type: none"> <li>a. Interpret parts of an expression, such as terms, factors, and coefficients.</li> <li>b. Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret <math>P(1+r)^t</math> as the product of <math>P</math> and a factor not depending on <math>P</math>.</i></li> </ul>		B3.0, B4.0, B9.0	

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
<p>2. Use the structure of an expression to identify ways to rewrite it. <i>For example, see <math>x^4 - y^4</math> as <math>(x^2)^2 - (y^2)^2</math>, thus recognizing it as a difference of squares that can be factored as <math>(x^2 - y^2)(x^2 + y^2)</math>.</i></p> <p>a. <i>Use the distributive property to express a sum of terms with a common factor as a multiple of a sum of terms with no common factor. For example, express <math>xy^2 + x^2y</math> as <math>xy(y + x)</math>. (Common Core Standard A-SSE-2a)</i></p> <p>b. <i>Use the properties of operations to express a product of a sum of terms as a sum of products. For example, use the properties of operations to express <math>(x + 5)(3 - x + c)</math> as <math>-x^2 + cx - 2x + 5c + 15</math>. (Common Core Standard A-SSE-2b)</i></p>		B3.0, B9.0	
<p>2.1 Apply basic factoring techniques to second- and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials. (CA Standard Algebra I - 11.0)</p>		B3.0, B9.0	
<i>Write expressions in equivalent forms to solve problems</i>			
<p>3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <p>a. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.</p> <p>c. Use the properties of exponents to transform expressions for exponential functions. For example the expression <math>1.15^t</math> can be rewritten as <math>(1.15^{1/12})^{12t} = 1.012^{12t}</math> to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</p> <p>d. Prove simple laws of logarithms. (CA Standard Algebra II - 11.0)</p> <p>e. Use the definition of logarithms to translate between logarithms in any base. (CA Standard Algebra II - 13.0)</p> <p>f. Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values. (CA Standard Algebra II - 14.0)</p>		B3.0, B9.0	
<p>4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.</p>		B3.0, B9.0	
<b>Algebra – A-CED – Creating Equations</b>			
<i>Create equations that describe numbers or relationships</i>			
<p>1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.</p> <p>1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)</p>		B3.0, B4.0, B6.0	C2.0, C3.0, C5.0, C6.0, C7.0
<p>2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p>		B3.0, B4.0, B6.0	C2.0, C3.0, C5.0, C6.0, C7.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	A4.0	B3.0, B6.0	C5.0
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$ .		B3.0, B6.0	C2.0, C5.0, C7.0
<b>Algebra – A-REI – Reasoning with Equations and Inequalities</b>			
<i>Understand solving equations as a process of reasoning and explain the reasoning</i>			
1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	A1.0		
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	A1.0, A4.0	B4.0	C3.0, C4.0
<i>Solve equations and inequalities in one variable</i>			
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. 3.1 Solve equations and inequalities involving absolute value. (CA Standard Algebra I - 3.0 and CA Standard Algebra II - 1.0)	A1.0, A5.0	B4.0, B5.0	
<b>Functions – F-IF – Interpreting Functions</b>			
<i>Understand the concept of a function and use function notation</i>			
1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .	A1.0, A2.0, A4.0	B6.0	C5.0
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	A1.0, A2.0	B6.0	C5.0
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$ , $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$ .		B6.0	
<i>Interpret functions that arise in applications in terms of the context</i>			
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	A1.0, A2.0, A5.0, A4.0	B6.0	C5.0
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.	A1.0, A2.0, A5.0	B6.0	C5.0



TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	A1.0, A2.0, A4.0, A5.0	B6.0	C5.0, C6.0, C7.0
<i>Analyze functions using different representations</i>			
7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. <ul style="list-style-type: none"> <li>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</li> <li>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</li> <li>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</li> <li>d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</li> <li>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</li> </ul>	A1.0, A2.0	B6.0	C5.0
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. <ul style="list-style-type: none"> <li>a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</li> <li>b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as <math>y = (1.02)^t</math>, <math>y = (0.97)^t</math>, <math>y = (1.01)12^t</math>, <math>y = (1.2)^{t/10}</math>, and classify them as representing exponential growth or decay.</li> </ul>		B6.0	
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	A1.0, A2.0	B6.0	C5.0
10. Demonstrate an understanding of functions and equations defined parametrically and graph them. (CA Standard Math Analysis - 7.0)	A1.0, A2.0	B6.0	C5.0
<b>Functions – F-BF – Building Functions</b>			
<i>Build a function that models a relationship between two quantities</i>			
1. Write a function that describes a relationship between two quantities. <ul style="list-style-type: none"> <li>a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</li> <li>b. Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</i></li> <li>c. (+) Compose functions. For example, if <math>T(y)</math> is the temperature in the atmosphere as a function of height, and <math>h(t)</math> is the height of a weather balloon as a function of time, then <math>T(h(t))</math> is the temperature at the location of the weather balloon as a function of time.</li> </ul>	A1.0, A2.0	B6.0	C5.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	A1.0, A2.0	B6.0	C5.0
<i>Build new functions from existing functions</i>			
3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ , $k f(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. 3.1 Solve problems involving functional concepts. such as composition. defining the inverse function and performing arithmetic operations on functions. (CA Standard Algebra II - 24.0)	A1.0, A2.0	B6.0	C5.0
<b>Functions – F-LE – Linear, Quadratic, and Exponential Models</b>			
1. Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	A2.0	B5.0	C5.0
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	A2.0	B6.0	C5.0
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	A2.0	B6.0	C5.0
4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where $a$ , $c$ , and $d$ are numbers and the base $b$ is 2, 10, or $e$ ; evaluate the logarithm using technology.		B6.0	C5.0
<i>Interpret expressions for functions in terms of the situation they model</i>			
5. Interpret the parameters in a linear or exponential function in terms of a context.	A2.0	B6.0	C5.0
6. Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity. (CA Standard Algebra 1- 23.0)		B6.0	C5.0
<b>Geometry – G-CO – Congruence</b>			
<i>Experiment with transformations in the plane</i>			
1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	A1.0, A2.0	B6.0	C5.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	A1.0, A2.0	B6.0	C5.0
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	A1.0, A2.0	B6.0	C5.0
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	A1.0, A2.0	B6.0	C5.0
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	A1.0, A2.0	B6.0	C5.0
<i>Prove geometric theorems</i>			
9. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.	A1.0, A2.0	B6.0	C5.0
10. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. 10.1 Know and use the triangle inequality theorem. (CA Standard Geometry - 6.0)	A1.0, A2.0	B6.0	C5.0
11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.	A1.0, A2.0	B6.0	C5.0
<i>Make geometric constructions</i>			
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	A1.0, A2.0	B6.0	C5.0
<b>Number and Quantity – N-VM – Vector and Matrix Quantities</b>			
<i>Perform operations on matrices and use matrices in applications</i>			
6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.	A1.0, A2.0	B6.0	C5.0
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.	A1.0, A2.0	B6.0	C5.0
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.	A1.0, A2.0	B6.0	C5.0
9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	A1.0, A2.0	B6.0	C5.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.	A1.0, A2.0	B6.0	C5.0
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.	A1.0, A2.0	B6.0	C5.0
12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.	A1.0, A2.0	B6.0	C5.0
<b>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions</b>			
<i>Understand and evaluate random processes underlying statistical experiments</i>			
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	A1.0, A2.0, A4.0	B6.0	C5.0
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?	A1.0, A2.0	B6.0	C5.0
<i>Make inferences and justify conclusions from sample surveys, experiments, and observational studies</i>			
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	A1.0, A2.0, A4.0	B6.0	C5.0
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	A1.0, A2.0	B6.0	C5.0
6. Evaluate reports based on data.	A1.0, A2.0, A4.0, A5.0, A6.0	B6.0	C1.0, C5.0
<b>Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data</b>			
<i>Summarize, represent, and interpret data on a single count or measurement variable</i>			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	A1.0, A2.0, A4.0	B6.0	C5.0
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	A1.0, A2.0, A4.0	B6.0	C5.0
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	A1.0, A2.0, A4.0	B6.0	C5.0
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	A1.0, A2.0	B6.0	C5.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
<i>Summarize, represent, and interpret data on two categorical and quantitative variables</i>			
5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	A1.0, A2.0	B6.0	C5.0
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	A1.0, A2.0	B6.0	C5.0
<i>Interpret linear models</i>			
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	A1.0, A2.0, A4.0, A5.0	B6.0	C5.0
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.	A1.0, A2.0	B6.0	C5.0
9. Distinguish between correlation and causation.	A1.0, A2.0	B6.0	C5.0
<b>Statistics and Probability – S-CP – Conditional Probability and the Rules of Probability</b>			
<i>Understand independence and conditional probability and use them to interpret data</i>			
1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	A1.0, A2.0	B6.0	
2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.		B6.0	
3. Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$ , and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.	A1.0, A2.0	B6.0	
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.	A1.0, A2.0	B6.0	
<i>Use the rules of probability to compute probabilities of compound events in a uniform probability model</i>			
6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.	A1.0, A2.0	B6.0	

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
7. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ , and interpret the answer in terms of the model.	A1.0, A2.0	B6.0	
<b>Statistics and Probability – S-MD – Using Probability to Make Decisions</b>			
<i>Calculate expected values and use them to solve problems</i>			
1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.	A1.0, A2.0, A4.0	B6.0	C5.0
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	A1.0, A2.0, A4.0	B6.0	C5.0
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.	A1.0, A2.0, A4.0	B6.0	C5.0
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?	A1.0, A2.0, A4.0	B6.0	C5.0
<i>Use probability to evaluate outcomes of decisions</i>			
5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant. b. Evaluate and compare strategies on the basis of expected values. For example, compare a high deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	A1.0, A2.0, A4.0, A5.0	B6.0	C5.0
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	A1.0, A2.0	B6.0	C5.0
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	A1.0, A2.0, A4.0	B6.0	C5.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
<b>SCIENCE</b>			
<b>Scientific and Engineering Practices – SEP</b>			
1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0
<b>Crosscutting Concept – CC</b>			
1. Patterns 2. Cause and effect: Mechanism and explanation 3. Scale, proportion, and quantity 4. Systems and system models 5. Energy and matter: Flows, cycles, and conservation 6. Structure and function 7. Stability and change	A1.0, A2.0, A3.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B4.0, B5.0, B6.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0
<b>Physical Sciences – PS</b>			
PS1: Matter and Its Interactions PS1.A: Structure and Properties of Matter PS1.B: Chemical Reactions PS1.C: Nuclear Processes	A5.0, A6.0, A7.0	B1.0, B4.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0, C5.0
PS2: Motion and Stability: Forces and Interactions PS2.A: Forces and Motion PS2.B: Types of Interactions PS2.C: Stability and Instability in Physical Systems	A2.0, A3.0, A6.0	B1.0, B4.0, B7.0, B8.0	C1.0, C2.0, C3.0, C4.0
PS3: Energy PS3.A: Definitions of Energy PS3.B: Conservation of Energy and Energy Transfer PS3.C: Relationship Between Energy and Forces PS3.D: Energy in Chemical Processes and Everyday Life	A2.0, A3.0, A5.0, A6.0, A7.0	B1.0, B4.0, B8.0	C2.0, C3.0, C4.0, C5.0, C7.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
PS4: Waves and Their Applications in Technologies for Information Transfer PS4.A: Wave Properties PS4.B: Electromagnetic Radiation PS4.C: Information Technologies and Instrumentation		B4.0, B8.0	C2.0, C3.0, C4.0, C7.0
<b>Life Sciences – LS</b>			
LS1: From Molecules to Organisms: Structures and Processes LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS1.C: Organization for Matter and Energy Flow in Organisms LS1.D: Information Processing	A5.0, A6.0	B4.0	C3.0, C4.0
LS2: Ecosystems: Interactions, Energy, and Dynamics LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems LS2.C: Ecosystems Dynamics, Functioning, and Resilience LS2.D: Social Interactions and Group Behavior		B1.0	C1.0
LS3: Heredity: Inheritance and Variation of Traits LS3.A: Inheritance of Traits LS3.B: Variation of Traits	A6.0	B1.0	
LS4: Biological Evolution: Unity and Diversity LS4.A: Evidence of Common Ancestry and Diversity LS4.B: Natural Selection LS4.C: Adaptation LS4.D: Biodiversity and Humans	A4.0	B1.0	
<b>Earth and Space Sciences – ESS</b>			
ESS2: Earth's Systems ESS2.A: Earth Materials and Systems ESS2.B: Plate Tectonics and Large-Scale System Interactions ESS2.C: The Roles of Water in Earth's Surface Processes ESS2.D: Weather and Climate ESS2.E: Biogeology		B1.0	C1.0



TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
ESS3: Earth and Human Activity ESS3.A: Natural Resources ESS3.B: Natural Hazards ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change	A5.0	B1.0, B4.0, B8.0, B9.0	C1.0, C2.0, C4.0, C5.0
<b>Engineering, Technology, and the Applications of Science – ETS</b>			
ETS1: Engineering Design ETS1.A: Defining and Delimiting an Engineering Problem ETS1.B: Developing Possible Solutions ETS1.E: Optimizing the Design Solution	A1.0, A2.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0
ETS2: Links Among Engineering, Technology, Science, and Society ETS2.A: Interdependence of Science, Engineering, and Technology ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World	A1.0, A2.0, A4.0, A5.0, A6.0, A7.0	B1.0, B2.0, B3.0, B4.0, B5.0, B7.0, B8.0, B9.0	C1.0, C2.0, C3.0, C4.0, C5.0, C7.0
<b>HISTORY/SOCIAL SCIENCE</b>			
<b>Principles of American Democracy and Economics – AD</b>			
12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.			
12.7.2. Identify the major responsibilities and sources of revenue for state and local governments.		B1.0, B2.0	C1.0, C2.0
12.7.5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.	A6.0, A7.0	B1.0, B2.0, B9.0	C1.0, C2.0
12.7.7. Identify the organization and jurisdiction of federal, state, and local (e.g., California) courts and the interrelationships among them.	A6.0, A7.0	B1.0, B9.0	
<b>Principles of Economics – PE</b>			
12.1 Students understand common economic terms and concepts and economic reasoning.			
12.1.1. Examine the causal relationship between scarcity and the need for choices.	A4.0	B6.0	C1.0, C2.0, C5.0, C7.0, C8.0
12.1.2. Explain opportunity cost and marginal benefit and marginal cost.	A4.0	B1.0, B2.0, B6.0	C1.0, C2.0, C5.0, C7.0, C8.0
12.1.3. Identify the difference between monetary and non-monetary incentives and how changes in incentives cause changes in behavior.		B1.0, B2.0, B6.0	C5.0, C7.0, C8.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
12.1.4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.		B1.0, B2.0, B6.0	C5.0, C7.0, C8.0
12.2 Students analyze the elements of America's market economy in a global setting.			
12.2.5. Understand the process by which competition among buyers and sellers determines a market price.		B6.0	C5.0, C7.0, C8.0
12.2.6. Describe the effect of price controls on buyers and sellers.		B6.0	C5.0, C7.0, C8.0
12.2.9. Describe the functions of the financial markets.	A6.0	B6.0	C5.0, C7.0, C8.0
12.2.10. Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.	A1.0, A6.0	B6.0	C5.0, C7.0, C8.0
12.3 Students analyze the influence of the federal government on the American economy.			
12.3.1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.	A4.0	B1.0, B2.0, B6.0	C1.0, C2.0, C5.0, C7.0, C8.0
12.3.2. Identify the factors that may cause the costs of government actions to outweigh the benefits.	A7.0	B1.0, B2.0 B6.0	C1.0, C2.0, C5.0, C7.0, C8.0
12.3.3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.		B6.0	C5.0, C7.0, C8.0
12.3.4. Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).		B6.0	C5.0, C7.0, C8.0
12.4 Students analyze the elements of the U.S. labor market in a global setting.			
12.4.2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.	A4.0		
12.4.4. Explain the effects of international mobility of capital and labor on the U.S. economy.		B6.0	C5.0, C7.0, C8.0
12.5 Students analyze the aggregate economic behavior of the U.S. economy.		B6.0	C5.0, C7.0, C8.0
12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States' borders.			
12.6.1. Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.	A2.0, A3.0, A4.0 A7.0	B6.0	C5.0, C7.0, C8.0

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
12.6.2. Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.	A4.0		
12.6.3. Understand the changing role of international political borders and territorial sovereignty in a global economy.	A4.0		
<b>U.S. History and Geography – US</b>			
11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.			
11.2.1. Know the effects of industrialization on living and working conditions, including the portrayal of working conditions and food safety in Upton Sinclair's <i>The Jungle</i> .	A6.0	B1.0, B2.0	
11.2.2. Describe the changing landscape, including the growth of cities linked by industry and trade, and the development of cities divided according to race, ethnicity, and class.	A3.0, A4.0		
11.2.9. Understand the effect of political programs and activities of the Progressives (e.g., federal regulation of railroad transport, Children's Bureau, the Sixteenth Amendment, Theodore Roosevelt, Hiram Johnson).	A1.0, A6.0, A7.0		
11.4 Students trace the rise of the United States to its role as a world power in the twentieth century.			
11.4.4. Explain Theodore Roosevelt's Big Stick diplomacy, William Taft's Dollar Diplomacy, and Woodrow Wilson's Moral Diplomacy, drawing on relevant speeches.			C1.0
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.			
11.5.7. Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.	A1.0, A3.0, A5.0, A6.0, A7.0		C2.0, C3.0, C7.0, C8.0
11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.			
11.6.4. Analyze the effects of and the controversies arising from New Deal economic policies and the expanded role of the federal government in society and the economy since the 1930s (e.g., Works Progress Administration, Social Security, National Labor Relations Board, farm programs, regional development policies, and energy development projects such as the Tennessee Valley Authority, California Central Valley Project, and Bonneville Dam).	A7.0		
11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.			
11.11.5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.	A5.0, A6.0	B1.0	

TRANSPORTATION	PATHWAYS		
	A. Operations	B. Structural Repair and Refinishing	C. Systems Diagnostics and Service
11.11.7. Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.	A4.0, A5.0, A6.0		
<b>World History, Culture, and Geography – WH</b>			
10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.			
10.3.2. Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).	A4.0	B4.0, B5.0	
10.3.3. Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.	A2.0, A3.0, A4.0		
10.3.4. Trace the evolution of work and labor, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.	A1.0, A3.0, A4.0	B1.0, B3.0, B4.0	
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).	A1.0, A4.0		

## **Appendix: CTE Model Curriculum Standards Contributors**

### **Transportation**

Lloyd McCabe, Administrator, California Department of Education  
Dara Dubois, Education Consultant, California Department of Education

#### *Standards Review Team*

Armando Hernandez, Instructor, Montebello Unified School District  
Mickey Neilson, Instructor, Ramona Unified School District  
Michael Palmer, Owner, Midas of Sacramento  
Willard Ripley, Instructor, Alex Xydias Center for Automotive Arts  
Glenn Singley, Instructor, Sacramento City Unified School District  
John Tarrant, Owner, Chaffey Auto Body

#### *Standards Writing Team*

Armando Hernandez, Instructor, Montebello Unified School District  
Jennifer Lucero, Owner, EZ Parcel Express  
John Overton, President, California Teachers Association  
Willard Ripley, Instructor, Alex Xydias Center for Automotive Arts  
Steve Tomory, Rio Hondo Community College

#### *Common Core Alignment Team*

Autumn Chapman, Instructor, Oakland Unified School District  
Pamela Davis, Instructor, Sacramento City Unified School District  
Marty Gunn, Instructor, California Air Resources Board  
Kristi Leonard, Instructor, Lake Tahoe Unified School District  
Marcia McAllister, Instructor, Sacramento City Unified School District  
Sofia Paez-Valdez, Instructor, Pasadena Unified School District  
Sherry Penaflor, Instructor, Coachella Valley Unified School District  
Zach Ronnenberg, Instructor, Davis Joint Unified School District  
Russell Wong, Instructor, Pasadena Unified School District