Title: UC Media Design and Development

Job Titles:
- Desktop Publishers (43-9031)
- Executive Secretaries and Administrative Assistants (43-6011)
- Computer User Support Specialists (15-1151)

Course Description:
Media Design and Development is a course that explores the historical to the rapidly changing trends in the global field of design. Through two and three dimensional design projects, students develop problem-solving skills, artistic perception, critical thinking, and self-reflection. With the awareness of design solutions throughout history in various cultures students will understand the impact of the arts and design on the human experience. Students will also learn methods and theory such as elements and principles of design to enhance their artistic vision and style. Art critiques and presentations will provide opportunities for students to grow as design artists. All experiences will focus on developing perception and application of the elements of art and principles of design through contemporary design applications.

Learning the three main industry computer software including Adobe Photoshop, Adobe Illustrator, and Adobe InDesign will provide students with the professional environment and skills needed in the field of media design. This course will give students project-based experience in understanding common industry-standard software and its applications. Students will understand important aspects of project management. Media Design and Development allows students to progress through levels of training.

This course aligns with and incorporates the California Visual and Performing Arts Visual Arts Content Standards and the California Career Technical Education Model Curriculum Standards, Common Core Content Standards as reflected in the Academic Alignment Matrix, Standards for Career Ready Practice, Anchor Standards, and Pathway Standards.

| Module | Module Title                  | Classroom Hours | OJT (CC) Hours | OJT (CVE) Hours |
|--------|-------------------------------|----------------|---------------|----------------|---------------|
| I      | Career Ready Practice         | 12             |               |                |               |
| II     | Media Design and Development  | 168            |               |                |               |
|        | **Total Hours:** 180          |                | 180           |                |               |
# Los Angeles County Career Technical Education

## COURSE OUTLINE

### UC Media Design and Development

<table>
<thead>
<tr>
<th>Course Title</th>
<th>UC Media Design and Development</th>
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<tbody>
<tr>
<td>CBEDS Code</td>
<td>4615</td>
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<tr>
<td>State Course ID</td>
<td>3508-1</td>
</tr>
<tr>
<td>ROCP #</td>
<td>14-901</td>
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<tr>
<td>Approval Date</td>
<td>March 16, 1992</td>
</tr>
<tr>
<td>Revision Date</td>
<td>April, 2015</td>
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<tr>
<td>O*Net Codes and Job Titles</td>
<td>Desktop Publishers 43-9031 Executive Secretaries and Administrative Assistants 43-6011 Computer User Support Specialists 15-1151</td>
</tr>
<tr>
<td>CTE Industry Sector</td>
<td>Information and Communication Technologies Arts, Media, and Entertainment</td>
</tr>
<tr>
<td>Career Pathway(s)</td>
<td>Design, Visual, and Media Arts (AME A) Information Support and Services (ICT A)</td>
</tr>
<tr>
<td>UC Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry Certification</td>
<td>No</td>
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<tr>
<td>Student Prerequisites</td>
<td>A grade of B or better in a previous technology class.</td>
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<tr>
<td>Total Course Hours</td>
<td>380</td>
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</tbody>
</table>

### Course Description

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California Career Technical Education Model Curriculum Standards, Grades 7-12
Industry Sector Anchor Standards (AS): Information and Communication Technologies (ICT); Arts, Media, and Entertainment (AME)
Pathway Standards (PS): Information Support and Services (ICT A); Design, Visual, and Media Arts (AME A)
Common Core State Standards (CCSS): Language Arts (ELA); Mathematics (M)
California Visual and Performing Arts Standards: Visual Arts (VA)
Other Desirable Student Prerequisites
- Visual Arts course with a B or better
- Completion of a course/sequence including computer literacy, employability skills, career awareness and leadership skills
- Completion of a course/sequence including information processing core concepts
- Ability to perform basic math, reading comprehension, and language arts skills at grade level or above
- Show sufficient/interest motivation in the media design area and agree to complete all course requirement

Classroom Physical Environment
The classroom portion of this course should be conducted in a classroom or a site conducive to create/maintain an appropriate learning environment. The classroom setting requires equipment and supplies in sufficient quantity to train the number of students assigned to each instructor. This facility requires adequate storage, lighting, and heat/air conditioning. A computer ratio of two students to one computer is preferred. Peripheral ratio of 30 computers to one scanner and one printer at minimum.
- NOTE: This class should be conducted in a site that simulates an industry-standard workplace in this field.

Minimal Requirements
Student desks/workstations, teacher’s desk, whiteboard, locked cabinets for storage; computers, Internet, printer, scanner, document camera, projector, DVD player, and projection screen.

Equipment and Supplies
- Computers with Adobe Photoshop, Illustrator, InDesign, Internet, web graphic, web page editor programs
- Incorporate appropriate equipment to include but not be limited to MS-DOS and/or Macintosh computers with minimum memory capability to utilize industry-based standard software
- Integrated productivity software package containing word processing, database management, spreadsheet, and graphics.
- Instructional materials including AV materials, CD-ROMs/DVDs, and Internet resources
- Appropriate job-specific materials and simulation opportunities
- Digital cameras
- CD and DVD recorders

Operational Methodologies
- Classroom (C): Instruction provided by a qualified teacher, utilizing a lesson plan, to a group of students in a classroom.
- Community Classroom (CC): An instructional method which utilizes unpaid, on-the-job training experiences at business, industry, and public agency sites.

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California Visual and Performing Arts Standards: Visual Arts (VA)
• **Cooperative Vocational Education (CVE):** An instructional method which correlates concurrent, formal vocational classroom instruction with regularly scheduled, paid on-the-job training experience.

• **Related Instruction (RI):** Classroom instruction and unpaid/paid on-the-job training experiences are being conducted together within the same time frame (quarter, semester, etc.).

• **On-the-Job Training (OJT):** Refers to “hands-on” job skill training in either the community classroom (unpaid) or in correlation with cooperative vocational education (paid).

**Training OJT Environment**

*Title 5 Education Code No. 10085*

The following criteria shall be used to select and approve a community classroom training station:

(a) The management of the community classroom training station shall:

   (1) Have a clear understanding of the community classroom methodology and a willingness to participate in the training experience.

   (2) Cooperate with the career technical education director, or his/her designee, in preparing a written joint venture agreement.

   (3) Participate with the community classroom teacher in preparing an individualized training plan.

   (4) Provide and assist students with unpaid on-the-job training experiences as described in the individualized training plan.

   (5) Consult with the community classroom teacher regarding the student’s progress during the unpaid on-the-job training experiences.

   (6) Assist in maintaining accurate records of the pupils training hours.

(b) The training station shall offer training opportunities in the specific occupation for which the course is approved. Training opportunities at the station shall expand competencies developed in the classroom instruction portion of the student’s training.

(c) The training station shall have adequate equipment, materials, and other resources to provide an appropriate learning opportunity.

(d) Training station conditions shall prevail which will not endanger the health, safety, welfare, or morals of the pupil.

(e) The training station shall be concurrently engaged in a business operation, which requires employment in the occupation for which training is provided.

**Ed. Code Title 5 10107**

(a) The employer at the cooperative career technical training station shall:

   (1) Have a clear understanding of program objectives and a willingness to participate in the program.

   (2) Provide adequate supervision to ensure a planned program of the students’ paid on-the-job training in order that the student may receive maximum education benefit.

   (3) Consult with the cooperative career technical education teacher regarding the paid on-the-job progress of the student.

   (4) Cooperate with the career technical education direction or his or her designee in preparing a written training agreement.

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Standards for Career Ready Practice (CRP):

Common Core State Standards (CCSS): Language Arts (ELA); Mathematics (M)

California Visual and Performing Arts Standards: Visual Arts (VA)
(5) Participate with the cooperative career technical education teacher and the student in preparing an individualized training plan.
(6) Provide a minimum of 8 hours of paid employment per week to assist students to acquire those competencies necessary for employment and advancement in the occupational area for which training offered.
(7) Assist in maintaining accurate records of the students’ training hours.
(8) Provide Workers’ Compensation Insurance for students employed through the Cooperative Career Technical Education Program.

(b) The training station shall offer training opportunities in the specific occupation for which the course is approved. Training opportunities at the paid station shall be in the occupation for which related instruction is provided.
(c) Training station working conditions shall not endanger the health, safety, welfare or morals of the students.
(d) The training station shall have adequate equipment, materials and other resources to provide an appropriate learning opportunity.

Instructioonal Methodologies, Strategies and Techniques
A variety of instructional methodologies, strategies, and techniques are used to instruct the students. These include, but are not limited to the following:
- Teacher modeling
- Lecture and guided practice
- Demonstration
- Role-play
- Project-based learning
- Assigned readings from tutorials, textbooks, journals, etc.
- Class discussions
- Hands-on activities
- Multimedia presentations
- Individual instruction
- Cooperative learning
- Field trips
- Work-based learning experiences
- Guest speakers
- Web-based research
- DVDs
- Student presentations (oral, written, technological)
- Utilization of computers/technology
Assessment of Student Performance
Assessment of student performance may include but is not limited to:
- Student portfolios
- Student demonstrations
- Individual and group presentations
- Supervisor/teacher observations
- Peer evaluations
- Self-reflections
- Critiques
- Rubrics
- Oral assessment
- Reports and research papers
- Projects
- Tests and quizzes
- Performance tasks

Students will be assessed in multiple ways to ensure that a variety of learning styles are addressed.

Safety
- All students will successfully complete a safety exam with results kept on file.
- Specialized safety needs related to tools and supplies used.
- Desirable safety equipment includes safety desks with all electrical wiring hidden.

Recommended Supplemental Instructional Textbooks
- Learning Media Design with Adobe CS

Special Instructor(s) Prerequisites
- Valid California Designated Subjects credential authorizing CTE teaching in the industry sector identified.
- Knowledge of current industry trends and practices, including appropriate technology.
- Willingness to establish local community work sites and ability to access resources.
- Willingness to participate in advisory and committee meetings, including recruiting and collaborating with business partners.
<table>
<thead>
<tr>
<th>INSTRUCTIONAL CONTENT</th>
<th>STUDENT OUTCOMES</th>
<th>C</th>
<th>CC</th>
<th>CVE</th>
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<tbody>
<tr>
<td><strong>I. CAREER READY PRACTICE</strong></td>
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<tr>
<td>A. Orientation/ Introduction to CTE</td>
<td>• Relate philosophy, purpose and goals of CTE.  &lt;br&gt;• Explain the importance of meeting the demands of the 21st century workplace.  &lt;br&gt;• Explain the “Drivers of Change” and how it relates to college and career.</td>
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<td>B. Occupational Safety</td>
<td>• Discuss health and safety policies, procedures, regulations, practices and exhibit the proper use of equipment and handling of hazardous materials.  \textit{AS 6.0}  &lt;br&gt;• Explain the reasoning of basic safety rules in the classroom and workplace. Demonstrate an understanding of safety rules and practices by passing an assessment, with 90% accuracy.</td>
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<tr>
<td>C. Technical Skills and Academic Knowledge</td>
<td>• Apply appropriate technical skills and academic knowledge.  \textit{CRP 1}  &lt;br&gt;• Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the industry sector alignment matrix for identification of standards.  \textit{AS 1.0}</td>
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<td>D. Communication Skills</td>
<td>• Communicate clearly, effectively, and with reason.  \textit{CRP 2}  &lt;br&gt;• Explain how a positive attitude can help in becoming an effective communicator.  &lt;br&gt;• Practice good communication to help build positive relationships in the classroom and at the workplace.  &lt;br&gt;• Compare and contrast written and oral communications.  &lt;br&gt;• Describe the importance of email etiquette as it relates to effective communication.  &lt;br&gt;• Assess how nonverbal communication affects messages.  &lt;br&gt;• Explain the impact of personal and professional social media in communication.</td>
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| I. CAREER READY PRACTICE (Continued) | - Describe issues related to communicating in a global society.  
- Explain the appropriate etiquette for answering telephone calls and leaving voicemail messages; receiving and making requests; giving directions and persuading others.  
- Identify the steps to plan a successful oral presentation.  
- Develop an education and career plan aligned with personal goals.  
  **CRP 3**  
  - Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.  
  **AS 3.0**  
- Apply the decision-making process to develop a college and career plan.  
  **AS 5.0**  
- Identify employability skills required for participation in the world of work.  
- Assess interests, skills and aptitudes and match these to career options.  
- Identify further education and/or training needed for career choices.  
- Develop a resume, cover letter and other resources for the job search process.  
- Complete a job application.  
- Identify what employers are looking for when hiring employees.  
- Apply effective interviewing skills and write a thank-you note.  
- Create a career portfolio that links to future college and career options. |     |    |     |    |     |    |     |

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| F. Technology                                 | - Apply technology to enhance productivity.  
  - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments and information.  
  - Explain the role technology plays in the workplace.  
  - Describe the laws and licenses that govern the use of technology at school and in the workplace.  
  - Compare different types of media (word processing, digital media software, and video, audio) in relation to effectively communicating messages.  
  - Utilize critical thinking to make sense of problems and persevere in solving them.  
  - 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, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.  
  - Identify everyday strategies to build the capacity for critical thinking and school and the workplace.  
  - Explain the problem-solving process, including identifying the root cause of a problem, generating and considering possible solutions, choosing the best solution, and evaluating outcomes.  
  - Practice personal health and understand financial literacy.  
  - Identify factors related to a person’s well-being.  
  - Analyze the relationship between personal health and workplace performance. |   |     |     |
| G. Critical Thinking and Problems Solving Skills |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |     |     |
| H. Personal Health and Financial Literacy     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |     |     |

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</table>
| I. CAREER READY PRACTICE (Continued) | • Explain the relationship between stress and aggressive behavior.  
• Identify ways to lower the level of stress.  
• Use critical thinking and communication skills to manage conflict.  
• Develop potential living expenses and a budget based on income and needs.  
• Understand the responsible use of financial institutions and services (e.g. checking, savings, ATM, credit cards, investments, retirement, etc.).  
• Recognize that financial literacy and responsibility leads to a secure future and career success. | RI | OJT | RI | OJT |
| I. Responsible Citizenship | • Act as a responsible citizen in the workplace and the community.  
<em>CRP 7</em>  
• Explain what the school, workplace, and community expects of a student as a member of society.  
• Identify personality and behavior characteristics that have a positive or negative impact at school, in the workplace, and in the community.  
• Analyze the impact of an individual’s decision on others and on the environment, and recognize both short and long term consequences of actions.  
• Identify areas in which sensitivity is required in a diverse workplace. | RI | OJT | RI | OJT |
| J. Integrity, Ethical Leadership, and Effective Management | • Model integrity, ethical leadership, and effective management.  
<em>CRP 8</em>  
• Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the work.  
<em>AS 8.0</em>  
• Define integrity and how it relates to the classroom and workplace.  
• Identify characteristics of ethical behavior and leadership. | RI | OJT | RI | OJT |
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<td><strong>I. CAREER READY PRACTICE (Continued)</strong></td>
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<tr>
<td><strong>K. Human Relations in the Workplace</strong></td>
<td>• Compare and contrast the three basic management styles: authoritarian, democratic, and laissez faire.</td>
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<tr>
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<td>• Work productively in teams while integrating cultural and global competence. <em>CRP 9</em></td>
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<tr>
<td></td>
<td>• Define human relations.</td>
</tr>
<tr>
<td></td>
<td>• Explain the need for effective human relations skills at school and in the workplace.</td>
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<td>• Contrast the characteristics and consequences of positive and negative attitudes.</td>
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<td>• Recognize the contributions of diversity in society and in the workplace.</td>
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<td>• Assess the value of teamwork in the classroom and workplace.</td>
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<td>• Identify strategies that can be used to promote good working relationships within the classroom and in the workplace.</td>
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<td>• Explain the importance of networking.</td>
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<td>• Identify verbal, non-verbal, and physical types of harassment as defined by the state/federal law and determine appropriate behavior in the workplace.</td>
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</tbody>
</table>

| | **L. Creativity and Innovation** |
| | • Demonstrate creativity and innovation. *CRP 10* |
| | • Identify how new ideas, thinking, tasks, solutions, and methods can be fostered in the workplace. *AS 5.0* |
| | • Explain the appropriate and constructive expression of creativity and innovation at school and in a workplace situation. |

<p>| | <strong>M. Research Strategies</strong> |
| | • Employ valid and reliable research strategies. <em>CRP 11</em> |
| | • Define plagiarism. |
| | • Identify strategies for conducting basic research. |
| | • Explain resources for gathering information on a topic. |
| | • Explain how to confirm the validity of sources. |</p>
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</table>
| N. Decision-Making | • Understand the environmental, social, and economic impacts of decisions. *CRP 12*
| | • Work with peers to promote civil, democratic discussions and decision making; set clear goals and deadlines; and establish individual roles as needed. *AS 9.0*
| | • Explain the decision-making process |

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## II. MEDIA DESIGN AND DEVELOPMENT

### A. Design in Society
1. Design Use in Society
   a. Purpose and Role
   b. Where to find works of design
2. Design Applications
   a. Logos
   b. Brochures
   c. Products
   d. Marketing
   e. Engineering
   f. Symbols

- Correctly identify purpose and intent of design. **VA 1.1**
- Correctly identify where design could be used in society. **VA 3.1**
- Create a well thought-out written evaluation as to the effectiveness of selected published designs. **VA 4.5**
- Identify similarities and differences in the purposes of design toward focused market. **VA 3.1**
- Understand that the modern world is an international community and requires an expanded global view. **AS 9.5**
- Analyze and articulate how society influences the interpretation and effectiveness of an artistic product. **PS AME A4.5**

### B. History of Media Design
1. Early design
2. Cultural influences
3. Technological advancements
4. Modern design
5. Major figures in design

- Identify major attributes and influences from various cultures. **VA 3.3**
- Identify historical figures that influenced design. **VA 1.3 and 3.3**
- Identify cultural factors that influenced design subject matter. **VA 3.1 and 3.3**
- Describe technological advances. **VA 3.2**
- Identify and describe the role and influence of new technologies on contemporary arts industry. **PS AME A3.1**
- Predict how changes in technology might change the role and function of the visuals arts in the workplace. **PS AME A5.4**
- Describe how the issues of time, place, and cultural influence are reflected in a variety of artistic products. **PS AME A3.2**
- Identify art in international industry and discuss ways in which the work reflects cultural perspective. **PS AME A3.4**
- Analyze similarities and differences of purpose in art created in...
## INSTRUCTIONAL CONTENT

### II. MEDIA DESIGN AND DEVELOPMENT (Continued)

#### C. Development of the Language of Visual Arts

1. Elements of Design
   a. Line
   b. Shape
   c. Form
   d. Texture
   e. Color
   f. Value
   g. Space

   - Use the language of visual art when analyzing artwork. *PS AME A3.5*
   - Investigate and discuss universal concepts expressed in visual media products from diverse cultures. *PS AME A3.6*
   - Research past, present, and projected technological advances as they impact a particular pathway. *AS 4.5*
   - Explore issues of global significance and document the impact on the Information and Communication Technologies sector.
   - Respect individual and cultural differences and recognize the importance of diversity in the workplace. *AS 9.6*

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### STUDENT OUTCOMES

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</table>
| II. MEDIA DESIGN AND DEVELOPMENT (Continued) | culturally diverse industry applications. *PS AME A3.5*  
- Investigate and discuss universal concepts expressed in visual media products from diverse cultures. *PS AME A3.6*  
- Research past, present, and projected technological advances as they impact a particular pathway. *AS 4.5*  
- Explore issues of global significance and document the impact on the Information and Communication Technologies sector.  
- Respect individual and cultural differences and recognize the importance of diversity in the workplace. *AS 9.6* |

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<td>RI</td>
<td>OJT</td>
<td>RI</td>
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</table>
II. MEDIA DESIGN AND DEVELOPMENT (Continued)

2. Principles of Design
   a. Balance
   b. Unity
   c. Emphasis
   d. Contrast
   e. Movement
   f. Rhythm
   g. Pattern/Repetition

   • Identify the principles of design in works of art and designs. *VA 1.1*
   • View and respond to a variety of industry-related artistic products integrating industry appropriate vocabulary. *AME A1.1*
   • Identify and use the principles of design to discuss, analyze, and create projects and products across multiple industry applications. *PS AME A1.2*

3. Relationship Between Elements and Principles of Design

   • Analyze works of art to determine how the elements were used to achieve the principles of design. *VA 1.1*
   • Organize elements of design into creating effective composition displaying principles of design. *VA 2.1 and 2.5*
   • View and respond to a variety of industry-related artistic products integrating industry appropriate vocabulary. *PS AME A1.1*
   • Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment. *AS 5.3*
   • Interpret and explain terminology and practices specific to the Arts, Media, and Entertainment as well at the Information and Communication Technologies sectors. *AS 10.1*
   • Select industry-specific works and analyze the intent of the work and the appropriate use of media. *PS AME A1.4*
   • Analyze and discuss complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual in works of arts. *PS AME A1.7*
   • Create an artistic product that involves the effective use of the...
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<tr>
<td><strong>D. Color Theory</strong></td>
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<tr>
<td>1. Psychology of colors and communicating with colors</td>
<td>• Understand the component steps and skills required to design, edit, and produce</td>
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<tr>
<td>2. Color wheel</td>
<td>a production for audio, video, electronic, or printed presentation. *PS AME A2.6</td>
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<td>3. Color schemes</td>
<td>• Describe and analyze meaning of an artwork contributed by the colors. *VA 1.3, 1.4, and 3.1</td>
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<td>4. Grey value, neutrals, tint, tone, shade</td>
<td>• Know the color scheme and apply them in creating artwork. *VA 2.5</td>
</tr>
<tr>
<td>5. Pigments v. Light</td>
<td>• Identify the color scheme used in advertisements, logos, etc.</td>
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<tr>
<td>6. RGB and CYMK</td>
<td>• Develop skills on the computer to manipulate and create images. *VA 2.3 and 2.1</td>
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<tr>
<td>7. Introduction to basic functions and color in Adobe</td>
<td>• Interpret and explain terminology and practices specific to the Arts, Media,</td>
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<tr>
<td>Photoshop and Illustrator</td>
<td>and Entertainment as well as the Information and Communication Technologies</td>
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<td>sectors. *AS 10.1</td>
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<td></td>
<td>• Analyze and discuss complex ideas, such as distortion, color theory,</td>
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<td>arbitrary color, scale, expressive content, and real versus virtual in works</td>
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<td>of arts. *PS AME A1.7</td>
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<tr>
<td><strong>E. Problem Solving Skills and Visual Communication Skills</strong></td>
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<tr>
<td>1. Communicating visually</td>
<td>• Research and analyze the work of an artist and write about the artist’s</td>
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<tr>
<td>2. Design solutions</td>
<td>distinctive style and its contribution to the meaning of the work. *VA 1.4</td>
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<tr>
<td>3. Innovative Designs</td>
<td>• Create compositions that solve the problem of visual communication. *VA 2.5</td>
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<td></td>
<td>• Articulate a position regarding the aesthetic value of their work. *VA 4.3</td>
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<td>and 4.5</td>
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<td></td>
<td>• Analyze the aesthetic value of a specific commercial work of art and defend</td>
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<td></td>
<td>that analysis from an industry perspective. *PS AME A4.3</td>
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<td></td>
<td>• Use technical writing and communication skills to work effectively</td>
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<td>INSTRUCTIONAL CONTENT</td>
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<tr>
<td>II. MEDIA DESIGN AND DEVELOPMENT (Continued)</td>
<td>with diverse groups of people. <em>AS 2.7</em></td>
</tr>
<tr>
<td>F. Introduction to the Design Process</td>
<td>Recognize the elements of communication using a sender-receiver model. <em>AS 2.1</em></td>
</tr>
<tr>
<td>1. Concept Development and Research</td>
<td>Demonstrate elements of written and electronic communications such as accurate spelling, grammar, and format. <em>AS 2.4</em></td>
</tr>
<tr>
<td>2. Thumbnails and Brainstorming</td>
<td>Identify and ask significant questions that clarify various points of view to solve problems. <em>AS 5.1</em></td>
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<tr>
<td>3. Roughs</td>
<td>Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate. <em>AS 5.2</em></td>
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<tr>
<td>4. Comprehensives</td>
<td>Interpret information and draw conclusions, based on the best analysis, to make informed decisions. <em>AS 5.4</em></td>
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<tr>
<td>5. Final Product Presentations</td>
<td>Create quality illustration of steps of the design process. <em>VA 4.4</em></td>
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<tr>
<td></td>
<td>Describe in detail the steps of the design process.</td>
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<td></td>
<td>Use electronic reference materials to gather information and produce products and services. <em>AS 4.1</em></td>
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<td></td>
<td>Employ technology-based communications responsibly and effectively to explore complex systems and issues. <em>AS 4.2</em></td>
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<td>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. <em>AS 4.6</em></td>
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<td></td>
<td>Interpret and explain terminology and practices specific to the Arts, Media, and Entertainment as well as the Information and Communication Technologies sectors. <em>AS 10.1</em></td>
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<td></td>
<td>Use technology to create a variety of audio, visual, written, and electronic products and presentations. <em>PS AME A 8.2</em></td>
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<td>Analyze the way in which technical design contributes to an artistic product, performance, or presentation. <em>PS AME 8.4</em></td>
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California Career Technical Education Model Curriculum Standards, Grades 7-12

Industry Sector Anchor Standards (AS): Information and Communication Technologies (ICT); Arts, Media, and Entertainment (AME)
Pathway Standards (PS): Information Support and Services (ICT A); Design, Visual, and Media Arts (AME A)

Standards for Career Ready Practice (CRP):
Common Core State Standards (CCSS): Language Arts (ELA); Mathematics (M)
California Visual and Performing Arts Standards: Visual Arts (VA)
### II. MEDIA DESIGN AND DEVELOPMENT (Continued)

#### G. Logo Design
1. History of logos
2. Purpose of logos
3. Logo types
4. Text based logos
5. Graphic based logos
6. Adobe Illustrator and Adobe Photoshop – vector vs. raster programs

- Create and present logos. *VA 2.1*
- Make revisions based on feedback. *VA 4.4*
- Communicate information and ideas effectively to multiple audiences using a variety of media and formats. *AS 2.5*
- Complete a written critique of a peer’s design. *VA 4.5*
- Develop an essay describing and justifying design revisions. *VA 4.3 and 4.4*
- Interpret and explain terminology and practices specific to the Arts, Media, and Entertainment as well as the Information and Communication Technologies sectors. *AS 10.1*

#### H. Creative Advertisement in a Magazine
1. Functions of advertisements
2. Adobe Photoshop photo manipulation
3. Media design and electronic layout

- Create a well-balanced, unified design. *VA 2.1*
- Develop a promotional campaign idea. *VA 5.1*
- Apply design steps in creation of design. *VA 2.1*
- Use Adobe Photoshop to crop, resize, and enhance colors. *VA 2.3*
- Analyze the purpose of the media to determine the appropriate file format and level of compression.
- Use Adobe InDesign electronic page layout. *VA 2.3*
- Refine skills in digital photography. *VA 2.3*
- Communicate information and ideas effectively to multiple audiences using a variety of media and formats. *AS 2.5*
- Use technology to create a variety of audio, visual, written, and electronic products and presentations. *PS AME A 8.2*
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<td><strong>I. CD Cover</strong></td>
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| 1. History of Album Covers | • Develop an understanding of challenges and trends in Album Covers according to time and culture. *VA 3.3*
| 2. Functions of CD cover and able of Contents – purpose, intent, needs | • Identify the contemporary digital trends in creating album covers, CDs, album art. *VA 3.4 and 2.3*
| 3. Format and layout | • Identify connections to a contemporary market of their generation. *VA 5.2*
| 4. Target Audience and Communications | • Understand the principles of a customer-oriented approach to users. *AS 2.8*
| 5. Advancement Techniques in Adobe Photoshop | • Communicate information and ideas effectively to multiple audiences using a variety of media and formats. *AS 2.5*
| | • Use technology to create a variety of audio, visual, written, and electronic products and presentations. *PS AME A 8.2*
| **J. Interactive Project** | |
| 1. Function of Interactive Media – purpose, intent, needs | • Manipulate digital imagery. *VA 2.3*  
| 2. File formats and compression – video and audio | • Plan and create a project while applying their personal style. *VA 2.2 and 2.4*
| 3. Adobe Flash – Keyframe Animation, Storytelling, Simple Actionscript programming, audio import | • Demonstrate skill in the manipulation of digital imagery (either still or video) in an industry-relevant application. *PS AME A2.1*
| | • Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment. *AS 5.3*
| | • Interpret and explain terminology and practices specific to the Arts, Media, and Entertainment as well as the Information and Communication Technologies sectors. *AS 10.1*
| | • Understand the major software and hardware components of a computer and a network and how they relate to each other. *ICT AS 10.5*
### Media Design and Development (Continued)

#### K. Portfolio Development
1. Portfolio and Presentation
2. Resume
3. Statement
4. Presentation Skills

- Understand data sizes of various types of information (text, picture, sound, video, etc.) and data capacity of various forms of media. *ICT AS 10.6*
- Develop the purpose and scope of a project. *PS ICT A8.1*
- Design, develop, implement, and monitor a project by creating and integrating technologies. *PS ICT A8.5*
- Create a multimedia work of art that demonstrates knowledge of media and technology skills. *PS AME A2.9*
- Use technology to create a variety of audio, visual, written, and electronic products and presentations. *PS AME A 8.2*
- Explore how information and communication technologies are used in career planning and decision making. *AS 3.3*
- Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment. *AS 5.3*
- Practice time management and efficiency to fulfill responsibilities. *AS 7.4*
- Apply high-quality techniques to product or presentation design and development. *AS 7.5*
- Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession. *AS 7.7*
- Construct projects and products specific to the Information and Communication Technologies sector requirements and expectations. *AS 10.3*
- Use common industry-standard software and their applications including word processing, spreadsheets, databases, and multimedia software. *AS 10.9*
- Identify and apply multiple ways in which to transfer information and resources (e.g. text, data, sound, video, still images) between

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<td>- Understand data sizes of various types of information (text, picture, sound, video, etc.) and data capacity of various forms of media. <em>ICT AS 10.6</em>&lt;br&gt;- Develop the purpose and scope of a project. <em>PS ICT A8.1</em>&lt;br&gt;- Design, develop, implement, and monitor a project by creating and integrating technologies. <em>PS ICT A8.5</em>&lt;br&gt;- Create a multimedia work of art that demonstrates knowledge of media and technology skills. <em>PS AME A2.9</em>&lt;br&gt;- Use technology to create a variety of audio, visual, written, and electronic products and presentations. <em>PS AME A 8.2</em>&lt;br&gt;- Explore how information and communication technologies are used in career planning and decision making. <em>AS 3.3</em>&lt;br&gt;- Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment. <em>AS 5.3</em>&lt;br&gt;- Practice time management and efficiency to fulfill responsibilities. <em>AS 7.4</em>&lt;br&gt;- Apply high-quality techniques to product or presentation design and development. <em>AS 7.5</em>&lt;br&gt;- Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession. <em>AS 7.7</em>&lt;br&gt;- Construct projects and products specific to the Information and Communication Technologies sector requirements and expectations. <em>AS 10.3</em>&lt;br&gt;- Use common industry-standard software and their applications including word processing, spreadsheets, databases, and multimedia software. <em>AS 10.9</em>&lt;br&gt;- Identify and apply multiple ways in which to transfer information and resources (e.g. text, data, sound, video, still images) between</td>
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<td>software programs and systems. <em>PS ICT A3.1</em></td>
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<td>• Use multiple online search techniques and resources to acquire information. <em>PS ICT A3.5</em></td>
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<td>• Use different systems and associated utilities to perform such functions as file management, backup and recovery, and execution of programs. <em>PS ICT A4.1</em></td>
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<td>• Demonstrate personal style and advanced proficiency in communicating an idea, them, or emotion in an industry-relevant artistic product. <em>PS AME 2.2</em></td>
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<td>• Create original works of art of increasing complexity and skill in a variety of media that reflect their feeling and points of view. <em>PS AME A2.7</em></td>
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<td>• Plan and create artistic products that reflect complex ideas, such as distortion, color theory, scale, expressive content, and real versus virtual. <em>PS AME A2.8</em></td>
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<td>• 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. <em>AS 11.5</em></td>
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<td>• Prepare a portfolio of original art created for a variety of purposes and commercial applications. <em>PS AME A5.6</em></td>
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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.
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.
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.
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 command 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.
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.
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.
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### ENGLISH LANGUAGE ARTS

#### Language Standards – LS (Standard Area, Grade Level, Standard #)

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 grades 11–12 reading and content, 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

#### Reading Standards for Informational 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.
- 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
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<tr>
<td>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.</td>
<td>A1.0, A2.0, A4.0, A5.0, A6.0, A7.0</td>
<td>B4.0, B1.0, B5.0</td>
<td>C2.0, C4.0, D3.0</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td>B1.0, B5.0, B8.0</td>
<td>C2.0, C4.0, D3.0</td>
</tr>
<tr>
<td>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.</td>
<td>A1.0, A3.0, A8.0</td>
<td>B1.0, B2.0, B4.0, B5.0, B7.0</td>
<td>C1.0, C2.0, D3.0</td>
</tr>
</tbody>
</table>

Reading Standards for Informational Text – RSIT (Standard Area, Grade Level, Standard #) (continued)

<table>
<thead>
<tr>
<th>Writing Standards – WS (Standard Area, Grade Level, Standard #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>11-12.3 Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.</td>
</tr>
<tr>
<td>11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>
### Writing Standards – WS (Standard Area, Grade Level, Standard #) (continued)

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

### MATHEMATICS

#### Algebra – A-CED – Creating Equations

**Create equations that describe numbers or relationships**

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

#### Algebra – A-REI – Reasoning with Equations and Inequalities

**Understand solving equations as a process of reasoning and explain the reasoning**

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

#### Functions – F-IF – Interpreting Functions

**Understand the concept of a function and use function notation**

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

Interpret functions that arise in applications in terms of the context

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

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
### Academic Alignment Matrix

**INFORMATION AND COMMUNICATION TECHNOLOGIES**

<table>
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<tr>
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<th>A. Information Support and Services</th>
<th>B. Networking</th>
<th>C. Software and Systems Development</th>
<th>D. Games and Simulation</th>
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</thead>
<tbody>
<tr>
<td><strong>Functions – F–IF – Interpreting Functions</strong> (continued)</td>
<td></td>
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<tr>
<td>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.</td>
<td>A4.0, A8.0</td>
<td>B4.0, B7.0</td>
<td>C1.0, C4.0, C6.0, C10.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>Analyze functions using different representations</td>
<td></td>
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<tr>
<td>7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C1.0, C4.0, C6.0, C10.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</td>
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<tr>
<td>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</td>
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<tr>
<td>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</td>
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<tr>
<td>d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</td>
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<tr>
<td>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</td>
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<tr>
<td>8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C1.0, C4.0, C6.0, C10.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>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.</td>
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<tr>
<td>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)^{2t} ), ( y = (1.2)^{1/10} ), and classify them as representing exponential growth or decay.</td>
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<tr>
<td>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.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C1.0, C4.0, C6.0, C10.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>10. Demonstrate an understanding of functions and equations defined parametrically and graph them. (CA Standard Math Analysis – 7.0)</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C1.0, C4.0, C6.0, C10.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
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### Academic Alignment Matrix

#### INFORMATION AND COMMUNICATION TECHNOLOGIES

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<tbody>
<tr>
<td>Functions – F–LE – Linear, Quadratic, and Exponential Models</td>
<td></td>
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<tr>
<td>Interpret expressions for functions in terms of the situation they model</td>
<td></td>
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<tr>
<td>5. Interpret the parameters in a linear or exponential function in terms of a context.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C5.0, C6.0, D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td>C4.0, C6.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>Geometry – C – Circles</td>
<td></td>
<td></td>
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<tr>
<td>Find arc lengths and areas of sectors of circles</td>
<td></td>
<td></td>
<td>C2.0, C4.0, C9.0</td>
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<tr>
<td>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.</td>
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<tr>
<td>Geometry – G–CO – Congruence</td>
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</tr>
<tr>
<td>Understand congruence in terms of rigid motions</td>
<td></td>
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<td>C2.0, C4.0, C9.0</td>
</tr>
<tr>
<td>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.</td>
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<tr>
<td>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.</td>
<td></td>
<td>C4.0, C9.0</td>
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</tr>
<tr>
<td>8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.</td>
<td></td>
<td>C4.0, C9.0</td>
<td></td>
</tr>
<tr>
<td>Make geometric constructions</td>
<td></td>
<td></td>
<td>C2.0, C4.0</td>
</tr>
<tr>
<td>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.</td>
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<tr>
<td>Geometry – G-GMD – Geometric Measurement and Dimensions</td>
<td></td>
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<tr>
<td>Explain volume formulas and use them to solve problems</td>
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<tr>
<td>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.</td>
<td></td>
<td>C4.0, C10.0</td>
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</tr>
<tr>
<td>2. (+) Give an informal argument using Cavalieri’s principle for the formulas for the volume of a sphere and other solid figures.</td>
<td></td>
<td>C4.0, C10.0</td>
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</tr>
<tr>
<td>3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.</td>
<td></td>
<td>C4.0, C10.0</td>
<td></td>
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<tr>
<td>Visualize relationships between two-dimensional and three-dimensional objects</td>
<td></td>
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<tr>
<td>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.</td>
<td></td>
<td>C3.0, C5.0, C10.0</td>
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</tr>
<tr>
<td>5. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.</td>
<td></td>
<td>C4.0</td>
<td></td>
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<tr>
<td>Geometry – G-GPE – Expressing Geometric Properties with Equations</td>
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</tr>
<tr>
<td>Use coordinates to prove simple geometric theorems algebraically</td>
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<tr>
<td>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).</td>
<td></td>
<td>C2.0, C4.0, C6.0, C9.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>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).</td>
<td></td>
<td>C2.0, C4.0, C6.0, C9.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</td>
<td></td>
<td>C2.0, C4.0, C6.0, C9.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
</tr>
<tr>
<td>7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.</td>
<td></td>
<td>C2.0, C4.0, C6.0, C9.0</td>
<td>D3.0, D4.0, D5.0, D6.0, D7.0</td>
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<td><strong>Geometry – G-MG – Modeling with Geometry</strong></td>
<td><strong>Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry</strong></td>
<td><strong>Numbers and Quantities – N-RN – The Real Number System</strong></td>
<td><strong>Academic Standards</strong></td>
</tr>
</tbody>
</table>

#### Geometry – G-MG – Modeling with Geometry

**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).

   - 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).

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

#### Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry

**Understand similarity in terms of similarity transformations**

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

#### Numbers and Quantities – N-RN – The Real Number System

**Extend the properties of exponents to rational exponents**

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 $(5^{1/3})^3 = 5^{(1)(3)}$ to hold, so $(5^{1/3})^3$ must equal 5.

   - A8.0
   - B4.0, B7.0
   - C1.0, C4.0
   - D7.0
### Academic Alignment Matrix

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<tr>
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<tr>
<td><strong>Numbers and Quantities – N-RN – The Real Number System (continued)</strong></td>
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</tr>
<tr>
<td>2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.</td>
<td>A8.0</td>
</tr>
<tr>
<td><strong>Use properties of rational and irrational numbers</strong></td>
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<tr>
<td>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.</td>
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<tr>
<td><strong>Numbers and Quantities – N-Q – Quantities</strong></td>
<td></td>
</tr>
<tr>
<td><em>Reason quantitatively and use units to solve problems</em></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>A2.0, A8.0</td>
</tr>
<tr>
<td>2. Define appropriate quantities for the purpose of descriptive modeling.</td>
<td>A2.0, A8.0</td>
</tr>
<tr>
<td>3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</td>
<td>A2.0, A8.0</td>
</tr>
<tr>
<td><strong>Numbers and Quantities – N-CN – Complex Number System</strong></td>
<td></td>
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<tr>
<td><em>Represent complex numbers and their operations on the complex plane</em></td>
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<tr>
<td>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.</td>
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<tr>
<td>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 + -√3 i) = 8 because (-1 + -√3 i) has modulus 2 and argument 120°.</td>
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<tr>
<td>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.</td>
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</table>
### Academic Alignment Matrix

#### INFORMATION AND COMMUNICATION TECHNOLOGIES

<table>
<thead>
<tr>
<th>PATHWAYS</th>
<th>A. Information Support and Services</th>
<th>B. Networking</th>
<th>C. Software and Systems Development</th>
<th>D. Games and Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number and Quantity – N-VM – Vector and Matrix Quantities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform operations on matrices and use matrices in applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C7.0, C8.0</td>
<td>D6.0, D7.0</td>
</tr>
<tr>
<td>7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C7.0, C8.0</td>
<td>D6.0, D7.0</td>
</tr>
<tr>
<td>8. (+) Add, subtract, and multiply matrices of appropriate dimensions.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C7.0, C8.0</td>
<td>D6.0, D7.0</td>
</tr>
<tr>
<td>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.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C7.0, C8.0</td>
<td>D6.0, D7.0</td>
</tr>
<tr>
<td>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.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C7.0, C8.0</td>
<td>D6.0, D7.0</td>
</tr>
<tr>
<td>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.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C6.0, C7.0, C8.0</td>
<td>D6.0, D7.0</td>
</tr>
<tr>
<td>12. (+) Work with 2 x 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.</td>
<td>A8.0</td>
<td>B4.0, B7.0</td>
<td>C4.0, C6.0, C7.0, C8.0</td>
<td>D6.0, D7.0</td>
</tr>
</tbody>
</table>

| **Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions** | | | | |
| Understand and evaluate random processes underlying statistical experiments | | | | |
| 1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. | A1.0, A8.0 | A4.0, 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 |

**Make inferences and justify conclusions from sample surveys, experiments, and observational studies**

| 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 |
Academic Alignment Matrix

### INFORMATION AND COMMUNICATION TECHNOLOGIES

<table>
<thead>
<tr>
<th>Statistics and Probability – S-IC – Making Inferences and Justifying Conclusions (continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.</td>
</tr>
<tr>
<td>A. Information Support and Services</td>
</tr>
<tr>
<td>A1.0, A2.0, A8.0</td>
</tr>
<tr>
<td>6. Evaluate reports based on data.</td>
</tr>
<tr>
<td>A1.0, A2.0, A8.0</td>
</tr>
</tbody>
</table>

### Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data

**Summarize, represent, and interpret data on a single count or measurement variable**

<table>
<thead>
<tr>
<th>1. Represent data with plots on the real number line (dot plots, histograms, and box plots).</th>
</tr>
</thead>
<tbody>
<tr>
<td>A8.0</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>A8.0</td>
</tr>
<tr>
<td>3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</td>
</tr>
<tr>
<td>A8.0</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>A8.0</td>
</tr>
</tbody>
</table>

**Summarize, represent, and interpret data on two categorical and quantitative variables**

<table>
<thead>
<tr>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A8.0</td>
</tr>
<tr>
<td>6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>A8.0</td>
</tr>
<tr>
<td>b. Informally assess the fit of a function by plotting and analyzing residuals.</td>
</tr>
<tr>
<td>c. Fit a linear function for a scatter plot that suggests a linear association.</td>
</tr>
</tbody>
</table>
### Academic Alignment Matrix

**INFORMATION AND COMMUNICATION TECHNOLOGIES**

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</tr>
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<tbody>
<tr>
<td><strong>Calculate expected values and use them to solve problems</strong></td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>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?</td>
</tr>
</tbody>
</table>

Use probability to evaluate outcomes of decisions

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.

6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).
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</tr>
<tr>
<td>Statistics and Probability – APPS – Advanced Placement Probability and Statistics</td>
<td></td>
</tr>
<tr>
<td>10. Students know the definitions of the mean, median and mode of distribution of data and can compute each of them in particular situations.</td>
<td>A3.0, A4.0, A7.0, A8.0</td>
</tr>
<tr>
<td>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.</td>
<td>A3.0, A4.0, A7.0, A8.0</td>
</tr>
<tr>
<td>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.</td>
<td>A3.0, A4.0, A7.0, A8.0</td>
</tr>
<tr>
<td>SCIENCE</td>
<td></td>
</tr>
<tr>
<td>Life Sciences – LS</td>
<td></td>
</tr>
<tr>
<td>LS1: From Molecules to Organisms: Structures and Processes</td>
<td></td>
</tr>
<tr>
<td>LS1.A: Structure and Function</td>
<td>A3.0</td>
</tr>
<tr>
<td>LS1.B: Growth and Development of Organisms</td>
<td>A3.0</td>
</tr>
<tr>
<td>LS4: Biological Evolution: Unity and Diversity</td>
<td></td>
</tr>
<tr>
<td>LS4.B: Natural Selection</td>
<td>A2.0</td>
</tr>
<tr>
<td>HISTORY/SOCIAL SCIENCE</td>
<td></td>
</tr>
<tr>
<td>Principles of American Democracy and Economics – AD</td>
<td></td>
</tr>
<tr>
<td>12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.</td>
<td>A1.0, A5.0, A8.0</td>
</tr>
<tr>
<td>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.</td>
<td>A1.0, A5.0</td>
</tr>
<tr>
<td>12.8 Students evaluate and take and defend positions on the influence of the media on American political life.</td>
<td>A3.0</td>
</tr>
<tr>
<td>12.8.2. Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.</td>
<td>A1.0, A3.0</td>
</tr>
<tr>
<td>12.8.3. Explain how public officials use the media to communicate with the citizenry and to shape public opinion.</td>
<td>A1.0, A3.0</td>
</tr>
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</tr>
<tr>
<td><strong>U.S. History and Geography – US</strong></td>
<td>A1.0, A8.0</td>
</tr>
<tr>
<td>11.8 Students analyze the economic boom and social transformation of post-World War II America.</td>
<td>A1.0, A8.0</td>
</tr>
<tr>
<td>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.</td>
<td>A1.0, A8.0</td>
</tr>
<tr>
<td><strong>World History, Culture, and Geography – WH</strong></td>
<td>A1.0, A8.0</td>
</tr>
<tr>
<td>10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.</td>
<td>A1.0, A8.0</td>
</tr>
<tr>
<td>10.3.5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.</td>
<td>A1.0, A6.0, A8.0</td>
</tr>
<tr>
<td>10.9 Students analyze the international developments in the post-World World War II world.</td>
<td>A1.0, A6.0, A8.0</td>
</tr>
<tr>
<td>10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).</td>
<td>A1.0, A3.0, A8.0</td>
</tr>
</tbody>
</table>
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 (Tecnologia-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


UC - Media Design and Development Proficiencies

(Please choose from the following proficiencies – not to exceed 35 lines)

1. Uses technical skills and academic knowledge.
2. Communicates effectively.
3. Researches, accesses and manages career-related resources.
4. Develops a career plan and life goals.
5. Accepts personal and responsible citizenship.

Demonstrates the following job skills:
6. Keyboards accurate (alphabetic) speed of more than 30 words per minute.
7. Passes successfully an industry certification such as the IC3 or MOS.
8. Uses electronic media, manuals, and tutorials as resources to access information.
9. Understands basic office organization, setting priorities, maintaining a project plan, establishing timelines, and creating a workflow chart based on provided input.
10. Listens with specific work related objectives such as carrying out assigned tasks, taking messages clearly, and following oral and written directions in order to function in a business specific industry.
11. Understands and uses basic math components; addition, subtraction, multiplication, division of whole numbers, fractions, percents, and decimals in routine office tasks including the ability to use reference materials to assist with deficient areas.
12. Understands and uses appropriate language components; grammar, punctuation, spelling, vocabulary, and composition in performing routine office tasks.
13. Demonstrates proper use and care of equipment.
14. Creates and uses graphics in a business setting.
15. Uses operating systems, hardware, peripherals, integrating communication tools, and appropriate resources to share information.
16. Demonstrates the ability to work in teams by participating in group activities.
17. Functions effectively and within accepted industry specific standards when using computer applications skills.
18. Develops and demonstrates awareness, sensitivity, and knowledge of cooperatively working with a diverse population.
19. Uses an appropriate word processing, database management, spreadsheet, or desktop publishing application.
20. Analyzes and discusses the ever changing interrelationships between All Aspects of the Industry.

Information Technology Support and Services Proficiencies

21. Understands the goals and objectives of basic computer applications.
22. Uses entry-level clerical skills in a business environment.
23. Performs entry-level word processing tasks in a business setting.
24. Performs entry-level database management tasks in a business setting.
25. Performs entry-level spreadsheet tasks in a business setting.
26. Performs entry-level desktop publishing tasks in a business setting.
27. Performs entry-level presentation tasks in a business setting.
28. Demonstrates the use of appropriate letter formats.
29. Utilizes spreadsheet to develop budget.
30. Utilizes formulas in spreadsheet.

Effective 2014-2015
31. Creates graph or chart to represent information.
32. Sorts data in spreadsheet.
33. Performs expert-level word processing tasks in a business setting.
34. Performs expert-level database management tasks in a business setting.
35. Performs expert-level spreadsheet tasks in a business setting.
36. Performs expert-level presentation tasks in a business setting.
37. Performs expert-level desktop publishing tasks in a business setting.
38. Illustrates and implements basic security plans and procedures for information systems.

Media Design and Development Proficiencies
39. Understands the application of advanced design and development evidenced by successful completion of the Applications Design and Development Objective Test with a score of 90% or better.
40. Understands the application of advanced design and development evidenced by successful completion of the Applications Design and Development Objective Test with a score of 98% or better.
41. Understands the types of business software applications and hardware limitations.
42. Understands the elements of design project purpose.
43. Demonstrates effective use of the internet.
44. Designs an advertisement that communicates an idea, service, or product.
45. Demonstrates effective use of 2D animation software.
46. Demonstrates effective use of 3D animation software.
47. Applies digital photography and electronic imaging to enhance multimedia projects.
48. Demonstrates rendering techniques using various media.
49. Develops a multimedia project.
50. Understands tweening using various software programs.
51. Transfers video images to the computer and edits using technology.
52. Demonstrates effective use of digital imaging software.
53. Demonstrates effective use of non-linear software.
54. Understands the criteria used for determining the most appropriate application software tool for a given project.
55. Understands a “prototype” system.
56. Compares software utilized in industry and formulates ability/function/outcome comparisons.

Multimedia Publishing Proficiencies
57. Understands the application of desktop publishing concepts and software functions evidenced by successful completion of the Desktop Publishing Objective Test with a score of 90% or better.
58. Analyzes and discusses when to use multimedia and desktop publishing.
59. Uses and evaluates the impact of using elements of design in an industry specific task.
60. Demonstrates the ability to apply style and graphic layout to an industry specific task.
61. Understands the proper use of different media formats.
62. Uses elements of presentation plan and design in an industry specific task.
63. Explains and uses project guidelines and acceptable project procedures to select, develop, print, and present two multimedia or desktop publishing projects.
64. Compares various multimedia publishing software utilized in industry and formulates ability, function, and outcome comparisons for each.
65. Evaluates the appropriateness of design elements and outcomes based on need and accepted design parameters.
66. Identifies and describes the marketing mix: product, place, price, and promotion.
67. Correlates work-related desktop publishing issues and possible reference sources/solutions applicable to job title/position duties and responsibilities.
68. Researches, composes, and presents information orally and through electronic media.
69. Demonstrates the use of desktop publishing in on-the-job training by developing an industry related document(s).