Mississippi Department of Education
Office of Curriculum and Instruction

Course Title: **Information and Communication Technology II**

Grade Level: **7, 8**

Carnegie Unit: **1**

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Course Outline

Information and Communication Technology II – Course Code: 000272

Unit	Unit Name	Hours
1	Orientation, Ethics, and Keyboarding Continuation (ongoing)	15
2	Lab Management and Networking	10
3	Financial Literacy	15
4	Spreadsheet Applications	15
5	Database Applications	15
6	Design Applications	15
7	Graphic Design Applications	20
8	Web Design Applications	20
9	Career Preparation* *To be taught any time during the year in association with the next year's course selection	10
Total		135

Unit 1: Orientation, Ethics, and Keyboarding

Competencies and Suggested Objectives

1. Identify school policies, program policies, and safety procedures related to Information and Communication Technology II (ICT II). [DOK1, CS3, CS5, CS14]
   a. Preview school handbook, the technology acceptable use policy, and other safety procedures for building level.
   b. Preview course outline and its relevance in today's workforce.
   c. Recognize appropriate safety measures in relation to technology in the computer lab and internet usage.
   d. Provide an overview of career pathways and careers related to each pathway.

2. Identify ethical issues related to technology and the workplace. [DOK1, CS1, CS3, CS8, CS14, CS16]
   a. Discuss ethics related to computer usage.
   b. Discuss ethics related to educational applications.
   c. Discuss ethics related to the workplace.

3. Perform keyboarding applications. [DOK2, CS9, CS10, CS11, CS13, CS15]
   a. Demonstrate proper keyboarding techniques (ongoing).
   b. Demonstrate speed and accuracy with the touch keyboard (ongoing).

4. Discover career opportunities within the Law, Public Safety, Corrections, & Security career cluster. [DOK1, CS1, CS3, CS8, CS14, CS16]
   a. Research career opportunities for employment in law, public safety, corrections, and security by exploring the Law, Public Safety, Corrections, & Security career cluster.
   b. Examine the requirements, skills, wages, education, and employment opportunities in at least one career pathway from the Law, Public Safety, Corrections, & Security career cluster.
   c. Link technology skills and knowledge of ethics with employment opportunities in the Law, Public Safety, Corrections, & Security career cluster.

5. Interact with teachers, peers, and course material using a learning management system. [DOK2, CS3, CS8, CS9, CS11, CS13, CS16]
   a. Discover online learning environments and how they operate among teachers and students.
   b. Demonstrate proper email etiquette.
   c. Participate in online learning methods such as discussion boards, student journals, blogs, wikis, and so forth.

Scenario

<u>Cyber Safety</u>

Unit 1

You are a Cyber Detective for your local police department. One of your jobs is to educate students about cyber safety. Research cyber safety as it relates to Internet safety, cyber bullying, digital footprint and reputation, creative credit and copyright, etc. Create a presentation to explain these topics to an 8th grade class. In your presentation, be sure to include illustrations, text, animations, and slide transitions. In addition to the presentation, create a brochure outlining a code of ethics for students to follow with regards to technology use.

<u>*Important Notes for Unit 1: Keyboarding</u>

Model for and review students the proper body posture for effective keyboarding. Students should have the following posture:
- Sit straight up in chair
- Back straight
- Feet flat on the floor
- Arms parallel with the keyboard
- Wrists low but off keyboard
- Fingers curved and upright
- Eyes focused on copy

Refer to the fingers as such: index (L1/R1), middle (L2/R2), ring (L3/R3), pinky (L4/R4) and thumb (RT). Use keyboarding software to supplement instruction. Space ONCE after all punctuation marks. To calculate NWAM, subtract errors from GWAM (GWAM-errors=NWAM). Continue to have students perform timed writings throughout the school year. Students should strive for 40 NWAM by the end of the school year by keying a 5-minute timed writing.

Unit 2: Lab Management and Networking

Competencies and Suggested Objectives
1. Discover career opportunities within the Information Technology career cluster. ^{DOK1, CS1, CS9, CS11, CS13}
a. Research career opportunities for employment in lab management and networking by exploring the Information Technology career cluster.
b. Examine the requirements, skills, wages, education and employment opportunities in at least one career pathway from the Information and Technology career cluster.
c. Link lab management and networking skills with employment opportunities in the Information Technology career cluster.
2. Explain basic network components. ^{DOK2, CS6, CS7, CS8, CS9, CS10, CS11, CS13}
a. Discuss the terminology and components of a successful network.
b. List advantages of using a network.
c. Differentiate among different types of networks.
d. Describe the various network communications.
3. Demonstrate network design and management. ^{DOK3, CS6, CS7, CS8, CS9, CS10, CS11, CS13}
a. Recognize different ways to set up a network using multiple topologies.
b. Differentiate between network designs.
c. Recreate your classroom lab network design.
d. Design a computer lab.
e. Troubleshoot common problems in a networked computer lab.

Scenario

New Computer Lab

Unit 2

You are the director of the Information Technology Department of a school district. A new school is being built in the district and you have been asked to design a network of computers to be used in the computer labs of the new school. Most of the programs to be used in the computer labs will be obtained through the main server at the district central office, so computers in the lab must be able to access this. In addition, the students at the new school must be able to login, save, and access information from any computer in the new school. Teachers in the new school will be given laptops to use wirelessly and student computers will be connected via Ethernet. In a report of your suggested design, discuss which components will be required, which topology will be used in each lab, and how the labs will be connected to the district office server. In addition to your report, illustrate the layout of the labs and the connections used.

Unit 3: Financial Literacy

Competencies and Suggested Objectives

1. Discover career opportunities within the Finance career cluster. ^{DOK1, CS1, CS2, CS3, CS7, CS12, S13, CS16}
 	
     a. Research career opportunities for employment in financial literacy by exploring the Finance career cluster.
     b. Examine the requirements, skills, wages, education, and employment opportunities in at least one career pathway from the Finance career cluster.
     c. Link financial literacy skills with employment opportunities in the Finance career cluster.

2. Apply reliable information and systematic decision making to personal financial decisions. ^{DOK3, CS1, CS2, CS3, CS7, CS12, CS13, CS16}
 	
     a. Find and evaluate financial information from a variety of sources.
     b. Make financial decisions by systematically considering alternatives and consequences.
     c. Control personal information.

3. Use a career plan to develop personal income potential. ^{DOK3, CS1, CS2, CS3, CS7, CS12, CS13, CS16}
     a. Evaluate income potential of various career options.
     b. Identify sources of personal income.
     c. Describe factors affecting take-home pay.

4. Organize personal finances and use a budget to manage cash flow. ^{DOK4, CS1, CS2, CS3, CS7, CS12, CS13, CS16}
 	
     a. Develop a plan for spending and saving.
     b. Describe how to use different payment methods.
     c. Manage and maintain a functioning budget.

Scenario

Monthly Budget

Unit 3

Congratulations! You have just graduated with a Bachelor's degree in your desired profession in the Finance career cluster. You are beginning your career in an entry-level position and are living in your own apartment with basic expenses such as electricity, water, and cable. You wish to make a major purchase (examples: car, house) and need to determine if you can afford a monthly payment. Create a budget to illustrate your monthly income less expenses to determine your net income in order to make an informed decision.

Unit 4: Spreadsheet Applications

Competencies and Suggested Objectives

1. Investigate spreadsheet applications in the context of the Human Services career cluster. [DOK1, CS1, CS2, CS3, CS9, CS14]
 	
    a. Research opportunities for employment in Human Services career cluster.
    b. Link careers in the Human Services career cluster to spreadsheet application skills.
    c. Apply skills and knowledge of human services and spreadsheet applications to a real-world scenario associated with the Human Services career cluster.

2. Discover the purposes of spreadsheet applications. [DOK1, CS1, CS2, CS3, CS9, CS14, CS15]
    a. Define basic terminology relating to a spreadsheet program.
    b. Identify parts of the spreadsheet window.

3. Perform spreadsheet applications in the context of the Human Services career cluster. [DOK2, CS1, CS2, CS3, CS9, CS11, CS14, CS15]
 	
    a. Demonstrate the use of basic spreadsheet format and edit commands.
    b. Demonstrate the use of basic spreadsheet formulas.
    c. Demonstrate the use of basic spreadsheet functions.
    d. Demonstrate other basic spreadsheet commands including sorting and filtering.

4. Develop and interpret spreadsheet tables, charts, and figures to support written and oral Communication. [DOK3, CS1, CS2, CS3, CS6, CS9, CS11, CS14, CS15]
    a. Create spreadsheet tables, charts, and figures to support written and oral communication.
    b. Interpret spreadsheet tables, charts, and figures used to support written and oral communication.

Scenario

The Social Worker

Unit 4

As a social worker you have been assigned 10 clients who have been displaced from their homes for various reasons. You have been given a budget of $500,000 to assist the clients with finding temporary housing, utilities, food, clothing, and other necessities for a period of 12 months. In order to keep track of the money spent on each client you must create individual worksheets (including charts). Present the spreadsheets to your supervisor for approval and accuracy.

Unit 5: Database Applications

Competencies and Suggested Objectives
1. Discover career opportunities within the Health Science career cluster. [DOK1, CS1, CS2, CS3, CS4, CS5, CS9, CS11, CS14, CS15]   a. Research opportunities for employment in Health Services career cluster.   b. Link careers in the Health Services career cluster to database application skills.   c. Apply skills and knowledge of health services and database applications to a real-world scenario associated with the Human Services career cluster.
2. Discover the purposes of database applications. [DOK1, CS1, CS2, CS3, CS8, CS9, CS14, CS15]   a. Define terminology associated with database applications.   b. Identify components of a database application screen.
3. Perform database applications. [DOK2, CS1, CS2, CS3, CS8, CS9, CS11, CS14, CS15]   a. Demonstrate the use of a database.   b. Create and modify forms and tables in a database.   c. Enter and update records in a database.   d. Sort records in a database.
3. Perform advanced database applications. [DOK2, CS1, CS2, CS3, CS8, CS9, CS11, CS14, CS15]   a. Compare and contrast a database and a relational database.   b. Create queries.   c. Create mailing labels.   d. Create a mail merge using a database and word processing file.   e. Create reports.

Scenario

Medical Records

Unit 5

You are a medical records technician for your local hospital. You have been asked by the hospital administrator to create a new database to manage the patient records of the hospital. Your database should include date of admittance into hospital, patient name, complete address, date of birth, telephone number, height, weight, blood pressure, general complaint, and date of release from hospital.

The administrator is concerned about the large amount of children admitted to the hospital so you will need to create a query to report this information. The administrator would also like to know the number of patients from a certain zip code so create another query for this information. Present your information in a sorted list using database reports.

Unit 6: Design Applications

Competencies and Suggested Objectives
1. Discover career opportunities within the Science, Technology, Engineering and Mathematics; Transportation, Distribution and Logistics; and Architecture and Construction career clusters. DOK1, CS1, CS2, CS3, CS4, CS5, CS8, CS9, CS11, CS14, CS15
a. Research career opportunities for employment in design in the Science, Technology, Engineering and Mathematics; Transportation, Distribution and Logistics; and Architecture and Construction career clusters.
b. Link design application skills with employment opportunities in the Science, Technology, Engineering and Mathematics; Transportation, Distribution and Logistics; and Architecture and Construction career clusters.
c. Apply skills and knowledge in these areas and design applications to a real-world scenario associated with these career clusters.
2. Discover the purposes of design applications. DOK1, CS1, CS2, CS3, CS8, CS9, CS14, CS15
a. Identify terminology used with advanced design applications.
b. Identify the basic components of an advanced design application screen.
3. Perform design applications. DOK2, CS1, CS2, CS3, CS8, CS9, CS11, CS14, CS15
a. Demonstrate the use of basic computer-aided design application software.
b. Create a simple model using basic styling and simple colors.
4. Create advanced design applications. DOK4, CS1, CS2, CS3, CS8, CS9, CS11, CS14, CS15
a. Make complex choices when using a computer-aided design application.
b. Incorporate advanced computer-aided design applications to create a comprehensive project.

Scenario

Welcome Home

Unit 6

You are an architect working in an architectural firm. You have been assigned to plan and create an architectural model for a new subdivision to be developed in your town. Using a computer-aided design application, create a model of the subdivision development including house designs, locations, and other features such as landscaping to be included in the development.

Unit 7: Graphic Design Applications

Competencies and Suggested Objectives

1. Discover career opportunities within the Arts, A/V Technology, & Communications and the Marketing career clusters. [DOK1, CS1, CS2, CS3, CS4, CS5, CS6, CS8, CS9, CS11, CS14, CS15]
  a. Research career opportunities for employment in graphic design by exploring the Arts, A/V Technology, & Communication and the Marketing career clusters.
  b. Link graphic design skills with employment opportunities in the Arts, A/V Technology, & Communications and the Marketing career clusters.
  c. Apply skills and knowledge of graphic design applications to a real-world scenario associated with the Arts, A/V Technology, & Communications and the Marketing career clusters.

2. Discover the purposes of graphic design applications. [DOK1, CS1, CS2, CS3, CS4, CS5, CS6, CS8, CS9, CS11, CS14, CS15]
 	
  a. Identify terminology used with graphic design applications.
  b. Identify the basic components of a graphic design application screen.
  c. Identify legal issues related to graphic design
  d. Differentiate between 2D and 3D computer graphic design concepts.

3. Perform graphic design applications. [DOK2, CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS11, CS12, CS14, CS15]
 	
  a. Create design elements for 2D and 3D products (such as business card, letterhead, magazine cover, and so forth.)
  b. Edit design elements for 2D and 3D products.

4. Generate and manipulate graphics in common graphic design applications. [DOK2, CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS11, CS12, CS14, CS15]
 	
  a. Construct transformations of graphic designs.
  b. Construct graphic animations.
  c. Generate the graphics and animations.

Scenario

Arts Commission

Unit 7

You are a graphic designer for the Mississippi Arts Commission. You have been asked to design a campaign that advertises an upcoming special exhibit. You will need to design a poster, flyer, and a brochure that will be used throughout the state of Mississippi. In addition, you will make a presentation to the Arts Commission's board of directors explaining the vision of the advertisements and how they will positively impact the community.

Unit 8: Web Design Applications

Competencies and Suggested Objectives

1. Discover career opportunities within the Agriculture, Food, and Natural Resources and Manufacturing career clusters. DOK1, CS1, CS2, CS3, CS4, CS5, CS8, CS9, CS11, CS14, CS15
   a. Research careers opportunities for employment in web design by exploring the Agriculture, Food, and Natural Resources and Manufacturing career clusters.
   b. Link web design skills with employment opportunities in the Agriculture, Food, and Natural Resources and Manufacturing career clusters.
   c. Apply skills and knowledge of web design applications to a real-world scenario associated with the Agriculture, Food, and Natural Resources and Manufacturing career clusters.

2. Discover the purposes of web design applications. DOK1, CS1, CS2, CS3, CS4, CS5, CS8, CS9, CS11, CS14, CS15
   a. Define terminology associated with web design applications.
   b. Identify components of a web design application screen.

3. Perform basic web design applications using the HTML programming language. DOK2, CS1, CS2, CS3, CS4, CS5, CS6, CS8, CS9, CS11, CS14, CS15
   a. Demonstrate knowledge of HTML programming language.
   b. Create and modify web pages using HTML programming language.

4. Perform advanced web design applications. DOK3, CS1, CS2, CS3, CS4, CS5, CS6, CS8, CS9, CS11, CS14, CS15, CS16
   a. Demonstrate knowledge of a web design program.
   b. Create and modify webpages using a web design program.

5. Design and create a web page. DOK4, CS1, CS2, CS3, CS4, CS5, CS6, CS8, CS9, CS11, CS14, CS15, CS16
   a. Research a selected topic in order to design a webpage.
   b. Present researched information in a functional webpage.

Scenario

Web Designer

Unit 8

You are a web designer contracting with a manufacturing plant in the community. You have been asked to let the community know what the plant produces as well as available employment opportunities. Create a functional webpage to inform the community about the manufacturing plant.

Note: Include the following web page elements: web page title, formatted text, graphics, hyperlinks, tables, lists, and horizontal rules.

Unit 9: Career Preparation

Competencies and Suggested Objectives
1. Complete interest profiler and career exploration exercises. ^{DOK1, CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16}
a. Complete career interest survey and log results.
b. Explore career options in career cluster(s) of choice.
2. Complete a career plan builder. ^{DOK1, CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16}
a. Explore careers identified in the interest profiler.
b. Explore future education plans and lifestyle choices.
c. Complete an 8th grade course builder plan.
3. Develop an individual career and academic plan (iCAP). ^{DOK2, CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16}
a. Link the iCAP to the 16 national career clusters and to secondary and postsecondary education.
b. Apply the basic components of the iCAP to build a plan of study.
c. Identify, select, and print courses that meet graduation requirements and that reflect the iCAP.
4. Complete a scholarship finder exercise. ^{DOK2, CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16}
a. Identify types of scholarships available.
b. Research and locate relevant college scholarships and applications.

Scenario

iCAP Creation

Unit 9

No scenario needed. Please use the following notes to effectively build a student iCAP:

- Discuss graduation requirements specific to your school district.
- Discuss Mississippi's three graduation pathway options. (Minimum requirements mandated by the Mississippi State Department of Education)
- View recommended courses.
- Complete 7th grade course builder plan.
- Complete 8th grade course builder plan.

Student Competency Profile

Student Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Orientation, Ethics, and Keyboarding		
	1.	Identify school policies, program policies, and safety procedures related to Information and Communication Technology II (ICT II).
	2.	Identify ethical issues related to technology and the workplace.
	3.	Perform keyboarding applications.
	4.	Discover career opportunities within the Law, Public Safety, Corrections, & Security career cluster.
	5.	Interact with teachers, peers, and course material using a learning management system.
Unit 2: Lab Management and Networking		
	1.	Discover career opportunities within the Information Technology career cluster.
	2.	Explain basic network components.
	3.	Demonstrate network design and management.
Unit 3: Financial Literacy		
	1.	Discover career opportunities within the Finance career cluster.
	2.	Apply reliable information and systematic decision making to personal financial decisions.
	3.	Use a career plan to develop personal income potential.
	4.	Organize personal finances and use a budget to manage cash flow.
Unit 4: Spreadsheet Applications		
	1.	Investigate spreadsheet applications in the context of the Human Services career cluster.
	2.	Discover the purposes of spreadsheet applications.
	3.	Perform spreadsheet applications in the context of the Human Services career cluster.
Unit 5: Database Applications		
	1.	Discover career opportunities within the Health Science career cluster.
	2.	Discover the purposes of database applications.
	3.	Perform database applications.

	4.	Perform advanced database applications.
Unit 6: Design Applications		
	1.	Discover career opportunities within the Science, Technology, Engineering and Mathematics; Transportation, Distribution and Logistics; and Architecture and Construction career clusters.
	2.	Discover the purposes of design applications.
	3.	Perform design applications.
	4.	Create advanced design applications.
Unit 7: Graphic Design Applications		
	1.	Discover career opportunities within the Arts, A/V Technology, & Communications and the Marketing career clusters.
	2.	Discover the purposes of graphic design applications.
	3.	Perform graphic design applications.
	4.	Generate and manipulate graphics in common graphic design applications.
Unit 8: Web Design Applications		
	1.	Discover career opportunities within the Agriculture, Food, and Natural Resources and Manufacturing career clusters.
	2.	Discover the purposes of web design applications.
	3.	Perform basic web design applications using the HTML programming language.
	4.	Perform advanced web design applications.
	5.	Design and create a web page.
Unit 9: Career Preparation		
	1.	Complete interest profiler and career exploration exercises.
	2.	Complete a career plan builder.
	3.	Develop an individual career and academic plan (iCAP).
	4.	Complete a scholarship finder exercise.

Appendix A: Unit References

Unit 1

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Appendix B: 21st Century Skills[1]

21st Century Crosswalk for Information and Communication Technology II										
	Units	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
21st Century Standards										
CS1		x	x	x	x	x	x	x	x	x
CS2			x	x	x	x	x	x	x	x
CS3		x		x	x	x	x	x	x	x
CS4						x	x	x	x	x
CS5		x				x	x	x	x	x
CS6			x					x	x	x
CS7			x	x				x		x
CS8		x	x			x	x	x	x	x
CS9		x	x		x	x	x	x	x	x
CS10		x	x							x
CS11		x	x			x	x	x	x	x
CS12				x				x		x
CS13		x	x	x						x
CS14		x			x	x	x	x	x	x
CS15		x				x	x	x	x	x
CS16		x		x					x	x

CSS1-21st Century Themes
   CS1   Global Awareness
        1. Using 21st century skills to understand and address global issues
        2. Learning from and working collaboratively with individuals representing diverse
           cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue in
           personal, work, and community contexts
        3. Understanding other nations and cultures, including the use of non-English
           languages
   CS2   Financial, Economic, Business, and Entrepreneurial Literacy
        1. Knowing how to make appropriate personal economic choices
        2. Understanding the role of the economy in society
        3. Using entrepreneurial skills to enhance workplace productivity and career options
   CS3   Civic Literacy
        1. Participating effectively in civic life through knowing how to stay informed and
           understanding governmental processes
        2. Exercising the rights and obligations of citizenship at local, state, national, and
           global levels
        3. Understanding the local and global implications of civic decisions
   CS4   Health Literacy
        1. Obtaining, interpreting, and understanding basic health information and services
           and using such information and services in ways that enhance health
        2. Understanding preventive physical and mental health measures, including proper
           diet, nutrition, exercise, risk avoidance, and stress reduction
        3. Using available information to make appropriate health-related decisions
        4. Establishing and monitoring personal and family health goals

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[1] *21st century skills.* (n.d.). Washington, DC: Partnership for 21st Century Skills.

     5. Understanding national and international public health and safety issues

CS5   Environmental Literacy
1. Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water, and ecosystems.
2. Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.).
3. Investigate and analyze environmental issues, and make accurate conclusions about effective solutions.
4. Take individual and collective action toward addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues).

CSS2-Learning and Innovation Skills

CS6   Creativity and Innovation
1. Think Creatively
2. Work Creatively with Others
3. Implement Innovations

CS7   Critical Thinking and Problem Solving
1. Reason Effectively
2. Use Systems Thinking
3. Make Judgments and Decisions
4. Solve Problems

CS8   Communication and Collaboration
1. Communicate Clearly
2. Collaborate with Others

CSS3-Information, Media and Technology Skills

CS9   Information Literacy
1. Access and Evaluate Information
2. Use and Manage Information

CS10 Media Literacy
1. Analyze Media
2. Create Media Products

CS11 ICT Literacy
1. Apply Technology Effectively

CSS4-Life and Career Skills

CS12 Flexibility and Adaptability
1. Adapt to change
2. Be Flexible

CS13 Initiative and Self-Direction
1. Manage Goals and Time
2. Work Independently
3. Be Self-directed Learners

CS14   Social and Cross-Cultural Skills
1. Interact Effectively with others
2. Work Effectively in Diverse Teams

CS15   Productivity and Accountability
1. Manage Projects
2. Produce Results

CS16   Leadership and Responsibility
1. Guide and Lead Others
2. Be Responsible to Others

Appendix C: Common Core Standards

Common Core Crosswalk for English/Language Arts (11-12)

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
Common Core Standards										
RI.11.1.		x	x	x	x	x	x	x	x	x
RI.11.2.							x	x	x	x
RI.11.4.		x	x	x	x	x	x	x	x	x
RI.11.5.		x								
RI.11.7.			x	x	x	x	x	x	x	
W.11.1.		x	x	x	x	x	x	x	x	x
W.11.2.		x	x	x	x	x	x	x	x	x
W.11.4.		x	x	x	x	x	x	x	x	x
W.11.5.										x
W.11.6.		x	x	x	x	x	x	x	x	x
W.11.8.		x	x	x	x	x	x	x	x	x
SL.11.1.		x	x	x	x	x	x	x	x	x
SL.11.2.		x	x	x	x	x	x	x	x	x
SL.11.4.		x	x	x	x	x	x	x	x	x
SL.11.5.		x	x	x	x	x	x	x	x	x
SL.11.6.		x	x	x	x	x	x	x	x	x
L.11.1.		x	x	x	x	x	x	x	x	x
L.11.2.		x	x	x	x	x	x	x	x	x
L.11.3.		x	x	x	x	x	x	x	x	x
L.11.4.		x	x	x	x	x	x	x	x	x
RH.11.1.		x	x	x	x	x	x	x	x	x
RH.11.4.		x	x	x	x	x	x	x	x	x

Reading Standards for Literature (11-12)

College and Career Readiness Anchor Standards for *Reading Literature*

Key Ideas and Details

> RL.11.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

> RL.11.2. Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.

> RL.11.3. Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).

Craft and Structure

RL.11.4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.)

RL.11.5. Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.

RL.11.6. Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).

Integration of Knowledge and Ideas

RL.11.7. Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)

RL.11.8. (Not applicable to literature)

RL.11.9. Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.

Range of Reading and Level of Text Complexity

RL.11.10. By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11–CCR text complexity band independently and proficiently.

Reading Standards for Informational Text (11-12)

College and Career Readiness Anchor Standards for *Informational Text*

Key Ideas and Details

RI.11.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

RI.11.2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.

RI.11.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.

Craft and Structure

RI.11.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

RI.11.5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.

RI.11.6. Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.

Integration of Knowledge and Ideas

RI.11.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

RI.11.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., The Federalist, presidential addresses).

RI.11.9. Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of

Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features.

<u>Range of Reading and Level of Text Complexity</u>

RI.11.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

College and Career Readiness Anchor Standards for *Writing*

<u>Text Types and Purposes</u>

W.11.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from and supports the argument presented.

W.11.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

a. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole;

include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

W.11.3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

a. Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.

b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters

c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution).

d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.
e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.

Production and Distribution of Writing

W.11.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

W.11.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11–12 on page 54.)

W.11.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

W.11.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

W.11.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

W.11.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

> a. Apply grades 11–12 Reading standards to literature (e.g., "Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics").

> b. Apply grades 11–12 Reading standards to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., The Federalist, presidential addresses]").

Range of Writing

W.11.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

College and Career Readiness Anchor Standards for *Speaking and Listening*

Comprehension and Collaboration

SL.11.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. 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 task.

SL.11.2. 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.

SL.11.3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Presentation of Knowledge and Ideas

SL.11.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

SL.11.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

SL.11.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 on page 54 for specific expectations.)

College and Career Readiness Anchor Standards for *Language*

Conventions of Standard English

L.11.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested.

b. Resolve issues of complex or contested usage, consulting references (e.g., Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage) as needed.

L.11.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Observe hyphenation conventions.

b. Spell correctly.

Knowledge of Language

L.11.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

a. Vary syntax for effect, consulting references (e.g., Tufte's Artful Sentences) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.

Vocabulary Acquisition and Use

L.11.4. 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.

a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., conceive, conception, conceivable).

c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.

d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

L.11.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text.
b. Analyze nuances in the meaning of words with similar denotations.

L.11.6. Acquire and use accurately 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.

Reading Standards for Literacy in History/Social Studies (11-12)

Key Ideas and Details

RH.11.1 Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.

RH.11.2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas

RH.11.3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain

Craft and Structure

RH.11.4. Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

RH.11.5. Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.

RH.11.6. Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.

Integration of Knowledge and Ideas

RH.11.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

RH.11.8. Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.

RH.11.9. Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.

Range of Reading and Level of Text Complexity

RH.11.10. By the end of grade 12, read and comprehend history/social studies texts in the grades 11–CCR text complexity band independently and proficiently.

Reading Standards for Literacy in Science and Technical Subjects (11-12)

Key Ideas and Details

RST.11.1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

RST.11.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

RST.11.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas

RST.11.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

RST.11.9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

RST.11.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)

Text Types and Purposes

WHST.11.1. Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s)

and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

WHST.11.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

WHST.11.3. (Not applicable as a separate requirement)

Production and Distribution of Writing

WHST.11.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.11.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.11.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

WHST.11.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.11.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

WHST.11.9. Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

WHST.11.10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Common Core Crosswalk for Mathematics (11-12)										
	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
Common Core Standards										
G-CO.1.							x			
G-CO.7.							x			
G-CO.9.							x			
G-CO.10.							x			
G-CO.12.							x			
G-CO.13.							x			
G-C.5.							x			
G-GPE.6.							x			
G-GPE.7.							x			
G-GMD.3.							x			
G-GMD.4.							x			
G-MG.1.							x			
G-MG.3.							x			
S-ID.1.		x	x	x	x	x	x	x	x	x
S-ID.2.					x					
S-ID.3.					x					
S-ID.4.				x	x					
S-ID.5.					x					
S-ID.6.					x					
S-ID.7.					x					

Mathematics (High School)

Number and Quantity

The Real Number System

>N-RN.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.

>N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

>N-RN.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.

Quantities

>N-Q.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.

>N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.

N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

The Complex Number System

N-CN.1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.

N-CN.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

N-CN.3. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

N-CN.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.

N-CN.5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, $(-1 + \sqrt{3}\ i)^3 = 8$ because $(-1 + \sqrt{3}\ i)$ has modulus 2 and argument 120°.

N-CN.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.

N-CN.7. Solve quadratic equations with real coefficients that have complex solutions.

N-CN.8. (+) Extend polynomial identities to the complex numbers. For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.

N-CN.9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Vector and Matrix Quantities

N-VM.1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v).

N-VM.2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

N-VM.3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.

N-VM.4. (+) Add and subtract vectors

    N-VM.4.a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.

    N-VM.4.b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.

    N-VM.4.c. Understand vector subtraction v – w as v + (–w), where –w is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.

N-VM.5. (+) Multiply a vector by a scalar.

    N-VM.5.a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(vx, vy) = (cvx, cvy)$.

    N-VM.5.b. Compute the magnitude of a scalar multiple cv using $\|cv\| = |c|v$. Compute the direction of cv knowing that when $|c|v \neq 0$, the direction of cv is either along v (for $c > 0$) or against v (for $c < 0$).

N-VM.6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.

N-VM.7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.

N-VM.8. (+) Add, subtract, and multiply matrices of appropriate dimensions.

N-VM.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

N-VM.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.

N-VM.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.

N-VM.12. (+) Work with 2×2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

Algebra

Seeing Structure in Expressions

A-SSE.1. Interpret expressions that represent a quantity in terms of its context.

A-SSE.1.a. Interpret parts of an expression, such as terms, factors, and coefficients.

A-SSE.1.b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)n$ as the product of P and a factor not depending on P.

A-SSE.2. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

A-SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

A-SSE.3.a. Factor a quadratic expression to reveal the zeros of the function it defines.

A-SSE.3.b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

A-SSE.3.c. Use the properties of exponents to transform expressions for exponential functions.

A-SSE.4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.

Arithmetic with Polynomials and Rational Expressions

A-APR.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials

A-APR.2. Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by $x - a$ is p(a), so p(a) = 0 if and only if $(x - a)$ is a factor of p(x).

A-APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A-APR.4. Prove polynomial identities and use them to describe numerical relationships.

A-APR.5. (+) Know and apply the Binomial Theorem for the expansion of $(x+y)n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

A-APR.6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

A-APR.7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Creating Equations

A-CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A-CED.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.

A-CED.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.

Reasoning with Equations and Inequalities

A-REI.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.

A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A-REI.4. Solve quadratic equations in one variable.

A-REI.4.a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

A-REI.4.b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

A-REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A-REI.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

A-REI.8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.

A-REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3×3 or greater).

A-REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A-REI.11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

A-REI.12.Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Functions

Interpreting Functions

F-IF.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).

F-IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F-IF.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 ≥ 1.

F-IF.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.

F-IF.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.

F-IF.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.

F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

> F-IF.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

> F-IF.7.b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

> F-IF.7.c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

> F-IF.7.d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

F-IF.7.e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

F-IF.8.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.

F-IF.8.b. Use the properties of exponents to interpret expressions for exponential functions.

F-IF.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.

Building Functions

F-BF.1. Write a function that describes a relationship between two quantities.

F-BF.1.a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

F-BF.1.b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

F-BF.1.c. (+) Compose functions. For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.

F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

F-BF.3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

F-BF.4. Find inverse functions.

F-BF.4.a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.

F-BF.4.b. (+) Verify by composition that one function is the inverse of another.

F-BF.4.c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.

F-BF.4.d. (+) Produce an invertible function from a non-invertible function by restricting the domain.

F-BF.5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Linear, Quadratic, and Exponential Models

F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

F-LE.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

F-LE.1.b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

F-LE.1.c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another

F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

F-LE.4. For exponential models, express as a logarithm the solution to $ab\ ct = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.

Trigonometric Functions

F-TF.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

F-TF.2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

F-TF.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number.

F-TF.4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

F-TF.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

F-TF.6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

F-TF.7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

F-TF.8. Prove the Pythagorean identity $\sin2(\theta) + \cos 2 (\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

F-TF.9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Geometry

Congruence

G-CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G-CO.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

G-CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G-CO.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G-CO.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

G-CO.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.

G-CO.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.

G-CO.8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

G-CO.9. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

G-CO.10. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

G-CO.11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

G-CO.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.

G-CO.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, and Trigonometry

G-SRT.1. Verify experimentally the properties of dilations given by a center and a scale factor:

G-SRT.1.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.

G-SRT.1.b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

G-SRT.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.

G-SRT.3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

G-SRT.4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

G-SRT.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

G-SRT.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

G-SRT.7. Explain and use the relationship between the sine and cosine of complementary angles.

G-SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

G-SRT.9. (+) Derive the formula $A = 1/2\ ab\ \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

G-SRT.10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.

G-SRT.11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Circles

G-C.1. Prove that all circles are similar.

G-C.2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

G-C.3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

G-C.4. (+) Construct a tangent line from a point outside a given circle to the circle.

G-C.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.

Expressing Geometric Properties with Equations

G-GPE.1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

G-GPE.2. Derive the equation of a parabola given a focus and directrix.

G-GPE.3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

G-GPE.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 $(0, 2)$.

G-GPE.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).

G-GPE.6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

G-GPE.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Geometric Measurement and Dimension

G-GMD.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.

G-GMD.2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.

G-GMD.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

G-GMD.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.

Modeling with Geometry

G-MG.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).

G-MG.2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

G-MG.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).

Statistics and Probability

Interpreting Categorical and Quantitative Data

S-ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID.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.

S-ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S-ID.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.

S-ID.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.

S-ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

> S-ID.6.a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

> S-ID.6.b. Informally assess the fit of a function by plotting and analyzing residuals.

> S-ID.6.c. Fit a linear function for a scatter plot that suggests a linear association.

S-ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S-ID.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

S-ID.9. Distinguish between correlation and causation.

Making Inferences and Justifying Conclusions

S-IC.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

S-IC.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?

S-IC.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S-IC.4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

S-IC.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

S-IC.6. Evaluate reports based on data.

Conditional Probability and the Rules of Probability

S-CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

S-CP.2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

S-CP.3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

S-CP.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.

S-CP.5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.

S-CP.6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

S-CP.7. Apply the Addition Rule, P(A or B) = P(A) + P(B) − P(A and B), and interpret the answer in terms of the model.

S-CP.8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.

S-CP.9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions

S-MD.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.

S-MD.2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

S-MD.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.

S-MD.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?

S-MD.5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

> S-MD.5.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.

> S-MD.5.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.

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

S-MD.7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Appendix D: National Educational Technology Standards for Students (NETS-S)

	Course	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
NETS Standards										
T1		x	x	x	x	x	x	x	x	x
T2		x	x	x	x	x	x	x	x	x
T3		x	x	x	x	x	x	x	x	x
T4		x	x	x	x	x	x	x	x	x
T5		x	x	x	x	x	x	x	x	x
T6		x	x	x	x	x	x	x	x	x
T6		x	x	x	x	x	x	x	x	x

NETS Crosswalk for Information and Communication Technology II

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

T1 Creativity and Innovation
Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students do the following:
a. Apply existing knowledge to generate new ideas, products, or processes.
b. Create original works as a means of personal or group expression.
c. Use models and simulations to explore complex systems and issues.
d. Identify trends and forecast possibilities.

T2 Communication and Collaboration
Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students do the following:
a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
c. Develop cultural understanding and global awareness by engaging with learners of other cultures.
d. Contribute to project teams to produce original works or solve problems.

T3   Research and Information Fluency
Students apply digital tools to gather, evaluate, and use information. Students do the following:
  a. Plan strategies to guide inquiry.
  b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
  c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
  d. Process data and report results.

T4   Critical Thinking, Problem Solving, and Decision Making
Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students do the following:
  a. Identify and define authentic problems and significant questions for investigation.
  b. Plan and manage activities to develop a solution or complete a project.
  c. Collect and analyze data to identify solutions and/or make informed decisions.
  d. Use multiple processes and diverse perspectives to explore alternative solutions.

T5   Digital Citizenship
Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students do the following:
  a. Advocate and practice safe, legal, and responsible use of information and technology.
  b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
  c. Demonstrate personal responsibility for lifelong learning.
  d. Exhibit leadership for digital citizenship.

T6   Technology Operations and Concepts
Students demonstrate a sound understanding of technology concepts, systems, and operations. Students do the following:
  a. Understand and use technology systems.
  b. Select and use applications effectively and productively.
  c. Troubleshoot systems and applications.
  d. Transfer current knowledge to learning of new technologies.