

**Exploring  
Computer  
Science**

**Curriculum Mapping to Learning Standards**  
State Standards Edition

## Acknowledgements

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## Day by Day Mapping to State Learning Standards

### UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 1-2

**Topic:** Explore the concepts of computer and computing:

- Students identify computers in the room.
- Students classify the computes into computing groups.
- Students define the terms computer an computing.
- Students are introduced to the Compute Buying Project assignment.

#### ECS Focus

1.1 Hardware components

#### Computational Practices

- Analyze the characteristics of hardware components.

#### Standards

##### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

##### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

##### CSTA K-12 Computer Science Standards

- CD.L2-02: Identify a variety of electronic devices that contain computational processors.
- CD.L2-04: Use developmentally appropriate, accurate terminology when communicating about technology.

##### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.

## UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 3-4

**Topic:** “Demystify” and learn the function of the parts of a personal computer. Learn the terminology of hardware components necessary for the purchase of a home computer:

- Student groups work to choose one of the interviews from the previous day, research four options and give advice on which computer to buy.
- Student groups present their findings to the class.
- Students reason as to why something is or is not a computer.
- Students classify computers
- Students interview a family member or friend to find out what features that person would like to have if they were buying a new personal computer

### ECS Focus

- 1.1 Hardware components
- 1.3 Software components
- 1.3 Interaction of appropriate components

### Computational Practices

- Work effectively in teams
- Communicate thought processes and results

### Standards

#### Illinois Standards

- Reading - Goal 1 - 1.C.4c: Interpret, evaluate and apply information from a variety of sources to other situations (e.g., academic, vocational, technical, personal).
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards

- CCSS.ELA-Literacy.CCRA.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- CCSS.ELA-Literacy.CCRA.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- CCSS.ELA-Literacy.CCRA.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.CCRA.L.6 Acquire and use accurately a range of 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 encountering an unknown term important to comprehension or expression.

#### CSTA K-12 Computer Science Standards

- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CD.L3A-02: Develop criteria for purchasing or upgrading computer system hardware.
- CD.L3A-03: Describe the principal components of computer organization (e.g., input, output, processing, and storage).

#### ISTE National Educational Technology Standards (NETS)

- 2b. Communicate information and ideas effectively to multiple audiences using a variety of digital environments and media.
- 2d. Contribute to project teams to produce original works or solve problems.
- 3b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 5-7

**Topic:** Explore the World Wide Web and search engines. Experiment with a variety of search techniques, Internet resources, and Web 2.0, applications. Evaluate websites:

- Students perform searches and explain how to refine searches to retrieve better information by completing an Internet Scavenger Hunt.
- Students identify resources for finding information in addition to ranking based search engines.
- Students differentiate between ranking based search engines and social bookmarking (collaborative) search engines.
- Use a variety of Web 2.0 applications in a jigsaw activity.
- Students share their experience with Web2.0 applications like delicious.com, stumbleupon.com, word cloud sites, and list creation sites with class.
- Develop and use a rubric to evaluate websites.

### ECS Focus

- 1.5 Search Engine Fundamentals
- 1.7 Evaluating Websites

### Computational Practices

- Analyze the effects of developments in Computing

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
  - CCSS.ELA-Literacy.CCRA.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas

and expressing their own clearly and persuasively.

- Mathematical Practice
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.

#### CSTA K-12 Computer Science Standards

- CI.L2-04: Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems.
- CI.L2-05: Describe ethical issues that relate to computers and networks (e.g., security, privacy, ownership, and information sharing).
- CPP.L3A-09: Explain the principles of security by examining encryption cryptography, and authentication techniques. MARIE DISAGREES
- CI.L3A-05: Describe strategies for determining the reliability of information found on the Internet.
- CI.L3A-10: Describe security and privacy issues that relate to computer networks.

#### ISTE National Educational Technology Standards (NETS)

- 3b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- 3c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.



## UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 8-9

**Topic:** Examine the implications of data on society and how computers are used for communications

- Students identify communication mechanisms.
- Students work in pairs to complete a Communication Methods Chart in which they look at different ways to communicate with each other.
- Students reflect on the impact of changes to communication on society.
- Students work in groups to do a scenario based activity to analyze legal and privacy issues with private online data and make class presentations.

### ECS Focus

- 7.1 Legal and ethical concerns
- 7.3 Privacy and cyber security
- 7.4 Exploitation of information
- 7.7 Cultural influence

### Computational Practices

- Analyze the effects of developments in Computing

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews)

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CI.L2-02: Demonstrate knowledge of changes in information technologies over time and the effects those changes have on education, the workplace, and society.
- CD.L3A-09: Describe how the Internet facilitates global communication.

- CI.L3A-04: Compare the positive and negative impacts of technology on culture (e.g., social networking, delivery of news and other public media, and intercultural communication).

#### ISTE National Educational Technology Standards (NETS)

- 4b. Plan and manage activities to develop a solution or complete a project.
- 5a. Advocate and practice safe, legal, and responsible use of information technology.

## UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 10

**Topic:** Tell a story with data

- Students work in groups and learn how different views of data can tell a different story.
- Students learn that data is an incomplete record of reality.
- Students describe the limits of measurement (what can and can't be captured in data).

### ECS Focus

6.3 Patterns, trends, and discoveries

### Computational Practices

- Work effectively in teams
- Communicate thought processes and results

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers
- CT.L3B-05: Use data analysis to enhance understanding of complex natural and human systems.

- CL.L3A-03: Describe how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration.

#### ISTE National Educational Technology Standards (NETS)

- 3d. Process data and report results.

## UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 11-14

**Topic:** Explore how computers are used as a tool for visualizing data, modeling and design, and art in the context of culturally situated design tools:

- Students learn to use computers as a tool for visualizing data, modeling and design, and art in the context of culturally situated design tools.
- Students identify mathematical connections in the output of the design tools.
- Students use Photoshop or other image editing tools to edit their image.
- Students work in groups to make creative designs using the tools presented in the class.
- Students present their designs and describe the cultural and mathematical connections to the class.

### ECS Focus

1.2 Software components

### Computational Practices

- Design and implement creative solutions and artifacts.
- Work effectively in teams.
- Communicate thought processes and results.
- Connect computation with other disciplines.

### Standards

#### Illinois Standards

- Reading - Goal 1 - 1.C.4d: Summarize and make generalizations from content and relate them to the purpose of the material.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Geometry - Goal 9 - 9.A.5: Use geometric figures and their properties to solve problems in the arts, the physical and life sciences and the building trades, with and without the use of technology.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Geometry - Goal 9 - 9.A.5: Use geometric figures and their properties to solve problems in the arts, the physical and life sciences and the building trades, with and without the use of technology.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
  - CCSS.ELA-Literacy.CCRA.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
  - CCSS.ELA-Literacy.CCRA.W.6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.

### CSTA K-12 Computer Science Standards

- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CT.L2-09: Interact with content-specific models and simulations (e.g., ecosystems, epidemics, molecular dynamics) to support learning and research.
- CT.L2-14: Examine connections between elements of mathematics and computer science including binary numbers, logic, sets and functions.

- CT.L3A-08: Use modeling and simulation to represent and understand natural phenomenon.
- CT.L2-15: Provide examples of interdisciplinary applications of computational thinking.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CL.L3A-03: Describe how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration.
- CT.L3A-11: Describe how computation shares features with art and music by translating human intention into an artifact.

#### ISTE National Educational Technology Standards (NETS)

- 1a. Apply existing knowledge to generate new ideas, products, or processes.
- 1b. Create original works as a means of personal or group expression.
- 2b. Communicate information and ideas effectively to multiple audiences using a variety of digital environments and media.
- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6b. Select and use applications effectively and productively.
- 6d. Transfer current knowledge to learning new technologies

## UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 15-16

**Topic:** Introduce the concept of a computer program as a set of instructions:

- Students model "following directions" by taking a short Following Directions quiz.
- Students perform an activity in which each student first writes down the instructions for a computer to make a peanut butter and jelly sandwich and then they carry out the written instructions literally.
- Students learn the importance of precise and unambiguous instructions and hence a need for a better "language" other than English for describing instructions.

### ECS Focus

2.2 Computers vs. humans

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4b: Apply listening skills in practical settings (e.g., classroom note taking, interpersonal conflict situations, giving and receiving directions, evaluating persuasive messages.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

#### CSTA K-12 Computer Science Standards

- CD.L2-01: Recognize that computers are devices that execute programs.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.



## UNIT 1. HUMAN COMPUTER INTERACTION

**Instructional Days:** 17-19

**Topic:** Explore the idea of intelligence—especially as it relates to computers. Explore what it means for a machine to “learn”. Discuss whether computers are intelligent or whether they only behave intelligently:

- Students learn about The Turing Test through an activity.
- Students test various online Chatterbots to see if they pass The Turing Test.

### ECS Focus

- 2.1 What is intelligence?
- 2.2 Computers vs. humans

### Computational Practices

- Apply abstractions and models.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CD.L2-07: Describe what distinguishes humans from machines focusing on human intelligence versus machine intelligence and ways we can communicate.
- CD.L2-08: Describe ways in which computers use models of intelligent behavior (e.g., robot motion, speech and language understanding, and computer vision).
- CD.L3B-05: Explain the notion of intelligent behavior through computer modeling and robotics.

ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.

## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 1-2

**Topic:** Introduce data collection and problem solving

- Students share their Communication Methods and Data Chart from Unit 1.
- Students are able to recognize various forms of communication as data exchange.
- Students learn the implications of data exchange on social interactions.
- Students consider the privacy of data that they create.
- Students explain the difference between data used for making a case and data that forms a discovery.
- Students begin work on their unit 2 project by collecting data related to where they go after school and how long it takes them to get from one location to the next.

### ECS Focus

- 6.2 Methods for data collection and generation
- 7.3 Privacy and cyber security
- 7.4 Exploitation of information
- 7.6 Limits on information access

### Computational Practices

- Analyze the effects of developments in Computing
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas

and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- None

#### ISTE National Educational Technology Standards (NETS)

- 3a. Plan strategies to guide inquiry.
- 3b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- 4c. Collect and analyze data to identify solutions and/or make informed decisions.

## UNIT 2. PROBLEM SOLVING

### Instructional Days: 3

**Topic:** Introduce the four steps of the problem solving process:

- Students do a group activity to introduce the problem solving process.
- Students discuss their solutions.
- Students write down the approach used to solve the given problem.
- Students learn about the four steps of the problem solving process.
- Students generalize their solution.
- Students are introduced to the term - "algorithm".

### ECS Focus

3.2 Exploring problems: problem solving heuristics and strategies

### Computational Practices

- Apply abstractions and models.
- Communicate thought processes and results
- Work effectively in teams.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.
- Algebra - Goal 8 - 8.A.4b: Represent mathematical patterns and describe their properties using variables and mathematical symbols.
- Science - Goal 11 - 11.B.4c: Develop working visualizations of the proposed solution designs.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas

- and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
  - CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.
  - CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
  - CCSS.Math.Practice.MP4 Model with Mathematics.
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1a Building Functions - Write a function that describes a relationship between two quantities: Determine an explicit expression, a recursive process, or steps for calculation from a context.

#### CSTA K-12 Computer Science Standards

- CT.L2-03: Define an algorithm as a sequence of instructions that can be processed by a computer.
- CT.L2-08: Use visual representations of problem states, structures, and data (e.g., graphs, charts, network diagrams, flowcharts).
- CPP.L2-04: Demonstrate an understanding of algorithms and their practical application.
- CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software life cycle models).
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#### ISTE National Educational Technology Standards (NETS)

- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution or complete a project.

## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 4-6

**Topic:** Apply the problem solving process. Use different strategies to plan and carry out the plan to solve several problems

- Students do group activities to solve problems by applying the problem solving process.
- Students express a solution using standard design tools.
- Students find a general solution to the given problems.
- Students present their solutions to the class.
- Students determine if a given solution successfully solves a stated problem.

### ECS Focus

- 3.1 Understanding the Problem
- 3.2 Exploring problems: problem solving heuristics and strategies
- 3.3 Design creation and representation
- 3.5 Solution Accuracy
- 3.6 Design Re-evaluation and refinement
- 3.7 Decompose the complex
- 3.8 Communicate results

### Computational Practices

- Apply abstractions and models.
- Communicate thought processes and results.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.
- Algebra - Goal 8 - 8.A.4b: Represent mathematical patterns and describe their properties using variables and mathematical symbols.
- Science - Goal 11 - 11.B.4c: Develop working visualizations of the proposed solution designs.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas

and expressing their own clearly and persuasively.

- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
  - CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.
  - CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
  - CCSS.Math.Practice.MP4 Model with Mathematics
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1a Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Determine an explicit expression, a recursive process, or steps for calculation from a context.

#### CSTA K-12 Computer Science Standards

- CT.L2-01: Use the basic steps in algorithmic problem-solving to design solutions (e.g., problem statement and exploration, examination of sample instances, design, implementing a solution, testing, evaluation).
- CT.L2-08: Use visual representations of problem states, structures, and data (e.g., graphs, charts, network diagrams, flowcharts).
- CPP.L2-04: Demonstrate an understanding of algorithms and their practical application.
- CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software life cycle models).
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#### ISTE National Educational Technology Standards (NETS)

- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution or complete a project.



## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 7-9

**Topic:** Reinforce the four steps of the problems solving process:

- Students work in groups on a cornrow braiding project to create their own designs.
- Students use Cornrow Curves design tool to make their designs.
- Students implement the four steps of the problem solving process.
- Students use mathematical concepts of iteration, dilation, translation, symmetry, etc. in their designs.
- Students determine if a given solution successfully solves a stated problem.

### ECS Focus

- 3.1 Understanding the Problem
- 3.2 Exploring problems: problem solving heuristics and strategies
- 3.3 Design creation and representation
- 3.5 Solution Accuracy
- 3.7 Decompose the complex

### Computational Practices

- Apply abstractions and models.
- Communicate thought processes and results.
- Work effectively in teams.
- Connect computation with other disciplines.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.
- Geometry - Goal 9 - 9.A.5: Use geometric figures and their properties to solve problems in the arts, the physical and life sciences and the building trades, with and without the use of technology.
- Science - Goal 11 - 11.B.4c: Develop working visualizations of the proposed solution designs.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence

- when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
- CCSS.ELA-Literacy.CCRA.W.6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
- CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- CCSS.ELA-Literacy.CCRA.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- Mathematical Practice
  - CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
  - CCSS.Math.Practice.MP4 Model with mathematics.

### CSTA K-12 Computer Science Standards

- CT.L2-01: Use the basic steps in algorithmic problem-solving to design solutions (e.g., problem statement and exploration, examination of sample instances, design, implementing a solution, testing, evaluation).
- CT.L2-08: Use visual representations of problem states, structures, and data (e.g., graphs, charts, network diagrams, flowcharts).
- CT.L2-14: Examine connections between elements of mathematics and computer science including binary numbers, logic, sets and functions.
- CT.L2-15: Provide examples of interdisciplinary applications of computational thinking.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-04: Demonstrate an understanding of algorithms and their practical application.
- CT.L3A-03: Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
- CT.L3A-11: Describe how computation shares features with art and music by translating human intention into an artifact.
- CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software life cycle models).
- 

### ISTE National Educational Technology Standards (NETS)

- 1a. Apply existing knowledge to generate new ideas, products, or processes.
- 1b. Create original works as a means of personal or group expression.
- 2d. Contribute to project teams to produce original works or solve problems.

## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 10-12

**Topic:** Count in the binary number system. Convert between binary and decimal numbers in the context of topics that are important to computer science:

- Students do an activity to learn the binary number system.
- Students learn the importance of binary numbers in Computer Science.
- Students use binary digits to code and decode messages.

### ECS Focus

#### 4.2 Binary Number System

### Computational Practices

- Connect computation with other disciplines
- Communicate thought processes and results

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1a Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Determine an explicit expression, a recursive process, or steps for calculation from a context.

#### CSTA K-12 Computer Science Standards

- CT.L2-14: Examine connections between elements of mathematics and computer science including binary numbers, logic, sets and functions.
- CPP.L2-04: Demonstrate an understanding of algorithms and their practical application.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.

## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 13-14

**Topic:** Introduce the linear and binary search algorithms:

- Students do an activity to learn about binary search.
- Students compare linear and binary search.

### ECS Focus

- 3.1 Understanding the Problem
- 3.2 Exploring problems: problem solving heuristics and strategies
- 3.7 Decompose the complex
- 3.9 Algorithm efficiency

### Computational Practices

- Apply abstractions and models.
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Algebra - Goal 8 - 8.A.4b: Represent mathematical patterns and describe their properties using variables and mathematical symbols.
- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
- - CCSS.Math.Content.HSF-BF.A.1a Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Determine an explicit expression, a recursive process, or steps for calculation from a context.

**CSTA K-12 Computer Science Standards**

- CT.L2-05: Act out searching and sorting algorithms.
- CT.L2-06: Describe and analyze a sequence of instructions being followed (e.g., describe a character's behavior in a video game as driven by rules and algorithms).
- CPP.L2-04: Demonstrate an understanding of algorithms and their practical application.
- CT.L3A-03: Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
- CT.L2-04: Evaluate ways that different algorithms may be used to solve the same problem.
- 

**ISTE National Educational Technology Standards (NETS)**

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.

## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 15-16

**Topic:** Explore sorted and unsorted lists and various sorting algorithms:

- Students do a group activity to learn different sorting algorithms.
- Students compare the different sorting algorithms.

### ECS Focus

3.9 Algorithm efficiency

### Computational Practices

- Apply abstractions and models.
- Communicate thought processes and results.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- English Language Arts:
  - CCSS.ELA-Literacy.RST.9-10.3 Reading Standards for Literacy in Science and Technical Subjects 6-12 - Grades 9-10 students: Follow precisely a complex multi step procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exception defined in the text.
- Mathematical Practice
  - CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.

**CSTA K-12 Computer Science Standards**

- CT.L2-05: Act out searching and sorting algorithms.
- CT.L2-06: Describe and analyze a sequence of instructions being followed (e.g., describe a character's behavior in a video game as driven by rules and algorithms).
- CPP.L2-04: Demonstrate an understanding of algorithms and their practical application.
- CT.L3A-03: Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
- CT.L2-04: Evaluate ways that different algorithms may be used to solve the same problem.

**ISTE National Educational Technology Standards (NETS)**

- 1c. Use models and simulations to explore complex systems and issues.



## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 17

**Topic:** Introduce minimal spanning trees and how graphs can be used to help solve problems:

- Students do a group activity to learn minimal spanning trees.
- Students learn to draw and use graphs to solve problems.
- Students share their solutions and do a follow-up discussion.

### ECS Focus

- 3.1 Understanding the Problem
- 3.2 Exploring problems: problem solving heuristics and strategies
- 3.3 Design creation and representation
- 3.9 Algorithm efficiency
- 4.6 Graphs

### Computational Practices

- Apply abstractions and models.
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4c: Develop working visualizations of the proposed solution designs.

#### Common Core Standards

- Mathematical Practice
  - 
  - CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.

#### CSTA K-12 Computer Science Standards

- CPP.L2-04: Demonstrate an understanding of algorithms and their practical application.

#### ISTE National Educational Technology Standards (NETS)

- 4b. Plan and manage activities to develop a solution or complete a project.

## UNIT 2. PROBLEM SOLVING

**Instructional Days:** 18-21

**Topic:** Final projects and presentation:

- Student groups use data collected about their after school activities to determine the shortest routes in terms of mileage and time if they were to car pool on a particular day.

### ECS Focus

- 3.1 Understanding the Problem
- 3.2 Exploring problems: problem solving heuristics and strategies
- 3.3 Design creation and representation
- 3.5 Solution Accuracy
- 3.6 Design Re-evaluation and refinement
- 3.7 Decompose the complex
- 3.8 Communicate results

### Computational Practices

- Apply abstractions and models.
- Communicate thought processes and results.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.
- Data Analysis - Goal 10 - 10.B.4: Design and execute surveys or experiments, gather data to answer relevant questions, and communicate results and conclusions to an audience using traditional methods and contemporary technology.
- Science - Goal 11 - 11.A.4c: Collect, organize and analyze data accurately and precisely.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards

- CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- CCSS.ELA-Literacy.CCRA.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

#### CSTA K-12 Computer Science Standards

- CT.L2-01: Use the basic steps in algorithmic problem-solving to design solutions (e.g., problem statement and exploration, examination of sample instances, design, implementing a solution, testing, evaluation).
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-033: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).

#### ISTE National Educational Technology Standards (NETS)

- 2b. Communicate information and ideas effectively to multiple audiences using a variety of digital environments and media.
- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution or complete a project.

## UNIT 3. WEB DESIGN

**Instructional Days:** 1-2

**Topic:** Explore issues of social responsibility in web use as well as the relative merits of the influence of the web on society, personal lives, and education:

- Students learn to set up a blog.
- Students participate in a discussion of online security issues.
- Students watch a video "Growing Up Online".
- Students identify web applications which influence society and education.

### ECS Focus

- 1.6 Collaborative tools
- 1.7 Evaluating websites
- 7.3 Privacy and cyber security

### Computational Practices

- Analyze the effects of developments in computing.
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.

#### Common Core Standards

- **Anchor Standards**
  - CCSS.ELA-Literacy.CCRA.W.6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

#### CSTA K-12 Computer Science Standards

- CI.L3A-01: Compare appropriate and inappropriate social networking behaviors.
- CI.L3A-04: Compare the positive and negative impacts of technology on culture (e.g., social networking, delivery of news and other public media, and intercultural communication).
- CI.L2-03: Analyze the positive and negative impacts of computing on human culture.

#### ISTE National Educational Technology Standards (NETS)

- 5a. Advocate and practice safe, legal, and responsible use of information and technology.

## UNIT 3. WEB DESIGN

**Instructional Days:** 3-4

**Topic:** Introduce the use of basic html:

- Students create a storyboard.
- Students learn to create an Html page with a title and body.
- Students learn to create paragraphs and headings.
- Students learn to include horizontal lines and line breaks in their html page.

### ECS Focus

- 3.3 Design creation and representation
- 4.6 Graphs
- 5.1 Break a problem statement into specific requirements
- 5.2 Design a solution to a problem

### Computational Practices

- Apply abstractions and models.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4c: Develop working visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animations).

#### Common Core Standards

- None

#### CSTA K-12 Computer Science Standards

- CT.L2-08: Use visual representations of problem states, structures, and data (e.g., graphs, charts, network diagrams, flowcharts).
- CD.L3A-04: Compare various forms of input and output
- CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software life cycle models).
- CPP.L3A-01: Create and organize Web pages through the use of a variety of web programming design tools.

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.
- 6b. Select and use applications effectively and productively.

## UNIT 3. WEB DESIGN

**Instructional Days:** 5

**Topic:** Introduce basic formatting in html:

- Students learn how to create emphasized text.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 5.3 Choose appropriate tools and techniques

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- None

#### CSTA K-12 Computer Science Standards

- CPP.L3A-01: Create and organize Web pages through the use of a variety of web programming design tools.

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.
- 6b. Select and use applications effectively and productively.

## UNIT 3. WEB DESIGN

**Instructional Days:** 6-7

**Topic:** Explore image editing for the web using Photoshop or an image editor of choice:

- Students learn to identify the standard image resolution for the web.
- Students learn how to resize and crop images.
- Students learn to identify between different image formats used in web sites.
- Students learn how to include images in a web page.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 1.4 Selection of appropriate software components
- 5.3 Choose appropriate tools and techniques

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- None

#### CSTA K-12 Computer Science Standards

- CPP.L2-02: Use a variety of multimedia tools and peripherals to support personal productivity and learning throughout the curriculum.
- CPP.L3A-01: Create and organize Web pages through the use of a variety of web programming design tools.
- CPP.L3A-06: Select appropriate file formats for various types and uses of data (moderate)

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.



## UNIT 3. WEB DESIGN

**Instructional Days:** 8-10

**Topic:** Introduce basic css:

- Students learn the purpose of css.
- Students learn about different methods for inserting styles.
- Students create a web page using inline styles.
- Students learn about the disadvantage of using inline styles.
- Students practice using internal style sheets.
- Students create their own web page with a picture, text formatting, different background and foreground colors.
- Students share their work with peers.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 1.4 Selection of appropriate software components
- 5.2 Design a solution to a problem
- 5.3 Choose appropriate tools and techniques
- 5.4 Code a solution from a design
- 5.5 Test a solution to identify errors
- 5.7 Documentation and justification

### Computational Practices

- Design and implement creative solutions and artifacts.
- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
  - CCSS.ELA-Literacy.CCRA.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

**CSTA K-12 Computer Science Standards**

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CT.L3A-02: Describe a software development process used to solve software problems (e.g., design, coding, testing, verification).
- CPP.L3A-01: Create and organize Web pages through the use of a variety of web programming design tools.

**ISTE National Educational Technology Standards (NETS)**

- 1b. Create original works as a means of personal or group expression.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 3. WEB DESIGN

**Instructional Days:** 11-13

**Topic:** Explore the concept of separating style from structure by keeping separate html and css files:

- Students experience external styling.
- Students modify their webpage from the previous class to incorporate external style sheets.
- Students share their work through gallery walk.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 1.4 Selection of appropriate software components
- 5.2 Design a solution to a problem
- 5.3 Choose appropriate tools and techniques
- 5.4 Code a solution from a design
- 5.5 Test a solution to identify errors
- 5.7 Documentation and justification

### Computational Practices

- Design and implement creative solutions and artifacts.
- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CT.L2-12: Use abstraction to decompose a problem into sub problems

- CT.L3A-02: Describe a software development process used to solve software problems (e.g., design, coding, testing, verification).
- CPP.L3A-01: Create and organize Web pages through the use of a variety of web programming design tools.

#### ISTE National Educational Technology Standards (NETS)

- 1b. Create original works as a means of personal or group expression.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 3. WEB DESIGN

**Instructional Days:** 14

**Topic:** Add hyperlinks to other websites:

- Students learn how to add hyperlinks to their web page.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 1.4 Selection of appropriate software components
- 5.2 Design a solution to a problem
- 5.3 Choose appropriate tools and techniques
- 5.4 Code a solution from a design
- 5.5 Test a solution to identify errors
- 5.7 Documentation and justification

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- None

#### CSTA K-12 Computer Science Standards

- None

#### ISTE National Educational Technology Standards (NETS)

- None

## UNIT 3. WEB DESIGN

**Instructional Days:** 15-16

**Topic:** Introduce a variety of page layout styles:

- Students learn to add tables to their web page.
- Students learn to add css styling to an html table.
- Students learn about ordered and unordered lists in an html page.
- Students learn how to add css styling to a list.
- Students use grid elements in css div placement.
- Students learn to create menus.
- Students create a web page that includes page layout styles.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 5.3 Choose appropriate tools and techniques

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
  - CCSS.ELA-Literacy.CCRA.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

#### CSTA K-12 Computer Science Standards

- None

#### ISTE National Educational Technology Standards (NETS)

- None

## UNIT 3. WEB DESIGN

**Instructional Days:** 17-19

**Topic:** Practice the use of various design elements:

- Students create web pages which incorporate design elements previously studied.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 5.3 Choose appropriate tools and techniques

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
  - CCSS.ELA-Literacy.CCRA.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

#### CSTA K-12 Computer Science Standards

- None

#### ISTE National Educational Technology Standards (NETS)

- None

## UNIT 3. WEB DESIGN

**Instructional Days:** 20-21

**Topic:** Practice the use of various design elements: Introduce several different enhancements for website design, including web user interface elements combining JavaScript, html, css, and Photoshop, accordion menus, lightbox and sliding images:

- Students explore a variety of enhancements like rollover buttons, menus, accordion menus, lightbox, sliding images.
- Students create a multi-page website that includes 2 or more enhancements.

### ECS Focus

- 1.2 Software components
- 1.3 Interaction of components
- 5.3 Choose appropriate tools and techniques
- 5.4 Code a solution from a design

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- None

#### CSTA K-12 Computer Science Standards

- None

#### ISTE National Educational Technology Standards (NETS)

- None



## UNIT 3. WEB DESIGN

**Instructional Days:** 22-25

**Topic:** Final projects and gallery walk:

- Students incorporate all unit objectives into a final project.

### ECS Focus

- 3.1 Understanding the problem
- 3.2 Exploring problems: problem-solving heuristics and strategies
- 3.3 Design creating and representation
- 5.1 Break a problem statement into specific requirements
- 5.2 Design a solution to a problem
- 5.3 Choose appropriate tools and techniques
- 5.4 Code a solution from a design
- 5.5 Test a solution to identify errors
- 5.6 Refine solution
- 5.7 Documentation and justification

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
  - CCSS.ELA-Literacy.CCRA.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

#### CSTA K-12 Computer Science Standards

- CT.L2-01: Use the basic steps in algorithmic problem-solving to design solutions (e.g., problem statement and exploration, examination of sample instances, design,

implementing a solution, testing, evaluation).

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CT.L3A-01: Use predefined functions and parameters, classes and methods to divide a complex problem into simpler parts.
- CPP.L3A-01: Create and organize Web pages through the use of a variety of web programming design tools.
- CPP-L3A-03: Use various debugging and testing methods to ensure program correctness (e.g., test cases, unit testing, white box, black box, integration testing).
- CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software lifecycle models).
- 

#### ISTE National Educational Technology Standards (NETS)

- 1b. Create original works as a means of personal or group expression.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

### Instructional Days: 1

**Topic:** Introduce the Scratch programming language, including the basic terms utilized in the language:

- Students learn the basic terms used in Scratch.
- Create the beginning of a simple program in Scratch.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.
- CPP.L3A-08: Explain the program execution process.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 2-3

**Topic:** Practice using the basic features of Scratch in the context of creating a simple program:

- Students complete a simple Scratch program.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.
- CPP.L3A-08: Explain the program execution process.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.

- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 4

**Topic:** Create a dialogue between two sprites:

- Students develop a dialogue between two or more Scratch sprites.
- Students learn the reasoning behind how their dialogues work.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 5-6

**Topic:** Introduce the methods of moving sprites in Scratch:

- Students learn the concept of iteration or looping.
- Students write a program using iteration.
- Students learn the concept of reinitialization.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  -

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2--05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.



## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 7-8

**Topic:** Practice the concept of event driven programming through the creation of an alphabet game:

- Students do event-driven programming.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.

- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 9

**Topic:** Introduce the concept of broadcasting via role play:

- Students do an activity to understand the concept of broadcasting.
- Students continue implementing event driven programming.
- Students utilize broadcasting in an assignment to create a Summer Story using Scratch.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4b: Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.
- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

#### CSTA K-12 Computer Science Standards

- CT.L2-02: Describe the process of parallelization as it relates to problem solving.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.

- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 10-13

**Topic:** Write Scratch stories and present them to the class. Conduct peer reviews:

- Students work on a project to create their own Summer Story.
- Students implement the problem solving process to create their Summer Story.
- Students do peer reviews from time to time to provide feedback/suggestions to each other.
- Students present their stories to the class.
- Students do peer grading and select the best two projects.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.
- Analyze their computational work and the work of others.
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.SL.4 Present information, findings, and supporting

evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

#### CSTA K-12 Computer Science Standards

- CT.L2-02: Describe the process of parallelization as it relates to problem solving.
- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-055: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 14

**Topic:** Introduce the concept of variable:

- Students learn the concept of variables.
- Students learn to do some math using variables.
- Students use their knowledge of healthy and unhealthy food options.
- Students create examples of variables.
- Students learn why they need to initialize variables.
- Students learn about iteration.
- Students create examples of iteration.

### ECS Focus

5.5 Code a solution from a design

5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.
- Connect computation with other disciplines.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1b Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile

applications, animations) using technology resources that demonstrate and communicate curriculum concepts.

- CPP.L2-055: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.



## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 15

**Topic:** Introduce the concept of conditionals:

- Students learn the concept of conditionals.
- Students implement conditionals in a Scratch program.
- Students use their math knowledge of inequalities in a Scratch program.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.
- Connect computation with other disciplines.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content:
  - CCSS.Math.Content.HSA-CED.A.3 Creating Equations - Create Equations that describe numbers or relationships: 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.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.

- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 16-17

**Topic:** Introduce And, Or and randomness:

- Students learn to use conditionals with And and Or to write a program.
- Students learn to use a random number generator.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSA-CED.A.3 Creating Equations - Create Equations that describe numbers or relationships: 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.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.
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#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 18

**Topic:** Apply knowledge of conditionals to develop a Rock Paper Scissors program in Scratch:

- Students apply knowledge of variables, conditionals and random number generation to write a Scratch program.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSA-CED.A.3 Creating Equations - Create Equations that describe numbers or relationships: 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.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.

- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 19

**Topic:** Build on previous programming concepts to create a timer.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1b Building functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 20-23

**Topic:** Create a timing game in Scratch and present it to the class. Peer reviews are conducted:

- Students create a timing game.
- Students present their game to the class.
- Students do peer grading.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.
- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1b Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations.

#### CSTA K-12 Computer Science Standards

- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.



- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 24

**Topic:** Investigate two types of games that may provide ideas for the final project.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1b Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 25

**Topic:** Explain final project and the rubric for the final project:

- Students work on their final project to create a game using Scratch.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1b Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 26-28

**Topic:** Write Scratch programs for either My Community or Game project. Conduct peer reviews.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations)

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSF-BF.A.1b Building Functions - Build a function that models a relationship between two quantities - Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations.

#### CSTA K-12 Computer Science Standards

- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including:

looping behavior, conditional statements, logic, expressions, variables, and functions.

- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.
- 6a. Understand and use technology systems.

## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 29

**Topic:** Complete final projects.

### ECS Focus

- 5.5 Code a solution from a design
- 5.6 Test a solution to identify errors

### Computational Practices

- None

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 1c. Use models and simulations to explore complex systems and issues.
- 4b. Plan and manage activities to develop a solution or complete a project.

- 6a. Understand and use technology systems.



## UNIT 4. INTRODUCTION TO PROGRAMMING

**Instructional Days:** 30

**Topic:** Presentations of final projects:

- Students do peer grading and select the two best projects.

### ECS Focus

- None

### Computational Practices

- Communicate thought processes and results.
- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

#### CSTA K-12 Computer Science Standards

- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.

#### ISTE National Educational Technology Standards (NETS)

- 2b. Communicate information and ideas effectively to multiple audiences using a variety of digital environments and media.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 1

**Topic:** Review how data can be used for making a case/discovery and provide an overview of the final project.

### ECS Focus

- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries

### Computational Practices

- Communicate thought processes and results.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- None

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CT.L2-10: Evaluate what kinds of problems can be solved using modeling and simulation.

#### ISTE National Educational Technology Standards (NETS)

- 3a. Plan strategies to guide inquiry

## UNIT 5. COMPUTING AND DATA ANALYSIS

### Instructional Days: 2

**Topic:** Discuss photo ethics and student safety related to android phone use:

- Students learn about photo ethics.

### ECS Focus

- 7.2 Legal and ethical concerns.
- 7.3 Privacy and cyber security.

### Computational Practices

- Analyze the effects of developments in computing.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.2 [Integrate and] evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
  - CCSS.ELA-Literacy.CCRA.SL.3 Evaluate a [speaker's] point of view, reasoning, and use of evidence and rhetoric.

#### CSTA K-12 Computer Science Standards

- CI.L2-01: Exhibit legal and ethical behaviors when using information and technology and discuss the consequences of misuse. 2-CI-6: Discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power.

#### ISTE National Educational Technology Standards (NETS)

- 5a. Advocate and practice safe, legal, and responsible use of information and technology.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 3-5

**Topic:** Distribute phones. Create groups. Discuss group roles and responsibilities. Navigate the android application. Navigate the online system:

- Students learn about rules for sharing phones.
- Students login and navigate through the basic features of the phone applications.
- Students login and navigate through the basic features of the online system.
- Students develop a method for data collection for their final project.

### ECS Focus

6.2 Methods for collection and generation.

### Computational Practices

- Design and implement creative solutions and artifacts. Communicate thought processes and results.
- Work effectively in teams.

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers. 3-CPP-2: Use mobile devices/emulators to design, develop, and implement mobile computing applications.

#### ISTE National Educational Technology Standards (NETS)

- 5a. Advocate and practice safe, legal, and responsible use of information and technology.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 6

**Topic:** Data check-in—Discuss issues that arise (aggregating data, etc.):

- Students describe the data they have collected.
- Students discuss issues that may arise during data collection.
- Students learn why they will be pooling the data from all of the groups at the end of the unit.

### ECS Focus

- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.

### Computational Practices

- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Data Analysis - Goal 10 - 10.B.4: Design and execute surveys or experiments, gather data to answer relevant questions, and communicate results and conclusions to an audience using traditional methods and contemporary technology.
- Science - Goal 11 - 11.A.4c: Collect, organize, and analyze data accurately and precisely.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).

#### ISTE National Educational Technology Standards (NETS)

- 4c. Collect and analyze data to identify solutions and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 7-10

**Topic:** Introduce R/Deducer. Create maps using the latitude and longitude of a location and then create maps from a file of data:

- Students learn to use online graphing tools such as R/Deducer.
- Students learn to translate a place on a map to latitude and longitude.
- Students explore LA Bike data and Deducer.
- Students learn about a variable or column in a data set.
- Students learn how to make frequency tables.
- Students learn to sort data.
- Students learn to create subsets of data.
- Students learn to make Bubble charts.
- Students learn to analyze data sets using frequency tables and charts.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Connect computation with other disciplines.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content:
  - CCSS.Math.Content.HSS-ID.A.1 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement

variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).

- CCSS.Math.Content.HSS-CP.A.1 Conditional Probability and the Rules of Probability - Understand independence and conditional probability and use them to interpret data: 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").

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CT.L3A-04: Compare techniques for analyzing massive data collections.
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CPP.L3A-11: Describe techniques for locating and collecting small and large-scale data sets.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation. 3-CPP-7: Describe a variety of programming languages available to solve problems and develop systems.

#### ISTE National Educational Technology Standards (NETS)

- 3d. Process data and report results.
- 6a. Understand and use technology systems.



## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 11

**Topic:** Create maps with student data and related data set:

- Students learn to do spatial analysis for use in the final projects.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Connect computation with other disciplines.
- Analyze their computational work and the work of others.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.A.4c: Collect, organize, and analyze data accurately and precisely.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.

#### Mathematical Content

- CCSS.Math.Content.HSS-IC.B.4 Making inferences and Justifying Conclusions - Make inferences and justify conclusions from sample surveys, experiments, and observational studies: 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.

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability,

patience, propensity to tinker, creativity, accepting challenge).

- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.

#### ISTE National Educational Technology Standards (NETS)

- 4c. Collect and analyze data to identify solutions and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 12-14

**Topic:** Discuss bar plots, categorical and continuous data, and mosaic plots as a vehicle for comparing categorical data, and looking at trends in data:

- Students learn to read and interpret bar plots.
- Students learn to create bar plots.
- Students learn the difference between categorical and continuous data.
- Students learn to compare two categorical sources with mosaic plots.
- Student look for trends by analyzing various plots.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Data Analysis - Goal 10 - 10.A.4a: Represent and organize data by creating lists, charts, tables, frequency distributions, graphs, scatterplots and box-plots.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.L.6 Acquire and use accurately a range of 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 encountering an unknown term important to comprehension or expression.
- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.

- Mathematical Content
  - CCSS.Math.Content.HSS-ID.A.1 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).
  - CCSS.Math.Content.HSS-ID.A.3 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Interpret differences in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers).

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CT.L3A-04: Compare techniques for analyzing massive data collections.
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CPP.L3A-11: Describe techniques for locating and collecting small and large-scale data sets.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.

#### ISTE National Educational Technology Standards (NETS)

- 1d. Identify trends and forecast possibilities.
- 3d. Process data and report results.
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 15

**Topic:** Create bar plots and mosaic plots with student data and related data set:

- Students work in groups to analyze the data they collected using bar and mosaic plots.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Communicate thought processes and results.
- Work effectively in teams.
- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Data Analysis - Goal 10 - 10.A.4a: Represent and organize data by creating lists, charts, tables, frequency distributions, graphs, scatterplots and box-plots.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content
  - CCSS.Math.Content.HSS-ID.A.3 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Interpret differences in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers).

### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.

### ISTE National Educational Technology Standards (NETS)

- 1d. Identify trends and forecast possibilities.
- 4c. Collect and analyze data to identify solutions and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 16-18

**Topic:** Review mean, median, minimum, maximum. Discuss various ways to subset data. Represent data with box plots and histograms:

- Students learn to read and interpret a histogram.
- Students learn to create a histogram.
- Students learn to read and interpret a box plot.
- Students learn to create a box plot.
- Students learn when to use histograms and when to use bar charts.
- Students learn about mean, median, minimum, maximum.
- Students learn to create and query subsets of a data set.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Analyze their computational work and the work of others.
- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Data Analysis - Goal 10 - 10.A.4b: Analyze data using mean, median, mode, range, variance and standard deviation of a data set, with and without the use of technology.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.L.6 Acquire and use accurately a range of 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 encountering an

unknown term important to comprehension or expression.

- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content:
  - CCSS.Math.Content.HSS-ID.A.13 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).
  - CCSS.Math.Content.HSS-ID.A.3 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Interpret differences in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers).
  - CCSS.Math.Content.HSS-CP.A.1 Conditional Probability and Rules of Probability - 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").

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CT.L3A-04: Compare techniques for analyzing massive data collections.
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CPP.L3A-11: Describe techniques for locating and collecting small and large-scale data sets.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.

#### ISTE National Educational Technology Standards (NETS)

- 1d. Identify trends and forecast possibilities.
- 3d. Process data and report results.
- 6a. Understand and use technology systems.



## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 19

**Topic:** Identify mean, median, minimum, maximum, create subsets, and create box plots and histograms with student data and related data set:

- Students work in their groups to analyze their data using statistical analysis and a variety of plots.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Work effectively in teams.
- Communicate thought processes and results.
- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Data Analysis - Goal 10 - 10.A.4b: Analyze data using mean, median, mode, range, variance and standard deviation of a data set, with and without the use of technology.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - Mathematical Practice CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content
  - CCSS.Math.Content.HSS-IC.B.4 Making Inferences and Justifying Conclusions - Make inferences and justify conclusions from sample surveys, experiments, and observational studies: 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.

### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-088: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.

### ISTE National Educational Technology Standards (NETS)

- 1d. Identify trends and forecast possibilities.
- 4c. Collect and analyze data to identify solutions and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 20-22

**Topic:** Use a variety of filters and queries to create subsets of text data. Create bar plots to graphically display the information:

- Students work with textual data.
- Students learn to filter text data (remove punctuation, remove case, remove stop words, etc.)
- Students create a bar chart for analyzing text.
- Students create and query subsets of a text data set.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Data Analysis - Goal 10 - 10.A.4a: Represent and organize data by creating lists, charts, tables, frequency distributions, graphs, scatterplots and box-plots.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.L.6 Acquire and use accurately a range of 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 encountering an unknown term important to comprehension or expression.

- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content
  - CCSS.Math.Content.HSS-ID.A.1 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).
  - CCSS.Math.Content.HSS-CP.A.1 Conditional Probability and the Rules of Probability - Understand independence and conditional probability and use them to interpret data: 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").

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CPP.L3A-11: Describe techniques for location and collecting small and large-scale data sets
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.

#### ISTE National Educational Technology Standards (NETS)

- 3d. Process data and report results
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 23

**Topic:** Analyze text in student data and related data set:

- Students work in groups to analyze their data using textual analysis techniques.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content
  - CCSS.Math.Content.HSS-IC.B.4 Making inferences and Justifying Conclusions - Make inferences and justify conclusions from sample surveys, experiments, and observational studies: 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.

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and

communicate curriculum concepts.

- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CPP.L3A-11: Describe techniques for location and collecting small and large-scale data sets
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-08: Analyze data and identify patterns through modeling and simulation.

#### ISTE National Educational Technology Standards (NETS)

- 1d. Identify trends and forecast possibilities.
- 4c. Collect and analyze data to identify solutions and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 24-26

**Topic:** Finalize data analysis for final project:

- Student groups work to incorporate unit objectives into their projects.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.5 Computational Models

### Computational Practices

- Design and implement creative solutions and artifacts.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations
- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content
  - CCSS.Math.Content.HSS-IC.B.4 Making inferences and Justifying Conclusions - Make inferences and justify conclusions from sample surveys, experiments, and observational studies: 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.
  - CCSS.Math.Content.HSS-ID.A.1 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement

variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.
- CD.L3A-04: Compare various forms of input and output

#### ISTE National Educational Technology Standards (NETS)

- 1d. Identify trends and forecast possibilities.
- 2b. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
- 2d. Contribute to project teams to produce original works or solve problems.
- 4c. Collect and analyze data to identify solutions and/or make informed decisions.
- 6a. Understand and use technology systems.



## UNIT 5. COMPUTING AND DATA ANALYSIS

**Instructional Days:** 27-29

**Topic:** Develop website or Scratch program to present data analysis campaign:

- Student groups work to incorporate all unit objects into the final project.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.4 Evaluation
- 6.5 Computational Models

### Computational Practices

- Design and implement creative solutions and artifacts.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations
- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content
  - CCSS.Math.Content.HSS-IC.B.4 Making inferences and Justifying Conclusions - Make inferences and justify conclusions from sample surveys, experiments, and observational studies: 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.
  - CCSS.Math.Content.HSS-ID.A.1 Interpreting Categorical and Quantitative Data -

Summarize, represent, and interpret data on a single count or measurement variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).

#### CSTA K-12 Computer Science Standards

- CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CT.L3A-06: Analyze the representation and trade-offs among various forms of digital information.
- CT.L3A-07: Describe how various types of data are stored in a computer system.
- CL.L3A-01: Work in a team to design and develop a software artifact.
- CT.L3B-08: Use models and simulations to help formulate, refine, and test scientific hypotheses.
- CT.L3B-09: Analyze data and identify patterns through modeling and simulation.

#### ISTE National Educational Technology Standards (NETS)

- 1d. Identify trends and forecast possibilities.
- 2b. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
- 2d. Contribute to project teams to produce original works or solve problems.
- 4c. Collect and analyze data to identify solutions and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 5. COMPUTING AND DATA ANALYSIS

- **Instructional Days:** 30

**Topic:** Final project presentations:

- Teams present their findings to the class.
- Other teams ask questions and participate in the discussion.

### ECS Focus

- 4.2 Basic Sets
- 6.1 Representation and Storage
- 6.2 Methods for collection and generation.
- 6.3 Patterns, trends, and discoveries
- 6.4 Evaluation
- 6.5 Computational Models

### Computational Practices

- Communicate thought processes and results.
- Analyze their computational work and the work of others.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Science - Goal 11 - 11.A.4f: Using available technology, report, display and defend to an audience conclusions drawn from investigations.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
  - CCSS.ELA-Literacy.CCRA.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
  - CCSS.ELA-Literacy.CCRA.SL.5 Make strategic use of digital media and visual

displays of data to express information and enhance understanding of presentations

- Mathematical Practice
  - CCSS.Math.Practice.MP4 Model with mathematics.
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- Mathematical Content
  - CCSS.Math.Content.HSS-IC.B.4 Making inferences and Justifying Conclusions - Make inferences and justify conclusions from sample surveys, experiments, and observational studies: 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.
  - CCSS.Math.Content.HSS-ID.A.1 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).

#### CSTA K-12 Computer Science Standards

- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.

#### ISTE National Educational Technology Standards (NETS)

- 2b. Communicate information and ideas effectively to multiple audiences using a variety of digital environments and media.

## UNIT 6. ROBOTICS

### Instructional Days: 1

**Topic:** What is a robot? Identify the criteria that make an item a robot:

- Students do activities to list and explain the criteria that describe a robot.
- Students determine if something is a robot, using the criteria.

### ECS Focus

- 2.1 What is intelligence?
- 2.2 Computers vs. humans

### Computational Practices

- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.L.6 Acquire and use accurately a range of 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 encountering an unknown term important to comprehension or expression.

#### CSTA K-12 Computer Science Standards

- CD.L2-07: Describe what distinguishes humans from machines focusing on human intelligence versus machine intelligence and ways we can communicate.
- CD.L2-08: Describe ways in which computers use models of intelligent behavior (e.g., robot motion, speech and language understanding, and computer vision).
- CD.L3A-10: Describe the major applications of artificial intelligence and robotics.
- CD.L3B-05: Explain the notion of intelligent behavior through computer modeling and robotics.

#### ISTE National Educational Technology Standards (NETS)

- 4b. Plan and manage activities to develop a solution or complete a project.

## UNIT 6. ROBOTICS

**Instructional Days:** 2-3

**Topic:** Evaluate robot body designs and create algorithms to control robot behavior:

- Students evaluate how the design of a robot's body affects its behavior.
- Students simulate a human robot using only 5 commands.

### ECS Focus

- 3.1 Exploring problems: problem-solving heuristics and strategies
- 3.9 Algorithm efficiency

### Computational Practices

- Communicate thought processes and results.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4c: Develop working visualizations of the proposed solution designs.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 – 4.A.4b: Apply listening skills in practical settings (e.g., classroom note taking, interpersonal conflict situations, giving and receiving directions, evaluating persuasive messages).

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CT.L2-03: Define an algorithm as a sequence of instructions that can be processed by a computer.
- CT.L2-06: Describe and analyze a sequence of instructions being followed (e.g., describe a character's behavior in a video game as driven by rules and algorithms).

ISTE National Educational Technology Standards (NETS)

- 4b. Plan and manage activities to develop a solution or complete a project.

## UNIT 6. ROBOTICS

**Instructional Days:** 4

**Topic:** Set up LEGO® Mindstorms® NXT® kit.

### ECS Focus

None

### Computational Practices

None

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.
- CL.L3A-04: Identify how collaboration influences the design and development

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.



## UNIT 6. ROBOTICS

**Instructional Days:** 5

**Topic:** Build robot base.

### ECS Focus

None

### Computational Practices

None

### Standards

#### Illinois Standards

- None

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

#### CSTA K-12 Computer Science Standards

- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04. Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.
- ~~3A-CL 4: Identify how collaboration influences the design and development~~

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.
- ~~2-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.~~

- ~~• 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~~
- 2d. Contribute to project teams to produce original works or solve problems

## UNIT 6. ROBOTICS

**Instructional Days:** 6-7

**Topic:** Introduce the features of NXT Brick—the “brain” of the robot:

- Students distinguish between parts of the NXT brick.
- Students learn to hook up input and output devices correctly.
- Student use built-in NXT Brick programs.

### ECS Focus

None

### Computational Practices

None

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 – 4.A.4b: Apply listening skills in practical settings (e.g., classroom note taking, interpersonal conflict situations, giving and receiving directions, evaluating persuasive messages).

#### Common Core Standards

- None

#### CSTA K-12 Computer Science Standards

- None

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.

## UNIT 6. ROBOTICS

**Instructional Days:** 8-9

**Topic:** Introduce the features of the Mindstorms NXT software:

- Students recognize the parts of the Mindstorms software.
- Students learn about the different palettes and how to use them.
- Students learn about the difference between software errors and hardware errors.
- Students learn about the difference between logical errors and syntax errors.

### ECS Focus

None

### Computational Practices

None

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 – 4.A.4b: Apply listening skills in practical settings (e.g., classroom note taking, interpersonal conflict situations, giving and receiving directions, evaluating persuasive messages).

#### Common Core Standards

- Mathematical Practice
  - CCSS.Math.Practice.MP5 Use appropriate tools strategically.

#### CSTA K-12 Computer Science Standards

- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.

## UNIT 6. ROBOTICS

**Instructional Days:** 10-13

**Topic:** Program the robot using the Mindstorm Robot Educator Software tutorials:

- Students program the robot using some or all of the complete palette of blocks.

### ECS Focus

- 3.2 Design a solution to a problem.
- 3.3 Choose appropriate tools and techniques.
- 3.4 Code a solution from a design.
- 3.5 Test a solution to identify errors.

### Computational Practices

None

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

#### CSTA K-12 Computer Science Standards

- CT.L3A-01: Use predefined functions and parameters, classes and methods to divide a complex problem into simpler parts.
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.
- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate

curriculum concepts.

- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04. Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.

#### ISTE National Educational Technology Standards (NETS)

- 6a. Understand and use technology systems.
- 2d. Contribute to project teams to produce original works or solve problems

## UNIT 6. ROBOTICS

**Instructional Days:** 14

**Topic:** Introduce RoboCup real life robotic competition and write instructions for tic-tac-toe:

- Students learn how a sequence of game moves can be expressed in simple statements.
- Students examine how robots may be programmed to play soccer.
- Students learn to develop if-then statements and use Boolean operators to direct a human "robot" to play tic-tac-toe.

### ECS Focus

- 3.1 Exploring problems: problem-solving heuristics and strategies
- 3.9 Algorithm efficiency

### Computational Practices

- Design and implement creative solutions and artifacts.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSA-CED.A.3 Creating Equations - Create Equations that describe numbers or relationships: 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.

#### CSTA K-12 Computer Science Standards

- CT.L2-03: Define an algorithm as a sequence of instructions that can be processed by a computer.
- CT.L2-06: Describe and analyze a sequence of instructions being followed (e.g., describe a character's behavior in a video game as driven by rules and algorithms).
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).
- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04: Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.

#### ISTE National Educational Technology Standards (NETS)

- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution and/or make informed decisions.
- 6a. Understand and use technology systems.



## UNIT 6. ROBOTICS

**Instructional Days:** 15

**Topic:** RoboTic-Tac-Toe Tournament and introduction to RoboCupJunior Dance Challenge:

- Students learn to debug conditional statements by testing them and compete as teams in a Robot Tic-Tac-Toe Challenge.
- Students describe dancing robots that have competed in the RoboCupJunior Dance Challenge.

### ECS Focus

- 3.2 Design a solution to a problem.
- 3.3 Choose appropriate tools and techniques.
- 3.4 Code a solution from a design.
- 3.5 Test a solution to identify errors.

### Computational Practices

- Design and implement creative solutions and artifacts.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 – 4.A.4b: Apply listening skills in practical settings (e.g., classroom note taking, interpersonal conflict situations, giving and receiving directions, evaluating persuasive messages).

#### Common Core Standards

- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- Mathematical Content
  - CCSS.Math.Content.HSA-CED.A.3 Creating Equations - Create Equations that describe numbers or relationships: 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.

#### CSTA K-12 Computer Science Standards

- CPP.L2-08: Demonstrate dispositions amenable to open-ended problem solving and

programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).

- CPP.L3A-03: Use various debugging and testing methods to ensure program correctness (e.g., test cases, unit testing, white box, black box, integration testing)
- CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software life cycle models).
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.
- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04. Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.

#### ISTE National Educational Technology Standards (NETS)

- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 6. ROBOTICS

**Instructional Days:** 16-18

**Topic:** Student teams build, program, and present a dancing robot.

### ECS Focus

- 3.2 Design a solution to a problem.
- 3.3 Choose appropriate tools and techniques.
- 3.4 Code a solution from a design.
- 3.5 Test a solution to identify errors.

### Computational Practices

- Design and implement creative solutions and artifacts.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.
- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

#### CSTA K-12 Computer Science Standards

- CPP.L2-03: Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.
- CPP.L2-05: Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
- CPP.L2-088: Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability,

patience, propensity to tinker, creativity, accepting challenge).

- CPP.L3A-03: Use various debugging and testing methods to ensure program correctness (e.g., test cases, unit testing, white box, black box, integration testing).
- CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software life cycle models).
- CPP.L3A-05: Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.
- CL.L3A-01: Work in a team to design and develop a software artifact.
- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04. Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.
- ~~3A-CL-4: Identify how collaboration influences the design and development~~

#### ISTE National Educational Technology Standards (NETS)

- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 6. ROBOTICS

**Instructional Days:** 19-23

**Topic:** Student teams build program and present a rescue robot.

### ECS Focus

- 3.2 Design a solution to a problem.
- 3.3 Choose appropriate tools and techniques.
- 3.4 Code a solution from a design.
- 3.5 Test a solution to identify errors.

### Computational Practices

- Design and implement creative solutions and artifacts.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- 

#### CSTA K-12 Computer Science Standards

- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.

- CL.L2-044. Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.

#### ISTE National Educational Technology Standards (NETS)

- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution and/or make informed decisions.
- 6a. Understand and use technology systems.

## UNIT 6. ROBOTICS

**Instructional Days:** 24-33

**Topic:** Final projects and presentations:

- Student groups design, build, and program a robot that solves a stated problem.

### ECS Focus

- 3.2 Design a solution to a problem.
- 3.3 Choose appropriate tools and techniques.
- 3.4 Code a solution from a design.
- 3.5 Test a solution to identify errors.

### Computational Practices

- Design and implement creative solutions and artifacts.
- Work effectively in teams.

### Standards

#### Illinois Standards

- Listen and Speak - Goal 4 - 4.A.4a: Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).
- Listen and Speak - Goal 4 - 4.B.4a: Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.
- Science - Goal 11 - 11.B.4e: Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.

#### Common Core Standards

- Anchor Standards
  - CCSS.ELA-Literacy.CCRA.W.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.
  - CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
  - CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Mathematical Practice
  - CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

### CSTA K-12 Computer Science Standards

- CL.L1-02: Work cooperatively and collaboratively with peers, teachers, and others using technology.
- CL.L2-02: Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.
- CL.L2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
- CL.L2-04. Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.
- CL.L3A-01: Work in a team to design and develop a software artifact.
- CL.L3A-04: Identify how collaboration influences the design and development

### ISTE National Educational Technology Standards (NETS)

- 2d. Contribute to project teams to produce original works or solve problems.
- 4b. Plan and manage activities to develop a solution and/or make informed decisions.
- 6a. Understand and use technology systems.



## References

### STATE STANDARDS

#### ILLINOIS

<http://www.isbe.net/ils/default.htm>

### NATIONAL STANDARDS

#### COMMON CORE STANDARDS

<http://www.corestandards.org/the-standards>

### NATIONAL IT- RELATED STANDARDS

#### NETS

<http://www.iste.org/standards/nets-for-students>

#### CSTA K-12 COMPUTER SCIENCE STANDARDS

<http://csta.acm.org/Curriculum/sub/K12Standards.html>  
[http://csta.acm.org/Curriculum/sub/CurrFiles/CSTA\\_Standards Mapped to CommonCoreStandards.pdf](http://csta.acm.org/Curriculum/sub/CurrFiles/CSTA_Standards_Mapped_to_CommonCoreStandards.pdf)