Spokane Public Schools
MS Intro to Computer Science

Course: Introduction to Computer Science			**Total Framework Hours up to:** 90
CIP Code: 110701	✓ **Exploratory**	o **Preparatory**	**Date Last Modified:** Feb. 16, 2016
Career Cluster: Information Technology			**Cluster Pathway:** Programming and Software Development

M.S. Intro to Computer Science (PLTW) Scope & Sequence	
Unit 1: Mobile Computing	
Section 1.1: The Computer Revolution	**18 hours**
Section 1.2: Putting Together Pieces	**16 hours**
Section 1.3: Collaborate to Solve Problems	**11 hours**
Unit 2: Crowds and Clouds	
Section 2.1: Coding for the Crowd	**21 hours**
Section 2.2: Cracking the Code	**24 hours**

UNIT 1 Mobile Computing

Section 1:1 - The Computer Revolution	**Time: 18 hours**

Components and Assessments

Performance Assessments:

Students create original programs with MIT App Inventor through an introduction to pair programming and the software design process. As part of the application-building process, students create audio and visual elements and examine how sound and images are represented in digital data. Event-driven programming provides the iteration in this lesson, allowing students to inspect the value of variables after each iteration. The properties and procedures that belong to each component build student familiarity with the concepts of object-oriented programming.

Leadership Alignment:

21st Century Skills demonstrated in this unit are indicated below based on the following student learning targets:

- Students pick a grand challenge and consider how mobile computing, the Internet, Big Data, and simulation are contributing to solving that challenge.
- Students use MIT App Inventor (AI2) to create an app with a drawing canvas and its own camera control.
- Students create a mobile app with a counter operated by buttons and voice recognition.
- Students learn about the properties and events associated with AI2 components and are introduced to Agile development.
- Students analyze digital and analog sound.
- Students use Audacity® software and a spectrum analyzer to create and analyze a digital recording of themselves

- Students use an AI2 canvas to create a bouncing ball with sounds that depend on which side the ball bounces against.
- Students use GIMP to create a sprite from an image. Representation and ownership of images are considered.
- Students create a game, Sprite Smash, in which a sprite pops up at random positions on the screen.
- Students apply event handlers, procedures, global variables, and the Cartesian coordinate system.

Section 1.2: Putting Together Pieces	**Time: 16 hours**

Components and Assessments

Performance Assessments:
Students continue to pair program and to explore the impact of the computing revolution as they learn how more complex programs are put together. Students build skills with collaboration tools and processes. They apply these collaboration skills while creating new MIT App Inventor projects. Students investigate community needs to identify an app they can develop to meet a real client's need.

Leadership Alignment:

21st Century Skills demonstrated in this unit are indicated below based on the following student learning targets:

- Students create an app in which a sprite slides around a canvas based on randomness, tablet tilt, flings, or taps.
- Students make meaning of a URL by creating an app in which the user can open side-by-side browsers to Google and Wikipedia using a text entry box and button.
- Students pick a task to complete from a crowdsourced document shared among teachers that accumulates tasks in bite-sized pieces appropriate for students new to programming.
- Students pick a larger goal to complete, written as one or more user stories. Students break the user story into smaller tasks and complete a sprint toward their goal.
- Students interview a family member, a community member, and a school member while seeking a client for a mobile app. Students consider examples of how mobile and embedded computing are improving people's lives, and with what accompanying detriment.

Section 1.3: Collaborate to Solve Problems	**Time: 11 hours**

Components and Assessments

Performance Assessments: Students examine how the computing revolution has affected collaboration and creativity. Ethical and safe behavior on the Internet is developed alongside opportunities and tools for collaboration over the Internet. In the culminating problem of the unit, students develop an app to meet a real client's need.

Leadership Alignment:

21st Century Skills demonstrated in this unit are indicated below based on the following student learning targets:

- Students consider life as one big collaboration.
- Students reason about consequences for themselves and others in scenarios involving texting, creating and sharing pictures, posting to social media, and using email.
- Students within a school or in a pair of schools collaborate to create a product that includes text.
- Students research and present about career opportunities in a field of their choice, focusing on the way in which CS and IT skills improve the opportunities in that career field.
- Students develop an app to express creativity or to meet a need in a project growing out of the interviews in the previous lesson.

Computer Science Teachers Association Standards
Computer Science in the Modern World
CSTA.3A.CD3 - Describe the principal components of computer organization (e.g., input, output, processing, and storage).
CSTA.3A.CD5 - Explain the multiple levels of hardware and software that support program execution (e.g., compilers, interpreters, operating systems, networks).
CSTA.3A.CD8 - Explain the basic components of computer networks (e.g., servers, file protection, routing, spoolers and queues, shared resources, and fault-tolerance).
CSTA.3A.CD1 - Describe the unique features of computers embedded in mobile devices and vehicles (e.g., cell phones, automobiles, airplanes).
CSTA.3A.CI 5 - Describe strategies for determining the reliability of information found on the Internet.
CSTA.3A.CL1 - Work in a team to design and develop a software artifact.
CSTA.3A.CL3 - Describe how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration.
CSTA.3A.CPP3 - Use various debugging and testing methods to ensure program correctness (e.g., test cases, unit testing, white box, black box, integration testing).
CSTA.3A.CPP7 - Describe a variety of programming languages available to solve problems and develop systems.
CSTA.3A.CD10 - Describe the major applications of artificial intelligence and robotics. CSTA.3A.CD3 -
Describe the principal components of computer organization (e.g., input, output, processing, and storage).
CSTA.3A.CD4 - Compare various forms of input and output. CSTA.3A.CD6 -
Apply strategies for identifying and solving routine hardware and software problems that occur in everyday life.
CSTA.3A.CD9 - Describe how the Internet facilitates global communication.CSTA.3A.CI3 -- Describe the role that adaptive technology can play in the lives of people with special needs.
CSTA.3A.CI4 - Compare the positive and negative impacts of technology on culture (e.g., social networking, delivery of news and other public media, and intercultural communication).
CSTA.3A.CI6 - Differentiate between information access and information distribution rights. CSTA.3A.CI7 -- Describe how different kinds of software licenses can be used to share and protect intellectual property.
CSTA.3A.CI8 - Discuss the social and economic implications associated with hacking and software piracy.
CSTA.3A.CI9 - Describe different ways in which software is created and shared and their benefits and drawbacks (commercial software, public domain software, open source development).
CSTA.3A.CL1 - Work in a team to design and develop a software artifact.
CSTA.3A.CL3 - Describe how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration.
CSTA.3A.CL4 - Identify how collaboration influences the design and development of software products.
CSTA.3A.CPP4 -Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software lifecycle models).
CSTA.3A.CPP6 -Select appropriate file formats for various types and uses of data.
CSTA.3A.CPP7 -Describe a variety of programming languages available to solve problems and develop systems.
CSTA.3A.CPP8 -Explain the program execution process.
CSTA.3A.CPP9 - Explain the principles of security by examining encryption, cryptography, and authentication techniques.
C STA.3A.CT1 - Use predefined functions and parameters, classes and methods to divide a complex problem into simpler parts.
CSTA.3A.CT2 - Describe a software development process used to solve software problems (e.g., design, coding, testing, verification).
CSTA.3A.CT3 - Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
CSTA.3A.CT5 - Describe the relationship between binary and hexadecimal representations. CSTA.3A.CT6 -
Analyze the rep
CSTA.3A.CT 7 - Describe how various types of data are stored in a computer system.
CSTA.3A.CT9 - Discuss the value of abstraction to manage problem complexity.

Aligned Washington State Standards	
Arts	N/A
Educational Technology	1.2.1 Communicate and collaborate to learn with others. 1.3.2 Locate and organize information from a variety of sources and media. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning. 2.3.1 Select and use common applications. 2.3.2 Select and use online applications.
Language	7.L.1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. 7.L.1.b - Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas. 7.L.2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. 7.L.2.b - Spell correctly. 7.L.3 - Use knowledge of language and its conventions when writing, speaking, reading, or listening. 7.L.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, choosing flexibly from a range of strategies. 7.L.4.a - Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. 7.L.4.c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. 7.L.4.d - Verify the preliminary determination of the meaning of a word or phrase (e.g., checking the inferred meaning in context or in a dictionary). 7.L.5.b - Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words. 7.L.6 - Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. 8.L.1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. 8.L.1.b - Form and use verbs in the active and passive voice. 8.L.2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. 8.L.2.a - Use punctuation (comma, ellipsis, dash) to indicate a pause or break. 8.L.2.c - Spell correctly. 8.L.3 - Use knowledge of language and its conventions when writing, speaking, reading, or listening. 8.L.4 - Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies. 8.L.4.a - Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. 8.L.4.c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. 8.L.4.d - Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). 8.L.5.b - Use the relationship between particular words to better understand each of the words.

Mathematics	7.RP.1 - Ratios And Proportional Relationships Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour. 7.NS.3 - The Number System - Solve real-world and mathematical problems involving the four operations with rational numbers. 7.EE.4 - Expressions And Equations - Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. 8.EE.1 - Expressions And Equations - Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 3^2 × 3^–5 = 3^–3 = 1/3^3 = 1/27. 8.EE.4 - Expressions And Equations - Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.
Reading Science/ Technical	6-8.RST.3 - Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. 6-8.RST.4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. 6-8.RST.6 - Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. 6-8.RST.7 - Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
Next Generation Science Standards	NGSS.MS-ETS1-1 - ED - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. NGSS.MS-ETS1-2 - ED - Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. NGSS.MS-ETS1-3 - ED - Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. NGSS.MS-PS2-5 - MS: Forces and Interactions - Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. NGSS.MS-PS4-3 - Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. NGSS.P1 - SEP - Asking questions (for science) and defining problems (for engineering) NGSS.P4 - SEP - Analyzing and interpreting data NGSS.P5 - SEP - Using mathematics and computational thinking NGSS.P6 - SEP - Constructing explanations (for science) and designing solutions (for engineering) NGSS.P7 - SEP - Engaging in argument from evidence NGSS.P8 – SEP -Obtaining, evaluating, and communicating information
Social Studies	4.2.3 Analyze and evaluate how technology and ideas have shaped United States and/or world history 5.1.1 Analyze consequences of positions on an issue or event. 5.2.1 Create and uses research questions that are tied to an essential question to focus inquiry on an idea, issue, or event.

Speaking & Listening	7.SL.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. 7.SL.1.b - Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. 7.SL.1.c - Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. 7.SL.1.d - Acknowledge new information expressed by others and, when warranted, modify their own views. 7.SL.6 - Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. 8.SL.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. 8.SL.1.b - Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. 8.SL.1.c - Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. 8.SL.1.d - Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented. 8.SL.6 - Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. AS.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. AS.SL.6 - Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Writing for History, Science and Technical Subjects	7-8.WHST.1.d - Establish and maintain a formal style. 7-8.WHST.2.e - Establish and maintain a formal style and objective tone. 7-8.WHST.4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 7-8.WHST.6 - Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. 8.W.1.d - Establish and maintain a formal style. 8.W.1.e - Provide a concluding statement or section that follows from and supports the argument presented. 8.W.2.a - Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. 8.W.2.d - Use precise language and domain-specific vocabulary to inform about or explain the topic. 8.W.2.e - Establish and maintain a formal style. 8.W.2.f - Provide a concluding statement or section that follows from and supports the information or explanation presented. 8.W.4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) 8.W.5 - With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. 8.W.6 - Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others. 8.W.7 - Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. 8.W.8 - Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. 8.W.9 - Draw evidence from literary or informational texts to support analysis, reflection, and research. 8.W.9.b - Apply grade 8 Reading standards to literary nonfiction (e.g., “Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced”).

Unit 2: Crowds and Clouds

Unit 2.1: Coding for the Crowd	Time: 21 hours

Components and Assessments

Performance Assessments: The goal of this lesson is to reinforce students' understanding and enthusiasm for computing as a powerful tool for collaboration. Activities explore how information is presented and exchanged on the Web. Building on their new understanding of the Web, students develop an app that transmits and receives data from a Web service through an application programming interface (API). In the final problem, students develop an app to crowdsource data collection on a topic of their interest and then analyze the data.

Leadership Alignment:

21st Century Skills demonstrated in this unit are indicated below based on the following student learning targets:

- Students explore basic HTML and CSS, the languages of the Web. Students manipulate a locally stored Web page, adding elements and modifying the background color, reinforcing hexadecimal RGB color representation.
- Students learn how to use an application programming interface (API) to send commands to a Web server over the Web.
- Students use MIT App Inventor to create a simple app to allow a user to send and receive API data over the Web. They automate the sending of data in a cybersecurity challenge.
- Student use a Google sheet to share data about themselves with the class. Patterns are observed and compared between two groups.
- Students discuss personally identifiable information (PII) and safe/common/legal practices regarding PII.
- Students crowdsource the collection of data for questions of interest to them and consider the effectiveness of measures to de-identify and analyze the data.
- Students develop an app that shares data across multiple users.
- Students reflect on their work from their created client app.
- Teams of students present their process and product to the class, to the client, or to an end user.

Unit 2.2: Cracking the Code	Time: 24 hours

Components and Assessments

Performance Assessments: The goal of this lesson is for students to become comfortable implementing algorithms using conditionals and loops in *Python*® and to generalize algorithmic structures from corresponding MIT App Inventor and *Python*®code. Students create a game simulation, learning about functions, arguments, and return values. Students generalize from this simulation to learn about model abstraction and the impact that simulation and data are having across all career fields. Students then apply their *Python*® skills to compete in a rock-paper-scissors game, developing functions to implement a complex strategy that attempts to detect their opponent's strategy.

Leadership Alignment:

21st Century Skills demonstrated in this unit are indicated below based on the following student learning targets:

- Students collect data about outcomes in Ezee, a game in which outcomes are random and players try to get 14 of a kind.
- Students explore a *Python*® development environment and become familiar with a code editor and an interactive command line.
- Students define and call functions with arguments to accomplish simple mathematical tasks.
- Students compare the meaning of the terms "variable," "function," and "equal" in the contexts of mathematics and computer programming languages.
- Students learn three patterns for loops: accumulation, aggregations, and finding the maximum or minimum in a set. For each pattern, students study an example, complete an example, and then create their own code.
- Students create a sequence of *Python*® functions to simulate a single game of Ezee, which they played at the beginning of the lesson.
- Students explore a distribution resulting from a Monte Carlo simulation and identify which details of a phenomenon are parameterized and which details are abstracted away by a model.
- Students research the impact of modeling and simulation in a career field of their choice.
- Students create an algorithm to analyze a competitor's history in rock-paper-scissors and predict the competitor's next move. Students implement their algorithm in *Python*® and compete in a round-robin tournament.

Computer Science Teachers Association Standards

Computer Science in the Modern World

CSTA.3A.CD7 -Compare and contrast client-server and peer-to-peer network strategies. CSTA.3A.CD8 -
Explain the basic components of computer networks (e.g., servers, file protection, routing, spoolers and queues, shared resources, and fault-tolerance).
CSTA.3A.CL1 - Work in a team to design and develop a software artifact. CSTA.3A.CI11 -Explain the impact of the digital divide on access to critical information.
CSTA.3A.CL1 -Work in a team to design and develop a software artifact.
CSTA.3A.CL2 - Use collaborative tools to communicate with project team members (e.g., discussion threads, wikis, blogs, version control, etc.).
CSTA.3A.CL3 - Describe how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration.
CSTA.3A.CL4 - Identify how collaboration influences the design and development of software products.
Describe how mathematical and statistical functions, sets, and logic are used in computation.
CSTA.3A.CPP1 - Create and organize Web pages through the use of a variety of web programming design tools.
CSTA.3A.CPP2 - Use mobile devices/emulators to design, develop, and implement mobile computing applications.
CSTA.3A.CPP5 - Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.
CSTA.3A.CPP6 - Select appropriate file formats for various types and uses of data.
CSTA.3A.CPP7 - Describe a variety of programming languages available to solve problems and develop systems.
CSTA.3A.CPP9 - Explain the principles of security by examining encryption, cryptography, and authentication techniques.
CSTA.3A.CPP10 - Explore a variety of careers to which computing is central.
CSTA.3A.CPP11 -Describe techniques for locating and collecting small- and large-scale data sets. CSTA.3A.CPP12 -
CSTA.3A.CPP12 - Describe how mathematical and statistical functions, sets, and logic are used in computation.
CSTA.3A.CT4 -Compare techniques for analyzing massive data collections.
CSTA.3A.CT5 -Describe the relationship between binary and hexadecimal representations.
CSTA.3A.CT7 -Describe how various types of data are stored in a computer system.
CSTA.3A.CT9 - Discuss the value of abstraction to manage problem complexity.

Aligned Washington State Standards	
Arts	N/A
Educational Technology	1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively. 2.4.1 Formulate and synthesize new knowledge.
Language	7-8.L.1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. 7-8.L.1.b - Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas. 7-8.L.2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. 7-8.L.2.b - Spell correctly. 7-8.L.3 - Use knowledge of language and its conventions when writing, speaking, reading, or listening. 7-8.L.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7-8 reading and content, choosing flexibly from a range of strategies. 7-8.L.4.a - Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. 7-8.L.4.c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. 7-8.L.4.d - Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). 7-8.L.5.b - Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words. 7-8.L.6 - Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Math	7.EE.4 – EE - Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. 7.SP.2 - SP - Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. 7.SP.3 – SP - Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable. 7.SP.4 – SP - Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book. 7.SP.5 - SP - Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. 7.SP.6 - SP - Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. 7.SP.7 - SP - Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. 7.SP.7.a - SP - Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. 7.SP.7.b - SP - Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies? 7.SP.8 - SP - Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. 7.SP.8.a - SP - Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. 7.SP.8.b - SP - Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event. 8.NS.2 - The Number System - Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. 8.EE.1 – Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 3^2 × 3^–5 = 3^–3 = 1/3^3 = 1/27. 8.EE.5 – EE - Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

	8.EE.7 – EE - Solve linear equations in one variable. 8.F.1 – Functions - Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. 8.F.2 – Functions - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. 8.F.3 – Functions - Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4), and (3,9), which are not on a straight line. 8.SP.1 – SP - Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. 8.SP.2 – SP - Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. 8.SP.3 - SP - Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. 8.G.7 – Geometry - Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
Reading Standards for Literacy	6-8.RST.3 - Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. 6-8.RST.4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. 6-8.RST.6 - Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. 6-8.RST.7 - Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). 6-8.RST.8 - Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. 6-8.RST.9 - Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. 6-8.RST.10 - By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Next Generation Science Standards	NGSS.MS-ESS3-4 - Earth and Human Activity - Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. NGSS.MS-ESS3-5 - Earth and Human Activity - Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. NGSS.MS-ETS1-4 - Engineering Design - Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. NGSS.MS-LS4-4 - Biological Evolution: Unity and Diversity - Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. NGSS.MS-LS4-6 - Biological Evolution: Unity and Diversity - Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. NGSS.MS-ETS1-1 – ED - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. NGSS.MS-ETS1-2 - ED - Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. NGSS.MS-ETS1-3 - ED - Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. NGSS.MS-PS4-3 - Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. NGSS.P1 – SEP - Asking questions (for science) and defining problems (for engineering) NGSS.P2 - SEP - Developing and using models NGSS.P3 – SEP - Planning and carrying out investigations NGSS.P4 – SEP - Analyzing and interpreting data NGSS.P5 – SEP - Using mathematics and computational thinking NGSS.P6 – SEP - Constructing explanations (for science) and designing solutions (for engineering) NGSS.P7 - Science and Engineering Practices Engaging in argument from evidence NGSS.P8 – SEP - Obtaining, evaluating, and communicating information
Social Studies	N/A
Speaking & Listening	7-8.SL.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. 7-8.SL.1.b - Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. 7-8.SL.1.c - Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. 7-8.SL.1.d - Acknowledge new information expressed by others and, when warranted, modify their own views. 7-8.SL.4 - Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. 7-8.SL.5 - Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. 7-8.SL.6 - Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Writing for History, Science and Technical Subjects	7-8.WHST.1.d - Establish and maintain a formal style. 7-8.WHST.1.e - Provide a concluding statement or section that follows from and supports the argument presented. 7-8.WHST.2.a - Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. 7-8.WHST.2.c - Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. 7-8.W.2.d - Use precise language and domain-specific vocabulary to inform about or explain the topic. 7-8.WHST.2.e - Establish and maintain a formal style and objective tone. 7-8.WHST.2.f - Provide a concluding statement or section that follows from and supports the information or explanation presented. 7-8.WHST.4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 7-8.WHST.6 - Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. 7-8.W.9.b - Apply grade 7/ 8 Reading standards to literary nonfiction (e.g., “Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced”). 7-8.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 discipline-specific tasks, purposes, and audiences.

Aligned Washington State Core Standards (GLE Components and Anchor CCSS unless indicated otherwise)	
Arts	N/A
Educational Technology	1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.2.1 Communicate and collaborate to learn with others. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 1.3.2 Locate and organize information from a variety of sources and media. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning. 2.3.2 Select and use online applications. 2.4.1 Formulate and synthesize new knowledge.
Health & Fitness	1.2.1 Apply and/or analyze how to perform activities and tasks safely and appropriately. 3.1.3 Evaluate environmental risks associated with certain occupational, residential, and recreational choices
Language	8.L.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Math *To be updated through additional curricular work with Code*	**Mathematical Practice** CCSS.MP.4 Model with mathematics. CCSS.MP.5 Use appropriate tools strategically. **Mathematical Content** Interpreting Categorical & Quantitative Data **S-ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).** S-ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. **S-ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).** Making Inferences & Justifying Conclusions S-IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S-IC.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation S-IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. **S-IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.** S-IC.6 Evaluate reports based on data.

	S-CP.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. S-CP.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
Reading Standards for Literacy in Social Studies, Science and Technical Subjects	N/A
Next Generation Science Standards	ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
Social Studies	5.2.1 Create and uses research questions that are tied to an essential question to focus inquiry on an idea, issue, or event. 5.4.1 Evaluate multiple reasons or factors to develop a position paper or presentation. 5.4.2 Create strategies to avoid plagiarism and respect intellectual property when developing a paper or presentation.
Speaking & Listening	8. SL1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly. 8. SL2 Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. 8. S.3 Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced. 8. SL4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. 8. SL5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
Writing for History, Science and Technical Subjects	6-8.WHST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.