WDHS Curriculum Map
Course: AP Computer Science Principles

AP CSP Curriculum Framework
Taken from Code.org CSP Curriculum

Time Interval/ Content	Standards/ Strands	Essential Questions	Skills	Assessment
Unit 0: Global Impact Time Interval: 8 weeks (summer) + 1 week (school year) Resources: *Blown to Bits: Your Life, Liberty, and Happiness After the Digital Explosion*	**MA.K-12.CCSS.Math.Practice.MP1** - [*Standard*] - Make sense of problems and persevere in solving them. **MA.K-12.CCSS.Math.Practice.MP2** - [*Standard*] - Reason abstractly and quantitatively. **MA.K-12.CCSS.Math.Practice.MP3** - [*Standard*] - Construct viable arguments and critique the reasoning of others. **MA.K-12.CCSS.Math.Practice.MP4** - [*Standard*] - Model with mathematics. **MA.K-12.CCSS.Math.Practice.MP5** - [*Standard*] - Use appropriate tools strategically. **MA.K-12.CCSS.Math.Practice.MP6** - [*Standard*] - Attend to precision. **MA.K-12.CCSS.Math.Practice.MP7** - [*Standard*] - Look for and make use of structure. **MA.K-12.CCSS.Math.Practice.MP8** - [*Standard*] - Look for and express regularity in repeated reasoning. **TECH.8.1.12.A.CS1** - [*Content Statement*] - Understand and use technology systems. **TECH.8.1.12.C.CS1** - [*Content Statement*] - Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media. **TECH.8.1.12.C.CS3** - [*Content Statement*] - Develop cultural understanding and global awareness by engaging with learners of other cultures.	How does computing enhance human communication, interaction, and cognition? How does computing enable innovation? What are some potential beneficial and harmful effects of computing? How do economic, social, and cultural contexts influence innovation and the use of computing?	Students will understand that… ● Computing enhances communication, interaction, and cognition. (EU 7.1) ● Computing enables innovation in nearly every field. (EU 7.2) ● Computing has a global effect - both beneficial and harmful - on people and society. (EU 7.3) ● Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used. (EU 7.4) Students will know… ● The definition of ASCII, audio compression, bandwidth, binary search, bits, ciphers, cookies, cryptography, data mining, decryption, encryption, HTML, indexes, Internet, IP, ISP, metadata, modelling, Moore's Law, networks, packets, peer-to-peer architecture, queries, router, spectrum, TCP, WPA. ● Various technologies that have affected communication, interaction, and cognition, including email, SMS, video chat, social media, cloud	● Chapter Response ● Online Discussion Board ● Essay *Performance Task*: Students will debate several topics from the book, including the nature of privacy in a digital world, and the concept of ownership of data.

	TECH.8.1.12.D.CS1 - [*Content Statement*] - Advocate and practice safe, legal, and responsible use of information and technology. **TECH.8.1.12.D.1** - [*Cumulative Progress Indicator*] - Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work. **TECH.8.1.12.D.2** - [*Cumulative Progress Indicator*] - Evaluate consequences of unauthorized electronic access (e.g., hacking) and disclosure, and on dissemination of personal information. **TECH.8.1.12.D.3** - [*Cumulative Progress Indicator*] - Compare and contrast policies on filtering and censorship both locally and globally. **TECH.8.1.12.D.4** - [*Cumulative Progress Indicator*] - Research and understand the positive and negative impact of one's digital footprint. **TECH.8.1.12.D.5** - [*Cumulative Progress Indicator*] - Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs. **12.9.3.ST-SM.3** - [*Standard Statement*] - Analyze the impact that science and mathematics has on society. **12.9.3.ST-SM.4** - [*Standard Statement*] - Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.		computing, public data, search trends, GPA, sensor networks, assistive technologies, and the Internet. ● Scaling is an important part of digital problem solving. ● Access to digital information raises legal and ethical concerns. ● The innovation and impact of social media and online access varies in different countries and in different socioeconomic groups. Students will be able to… ● Explain how computing innovations affect communication, interaction, and cognition. (LO 7.1.1) ● Explain how people participate in a problem-solving process that scales.(LO 7.1.2) ● Explain how computing has impacted innovations in other fields. (LO 7.2.1) ● Analyze the beneficial and harmful effects of computing. (LO 7.3.1) ● Explain the connections between computing and economic, social, and cultural contexts. (LO 7.4.1)	
Unit 1: Digital Information	**MA.K-12.CCSS.Math.Practice.MP1** - [*Standard*] - Make sense of problems and persevere in solving them.	How can a creative development process	Students will understand that…	● Homework ● Classwork ● Quiz

Time Interval: 6 weeks Resources: Code.org CSP Unit 1	**MA.K-12.CCSS.Math.Practice.MP2** - [*Standard*] - Reason abstractly and quantitatively. **MA.K-12.CCSS.Math.Practice.MP3** - [*Standard*] - Construct viable arguments and critique the reasoning of others. **MA.K-12.CCSS.Math.Practice.MP4** - [*Standard*] - Model with mathematics. **MA.K-12.CCSS.Math.Practice.MP5** - [*Standard*] - Use appropriate tools strategically. **MA.K-12.CCSS.Math.Practice.MP6** - [*Standard*] - Attend to precision. **MA.K-12.CCSS.Math.Practice.MP7** - [*Standard*] - Look for and make use of structure. **MA.K-12.CCSS.Math.Practice.MP8** - [*Standard*] - Look for and express regularity in repeated reasoning. **TECH.8.1.12.A.1** - [*Cumulative Progress Indicator*] - Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources. **TECH.8.1.12.A.3** - [*Cumulative Progress Indicator*] - Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue. **TECH.8.2.12.A.2** - [*Cumulative Progress Indicator*] - Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste. **TECH.8.2.12.E.1** - [*Cumulative Progress Indicator*] - Demonstrate an understanding of the problem-solving capacity of computers in our world. **TECH.8.2.12.E.2** - [*Cumulative Progress Indicator*] - Analyze the relationships between internal and external computer components.	affect the creation of computational artifacts? How can computing and the use of computational tools foster creative expression? How can computing extend traditional forms of human expression and experience? How are vastly different kinds of data, physical phenomena, and mathematical concepts represented on a computer? How does abstraction help us in writing programs, creating computational artifacts, and solving problems? How can computational models and simulations help generate new understanding and knowledge? How can computation be employed to help people process data and information to gain insight and knowledge?	● Creative development can be an essential process for creating computational artifacts. (EU 1.1) ● Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem. (EU 1.2) ● A variety of abstractions built on binary sequences can be used to represent all data. (EU 2.1) ● Multiple levels of abstraction are used to write programs or create other computational artifacts. (EU 2.2) ● Computing facilitates exploration and the discovery of connections in information. (EU 3.2) ● There are trade-offs when representing information as digital data. (EU 3.3) Students will know… ● Creating computational artifacts employs an iterative and often exploratory process to translate ideas into tangible form. ● A collaboratively created computational artifact reflects effort by more than one person. ● Effective collaborative teams practice interpersonal communication, consensus building, conflict resolution, and negotiation.	● Test *Performance Task:* Encode a Complex Thing -- To conclude Unit 1, students will select a personally meaningful real-world thing (an object, system, idea, etc.) and develop an encoding protocol for representing it in bits. The project presents students with the “tree of abstractions” they have explored through this first unit and challenges them to build upon it, developing their own layers of encoding along the way. Over three class day, students develop a visual representation of their encoding and respond to reflection questions similar to those students will see on the AP Performance Tasks. While students will complete this project individually, they will be supported throughout by consultations with a peer reviewer.

	TECH.8.2.12.E.4 - [*Cumulative Progress Indicator*] - Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements). **12.9.3.ST-SM.2** - [*Standard Statement*] - Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems. **12.9.3.ST-ET.2** - [*Standard Statement*] - Display and communicate STEM information.	How can computation be employed to facilitate exploration and discovery when working with data? What considerations and trade-offs arise in the computational manipulation of data? What opportunities do large data sets provide for solving problems and creating knowledge?	● Digital data is represented by abstractions at different levels which, at its lowest level, is represented by bits. ● Number bases, including binary, decimal, and hexadecimal are used to represent and investigate digital data. ● A finite representation is used to model the infinite mathematical concept of a number. ● In many programming languages, the fixed number of bits used to represent characters or integers limits the range of integer values and mathematical operations; this limitation can result in overflow or other errors. ● The process of developing an abstraction involves removing detail and generalizing functionality. ● Large data sets provide opportunities and challenges for extracting information and knowledge. ● Computing tools facilitate the discovery of connections in information within large data sets. ● Metadata is data about data. ● Digital data representations involve trade-offs related to storage, security, and privacy concerns.	

			● Data is stored in many formats depending on its characteristics. Students will be able to... ● Apply a creative development process when creating computational artifacts. (LO 1.1.1) ● Collaborate in the creation of computational artifacts. (LO 1.2.4) ● Describe the variety of abstractions used to represent data. (LO 2.1.1) ● Explain how binary sequences are used to represent digital data. (LO 2.1.2) ● Develop an abstraction when writing a program or creating other computational artifacts. (LO 2.2.1) ● Extract information from data to discover and explain connections, patterns, or trends. (LO 3.2.1) ● Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (LO 3.3.1)	
Unit 2: The Internet	**MA.K-12.CCSS.Math.Practice.MP1** - [*Standard*] - Make sense of problems and persevere in solving them.	How can computation be employed to help people process data and	Students will understand that... ● There are trade-offs when representing information as digital data. (EU 3.3)	● Homework ● Classwork ● Quiz ● Test

Time Interval: 6 weeks Resources: Code.org CSP Unit 2	**MA.K-12.CCSS.Math.Practice.MP2** - [*Standard*] - Reason abstractly and quantitatively. **MA.K-12.CCSS.Math.Practice.MP3** - [*Standard*] - Construct viable arguments and critique the reasoning of others. **MA.K-12.CCSS.Math.Practice.MP4** - [*Standard*] - Model with mathematics. **MA.K-12.CCSS.Math.Practice.MP5** - [*Standard*] - Use appropriate tools strategically. **MA.K-12.CCSS.Math.Practice.MP6** - [*Standard*] - Attend to precision. **MA.K-12.CCSS.Math.Practice.MP7** - [*Standard*] - Look for and make use of structure. **MA.K-12.CCSS.Math.Practice.MP8** - [*Standard*] - Look for and express regularity in repeated reasoning. **TECH.8.1.12.D.2** - [*Cumulative Progress Indicator*] - Evaluate consequences of unauthorized electronic access (e.g., hacking) and disclosure, and on dissemination of personal information. **TECH.8.1.12.D.4** - [*Cumulative Progress Indicator*] - Research and understand the positive and negative impact of one's digital footprint. **TECH.8.1.12.E.2** - [*Cumulative Progress Indicator*] - Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers. **TECH.8.2.12.A.2** - [*Cumulative Progress Indicator*] - Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste. **TECH.8.2.12.B.1** - [*Cumulative Progress Indicator*] - Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.	information to gain insight and knowledge? How can computation be employed to facilitate exploration and discovery when working with data? What considerations and trade-offs arise in the computational manipulation of data? What opportunities do large data sets provide for solving problems and creating knowledge? What is the Internet? How is it built? How does it function? What aspects of the Internet's design and development have helped it scale and flourish? How is cybersecurity impacting the ever-increasing number of Internet users? How does computing enhance human communication, interaction, and cognition?	● The Internet is a network of autonomous systems. (EU 6.1) ● Characteristics of the Internet influence the systems built on it. (EU 6.2) ● Cybersecurity is an important concern for the Internet and the systems built on it. (EU 6.3) ● Computing has a global effect - both beneficial and harmful - on people and society. (EU 7.3) ● Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used. (EU 7.4) Students will know… ● Digital data representations involve trade-offs related to storage, security, and privacy concerns. ● Data is stored in many formats depending on its characteristics. ● The Internet connects devices and networks all over the world. ● An end-to-end architecture facilitates connecting new devices and networks on the Internet. ● Connecting new devices to the Internet is enabled by assignment of an Internet protocol (IP) address. ● The Internet is built on evolving standards, including those for addresses and names (i.e. DNS, IPv6, HTTP, SMTP).	*Performance Task:* Challenges of the Internet *Performance Task:* Security and Hacking in the Real World -- This assignment mimics many of the elements of the Explore Performance Task. Students will investigate and research an issue related to internet security or privacy examine it with a critical eye to demonstrate a deep understanding of the issue, its functionality, and its potential impact on people and society. Students may investigate such topics as Net Neutrality, cybercrime, or other legal, political, or societal issues that stem from the structure and and usage of the Internet. A key element of the assignment is communicating and explaining the interplay between the technology and societal issue.

	TECH.8.2.12.B **.3** - [*Cumulative Progress Indicator*] - Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs. **TECH.8.2.12.E.2** - [*Cumulative Progress Indicator*] - Analyze the relationships between internal and external computer components. **TECH.8.2.12.E.4** - [*Cumulative Progress Indicator*] - Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements). **12.9.3.ST-ET.6** - [*Standard Statement*] - Apply the knowledge learned in the study of STEM to provide solutions to human and societal problems in an ethical and legal manner. **12.9.3.ST-SM.3** - [*Standard Statement*] - Analyze the impact that science and mathematics has on society. **12.9.3.ST-ET.2** - [*Standard Statement*] - Display and communicate STEM information.	How does computing enable innovation? What are some potential beneficial and harmful effects of computing? How do economic, social, and cultural contexts influence innovation and the use of computing?	● The Internet and the systems built on it are hierarchical and redundant. ● Hierarchy and redundancy help systems scale. ● Interfaces and protocols enable widespread use of the Internet. ● Open standards fuel the growth of the Internet. ● The Internet is a packet-switched system through which digital data is sent by breaking the data into blocks of bits called packets, which contain both the data being transmitted and control information for routing the data. ● The bandwidth of a system is a measure of bit rate - the amount of data (measured in bits) that can be sent in a fixed amount of time. ● The trust model of the Internet involves trade-offs. ● Implementing cybersecurity has software, hardware, and human components. ● Cyber warfare and cyber crime have widespread and potentially devastating effects. ● Access to digital information raises legal and ethical concerns. ● The innovation and impact of social media and online access varies in different countries and in different socioeconomic groups.	

			Students will be able to... ● Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (LO 3.3.1) ● Explain the abstractions in the Internet and how the Internet functions (LO 6.1.1) ● Explain characteristics of the Internet and the systems built on it. (LO 6.2.1) ● Explain how the characteristics of the Internet influence the systems built on it. (LO 6.2.2) ● Identify existing cybersecurity concerns and potential options to address these issues with the Internet and the systems built on it. (LO 6.3.1) ● Analyze the beneficial and harmful effects of computing. (LO 7.3.1) ● Explain the connections between computing and economic, social, and cultural contexts. (LO 7.4.1)	
Unit 3: Programming Time Interval: 8 weeks	**MA.K-12.CCSS.Math.Practice.MP1** - [*Standard*] - Make sense of problems and persevere in solving them. **MA.K-12.CCSS.Math.Practice.MP2** - [*Standard*] - Reason abstractly and quantitatively.	How can a creative development process affect the creation of computational artifacts? How can computing and the use of computational	Students will understand that... ● Creative development can be an essential process for creating computational artifacts. (EU 1.1) ● Computing enables people to use creative development processes to create	● Homework ● Classwork ● Quiz ● Test *Performance Task:* Digital Scene Design -- In this project

Resources: Code.org CSP Unit 3	**MA.K-12.CCSS.Math.Practice.MP3** - [*Standard*] - Construct viable arguments and critique the reasoning of others. **MA.K-12.CCSS.Math.Practice.MP4** - [*Standard*] - Model with mathematics. **MA.K-12.CCSS.Math.Practice.MP5** - [*Standard*] - Use appropriate tools strategically. **MA.K-12.CCSS.Math.Practice.MP6** - [*Standard*] - Attend to precision. **MA.K-12.CCSS.Math.Practice.MP7** - [*Standard*] - Look for and make use of structure. **MA.K-12.CCSS.Math.Practice.MP8** - [*Standard*] - Look for and express regularity in repeated reasoning. **TECH.8.2.12.E.3** - [*Cumulative Progress Indicator*] - Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games). **TECH.8.2.12.E.2** - [*Cumulative Progress Indicator*] - Analyze the relationships between internal and external computer components. **TECH.8.2.12.E.4** - [*Cumulative Progress Indicator*] - Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements). **TECH.8.2.12.E.1** - [*Cumulative Progress Indicator*] - Demonstrate an understanding of the problem-solving capacity of computers in our world. **TECH.8.1.12.C.CS1** - [*Content Statement*] - Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media. **TECH.8.1.12.A.1** - [*Cumulative Progress Indicator*] - Create a personal digital portfolio which reflects	tools foster creative expression? How can computing extend traditional forms of human expression and experience? How are vastly different kinds of data, physical phenomena, and mathematical concepts represented on a computer? How does abstraction help us in writing programs, creating computational artifacts, and solving problems? How can computational models and simulations help generate new understanding and knowledge? How are algorithms implemented and executed on computers and computational devices? Why are some languages better than others when used to implement algorithms?	computational artifacts for creative expression or to solve a problem. (EU 1.2) ● Computing can extend traditional forms of human expression and experience (EU 1.3) ● A variety of abstractions built on binary sequences can be used to represent all data. (EU 2.1) ● Multiple levels of abstraction are used to write programs or create other computational artifacts. (EU 2.2) ● Algorithms are precise sequences for instructions for processes that can be executed by a computer and are implemented using programming languages. (EU 4.1) ● Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society). (EU 5.1) ● Programming is facilitated by appropriate abstractions (EU 5.3) Students will know… ● A creative process in the development of a computational artifact can include, but is not limited to, employing nontraditional,	students work with a small team to create a digital scene with turtle graphics. They plan the scene together, code the parts separately and bring them together to make a whole. An important focus of this project is on how teams of programmers work together, and some insight is given into how real engineering teams do this. Students are asked to reflect on their experience in a way that is similar to the Create performance task. In terms of programming, a heavy emphasis is on writing functions (procedures) that can be easily incorporated into others' code.

	personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources. **TECH.8.1.12.A.3** - [*Cumulative Progress Indicator*] - Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue. **12.9.3.ST-ET.1** - [*Standard Statement*] - Use STEM concepts and processes to solve problems involving design and/or production. **12.9.3.ST-SM.2** - [*Standard Statement*] - Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.	What kinds of problems are easy, what kinds are difficult, and what kinds are impossible to solve algorithmically? How are algorithms evaluated? How are programs developed to help people, organizations, or society solve problems? How are programs used for creative expression, to satisfy personal curiosity, or to create new knowledge? How do computer programs implement algorithms? How does abstraction make the development of computer programs possible? How do people develop and test computer programs? Which mathematical and logical concepts are fundamental to computer programming?	non-prescribed techniques; the use of novel combinations of artifacts, tools, and techniques; and the exploration of personal curiosities. ● Creating computational artifacts employs an iterative and often exploratory process to translate ideas into tangible form. ● A computational artifact is something created by a human using a computer and can be, but is not limited to, a program, an image, audio, video, a presentation, or a Web page file. ● Creating computational artifacts requires understanding of and use of software tools and services. ● A collaboratively created computational artifact reflects effort by more than one person. ● Effective collaborative teams practice interpersonal communication, consensus building, conflict resolution, and negotiation. ● Creating digital effects, images, audio, video, and animations has transformed industries. ● The process of developing an abstraction involves removing detail and generalizing functionality. ● Software is developed using multiple levels of abstractions, such as constants, expressions,	

			statements, procedures, and libraries. ● Sequencing, selection, and iteration are building blocks of algorithms. ● Sequencing is the application of each step of an algorithm in the order in which the statements are given. ● Different algorithms can be developed to solve the same problem. ● Programs are developed and used in a variety of ways by a wide range of people depending on the goals of the programmer. ● Additional desired outcomes may be realized independently of the original purpose of the program. ● A computer program or the results of running a program may be rapidly shared with a large number of users and can have widespread impact of individuals, organizations, and society. ● Collaboration can decrease the size and complexity of tasks required of individual programmers. ● Collaboration in the iterative development of a program requires different skills than developing a program alone. ● Procedures are reusable programming abstractions.	

			● A procedure is a named grouping of programming instructions. ● Parameterization can generalize a specific solution. ● Data abstraction provides a means of separating behavior from implementation. ● Using lists and procedures as abstractions in programming can result in programs that are easier to develop and maintain. Students will be able to... ● Apply a creative development process when creating computational artifacts. (LO 1.1.1) ● Create a computational artifact for creative expression (LO 1.2.1) ● Collaborate in the creation of computational artifacts. (LO 1.2.4) ● Use computing tools and techniques for creative expressions (LO 1.3.1) ● Develop an abstraction when writing a program or creating other computational artifacts. (LO 2.2.1) ● Use multiple levels of abstraction to write programs. (LO 2.2.2)	
Unit 4: Data		How are algorithms implemented and	Students will understand that...	● Homework ● Classwork

Time Interval: 6 weeks Resources: Code.org CSP Unit 4	**MA.K-12.CCSS.Math.Practice.MP1** - [*Standard*] - Make sense of problems and persevere in solving them. **MA.K-12.CCSS.Math.Practice.MP2** - [*Standard*] - Reason abstractly and quantitatively. **MA.K-12.CCSS.Math.Practice.MP3** - [*Standard*] - Construct viable arguments and critique the reasoning of others. **MA.K-12.CCSS.Math.Practice.MP4** - [*Standard*] - Model with mathematics. **MA.K-12.CCSS.Math.Practice.MP5** - [*Standard*] - Use appropriate tools strategically. **MA.K-12.CCSS.Math.Practice.MP6** - [*Standard*] - Attend to precision. **MA.K-12.CCSS.Math.Practice.MP7** - [*Standard*] - Look for and make use of structure. **MA.K-12.CCSS.Math.Practice.MP8** - [*Standard*] - Look for and express regularity in repeated reasoning. **TECH.8.1.12.A.1** - [*Cumulative Progress Indicator*] - Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources. **TECH.8.1.12.A.3** - [*Cumulative Progress Indicator*] - Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue. **TECH.8.1.12.A.5** - [*Cumulative Progress Indicator*] - Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results. **TECH.8.1.12.E.CS4** - [*Content Statement*] - Process data and report results.	executed on computers and computational devices? What kinds of problems are easy, what kinds are difficult, and what kinds are impossible to solve algorithmically? How are programs developed to help people, organizations, or society solve problems? How are programs used for creative expression, to satisfy personal curiosity, or to create new knowledge? How do computer programs implement algorithms? How do people develop and test computer programs? What aspects of the Internet's design and development have helped it scale and flourish? How does computing enable innovation?	● Creative development can be an essential process for creating computational artifacts. (EU 1.1) ● Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem. (EU 1.2) ● A variety of abstractions built on binary sequences can be used to represent all data. (EU 2.1) ● Multiple levels of abstraction are used to write programs or create other computational artifacts. (EU 2.2) ● People use computer programs to process information to gain insight and knowledge (EU 3.1) ● Computing facilitates exploration and the discovery of connections in information. (EU 3.2) ● There are trade-offs when representing information as digital data. (EU 3.3) ● Algorithms are precise sequences for instructions for processes that can be executed by a computer and are implemented using programming languages. (EU 4.1) ● Algorithms can solve many, but not all, computational problems. (EU 4.2) ● Programs can be developed for creative expression, to satisfy	● Quiz ● Test *Performance Task:* Make a Web App -- This unit features a large ongoing project that students will continually build, edit, and revisit during the unit. Students will each create an app of their own design that collects data of some kind about its users. This app is used as a reference point to address many real-world issues that arise with data collection, in both technical and ethical realms. The student's app serves as a constant reminder that anyone can create apps that collect data, even early learners. With that power comes the responsibility of understanding the implications of what you're doing, and insight into what others are doing as well. This last project visits elements of all seven of the Big Ideas of the Framework.

	TECH.8.2.12.E.1 - [*Cumulative Progress Indicator*] - Demonstrate an understanding of the problem-solving capacity of computers in our world. **TECH.8.2.12.E.3** - [*Cumulative Progress Indicator*] - Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games). **TECH.8.2.12.E.4** - [*Cumulative Progress Indicator*] - Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).	How can computation be employed to help people process data and information to gain insight and knowledge? How can computation be employed to facilitate exploration and discovery when working with data? What considerations and trade-offs arise in the computational manipulation of data? What opportunities do large data sets provide for solving problems and creating knowledge? How does abstraction help us in writing programs, creating computational artifacts, and solving problems? How can a creative development process affect the creation of computational artifacts? How can computing and the use of computational tools foster creative expression?	personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society). (EU 5.1) ● People write programs to execute algorithms. (EU 5.2) ● Programming is facilitated by appropriate abstractions (EU 5.3) ● Programs are developed, maintained, and used by people for different purposes. (EU 5.4) ● Programming uses mathematical and logical concepts. (EU 5.5) ● Cybersecurity is an important concern for the Internet and the systems built on it. (EU 6.3) ● Computing has a global effect - both beneficial and harmful - on people and society. (EU 7.3) ● Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used. (EU 7.4) Students will know… ● A creative process in the development of a computational artifact can include, but is not limited to, employing nontraditional, non-prescribed techniques; the use of novel combinations of artifacts, tools, and techniques;	

			and the exploration of personal curiosities. ● A computational artifact is something created by a human using a computer and can be, but is not limited to, a program, an image, audio, video, a presentation, or a Web page file. ● Computing tools and techniques can enhance the process of finding a solution to a problem. ● A collaboratively created computational artifact reflects effort by more than one person. ● Digital data is represented by abstractions at different levels. ● Software is developed using multiple levels of abstractions, such as constraints, expressions, statements, procedures, and libraries. ● Computers are used in an iterative and interactive way when processing digital information to gain insight and knowledge. ● Collaboration is an important part of solving data-driven problems. ● Visualization tools and software can communicate information about data. ● Large data sets provide opportunities and challenges for extracting information and knowledge.	

			● Digital data representations involve trade-offs related to storage, security, and privacy concerns. ● Sequencing, selection, and iteration are building blocks of algorithms. ● Languages for algorithms include natural language, pseudocode, and visual and textual programming languages. ● Determining an algorithm's efficiency is done by reasoning formally or mathematically about the algorithm. ● Programs are developed and used in a variety of ways by a wide range of people depending on the goals of the programmer. ● Algorithms are implemented using program instructions that are processed during program execution. ● Program instructions are executed sequentially. ● Procedures are reusable programming abstractions. ● Program style can affect the determination of program correctness. ● Numbers and numerical concepts are fundamental to programming. ● The trust model of the Internet involves trade-offs. ● Innovations enabled by computing raise legal and ethical concerns.	

			● The innovation and impact of social media and online access varies in different countries and in different socio economic groups. Students will be able to... ● Apply a creative development process when creating computational artifacts. (LO 1.1.1) ● Create a computational artifact for creative expression (LO 1.2.1) ● Create a computational artifact using computing tools and techniques to solve a problem. (LO 1.2.2) ● Collaborate in the creation of computational artifacts. (LO 1.2.4) ● Develop an abstraction when writing a program or creating other computational artifacts. (LO 2.2.1) ● Use multiple levels of abstraction to write programs. (LO 2.2.2) ● Use computers to process information, find patterns, and test hypotheses about digitally processed information to gain insight and knowledge. (LO 3.1.1) ● Collaborate when processing information to gain insight and knowledge. (LO 3.1.2)	

			● Explain the insight and knowledge gained from digitally processed media by using appropriate visualizations, notations, and precise language. (LO 3.1.3) ● Extract information from data to discover and explain connections, patterns, or trends. (LO 3.2.1) ● Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (LO 3.3.1) ● Develop an algorithm for implementation in a program. (LO 4.1.1) ● Express an algorithm in a language. (LO 4.1.2) ● Evaluate algorithms analytically and empirically for efficiency, correctness, and clarity. (LO 4.2.4) ● Develop a program for creative expression, to satisfy personal curiosity, or to create new knowledge. (LO 5.1.1) ● Explain how programs implement algorithms. (LO 5.2.1) ● Use abstraction to manage complexity in programs. (LO 5.3.1) ● Evaluate the correctness of a program. (LO 5.4.1)	

			● Employ appropriate mathematical and logical concepts in programming. (LO 5.5.1) ● Identify existing cybersecurity concerns and potential options to address these issues with the Internet and the systems built on it. (LO 6.3.1) ● Analyze the beneficial and harmful effects of computing. (LO 7.3.1) ● Explain the connections between computing and economic, social, and cultural contexts. (LO 7.4.1)	
Unit 5: Performance Tasks Time Interval: 4 weeks Resources: Code.org CSP Unit 5	**MA.K-12.CCSS.Math.Practice.MP1** - [*Standard*] - Make sense of problems and persevere in solving them. **MA.K-12.CCSS.Math.Practice.MP2** - [*Standard*] - Reason abstractly and quantitatively. **MA.K-12.CCSS.Math.Practice.MP3** - [*Standard*] - Construct viable arguments and critique the reasoning of others. **MA.K-12.CCSS.Math.Practice.MP4** - [*Standard*] - Model with mathematics. **MA.K-12.CCSS.Math.Practice.MP5** - [*Standard*] - Use appropriate tools strategically. **MA.K-12.CCSS.Math.Practice.MP6** - [*Standard*] - Attend to precision. **MA.K-12.CCSS.Math.Practice.MP7** - [*Standard*] - Look for and make use of structure.	How do computer programs implement algorithms? How do people develop and test computer programs? What aspects of the Internet's design and development have helped it scale and flourish? How does computing enable innovation? How can computation be employed to help people process data and	Students will understand that… ● Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem. (EU 1.2) ● Multiple levels of abstraction are used to write programs or create other computational artifacts. (EU 2.2) ● There are trade-offs when representing information as digital data. (EU 3.3) ● Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using	● Homework ● Classwork ● Presentation *Performance Task:* Students will complete the "Create" and "Explore" Performance Tasks, as defined by the College Board.

	MA.K-12.CCSS.Math.Practice.MP8 - [*Standard*] - Look for and express regularity in repeated reasoning. **TECH.8.1.12.A.1** - [*Cumulative Progress Indicator*] - Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources. **TECH.8.1.12.A.3** - [*Cumulative Progress Indicator*] - Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue. **TECH.8.1.12.B.2** - [*Cumulative Progress Indicator*] - Apply previous content knowledge by creating and piloting a digital learning game or tutorial. **TECH.8.1.12.C.1** - [*Cumulative Progress Indicator*] - Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community. **TECH.8.2.12.E.1** - [*Cumulative Progress Indicator*] - Demonstrate an understanding of the problem-solving capacity of computers in our world. **TECH.8.2.12.E.2** - [*Cumulative Progress Indicator*] - Analyze the relationships between internal and external computer components. **TECH.8.2.12.E.3** - [*Cumulative Progress Indicator*] - Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games). **TECH.8.2.12.E.4** - [*Cumulative Progress Indicator*] - Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).	information to gain insight and knowledge? How can computation be employed to facilitate exploration and discovery when working with data? What considerations and trade-offs arise in the computational manipulation of data? What opportunities do large data sets provide for solving problems and creating knowledge? How does abstraction help us in writing programs, creating computational artifacts, and solving problems? How can a creative development process affect the creation of computational artifacts? How can computing and the use of computational tools foster creative expression?	programming languages. (EU 4.1) ● Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society). (EU 5.1) ● People write programs to execute algorithms. (EU 5.2) ● Programming is facilitated by appropriate abstractions (EU 5.3) ● Programs are developed, maintained, and used by people for different purposes. (EU 5.4) ● Programming uses mathematical and logical concepts. (EU 5.5) ● Computing enhances communication, interaction, and cognition. (EU 7.1) ● Computing enables innovation in nearly every field. (EU 7.2) ● Computing has a global effect - both beneficial and harmful - on people and society. (EU 7.3) ● Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used. (EU 7.4) Students will know… ● Creating computational artifacts employs an iterative and often	

	12.9.3.ST-ET.1 - [*Standard Statement*] - Use STEM concepts and processes to solve problems involving design and/or production. **12.9.3.ST-ET.2** - [*Standard Statement*] - Display and communicate STEM information. **12.9.3.ST-ET.3** - [*Standard Statement*] - Apply processes and concepts for the use of technological tools in STEM. **12.9.3.ST-ET.4** - [*Standard Statement*] - Apply the elements of the design process. **12.9.3.ST-ET.5** - [*Standard Statement*] - Apply the knowledge learned in STEM to solve problems.		exploratory process to translate ideas into tangible form. ● A collaboratively created computational artifact reflects effort by more than one person. ● Effective collaborative teams practice interpersonal communication, consensus building, conflict resolution, and negotiation. ● Digital data is represented by abstractions at different levels which, at its lowest level, is represented by bits. ● The process of developing an abstraction involves removing detail and generalizing functionality. ● Large data sets provide opportunities and challenges for extracting information and knowledge. ● Computing tools facilitate the discovery of connections in information within large data sets. ● Digital data representations involve trade-offs related to storage, security, and privacy concerns. ● Data is stored in many formats depending on its characteristics. ● A creative process in the development of a computational artifact can include, but is not limited to, employing nontraditional, non-prescribed techniques; the	

			use of novel combinations of artifacts, tools, and techniques; and the exploration of personal curiosities. ● Creating computational artifacts employs an iterative and often exploratory process to translate ideas into tangible form. ● A computational artifact is something created by a human using a computer and can be, but is not limited to, a program, an image, audio, video, a presentation, or a Web page file. ● Creating computational artifacts requires understanding of and use of software tools and services. ● Software is developed using multiple levels of abstractions, such as constants, expressions, statements, procedures, and libraries. ● Sequencing, selection, and iteration are building blocks of algorithms. ● Sequencing is the application of each step of an algorithm in the order in which the statements are given. ● Different algorithms can be developed to solve the same problem. ● Programs are developed and used in a variety of ways by a wide range of people depending on the goals of the programmer.	

			Students will be able to… ● Create a computational artifact for creative expression. (LO 1.2.1) ● Create a computational artifact using computing tools and techniques to solve a problem. (LO 1.2.2) ● Create a new computational artifact by combining or modifying existing artifacts. (LO 1.2.3) ● Collaborate in the creation of computational artifacts. (LO 1.2.4) ● Analyze the correctness, usability, functionality, and suitability of computational artifacts. (LO 1.2.5) ● Develop an abstraction when writing a program or other computational artifacts. (LO 2.2.1) ● Use multiple levels of abstraction to write programs. (LO 2.2.2) ● Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (LO 3.3.1) ● Develop an algorithm for implementation in a program. (LO 4.1.1) ● Express an algorithm in a language. (LO 4.1.2)	

			● Develop a program for creative expression, to satisfy personal curiosity, or to create new knowledge. (LO 5.1.1) ● Develop a correct program to solve problems. (LO 5.1.2) ● Collaborate to develop a program. (LO 5.1.3) ● Explain how programs implement algorithms. (LO 5.2.1) ● Use abstraction to manage complexity in programs. (LO 5.3.1) ● Evaluate the correctness of a program. (LO 5.4.1) ● Employ appropriate mathematical and logical concepts in programming. (LO 5.5.1) ● Explain how computing innovations affect communication, interaction, and cognition. (LO 7.1.1) ● Explain how computing has impacted innovations in other fields. (LO 7.2.1) ● Analyze the beneficial and harmful effects of computing. (LO 7.3.1) ● Explain the connections between computing and economic, social, and cultural contexts. (LO 7.4.1)	