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Subject	AP Computer Science Principles
Unit	Unit 1: Visualizing the world on the computer
Est. Length	14 lessons (Aug 29 - Sept 24)
Big Idea	Students will explore their creative side while learning to program. As part of this, they will be introduced to two major computer science concepts: Algorithms and Abstraction. Algorithms will be the solutions to solving computing problems while Abstraction will help students reduce the amount of information in their programs in order to focus on their goals. While learning to program students will also learn about what data is and how the Internet functions.
Essential Questions	<ol style="list-style-type: none">How are algorithms implemented and executed on computers?How can computing extend traditional forms of human expression and experience?
Advanced Placement	Enduring Understandings:

Standards (AP) <small>*Power standards in bold</small>	<ul style="list-style-type: none">• EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts.• EU 5.3 Programming is facilitated by appropriate abstractions.• EU 1.2 Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem.• EU 6.1 The internet is a network of autonomous systems
Common Core State Standards (CCSS)	<p>Reading</p> <p>CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> <p>CCSS.ELA-Literacy.RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> <p>CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</p> <p>CCSS.ELA-Literacy.RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</p> <p>CCSS.ELA-Literacy.RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</p> <p>CCSS.ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</p> <p>CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>

	<p>CCSS.ELA-Literacy.RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.</p> <p>Writing</p> <ul style="list-style-type: none">• CCSS.ELA-Literacy.WHST.11-12.1 Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.CCSS.ELA-Literacy.WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.CCSS.ELA-Literacy.WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.CCSS.ELA-Literacy.WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.CCSS.ELA-Literacy.WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.CCSS.ELA-Literacy.WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.CCSS.ELA-Literacy.WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.CCSS.ELA-Literacy.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.CCSS.ELA-Literacy.WHST.11-12.10 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.
Science Practices (SP)	<ol style="list-style-type: none">1. Asking scientific questions & defining engineering problems2. Developing & using models3. Planning & carrying out investigations4. Analyzing & interpreting data5. Using mathematics & computational thinking

	<p>6. Constructing scientific explanations & designing engineering solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information</p>
Assessment Alignment	<p>Minor Assessments</p> <ul style="list-style-type: none"> • Lessons 2-7 Quiz (vocab, blocks) <p>Major Assessment</p> <ul style="list-style-type: none"> • Lessons 2-9 E-card project
Honors Assignments	Not required for AP
20 Key Vocabulary Words	Abstraction, algorithm, blocks, Collaboration, command , Execute, Input, motion, nested operation, Output, reporter, sequential , Snap!, sprite , stage, variable, Internet, router, bits, byte, mega, giga, wireless, ethernet, modem,

Prior knowledge that students have entering this unit
<ul style="list-style-type: none"> • Understanding of the coordinate plane and how values change if we move a point. • Basic understanding of Google Docs • Basic understanding of how Snap is laid out from the Intro class (2 years ago)

Where this knowledge goes next
<ul style="list-style-type: none"> • Building sequential scripts will allow students to continue to use linear thinking when building future programs • Sprite movement is important for future AP projects • Paired programming is a skill that students will use for most of the year, training it now hopefully gives a basis for that • Students will continue to build off of the initial Debugging strategies taught in this unit throughout the year. • Differentiating between when to use command and reporter blocks in their programs. • Knowing what Data and the internet are allows students to develop an understanding of the systems in which information travels around the world.

Descriptive outline narrative of unit

This Unit will give students the basic knowledge of how to navigate in our programming language Snap! Students will begin the year with concrete concepts of sprite movement and shape design that should allow them to get familiar with simple algorithms and abstraction in the form of detail removal. Students will also have an opportunity to “debug” a broken program in order to help develop skills for checking how to fix a program. Students will also have the opportunity to work with simple loops and developing their generalization skills. Also throughout the Unit students will be introduced to data and how it flows through the internet. Students will be introduced to a weekly share out called Computing in the News. These CitN presentations are meant to showcase how involved computers are in our lives as well as prep students for the explore task. These will continue all year long. The Unit culminates in a simple visual ECard project where kids create their own ECard in Snap and then explain the algorithms behind how it functions. This project is a summative assessment of all the work that students will have done this unit.

Day	Lesson #/name	AP	CCSS	Content Objective	Language Objective	Science practice(s)
1	Intro to the course	1.2	WHST. 11-12.4	SWBAT identify the key requirements for creating a computational artifact for creative expression.	(S) explain to a partner the 2-3 requirements for AP CSP Create task and Explore task using the sentence starters: <i>“The three Create task requirements are...”</i> <i>“The two Explore task requirements are...”</i>	SP1: Asking scientific questions & defining engineering problems
2	Gossip	2.2	RST.11 -12.4	SWBAT analyze code and explain how the code works in the context of the program!	(W) Explain in writing with sentence frames what different code scripts do in the context of the gossip program by adding comments to the block. “This block (does, makes, causes,...)	SP5: Using mathematics & computational thinking

3	Gossip and greet	5.3	RST.11 -12.4	SWBAT develop custom blocks to manage the growing complexity of a gossip program.	(S) Defend to a peer with sentence starters the use of their custom block to manage complexity. “My block _____ helps manage the complexity of my program by...”	SP6: Constructing scientific explanations & designing engineering solutions
4	Angles and turning	2.2	RST.11 -12.4	SWBAT develop blocks with inputs to generalize the block functionality.	(W) explain with sentence starters how adding an input to a block generalizes its functionality in a program. “When I added input to _____ block, it became an example of abstraction/generalization because...”	SP6: Constructing scientific explanations & designing engineering solutions
5	What is data?	3.3	RST.11 -12.4	SWBAT explain the difference between data and the tools that collect data.	(S) given a list of data and tools, students will be able to explain to a peer which items are tools and which are data	SP4: Analyzing & interpreting data
6	Our first algorithm	5.2	WHST. 11-12.1	SWBAT explain how programs implement algorithms in snap by developing simple pinwheels.	(W) define algorithm in writing using a sentence starter: “An algorithm is....”	SP2: Developing & using models
7	debugging	5.4	RST.11 -12.3	SWBAT evaluate the accuracy of a program in snap through locating and correcting errors, or debugging the program.	(W) write out a description of an error that was found and how it was corrected using the sentence starters: “The error I had was.... The way I corrected it was...”	SP2: Developing & using models SP3: Planning & carrying out investigations
8	Catch up/extension	5.4	RST.11 -12.3	SWBAT describe how they used the iterative design process to improve or complete previous programs.	(W) write out a description using sentence starters of how they used their time to improve or change a previous program to make it better.	SP1: Asking scientific questions & Defining engineering problems

					"By reviewing my _____ program, I noticed that (it was missing, I could add) _____. Adding this made my program better because..."	
9	E-card intro	1.1	WHST. 11-12.4	SWBAT apply a creative development process involving diagrams and pseudocode to create a plan for their ECard.	(L) listen to the criteria for their ECard assessment and explain it to their partner.	SP1: Asking scientific questions & defining engineering problems
10	Early E-card word	4.1	WHST. 11-12.4	SWBAT develop an algorithm to solve a problem for their ECard.	(S) explain to a partner their algorithms purpose and how it works using the sentence starters: "The purpose of my algorithm is.. The sequence of my algorithm is..."	SP6: Constructing scientific explanations & designing engineering solutions
11	Finishing E-card	2.2	WHST. 11-12.4	SWBAT develop an abstraction in snap for use in their ECard.	(W) explain in writing the purpose of their abstraction in their ECard using a sentence starter: "The purpose of my abstraction is..."	SP6: Constructing scientific explanations & designing engineering solutions
12	What is the internet	6.1	WHST. 11-12.2	SWBAT explain in writing the abstraction in the Internet end to end architecture.	(W) using sentence starters. describe the end-to-end architecture of the internet	SP8: Obtaining, evaluating, and communicating information
13	how does information pass through the internet	6.2	WHST. 11-12.2	SWBAT explain in writing how data is abstracted and transmitted across the Internet.	(W) using a word bank explain how data is transmitted across the internet.	SP8: Obtaining, evaluating, and communicating information

14	E-card write up	5.2	WHST. 11-12.4	SWBAT describe in writing how their ECard implements their algorithms to function.	(W) answer questions about their ECard project using a word bank: (algorithm, abstraction, detail removal, sequence, purpose, pseudocode)	SP8: Obtaining, evaluating, and communicating information
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Subject	AP Computer Science Principles
Unit	Unit 2: Digital Structures
Est. Length	12 lessons (Sept 25 - Oct 26)
Big Idea	Students will begin to add complexity to their algorithms in order to solve more complicated problems, specifically targeted around logic and decisions based off of input. While this is happening students will also have to grow in their use of abstraction in order to maintain focused, concise algorithms and projects. Students will continue to develop their understanding of how Computers are connected through the Internet and the systems used to make that communication reliable.
Essential Questions	<ol style="list-style-type: none"> How do people develop and test computer programs? How does abstraction help us write programs, create computational artifacts, and solve problems?
Advanced Placement Standards (AP) <small>*Power standards in bold</small>	<p>Enduring Understandings:</p> <ul style="list-style-type: none"> EU 1.1 Creative development can be an essential process for creating computational artifacts. EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts. EU 5.3 Programming is facilitated by appropriate abstractions. EU 5.5 Programming uses mathematical and logical concepts. EU 6.2 Characteristics of the Internet influence the systems built on it.
Common Core State Standards (CCSS)	<p>Reading</p> <p>CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> <p>CCSS.ELA-Literacy.RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> <p>CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on</p>

explanations in the text.

CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

CCSS.ELA-Literacy.RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

CCSS.ELA-Literacy.RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

CCSS.ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CCSS.ELA-Literacy.RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing

- CCSS.ELA-Literacy.WHST.11-12.1 Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

CCSS.ELA-Literacy.WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

CCSS.ELA-Literacy.WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-Literacy.WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

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CCSS.ELA-Literacy.WHST.11-12.7 Conduct short as well as more sustained research projects to

	<p>answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>CCSS.ELA-Literacy.WHST.11-12.10 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.</p>
Science Practices (SP)	<ol style="list-style-type: none"> 1. Asking scientific questions & defining engineering problems 2. Developing & using models 3. Planning & carrying out investigations 4. Analyzing & interpreting data 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information
Assessment Alignment	<p>Minor assessments</p> <ul style="list-style-type: none"> • Vocab quiz x2 <p>Major assessments</p> <ul style="list-style-type: none"> • Practice explore task
Honors Assignments	Not applicable in AP
20 Key Vocabulary Words	Logic, predicate, conditional, variables, script variable, global variable, pseudocode, Boolean values, boolean algebra, redundancy, fault tolerant, IP address, DNS, ISP, address hierarchy, HTTP, URL, HTML, Network,

Prior knowledge that students have entering this unit

- Difference between command blocks and reporters
- Understanding of movement and drawing in snap.
- Logic statements (proofs in Geometry)
- The difference between what data is vs the tools that collect it
- The Internet and how data is sent through it

Where this knowledge goes next

- Conditional blocks are the basis for logic in students create task
- Variables have a multitude of uses throughout all of programming and are vital to complex algorithms needed for the create task.
- Knowledge about the structure of the Internet and computer connectivity is on the AP test as well as setting a base for understanding online privacy(Unit 3), cryptography (Unit 4)

Descriptive outline narrative of unit

Students will develop taste for logic statements that will be similar to ones used in their previous math classes. They will combine these programming control structures and sequential programming to build simple and then more complex logic statements in Snap! Students will also be learning how the Internet, much like their programming, is abstracted in order to make an extremely complex system easily usable by anyone one in the world. This unit culminates in a practice create task where students program a Rock, Paper, Scissors game using Create task rubric and questions.

Day	Lesson #/name	AP	CCSS	Content Objective	Language Objective	Science practice(s)
1	Number guessing game	2.2	WHST. 11-12.1	SWBAT create a program that uses conditionals to control the flow of the program..	(W) Explain, using sentence starters, the logic behind their conditional statement and how it controls the flow of the program. “The conditional block I used	SP6: Constructing scientific explanations & designing engineering solutions

					was ____ and it controls the flow of the program by ____ ”	
2	Debugging number guessing game	2.2	WHST. 11-12.1	SWBAT analyze a program and debug the existing code.	(W) using sentence starters, explain the debugging process, the error they found and what they did to correct it. “The debugging process I followed was...” “The error I found was ___, I fixed it by ___”	SP6: Constructing scientific explanations & designing engineering solutions
3	how does information pass through the internet	6.2	WHST. 11-12.2	SWBAT describe in writing how data is abstracted and transmitted across the Internet.	(W) using a word bank explain how data is transmitted across the internet.	SP8: Obtaining, evaluating, and communicating information
4	Keeping score, global vs script variables	5.3	WHST. 11-12.1	SWBAT create conditions to manage the different parts of a game.	(W) Using a word bank, explain how their algorithms work together to keep track of the players score. (global variable, script variable, first, second, third, conditional, predicate)	SP6: Constructing scientific explanations & designing engineering solutions
5	What is a predicate	5.5	WHST. 11-12.2	SWBAT create new types of predicates to expand their use of logic statements.	(W) using a word bank, explain the differences between a predicate, boolean value and boolean expression. (predicate, boolean value, boolean expression, true/false, mod)	SP3: Planning & carrying out investigations
6	Address Hierarchy	6.1	RST.11-12.3	SWBAT describe the different levels of abstraction in a domain name.	(S) describe to a partner with a word bank how the DNS hierarchy works to connect	SP6: Constructing scientific explanations & designing engineering solutions

					computers. (Domain Name system, sub domain, server, URL)	
7	Plurals	5.1	WHST. 11-12.2	SWBAT create an algorithm to convert basic words into their plural forms.	(W) explain their logical thinking on a graphic organizer through the use of pseudocode.	SP1: Asking scientific questions & defining engineering problems
8	Finish plurals, make up/extension	5.2	WHST. 11-12.2	SWBAT iterate their plurals program to deal with more anomalies in their chosen language.	(W) Explain using sentence starters how they used the iterative design process to further develop their plural program. “In order to make sure word that end in ___ were correctly pluralized i needed to ___”	SP6: Constructing scientific explanations & designing engineering solutions
9	IP addresses and reliability	6.2	RST.11-12.2	SWBAT compare the functions of the different protocols that help devices communicate with each other.	(S) Explain to a peer, with a word bank, the functions of the four main protocols of the internet. (HTTP, DNS, TCP, IP)	SP8: Obtaining, evaluating, and communicating information
10	Practice task create	4.1	WHST. 11-12.2	SWBAT develop an initial algorithms for user and computer input in an Rock Paper Scissors (RPS) game.	(W) using a graphic organizer draw their first algorithm on paper.	SP6: Constructing scientific explanations & designing engineering solutions
11	Practice task create	5.5	WHST. 11-12.2	SWBAT create logic arguments for RPS win conditions in their RPS game.	(S) using sentence starters orally describe the logic statements needed for RPS to a peer.	SP5: Using mathematics & computational thinking
12	Practice task create	5.3	WHST. 11-12.2	SWBAT develop abstractions to manage the complexity of their RPS program.	(S) using sentence starters defend their abstractions in their own words to a partner. “I abstracted ____ because by doing so it helped manage the complexity of my program in ____ way.”	SP5: Using mathematics & computational thinking

13	Practice task create	5.4 .1L	WHST. 11-12.1 0	SWBAT describe in writing their design process for their RPS game.	(W) using sentence starters defend their design process and product in writing.	SP8: Obtaining, evaluating, and communicating information
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Subject	AP Computer Science Principles
Unit	Unit 3: Lists and the Create task
Est. Length	26 Lessons (Oct 30 - Dec 14)
Big Idea	Students will use algorithms to manipulate, create and remove data within lists in order to create something new or view information in different way. This unit will culminate with students taking what they have learned about programming, algorithms, abstraction and data and applying it on the Create Performance Task.
Essential Questions	<ol style="list-style-type: none"> 1. What considerations and trade-offs arise in the computational manipulation of data? 2. How are vastly different kinds of data, physical phenomena, and mathematical concepts represented on a computer?
Advanced Placement Standards (AP) <small>*Power standards in bold</small>	<p>Essential Understandings:</p> <ul style="list-style-type: none"> • EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts. • EU 5.1 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 5.2 People write programs to execute algorithms.
Common Core State Standards (CCSS)	<p>Reading</p> <p>CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> <p>CCSS.ELA-Literacy.RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> <p>CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other</p>

domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

CCSS.ELA-Literacy.RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

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CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CCSS.ELA-Literacy.RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing

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	<p>when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>CCSS.ELA-Literacy.WHST.11-12.10 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.</p>
Science Practices (SP)	<ol style="list-style-type: none">1. Asking scientific questions & defining engineering problems2. Developing & using models3. Planning & carrying out investigations4. Analyzing & interpreting data5. Using mathematics & computational thinking6. Constructing scientific explanations & designing engineering solutions7. Engaging in argument from evidence8. Obtaining, evaluating, and communicating information
Assessment Alignment	<p>Minor assessment</p> <ul style="list-style-type: none">• List quiz• Vocab quiz• Create task rubric quiz <p>Major assessment</p> <ul style="list-style-type: none">• Create task (Performance Task)
Honors Assignments	Not required for AP courses
20 Key Vocabulary Words	Lists, traversal, data, abstraction, algorithms, for each block, list manipulation (add, delete, replace, insert,) List reporter blocks (contains, keep, item _ of)

Prior knowledge that students have entering this unit

- Students should be comfortable creating conditional statements using predicates to control the flow of a program.
- Students will have had a lot of practice debugging both with and without teacher and or peer support
- Students will be able to create simple logical/mathematical algorithms to solve problems
- Students should be comfortable using the following blocks in snap
 - Conditional blocks
 - Predicate blocks
 - Boolean operations
 - Reporter blocks
 - Familiarity with the list block

Where this knowledge goes next

- Allows students to organize data for their create task
- AP test
- Debugging practice for future programs
- Abstract data types are used everywhere, giving students a better understanding of how they are being used.

Descriptive outline narrative of unit

This unit is about the manipulation of data in lists and the organization of lists. Students have already done some simple list operations, this unit will be more about the information in the lists. Students will be introduced to list manipulation through 2 simple programs, shopping list and sentence creation. Next students compare and contrast primitive vs abstract data types and where they are used in programming. Students will then synthesize these three lessons into a more complicated Contact List app that they will build from scratch with guidance. The contact list app will take about 3 days since it is more complicated and some of the ideas students will struggle with. Don't be afraid to have a cellphone handy to use the contact list in there as an example. The next 5 weeks will be students working on their create task. Throughout the unit students will continue to work once a week on continuing to understand how the structures of the internet work. This then leads into digital privacy, its importance and how info

about students is being used by others. Finally before the end of the semester, students will spend about 1 week working on a practice explore task. This should be just an expansion on the Computing in the News work kids have been doing all year long.

Day	Lesson #/name	AP	CCSS	Content Objective	Language Objective	Science practice(s)
1	Shopping list U3L1 (old)	3.1	WHST. 11-12.4	SWBAT manipulate information in a Snap list and process the output to gain insight on their shopping habits.	(S) use sentence starters to explain to a partner how items in a list can be manipulated <i>"Items in a list can be manipulated by..."</i> <i>"(insert block) changes the list by...."</i>	SP2: Developing & using models
2	Sentence Builder U3L2 (old)	2.2	WHST. 11-12.4	SWBAT develop multiple levels of abstraction in Snap to create grammatically correct sentences.	(W) use sentence starters and a word bank to explain in writing how information is accessed and combined between multiple lists	SP6: Constructing scientific explanations & designing engineering solutions
3	Censorship U4L4	7.1	RST.11-12.7	SWBAT Explain their own views on censorship.	(S) using sentence starters defend their views of censorship online and around the world	SP8: Obtaining, evaluating, and communicating information
4	Processing items in a list U2L2	4.1	WHST. 11-12.4	SWBAT develop an algorithm that searches through a sorted list in an efficient manner.	(W) Justify using three pieces of evidence why binary searching is an effective way to search through lists using sentence starters.	SP8: Obtaining, evaluating, and communicating information
5	Abstract data type	5.1	RST.11-12.2	SWBAT develop a program to draw a picture using abstract data types.	(W) explain using sentence starters the importance of Abstract data types in programming. <i>"The importance of ADT in</i>	SP5: Using mathematics & computational thinking

					<i>programming is...</i>	
6	Contact list U3L1	3.1	WHST. 11-12.2	SWBAT create a basic contact list app in snap to process abstract data.	(S) describe to a partner how to manipulate abstract data in a list using a word bank.	SP8: Obtaining, evaluating, and communicating information
7	Create task intro	7.1	WHST. 11-12.9	SWBAT evaluate exemplar Create Tasks using the CT rubric.	(S) justify to a peer, using the CT rubric, scores given on exemplar Create Tasks	SP7: Engaging in argument from evidence
8	Create task brainstorm	5.1	RST.11-12.2	SWBAT using a graphic organizer develop a program idea for the Create Task.	(W) defend to a peer using their graphic organizer the three algorithms in their CT program.	SP5: Using mathematics & computational thinking
9	Create Task (1)	1.1	RST.11-12.2	SWBAT apply the iterative design process to plan out their create task program.	(W) build a checklist for the create task based on the criteria on the handout.and a vocab bank.	SP8: Obtaining, evaluating, and communicating information
10	Digital privacy reflection	7.1	RST.11-12.7	SWBAT describe the impact of their digital footprints on their lives.	(W) outline a pros and cons list about their digital footprints to reflect on the impact it has on their lives.	SP8: Obtaining, evaluating, and communicating information
11	Create Task(2)	4.1	WHST. 11-12.7	SWBAT apply pseudocode to develop their first Create Task algorithm.	(W) identify items on their checklist that are associated with their first algorithm.	SP1: Asking scientific questions & defining engineering problems
12	Create Task(3)	4.1	WHST. 11-12.7	SWBAT complete their first algorithm and begin developing their second Create Task algorithm.	(W) create a list of needs for their second algorithm that are tied to the project criteria	SP6: Constructing scientific explanations & designing engineering solutions
13	Create Task(4)	4.1	WHST. 11-12.7	SWBAT finish creating their second Create Task algorithm.	(R) use their pseudocode to help complete their second algorithm in snap!	SP6: Constructing scientific explanations & designing engineering solutions
14	Create	2.2	WHST.	SWBAT synthesize the first two	(W) evaluate their pseudocode	SP7: Engaging in argument from

	Task(5)		11-12.5	created algorithms to begin developing their third Create Task algorithm,	to make sure their program is on the right track using their checklist and their initial algorithm plan.	evidence
15	Create Task(6)	5.3	WHST. 11-12.4	SWBAT continue developing their third algorithm and adding abstraction to their Create Task program.	(R) use their pseudocode to help create their third algorithm in snap!	SP6: Constructing scientific explanations & designing engineering solutions
16	Why your privacy is important	7.3	RST.11-12.7	SWBAT explain the complexity of privacy surrounding digital data.	(W) describe in writing the benefits and drawbacks of digital privacy in the 21 century	SP7: Engaging in argument from evidence
17	Create Task(7)	2.2	WHST. 11-12.7	SWBAT finish creating their third algorithm to complete the Create Task programming.	(R) utilize their pseudocode to help complete their third algorithm in snap!	SP6: Constructing scientific explanations & designing engineering solutions
18	Create Task(8)	5.2	WHST. 11-12.5	SWBAT explain in writing how the algorithms of their Create Task program function together.	(W) type first drafts of answers 2c and 2d from the Create task in a google doc.	SP7: Engaging in argument from evidence
19	Create Task(9)	5.3	WHST. 11-12.7	SWBAT explain in writing how their abstraction helps control the complexity of their Create Task program.	(W) describe in writing why they are using abstraction in their program.	SP8: Obtaining, evaluating, and communicating information
20	Innovations and privacy	7.3	RST.11-12.7	SWBAT explain how privacy and security concerns arise with the use of computational systems.	(S) using a word bank explain to a peer how computers affect your personal privacy	SP8: Obtaining, evaluating, and communicating information
21	Create Task(10)	5.2	WHST. 11-12.5	SWBAT explain their Create Task programs purpose and function on questions 2A and 2B of the performance task.	(W) write their Create task answers utilizing collected data from their daily journals as evidence.	SP7: Engaging in argument from evidence
22	Create Task(11)	5.2	WHST. 11-12.5	SWBAT explain how their Create Task programs implement algorithms on	(W) write their Create task answers utilizing collected data	SP7: Engaging in argument from evidence

				questions 2C and 2D of the performance task.	from their daily journals as evidence.	
23	Create Task(12)	1.2	WHST. 11-12.4	SWBAT create using Screencastify a video of their working Create Task program.	(S) create a video of their program working and describe how it works orally using their notes as a guide.	SP7: Engaging in argument from evidence
24	Upload task, comp artifact practice	1.2	WHST. 11-12.4	SWBAT plan how to create a practice computational artifact about self driving cars.	(S) describe, using the ET rubric, the key features of a computational artifact orally to a partner.	SP1: Asking scientific questions & defining engineering problems
25	Explore task inro	7.1	WHST. 11-12.9	SWBAT evaluate exemplar Explore Tasks using the ET rubric.	(S) justify to a peer, using the ET rubric, scores given on exemplar Explore Tasks	SP7: Engaging in argument from evidence
26	Practice task	7.3	WHST. 11-12.9	SWBAT analyze the beneficial and harmful effects of self driving cars societally, economically, or culturally.	(W) explain in writing with sentence starters one beneficial and one harmful effect of self driving cars.	SP7: Engaging in argument from evidence
27	Practice task	1.2	WHST. 11-12.7	SWBAT begin creating their practice computational artifact about self driving cars.	(W) explain the purpose and functionality of self driving cars in a computational artifact.	SP6: Constructing scientific explanations & designing engineering solutions
28	Practice task	1.2	WHST. 11-12.7	SWBAT complete their computational artifact on self driving cars.	(W) complete self driving cars purpose and functionality computational artifact.	SP6: Constructing scientific explanations & designing engineering solutions
29	Practice task	3.3	WHST. 11-12.7	SWBAT explain how data representation, storage, security and transmission are used in self driving cars.	(W) using the explore task handout and sentence starters answer in writing question 2b.	SP7: Engaging in argument from evidence

Subject	AP Computer Science Principles
Unit	Unit 4: The Explore Task
Est. Length	12 lessons (Jan 24 - Feb 14)
Big Idea	Students will gain insight into how computational innovations are changing the way that the world works. They will do this through researching articles, creating a computational artifact and explaining the computational innovation beneficial and harmful effects, as well as the data that it collects.
Essential Questions	<ol style="list-style-type: none">1. How are computing innovations affecting the world around us?2. How does technology collect and use data?
Advanced Placement Standards (AP) <small>*Power standards in bold</small>	Enduring Understandings: <ul style="list-style-type: none">• EU 3.1 People use computer programs to process information to gain insight and knowledge.• EU 3.2 Computing facilitates exploration and the discovery of connections in information.
Common Core State Standards (CCSS)	Reading <ul style="list-style-type: none">CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.CCSS.ELA-Literacy.RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

- CCSS.ELA-Literacy.RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
- CCSS.ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- CCSS.ELA-Literacy.RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
- Writing**
- CCSS.ELA-Literacy.WHST.11-12.1 Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
 - CCSS.ELA-Literacy.WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
 - CCSS.ELA-Literacy.WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
 - CCSS.ELA-Literacy.WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
 - CCSS.ELA-Literacy.WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
 - CCSS.ELA-Literacy.WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
 - CCSS.ELA-Literacy.WHST.11-12.8 Gather relevant information from multiple authoritative print and

	<p>digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and over reliance on any one source and following a standard format for citation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>CCSS.ELA-Literacy.WHST.11-12.10 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.</p>
Science Practices (SP)	<ol style="list-style-type: none"> 1. Asking scientific questions & defining engineering problems 2. Developing & using models 3. Planning & carrying out investigations 4. Analyzing & interpreting data 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information
Assessment Alignment	<p>Minor assessments</p> <ul style="list-style-type: none"> • none <p>Major assessments</p> <ul style="list-style-type: none"> • Explore task
Honors Assignments	Not required for AP courses
20 Key Vocabulary Words	Data, computational innovation, computational artifact, data storage, data privacy, data security,

Prior knowledge that students have entering this unit

- Practice having done a Computing in the News project
- What is a computational innovation

- Familiarity with the types of questions that will be on the explore task.

Where this knowledge goes next

This Unit is designed for the explore task itself. The knowledge and skills developed in this project are useful for understanding new technology that is developed for the rest of a students life. Also the explore task is 16% of their AP grade.

Descriptive outline narrative of unit

Students will start by reflecting on their practice explore task feedback as provided by the teacher. Students will then work on their explore tasks for the rest of the unit. They will be able to and should use the feedback provided on their practice explore task to help them answer questions correctly on their explore task. The teacher should help monitor kids time and make sure they are completing the project in the class. There is one reteach day built into the middle, I am choosing data as the reteach since that is the hardest question for students to answer and we will have not gone over it in a while.

Day	Lesson #/name	AP	CCSS	Content Objective	Language Objective	Science practice(s)
1	Practice explore task reflection	7.3	RST.1 1-12.8	SWBAT reflect on PET feedback and make plans for how to improve on the Explore Task.	(S) evaluate a partner's practice explore tasks using a rubric	SP8: Obtaining, evaluating, and communicating information
2	Explore task	7.5	WHST .11-12. 8	SWBAT access and manage articles about their Explore Task topic.	(W) cite in a google doc graphic organizer using APA format 3 articles that can justify the validity of the choice of an explore task topic	SP3: Planning & carrying out investigations
3	Explore task	7.3	RST.1 1-12.7	SWBAT Describe the beneficial and harmful effects of their Explore Task topic.	(W) explain in writing a beneficial and harmful effect on humans (?) of their Explore task	SP7: Engaging in argument from evidence

					topic.	
4	Explore task	3.3	WHST .11-12. 7	SWBAT Describe how data representation, storage, security and transmission are used in their Explore Task topic.	(W) using the explore task handout and sentence starters answer in writing question 2d.	SP7: Engaging in argument from evidence
5	Reteach data	3.3	RST.1 1-12.8	SWBAT examine tools and describe the data that the tools collect.	(S) using the Explore task rubric describe the data that tools collect to a peer.	SP8: Obtaining, evaluating, and communicating information
6	Explore task	1.1	WHST .11-12. 7	SWBAT apply a creative development process when creating an Explore Task computational artifact using the medium of their choice.	(W) identify and list items required for the computational artifact	SP1: Asking scientific questions & defining engineering problems
7	Explore task	1.2	RST.1 1-12.9	SWBAT continue developing their Explore Task computational artifact using the medium of their choice.	(R) Identify images that demonstrate the purpose, function or effect of their Innovation	SP6: Constructing scientific explanations & designing engineering solutions
8	Explore task	1.2	RST.1 1-12.9	SWBAT complete their Explore Task computational artifact in the medium of their choice.	(R) Describe in words how their images demonstrate the purpose function or effect of their innovation	SP6: Constructing scientific explanations & designing engineering solutions
9	Explore task	7.1	WHST .11-12. 8	SWBAT explain how their Explore Task computing innovation affects the world around them.	(W) using the explore task handout answer in writing question 2a	SP7: Engaging in argument from evidence
9	Explore task	7.4	WHST .11-12. 8	SWBAT describe their creative development process and the medium they used to create their Explore Task computational artifact	(W) using the explore task handout answer in writing question 2b	SP6: Constructing scientific explanations & designing engineering solutions
11	Upload task	7.5	RST.1 1-12.3	SWBAT upload all parts of their Explore Task to the AP portfolio website.	SWBAT use a checklist to make sure they have uploaded all parts of their explore task.	SP8: Obtaining, evaluating, and communicating information

Subject	AP Computer Science Principles
Unit	Unit 5: Conversions and privacy
Est. Length	11 lessons (Feb 25 - March 29)
Big Idea	Students will continue to grow their understanding of the Internet through an analysis of important concerns: digital privacy and cybersecurity. They will also see how computing has had a global impact through the creation of new fields of study and changes in business models. Programming wise, students will develop algorithms for effective searching through lists of information.
Essential Questions	<ol style="list-style-type: none">1. How is cybersecurity impacting the ever-increasing number of internet users?2. How does computing enable innovation?
Advanced Placement Standards (AP) <small>*Power standards in bold</small>	Enduring Understandings: <ul style="list-style-type: none">• EU 2.1 A variety of abstractions built on binary sequences can be used to represent all digital data.• EU 6.3 Cybersecurity is an important concern for the Internet and the systems built on it.• EU 3.2 Computing facilitates exploration and the discovery of connections in information.• EU 3.3 There are trade-offs when representing information as digital data.• EU 4.2 Algorithms can solve many but not all computational problems.• EU 5.2 People write programs to execute algorithms.
Common Core State Standards (CCSS)	Reading CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. CCSS.ELA-Literacy.RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on

- explanations in the text.
- CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- CCSS.ELA-Literacy.RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
- CCSS.ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- CCSS.ELA-Literacy.RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
- Writing**
- CCSS.ELA-Literacy.WHST.11-12.1 Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
 - CCSS.ELA-Literacy.WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
 - CCSS.ELA-Literacy.WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
 - CCSS.ELA-Literacy.WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
 - CCSS.ELA-Literacy.WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

	<p>CCSS.ELA-Literacy.WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>CCSS.ELA-Literacy.WHST.11-12.10 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.</p>
Science Practices (SP)	<ol style="list-style-type: none"> 1. Asking scientific questions & defining engineering problems 2. Developing & using models 3. Planning & carrying out investigations 4. Analyzing & interpreting data 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information
Assessment Alignment	<p>Minor assessment</p> <ul style="list-style-type: none"> • Conversions quiz • Vocab quiz <p>Major Assessment</p> <ul style="list-style-type: none"> • Unit 5 test
Honors Assignments	Not required for AP courses
20 Key Vocabulary Words	Binary, decimal, hexadecimal, encryption, cryptography, public key encryption, digital privacy, cookies, cyber security, DDOS attacks, “hacking”, place value, conversion, binary search, bubble sort, quick sort

Prior knowledge that students have entering this unit

- How information is sent through the internet
- What are routers and what is their role
- ISP (internet service providers)
- Basic arithmetic skills
- Having bought something online
- Familiarity with lists

Where this knowledge goes next

- In the next unit students will be talking about copyright issues and having some background knowledge in personal digital privacy will give them context for creating their own opinions about digital copyrights. Also, this material will be on the AP exam.

Descriptive outline narrative of unit

This unit will be the first to be primarily non-programming. There are a few days where kids will be writing search algorithms but for the most part it will be non-programming. (recognize that this will be a big shift in class culture and will require discussions around how to participate) There will be some hands on topics, conversions, where students will be relying upon their skills in arithmetic to change numbers between bases. Next, we will talk about encryption and how it was used in the past and how it is being employed today online. Finally we will focus more on the students online presence taking looks at their digital privacy, security and ways to protect themselves. This unit's goal is to cover a bunch of topics that are needed for the AP test but had not be covered before.

Day	Lesson #/name	AP	CCSS	Content Objective	Language Objective	Science practice(s)
1	U6L3	2.2	RST.11-12.3	SWBAT explain how binary sequences are used to represent digital data.	(S) using a word bank explain to a partner how Bits are used to store information digitally.	SP5: Using mathematics & computational thinking

1	Binary conversions U6L3	2.1	RST.11-12.3	SWBAT abstract bits by converting info between binary and decimal notation.	(W) using a graphic organizer, convert between binary and decimal notation.	SP5: Using mathematics & computational thinking
2	Hex conversions U6L3	2.1	RST.11-12.3	SWBAT abstract bits by converting info between hexadecimal and decimal notation.	(W) using a graphic organizer, convert between hexadecimal and decimal notation.	SP5: Using mathematics & computational thinking
3	Binary to hex conversions	2.1	RST.11-12.3	SWBAT abstract bits by converting info between hexadecimal and binary notation.	(W) using a graphic organizer, convert between hexadecimal and binary notation.	SP5: Using mathematics & computational thinking
3.5	Online profiles	3.3	WHST. 11-12.2	SWBAT analyze the beneficial and harmful effects of having an online profile.	(W) using sentence starters describe a harmful and beneficial effect to their personal privacy online.	SP8: Obtaining, evaluating, and communicating information
4	U4L3	6.3	WHST. 11-12.4	SWBAT describe in writing how caesar and substitution ciphers work.	(W) describe in writing how substitution ciphers work using a work bank.	SP1: Asking scientific questions & defining engineering problems
5	U4L3	6.3.	RST.11-12.3	SWBAT describe public key encryption as a CS method and how they work	(S) describe orally with a graphic organizer how public key encryption works.	SP1: Asking scientific questions & defining engineering problems
6	Cyber security	6.3	WHST. 11-12.4	SWBAT identify the different types of cybercrime that are out there.	(W) using a word bank, correctly explain the 4 main types of cybercrime (DDoS, phishing, viruses and malware)	SP8: Obtaining, evaluating, and communicating information
6.5	Military tech	7.2		SWBAT explain the role the military plays in tech development.	(S) discuss the pros and cons of the Military developing new tech with their peers	SP8: Obtaining, evaluating, and communicating information

7	Search ing sorted list	5.2		SWBAT create and implement an algorithm to reliably guess a number.	(W) using sentence starters, describe the design process around creating their algorithm	SP1: Asking scientific questions & defining engineering problems
8	SSL day 2	4.2		SWBAT describe the steps for an algorithm to search unsorted lists	(W) using sentence starters, describe the design process around updating their algorithm to search unsorted lists	SP1: Asking scientific questions & defining engineering problems
9	List proces sing algorith ms	4.2	RST.11-12.6	SWBAT develop an algorithm for checking if elements in a list are distinct items.	(W) using sentence starters explain their algorithm for checking all elements of a list.	SP1: Asking scientific questions & defining engineering problems
9.5	Computing in war	7.3	WHST. 11-12.2	SWBAT evaluate the need for computing in 21st century wars.	(S) with sentence starters defend the use of computer warfare to a peer.	SP8: Obtaining, evaluating, and communicating information
10			RST.11-12.9	SWBAT review material from unit 5 by answering practice questions and talking with their peers.	(S): review for the Unit 5 test using practice questions and small group discussions with peers.	
11				SWBAT demonstrate their knowledge or Unit 5 material on the test.		
12			RST.11-12.9	SWBAT review conversions using notes and peers in preparation for BA3.	(W): complete conversions problems using an algorithm in writing	
13			RST.11-12.9	SWBAT review digital privacy and the digital divide using notes and peers in preparation for BA3.	(S): answer questions orally about digital privacy and the digital divide.	

Subject	AP Computer Science Principles
Unit	Unit 6: Preparing for the AP exam
Est. Length	16 lessons (April 1 - May 10) (whatever day the AP exam is that week in may)
Big Idea	Effective review for the AP CSP exam includes being exposed to many different types of MC questions that range from all the units we have covered and even some material that we haven't. Students will have the opportunity to quiz each other, use note cards, and other various review methods to prepare themselves.
Essential Questions	<ol style="list-style-type: none">1. What is the internet? How is it built? How does it function?2. How does abstraction help us in writing programs, creating computational artifacts, and solving problems?3. How are algorithms implemented and executed on computers?4. How is data used and what info can be extracted by visualizing it?
Advanced Placement Standards (AP) <small>*Power standards in bold</small>	Enduring Understandings: <ul style="list-style-type: none">• EU 2.3 Models and simulations use abstraction to generate new understanding and knowledge.• EU 4.2 Algorithms can solve many but not all computational problems.
Common Core State Standards (CCSS)	Reading CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. CCSS.ELA-Literacy.RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other

	<p>domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</p> <p>CCSS.ELA-Literacy.RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</p> <p>CCSS.ELA-Literacy.RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</p> <p>CCSS.ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</p> <p>CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>CCSS.ELA-Literacy.RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.</p> <p>Writing</p> <ul style="list-style-type: none">• CCSS.ELA-Literacy.WHST.11-12.1 Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. CCSS.ELA-Literacy.WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. CCSS.ELA-Literacy.WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. CCSS.ELA-Literacy.WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. CCSS.ELA-Literacy.WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. CCSS.ELA-Literacy.WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry
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	<p>when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>CCSS.ELA-Literacy.WHST.11-12.10 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.</p>
Science Practices (SP)	<ol style="list-style-type: none">1. Asking scientific questions & defining engineering problems2. Developing & using models3. Planning & carrying out investigations4. Analyzing & interpreting data5. Using mathematics & computational thinking6. Constructing scientific explanations & designing engineering solutions7. Engaging in argument from evidence8. Obtaining, evaluating, and communicating information
Assessment Alignment	<p>Exams</p> <ul style="list-style-type: none">• AP exam <p>Major assessments</p> <ul style="list-style-type: none">• AP practice test <p>Minor assessments</p> <ul style="list-style-type: none">• Data quiz
Honors Assignments	Not required for AP courses
20 Key Vocabulary Words	Data, metadata, visualizations, compression, lossy compression, lossless compression,

Prior knowledge that students have entering this unit

- Algorithms
- Abstractions
- Predicates
- Conditionals
- Boolean algebra
- Logic statements
- Lists
- The internet
- Digital privacy
- Converting between bases (2, 10, 16)
- Encryption
- The digital divide
- Cyber attacks and security

Where this knowledge goes next

Students will be able to apply the review used in this unit for their BA4 exam as well as when they build their recursive projects in the next unit. Also data, metadata, compression, and unsolvable problems will all be talked about on the AP exam.

Descriptive outline narrative of unit

The goal of this unit is to explore data, metadata and how visualizing it in different ways allows us to discover new connections and trends. This is an interesting topic as it is one of the biggest ways that data is used in jobs. Getting students to see that and connect with that concept is huge here. Following 2 weeks on data we will spend 2 weeks prepping for the AP exam. This is a time to cover complex topics from earlier in the year as well as to give kids a chance to look at a practice test.

Day	Lesson #/name	AP	CCSS	Content Objective	Language Objective	Science practice(s)
1	Big data	3.2	RST.11-12.4	SWBAT analyze global health data to explain connections or trends for humanity.	(W) using sentence starters describe a trend in global health data.	SP8: Obtaining, evaluating, and communicating information
2	What is metadata	3.2	WHST.11-12.1	SWBAT explain what metadata is and how metadata can be used to explore trends.	(S) use a word bank to explain to partner what Metadata is.	SP8: Obtaining, evaluating, and communicating information
3	Data vs metadata	3.1	WHST.11-12.1	SWBAT analyze the difference between data and metadata.	(W) using a graphic organizer identify key information in AP data and metadata questions.	SP8: Obtaining, evaluating, and communicating information
3.5	copyright	7.2	RST.11-12.4	SWBAT evaluate how the protection of ideas might limit as well as promote creativity.	(S) using sentence starters, explain to a peer how protecting ideas is both a positive and a negative.	SP8: Obtaining, evaluating, and communicating information
4	Lossy vs Lossless compression	2.1	WHST.11-12.8	SWBAT explain the difference between lossy and lossless data compression.	(W) using sentence starters explain how lossy and lossless compression works.	SP5: Using mathematics & computational thinking
5	Unsolvable problems	4.2	WHST.11-12.10	SWBAT explain what proof by contradiction means in writing	(W) using sentence starters, explain how proof by contradiction allow them to solve certain problems.	SP5: Using mathematics & computational thinking
6	Comparing algorithms	4.2	WHST.11-12.8	SWBAT compare the efficiency of two or more different, correct, algorithms	(W) using sentence starters, explain how two algorithms can both be correct but one can be better.	SP8: Obtaining, evaluating, and communicating information
7			WHST.11-12.2	SWBAT evaluate text based programming test questions	(S) using a word bank explain how to break down a text based programming test question to a	SP5: Using mathematics & computational thinking

				peer.	
8		RST.11-12.2	SWBAT explain the purpose and function of a segment of code.	(W) using a sentence frame explain to a partner the purpose of a script.	SP5: Using mathematics & computational thinking
9		RST.11-12.5	SWBAT review AP content through review games!.	(S) using a reference sheet, solve AP questions while working with a partner.	
10		TBD	SWBAT review AP questions using Albert.io	(R) review list and motion questions for the AP exam using the reference guide.	
11		TBD	SWBAT begin taking AP practice exam.	(W) begin taking the AP practice exam using reference sheet..	
12		TBD	SWBAT complete AP Practice exam	(W) finish taking the AP practice exam using reference sheet	
13		TBD	SWBAT review answers to AP practice exam.	(W) using a graphic organizer review answers to AP practice exam.	
14		TBD	SWBAT develop questions about specific content, based on the AP practice test responses.	(W) using a reference sheet write out content questions they have based on the AP practice test	

Subject	AP Computer Science Principles
Unit	Unit 7: Fractals and recursion
Est. Length	16 lessons (May 10 - June 8)
Big Idea	Students will be returning to programming and adding in another level of complexity to their algorithms, recursion. Armed with new programming skills students will be able to apply their new algorithms to data sets to help create new knowledge.
Essential Questions	<ol style="list-style-type: none">How can computation be employed to facilitate exploration and discovery when working with data?How are programs used for creative expression, to satisfy personal curiosity, or to create new knowledge?
Advanced Placement Standards (AP) <small>*Power standards in bold</small>	Essential Understandings: <ul style="list-style-type: none">EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts.EU 5.3 Programming is facilitated by appropriate abstractions.EU 3.2 Computing facilitates exploration and the discovery of connections in information.
Common Core State Standards (CCSS)	Reading CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. CCSS.ELA-Literacy.RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

- CCSS.ELA-Literacy.RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
- CCSS.ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- CCSS.ELA-Literacy.RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
- Writing**
- CCSS.ELA-Literacy.WHST.11-12.1 Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
 - CCSS.ELA-Literacy.WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
 - CCSS.ELA-Literacy.WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
 - CCSS.ELA-Literacy.WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
 - CCSS.ELA-Literacy.WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
 - CCSS.ELA-Literacy.WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
 - CCSS.ELA-Literacy.WHST.11-12.8 Gather relevant information from multiple authoritative print and

	<p>digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>CCSS.ELA-Literacy.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>CCSS.ELA-Literacy.WHST.11-12.10 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.</p>
Science Practices (SP)	<ol style="list-style-type: none"> 1. Asking scientific questions & defining engineering problems 2. Developing & using models 3. Planning & carrying out investigations 4. Analyzing & interpreting data 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information
Assessment Alignment	<p>Minor assessment</p> <ul style="list-style-type: none"> • Vocab quiz <p>Major Assessment</p> <ul style="list-style-type: none"> • Recursion project
Honors Assignments	Not required for AP courses
20 Key Vocabulary Words	Recursion, fractals, algorithms, abstraction, logic, base case, recursive case

Prior knowledge that students have entering this unit

- Using abstraction to remove detail and generalize procedures
- Creating complex algorithms that utilize outputs from other algorithms as their input

- Creating logic statements using conditionals and predicates

Where this knowledge goes next

- This knowledge gets directly applied during the students AP create task at the end of the unit.
- Students will be able to analyze programs for efficiency by the end of this unit rather than just for functionality.

Descriptive outline narrative of unit

Students have completed the AP exam at this point and the goal of this unit is to continue to apply what students have learned throughout the year to tackle the more complex topic of recursion (which is not on the AP test). We will also take the time in this unit to cover other computer science topics that students have questions about (will be solicited from them at the beginning of the unit.)

Day	Lesson #/name	AP	CCSS	Content Objective	Language Objective	Science practice(s)
1	1		WHST. 11-12.9	SWBAT reflect in writing on the AP CSP class.	(W) answer questions on a survey in order to provide feedback on the class.	SP4: Analyzing & interpreting data
2	U7L1	5.3.1A	WHST. 11-12.2	SWBAT describe in writing the importance of a Base Case in recursive programming.	(W) using a word bank write a description of what a Base Case is in recursive programming	SP8: Obtaining, evaluating, and communicating information
3	3	3.2.2 D	WHST. 11-12.8	SWBAT explain in writing how personal data is used by corporations.	(W) answer questions about their digital selves after watching a movie.	SP8: Obtaining, evaluating, and communicating information
4	4		RST.11-12.7	SWBAT review material from S1.	(S) review material from S1 using review strategies provided by the teacher.	

5	5		RST.11-12.7	SWBAT review material from S2.	(W) review material from S2 using review strategies provided by the teacher.	
6	6			SWBAT demonstrate knowledge or the AP CSP material on their BA4.		
7	U7L1	2.2.2B	RST.11-12.3	SWBAT create simple fractal trees in Snap!	(W) using sentence starters explain how a fractal tree is designed.	SP1: Asking scientific questions & defining engineering problems
8	U7L1	2.2.2B	WHST. 11-12.4	SWBAT define recursion in writing and its use in programming.	(W) using a word bank explain what recursion is in writing.	SP1: Asking scientific questions & defining engineering problems
9	U7L1	5.3.1L	RST.11-12.8	SWBAT differentiate between the Base Case and the Recursive Case in a Snap! program.	(S) debug recursive programs to determine the difference between the Base Case and the Recursive Case and explain it to a peer	SP5: Using mathematics & computational thinking
10	U7L1	1.2.2A	WHST. 11-12.1	SWBAT create the recursive algorithm for their recursion project.	(W) using pseudocode and a graphic organizer plan out and create the recursive algorithm in their project.	SP6: Constructing scientific explanations & designing engineering solutions
11	U7L1	1.2.2A	WHST. 11-12.1	SWBAT develop other key algorithms for their recursive project.	(W) using pseudocode and a graphic organiser continue developing key parts of their program	SP6: Constructing scientific explanations & designing engineering solutions
12	U7L1	1.2.2A	WHST. 11-12.2	SWBAT complete their recursive projects.	(W) utilize their planning from last class to finish creating their recursive programs in Snap!	SP6: Constructing scientific explanations & designing engineering solutions
13	U7L1	1.2.4 D	WHST. 11-12.5	SWBAT share their recursion projects with the class and receive feedback.	(S) Using a rubric provide feedback to a peer.	SP8: Obtaining, evaluating, and communicating information
14	14			Senior topic of interest	TBD	

15	15			Senior topic of interest	TBD	
16	16			Senior topic of interest	TBD	