Course Title: AP Computer Science Principles (APCSP)

Subject: Computer Science

Grade Level: 10-12

Duration: 1 year (approx. 36 weeks)

Prerequisite: Grade of “A-” in most recent college prep math course or “B” in most recent honors math course.

Elective or Required: Elective

Computer Science, Engineering, and Technology Mission Statement
Since computational thinking and problem solving are integral parts of our lives and 21st century learning, students must be actively involved in their Computer Science, Engineering, and Technology (CSET) education. The CSET curricula will emphasize thinking skills through a balance of computation, intuition, common sense, logic, design, analysis, and technology. Students will use a combination of technology and critical thinking to solve real-world problems. To achieve these goals, students will be taught a standards-based curriculum that is aligned with the New Jersey Curriculum Standards.

Course Description:

AP Computer Science Principles is an elective course that prepares students for the Advanced Placement Computer Science Principles exam administered by the College Board in May. The course is designed to be equivalent to a first-semester introductory college computing course for non-computer science majors. This course is unrelated to the AP Computer Science A course offered, and does not require any previous computer science courses as a prerequisite. AP Computer Science Principles offers a multidisciplinary approach to learning the underlying principles of computation. The course will introduce students to the "big ideas" of computer science: creativity, programming, abstraction, algorithms, large data sets, the Internet, cybersecurity concerns, and the global impact of computing. The course will give students the opportunity to use technology to address real-world problems and build relevant solutions, while inviting students to understand how computing changes the world. Rather than focusing on a particular programming language or tool, the course focuses on using technology and programming as a means to solve computational problems and create exciting and personally relevant artifacts. The course is unique in its focus on
encouraging students to think creatively when developing computational artifacts and using simulations to explore questions that interest them, using an iterative process similar to what artists, writers, computer scientists, and engineers use to bring ideas to life.

**Author:** Kevin George

**Date Submitted:** Summer 2016
Resources

Due to the changing nature of computer programming and computer science, a paper textbook is not used for this course. The following online resources are used throughout this course:

- **Mobile CSP Web Site**: http://mobile-csp.org/
- **Mobile CSP Student Course**: https://ram8647.appspot.com/mobileCSP/course
- **Mobile CSP Teacher Course**: https://ram8647.appspot.com/teach_mobileCSP/course
- **Mobile CSP Teacher Resources Site**: https://ram8647.appspot.com/teach_mobileCSP/resources
- **Google Sites**: http://sites.google.com
- **App Inventor 2 Web Site**: ai2.appinventor.mit.edu
- **W3 Schools JavaScript Tutorials**, http://www.w3schools.com/js/
- **Glen Ridge High School Faculty pages**: http://www.glenridge.org/grhs/faculty.html

Software Tools

- **App Inventor**: ai2.appinventor.mit.edu
- **Google Sites**: http://sites.google.com
- Google Chrome (or other web browser, such as Safari, Internet Explorer, etc)
- Internet access
## Curriculum Standards

### Technology

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1.12.A.1</td>
<td>Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.</td>
</tr>
<tr>
<td>8.1.12.A.2</td>
<td>Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.</td>
</tr>
<tr>
<td>8.1.12.A.3</td>
<td>Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.</td>
</tr>
<tr>
<td>8.1.12.C.1</td>
<td>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.</td>
</tr>
<tr>
<td>8.1.12.D.1</td>
<td>Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.</td>
</tr>
<tr>
<td>8.1.12.D.4</td>
<td>Research and understand the positive and negative impact of one’s digital footprint.</td>
</tr>
<tr>
<td>8.1.12.D.5</td>
<td>Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs.</td>
</tr>
<tr>
<td>8.1.12.E.2</td>
<td>Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.</td>
</tr>
<tr>
<td>8.2.12.B.1</td>
<td>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.</td>
</tr>
<tr>
<td>8.2.12.C.1</td>
<td>Explain how open source technologies follow the design process.</td>
</tr>
<tr>
<td>8.2.12.C.2</td>
<td>Analyze a product and how it has changed or might change over time to meet human needs and wants.</td>
</tr>
<tr>
<td>8.2.12.C.4</td>
<td>Explain and identify interdependent systems and their functions.</td>
</tr>
<tr>
<td>8.2.12.C.6</td>
<td>Research an existing product, reverse engineer and redesign it to improve form and function.</td>
</tr>
<tr>
<td>8.2.12.D.1</td>
<td>Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.</td>
</tr>
<tr>
<td>8.2.12.D.3</td>
<td>Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.</td>
</tr>
<tr>
<td>8.2.12.E.1</td>
<td>Demonstrate an understanding of the problem-solving capacity of computers in our world.</td>
</tr>
<tr>
<td>8.2.12.E.2</td>
<td>Analyze the relationships between internal and external computer components.</td>
</tr>
<tr>
<td>8.2.12.E.3</td>
<td>Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).</td>
</tr>
<tr>
<td>8.2.12.E.4</td>
<td>Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).</td>
</tr>
</tbody>
</table>

### 21st Century Life and Careers

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.2.12.C.1</td>
<td>Review career goals and determine steps necessary for attainment.</td>
</tr>
<tr>
<td>9.2.12.C.3</td>
<td>Identify transferable career skills and design alternate career plans.</td>
</tr>
<tr>
<td>9.2.12.C.5</td>
<td>Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.</td>
</tr>
<tr>
<td>9.2.12.C.6</td>
<td>Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.</td>
</tr>
<tr>
<td>9.3.IT-PRG.1</td>
<td>Analyze customer software needs and requirements.</td>
</tr>
<tr>
<td>9.3.IT-PRG.2</td>
<td>Demonstrate the use of industry standard strategies and project planning to meet customer specifications.</td>
</tr>
<tr>
<td>9.3.IT-PRG.3</td>
<td>Analyze system and software requirements to ensure maximum operating efficiency.</td>
</tr>
<tr>
<td>9.3.IT-PRG.4</td>
<td>Demonstrate the effective use of software development tools to develop software applications.</td>
</tr>
<tr>
<td>9.3.IT-PRG.5</td>
<td>Apply an appropriate software development process to design a software application.</td>
</tr>
<tr>
<td>9.3.IT-PRG.6</td>
<td>Program a computer application using the appropriate programming language.</td>
</tr>
<tr>
<td>9.3.IT-PRG.7</td>
<td>Demonstrate software testing procedures to ensure quality products.</td>
</tr>
<tr>
<td>9.3.IT-PRG.8</td>
<td>Perform quality assurance tasks as part of the software development cycle.</td>
</tr>
</tbody>
</table>

**Mathematics**

| Math Practices.1 | Make sense of problems and persevere in solving them. |
| Math Practices.2 | Reason abstractly and quantitatively. |
| Math Practices.3 | Construct viable arguments and critique the reasoning of others. |
| Math Practices.4 | Model with mathematics. |
| Math Practices.5 | Use appropriate tools strategically. |
| Math Practices.6 | Attend to precision. |
| Math Practices.7 | Look for and make use of structure. |
| Math Practices.8 | Look for and express regularity in repeated reasoning. |

**Social Studies**

| 6.3.12.D.1 | Analyze the impact of current governmental practices and laws affecting national security and/or individual civil rights/privacy |

**Visual and Performing Arts**

| 1.1.12.D.2 | Translate literary, musical, theatrical, and dance compositions by using them as stimulus/inspiration for corresponding visual artworks. |

**English Language Arts**

| NJSLSA.R4 | Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. |
| NJSLSA.R7 | Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words. |
| RI.11-12.4 | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). |
| RI.11-12.7 | Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. |
| NJSLSA.W4 | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| NJSLSA.W6 | Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. |
| NJSLSA.W10 | Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. |
| W.11-12.4 | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) |
| W.11-12.6 | Use technology, including the Internet, to produce, share, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| W.11-12.10 | Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes |
Unit 1: Getting Started: Preview and Set up (Creativity, Algorithms, & Impact)

Approximate # Of Weeks: 2

Essential Questions:
- What is the Mobile CS Principles course?
- What is graphical blocks-based programming?
- Why is it important to study the impact of computing technology?
- How are digital artifacts created and shared globally?

Upon completion of this unit students will be able to:
- Identify and use a graphical blocks-based programming language (Blockly) to implement algorithms.
- Identify Google sites portfolio as an example of cloud computing.
- Create a Google sites portfolio that they will use during the course to post their work.
- Clearly communicate with a global audience about personal ideas.
- Understand how humans and computers interact through different languages.
- Identify and use the App Inventor program to package and send a very basic mobile app to a mobile device.

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- Use Blockly to navigate through several maze challenges.
- Students will create a Google sites portfolio that they will use during the course to post their work.
- Students will register as a user on App Inventor's development server; setup and configure their device (phone or tablet) for use in the course; and create a simple app to test the setup.
- Students will take a look at the free, online version of Blown to Bits. Readings from this book will be use throughout the course to focus on important issues that highlight the impact of computing on society.
- Unit test and quiz.

Enrichment Activities:
- Students will join the Mobile CSP forum to share questions and ideas with other members of the course.
- Students will create a user-interface in App Inventor with pictures downloaded from the Internet.
Methods of Assessments/Evaluation:
- Google site portfolio
- Test App creation and manipulation of the user interface
- Student responses / Oral evaluation
- Graded projects
- Quizzes

Resources/Including Online Resources
- Teacher Webpage
- Resources listed above in Resources section
Unit 2: Introduction to Mobile Apps and Pair Programming

Approximate # Of Weeks: 3

Essential Questions:
- How does one use App Inventor and event-driven programming to build a mobile app?
- What are the various hardware and software abstractions that make up a modern digital computer?
- What is the binary number system that underlies all digital representation?

Upon completion of this unit students will be able to:
- Create a computational artifact for creative expression. (APCSP LO 1.2.1)
- Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
- Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
- Use computing tools and techniques for creative expression (APCSP LO 1.3.1)
- Describe the variety of abstractions used to represent data. (APCSP LO 2.1.1)
- Explain how binary sequences are used to represent digital data. (APCSP LO 2.1.2)
- Identify multiple levels of abstractions being used when writing programs. (APCSP LO 2.2.3)
- Develop a program for creative expression, to satisfy personal curiosity or to create new knowledge. (APCSP LO 5.1.1)
- Explain how programs implement algorithms. (APCSP LO 5.2.1)
- Evaluate the correctness of a program. (APCSP LO 5.4.1)
- Explain how computing innovations affect communication, interaction, and cognition. (APCSP LO 7.1.1)

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- I Have a Dream Lab: Students explore App Inventor’s programming platform by developing an app that plays the famous “I Have a Dream” speech. In Mobile CSP, section 2.2, students learn what the App Inventor program is, how an event handler is used, and how an app makes decisions with if-else control blocks. In section 2.3, students modify the app and create simple programs. Pair programming,
described in the video, encourages collaboration. Stepwise refinement, in which programming is carried out in stages with errors corrected, is used as a problem-solving tool. Students also learn to resize images and edit sound files to meet App Inventor's size limits. Section 2.5 gives extension ideas to allow for creativity. As students enhance the app, we discuss copyright violations and free and open-source media.

- **Activity: Hardware / Software:** Lecture, combined with videos. GCFLearnFree.org has a good collection of short, accurate video lessons that introduce these basic concepts, including mobile devices: What is a computer?; Understanding operating systems; Understanding applications; Inside a desktop computer.
- **Activity: Abstraction:** Use Mobile CSP slides to give a brief explanation of abstraction with some examples. Explain to students that an abstraction is a general representation or concept or idea that stands for some collection of individual instances. Abstractions can be found in language, design, maps, and computer science. Ask each student to take a piece of paper and without talking communicate to the class what 'chair' means. Students may use words, phrases, pictures, etc but they cannot talk. When the students are finished have the students hold up their papers to show the entire class. Next, ask the students to do the same thing for 'rectangle'. What do the students notice about what they have put on their papers?
- **Activity: Binary Numbers:** Students will implement a binary odometer. A binary odometer is similar to a decimal odometer, like the one we have in our cars, except it only has two digits. The rightmost digit is the 1s place. The digit to its left is the 2s place and then comes the 4s place and so on. After this simulation, students will download and print the binary worksheet and use the odometer approach to write out the values of the first 20 binary numbers.
- **Lab: Where Is North? A Compass App:** Guide students, using Mobile CSP, to develop a compass app that uses the Location sensor and the Orientation sensor of App Inventor. While pair programming, students are shown how to use the Global Positioning System (GPS) to get the app’s latitude and longitude. The Orientation sensor is used to determine the location of geographic north. App Inventor components such as Canvas and Image Sprite are useful for drawing, and students explore animations and some of the properties of these components. Students also explore the App Inventor coordinate system and how the size of a mobile device affects the placement of a component.
- **Unit test and quiz.**

**Enrichment Activities:**
- **Activity:** Students will draw truth tables to explain AND, OR, and NOT.
- **Activity:** Have students explore logic gates using Logicly. They can create more complex designs (including using flip flops) by clicking the Edit button on the interactive examples. (The Edit button looks like a document with a pencil.)
• Journal entry: Students will write a reflection in their Google portfolio that explains event-driven programming. They might also reflect on UI components of other apps they have used.

Methods of Assessments/Evaluation:
• I Have a Dream Project
• Mobile apps
• Google Site Reflection pages
• Mobile CSP exercises / quizzes
• Student responses / Oral evaluation
• Graded projects
• Quizzes

Resources/Including Online Resources
• Teacher Webpage
• Resources listed above in Resources section
Unit 3: Creating Graphics & Images Bit by Bit

Approximate # Of Weeks: 3

Essential Questions:
1. How can binary numbers be used to represent all digital data?
2. How can algorithms be used to compress data?
3. How do variables of both simple and structured data, such as, lists, enable us manage the complexity of a programming?

Upon completion of this unit students will be able to:
1. Apply a creative development process when creating computational artifacts. (APCSP LO 1.1.1)
2. Create a computational artifact for creative expression. (APCSP LO 1.2.1)
3. Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
4. Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
5. Use computing tools and techniques for creative expression. (APCSP LO 1.3.1)
6. Describe the variety of abstractions used to represent data. (APCSP LO 2.1.1)
7. Explain how binary sequences are used to represent digital data. (APCSP LO 2.1.2)
8. Develop an abstraction when writing a program or creating other computational artifacts. (APCSP LO 2.2.1)
9. Identify multiple levels of abstractions being used when writing programs. (APCSP LO 2.2.3)
10. Use models and simulations to represent phenomena. (APCSP LO 2.3.1)
11. Collaborate when processing information to gain insight and knowledge. (APCSP LO 3.1.2)
12. Extract information from data to discover and explain connections or trends. (APCSP LO 3.2.1)
13. Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (APCSP LO 3.3.1)
14. Develop a program for creative expression, to satisfy personal curiosity or to create new knowledge. (APCSP LO 5.1.1)
15. Develop a correct program to solve problems. (APCSP LO 5.1.2)
16. Explain how programs implement algorithms. (APCSP LO 5.2.1)
17. Use abstraction to manage complexity in programs. (APCSP LO 5.3.1)
18. Evaluate the correctness of a program. (APCSP LO 5.4.1)
19. Employ appropriate mathematical and logical concepts in programming. (APCSP LO 5.5.1)
20. Explain how computing innovations affect communication, interaction, and cognition. (APCSP LO 7.1.1)
Interdisciplinary Standards

- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):

- Lab: Paint Pot: Through the Paint Pot Mobile CSP tutorial, its enhancements, and modifications, teacher will introduce students to the drawing and painting features of App Inventor to support the creation of computational artifacts that include graphics. Teacher will introduce variables as abstractions to vary the radius of a dot. As a class, we will discuss how to name variables, the need to initialize variables, and how to increment variables, plus debugging and how to handle errors in coding. This will utilize Mobile CSP sections 3.2, 3.3, 3.6, and 3.7.
- Activity: Image Representation: In groups, students will complete the Mobile CSP “Representing Images” and the CS Unplugged “Image Representation” activities, which describe the Run Length Encoding (RLE) method of representing data as bits. As a class, we will analyze the representation of different pixels and discuss lossy and lossless compression.
- Activity: Student groups will work in Mobile CSP section 3.8 and CS Unplugged “Error Detection” activities, which deal with data corruption and the detection of errors in stored or transmitted data. In Mobile CSP section 3.10, students the concept of parity bits and check sum are illustrated. Students complete quizzes on the concepts of error detection and correction.
- Lab: Magic 8 Ball App: Teacher/tutorial will lead students through Mobile CSP section 3.9 in the development of the Magic 8 Ball app, which is a mobile version of the fortune-telling toy where one asks a Yes or No question, shakes it, and it makes a prediction. This activity will introduce the concept of lists. The app and its enhancements also include use of the previously unexplored Clock and Speech Recognizer components of App Inventor.
- Activity: Map Tour Tutorial: Teacher will lead the students through the Map Tour Tutorial in Mobile CSP section 3.11, which introduces the Google Maps API and explains how to use the Activity Starter other applications (e.g., a selected destination in Google Maps).

- Unit test and quiz

Enrichment Activities:

- Activity: Students will take turns encoding messages in ASCII binary code that someone else could decode. Trade messages in class and decode each other's messages.
- Activity: Students will research other image types (e.g. GIF, PNG, BMP, TIFF, etc.) and then share what they discovered with the class.
They will compare and contrast the data needed to store information about the images. Include what type of compression is used.

- Activity: Students will watch the video under the Still Curious? section and practice with a set of cards using the error correction codes. Have the students explore how check sums are used with ISBNs to determine if there was an error.

**Methods of Assessments/Evaluation:**
- Paint Pot Project
- Map Tutorial
- Magic 8 Ball Project
- Mobile apps
- Google Site Reflection pages
- Mobile CSP exercises / quizzes
- Student responses / Oral evaluation
- Graded projects
- Quizzes

**Resources/Including Online Resources**
- Teacher Webpage
- Resources listed above in *Resources* section
Unit 3.5: Create: Programming Performance Task #1 (Practice for Unit 7.5: Create Task #2)

Approximate # Of Weeks: 3

Essential Questions:
1. How can the knowledge gained in this class be demonstrated and assessed?

Upon completion of this unit students will be able to:
1. Apply a creative development process when creating computational artifacts. (APCSP LO 1.1.1)
2. Create a computational artifact for creative expression. (APCSP LO 1.2.1)
3. Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
4. Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
5. Collaborate in the creation of computational artifacts. (APCSP LO 1.2.4)
6. Analyze the correctness, usability, functionality, and suitability of computational artifacts. (APCSP LO 1.2.5)
7. Develop an abstraction when writing a program or creating other computational artifacts. (APCSP LO 2.2.1)
8. Use multiple levels of abstraction to write programs. (APCSP LO 2.2.2)
9. Develop an algorithm for implementation in a program. (APCSP LO 4.1.1)
10. Express an algorithm in a language. (APCSP LO 4.1.2)
11. Develop a program for creative expression, to satisfy personal curiosity or to create new knowledge. (APCSP LO 5.1.1)
12. Develop a correct program to solve problems. (APCSP LO 5.1.2)
13. Collaborate to develop a program. (APCSP LO 5.1.3)
14. Explain how programs implement algorithms. (APCSP LO 5.2.1)
15. Use abstraction to manage complexity in programs. (APCSP LO 5.3.1)
16. Evaluate the correctness of a program. (APCSP LO 5.4.1)
17. Employ appropriate mathematical and logical concepts in programming. (APCSP LO 5.5.1)

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- Up until this point students have completed App Inventor tutorials and they have been given smaller challenges. This programming task is a
practice for the official Create programming performance task that will be submitted to the College Board.

- Students are given 12-15 hours of class time to complete this task.
- Students work collaboratively with a partner (pair programming) to create a socially useful, interactive, mobile app. The app must in some way include drawing, graphics, and programming constructs based on skills learned in prior lessons.
- Students are taught how to brainstorm their ideas and develop wireframes with storyboards to express those ideas.
- Students are asked to give a 1-2 minute elevator pitch of their app idea and receive feedback from the instructor and their classmates.
- In-class time is given to develop, test, and debug their app.
- The instructor answers any questions and provides feedback along the way.
- While working on their app, students are shown how to and asked to maintain a portfolio write up of their work making note of their progress and any challenges they may have faced, as well as, screenshots of blocks of code with written explanations of the how the code works.
- Students are shown how to record a video of their app.
- The project ends with an in class presentation and app demo by each pair of students

**Enrichment Activities:**

- None.

**Methods of Assessments/Evaluation:**

- Create: Programming Performance Task #1
- Student responses / Oral evaluation
- Graded projects

**Resources/Including Online Resources**

- Teacher Webpage
- Resources listed above in **Resources** section
Unit 4: Animation, Simulation, and Modeling: Exploring the Impact of Computing

Approximate # Of Weeks: 2.5

Essential Questions:
1. How do computers use simulation and modeling to represent real world phenomena?
2. Why is randomness important and how is it modeled inside a computer?
3. In what ways does simulation and modeling extend our knowledge and benefit society?

Upon completion of this unit students will be able to:
1. Create a computational artifact for creative expression. (APCSP LO 1.2.1)
2. Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
3. Use computing tools and techniques for creative expression. (APCSP LO 1.3.1)
4. Develop an abstraction when writing a program or creating other computational artifacts. (APCSP LO 2.2.1)
5. Use models and simulations to represent phenomena. (APCSP LO 2.3.1)
6. Use models and simulations to formulate, refine, and test hypotheses. (APCSP LO 2.3.2)
7. Collaborate when processing information to gain insight and knowledge. (APCSP LO 3.1.2)
8. Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (APCSP LO 3.3.1)
9. Develop an algorithm for implementation in a program. (APCSP LO 4.1.1)
10. Express an algorithm in a language. (APCSP LO 4.1.2)
11. Develop a correct program to solve problems. (APCSP LO 5.1.2)
12. Use abstraction to manage complexity in programs. (APCSP LO 5.3.1)
13. Employ appropriate mathematical and logical concepts in programming. (APCSP LO 5.5.1)
14. Explain how computing innovations affect communication, interaction, and cognition. (APCSP LO 7.1.1)
15. Analyze the beneficial and harmful effects of computing. (APCSP LO 7.3.1)
16. Explain the connections between computing and real-world contexts, including economic, social, and cultural contexts. (APCSP LO 7.4.1).
Interdisciplinary Standards

- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):

- Lab: Android Mash App: Students will develop the Android Mash app, which simulates the traditional Whack-a-Mole game using the Image Sprite and random number features of App Inventor. Students will go through Mobile CSP section 4.2 to develop the Android Mash app. Students deepen their understanding of how animation and randomness are programmed using the clock component. In Mobile CSP section 4.3, students will add features for score keeping and increasing the sprite’s speed as the score increases.
- Lab: Coin Flip App: A modeling app to simulate a coin flip. In Mobile CSP section 4.4, students will create the basic app, introducing the pseudo-random number generator. In section 4.5, students will perform an experiment to test that App Inventor’s random number generator is a good model of random behavior. In section 4.7, students will add new features (shaking) as well as new models -- 3-sided coin, biased coin.
- Activity: Privacy: Students will read and discuss Chapter 2 of Blown to Bits, which focuses on the issue of how our privacy is affected by the digital explosion. We will discuss the trade-offs between convenience and privacy.
- Unit test and quiz

Enrichment Activities:

- Activity: Students will do the optional Mobile CSP section 4.6 that discusses how computers use an algorithm to generate numbers that seem random, so that the numbers generator are not exactly random. This section also introduces clock arithmetic.

Methods of Assessments/Evaluation:

- Android Mash App
- Coin Flip App
- Class discussion: Internet Privacy
- Mobile apps
- Google Site Reflection pages
- Mobile CSP exercises / quizzes
- Student responses / Oral evaluation
- Graded projects
- Quizzes

Resources/Including Online Resources

- Teacher Webpage
- Resources listed above in Resources section
Unit 4.5: Explore: Impact of a Computing Innovation Performance
Task #1 (Practice for Unit 5.5: Explore Task #2)

Approximate # Of Weeks: 1.5

Essential Questions:
1. How can the knowledge gained in this class be demonstrated and assessed?

Upon completion of this unit students will be able to:
1. Apply a creative development process when creating computational artifacts. (APCSP LO 1.1.1)
2. Create a computational artifact for creative expression. (APCSP LO 1.2.1)
3. Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
4. Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
5. Analyze the correctness, usability, functionality, and suitability of computational artifacts. (APCSP LO 1.2.5)
6. Explain the insight and knowledge gained from digitally processed data by using appropriate visualizations, notation, and precise language. (APCSP LO 3.1.3)
7. Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (APCSP LO 3.3.1)
8. Explain how computing innovations affect communication, interaction, and cognition. (APCSP LO 7.1.1)
9. Analyze the beneficial and harmful effects of computing. (APCSP LO 7.3.1)
10. Explain the connections between computing and realworld contexts, including economic, social, and cultural contexts. (APCSP LO 7.4.1)
11. Access, manage, and attribute information using effective strategies. (APCSP LO 7.5.1)
12. Evaluate online and print sources for appropriateness and credibility. (APCSP LO 7.5.2).

Interdisciplinary Standards
• 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
• Up until this point students have read Blown to Bits chapters and excerpts, as well as, read and discussed articles about recent computing innovations that have been in the news. Students are encouraged to find daily news articles about advances in technology
and share them with the class. This task is a practice for the official Explore performance task that will be submitted to the College Board.

- Students are given 4-5 hours of class time to complete this activity.
- This activity involves discussing, as a class, a computing innovation that has had considerable impact on the social, economic, or cultural areas of our lives, such as phone monitoring software.
- Students work collaboratively in small groups to research the computing innovation and find reliable sources using sites such as the ACM Digital Library.
- Students are also asked to cite their sources and are instructed about plagiarism.
- The instructor assigns each group member a prompt taken from the official Explore Performance Task to answer about the innovation.
- Each group member answers the prompts in a single Google document that is shared among the group.
- The group then works together to edit the entire document discussing changes that need to be made.
- When the document is completed (i.e. all prompts are answered and all sources are cited), each student is asked prepare their own original digital artifact (e.g. music, image, video, infographic, presentation, program, web page) to express the effects of the chosen innovation.
- Students are asked to share their artifact with their group members. After completing this activity, the students are asked to reflect on the experience and to brainstorm at least three computing innovations they might want to research for the official Explore Performance Task.

**Enrichment Activities:**
- None.

**Methods of Assessments/Evaluation:**
- Explore: Impact of a Computing Innovation Performance Task #2
- Student responses / Oral evaluation
- Graded projects

**Resources/Including Online Resources**
- Teacher Webpage
- Resources listed above in *Resources* section
Unit 5: Algorithms and Procedural Abstraction

Approximate Duration: 3 weeks

Essential Questions:
1. How are multiple levels of abstraction used to create computational artifacts?
2. In what ways are some algorithms better than others?
3. What limits do algorithms have?

Upon completion of this unit students will be able to:
1. Develop an abstraction when writing a program or creating other computational artifacts. (APCSP LO 2.2.1)
2. Use multiple levels of abstraction to write programs. (APCSP LO 2.2.2)
3. Collaborate when processing information to gain insight and knowledge. (APCSP LO 3.1.2)
4. Develop an algorithm for implementation in a program. (APCSP LO 4.1.1)
5. Express an algorithm in a language. (APCSP LO 4.1.2)
6. Explain the difference between algorithms that run in a reasonable time and those that do not run in a reasonable time. (APCSP LO 4.2.1)
7. Explain the difference between solvable and unsolvable problems in computer science. (APCSP LO 4.2.2)
8. Explain the existence of undecidable problems in computer science. (APCSP LO 4.2.3)
9. Evaluate algorithms analytically and empirically for efficiency, correctness, and clarity. (APCSP LO 4.2.4)
10. Develop a correct program to solve problems. (APCSP LO 5.1.2)
11. Collaborate to develop a program. (APCSP LO 5.1.3)
12. Use abstraction to manage complexity in programs. (APCSP LO 5.3.1)
13. Evaluate the correctness of a program. (APCSP LO 5.4.1)
14. Explain how computing innovations affect communication, interaction, and cognition. (APCSP LO 7.1.1)
15. Explain how people participate in a problem solving process that scales. (APCSP LO 7.1.2).

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- Activity: Algorithm Writing: Teacher will split the class into pairs. Each member will write an algorithm for an everyday task (tying shoes, sharpening a pencil, doing jumping jacks, etc.). Then, partners will perform each other’s algorithms literally, spotlighting the flaws and
ambiguities in the algorithm, while allowing the writer to make corrections.

- **Lab: Logo:** In Mobile CSP section 5.3, students will use a template that provides a Logo-like drawing platform restricted to very primitive forward and right turn commands. Problems include various sized squares and a face. Then, in section 5.4, they will work on a version of Logo that has procedures with parameters. Problems include drawing polygons using procedures with one or more parameters. Students will get practice with sequences, selection, and repetition – the only control structures needed to write an algorithm.

- **Activity: Searching, Sorting, and Analyzing Algorithms:** In Mobile CSP sections 5.5 and 5.6, students will learn about searching and sorting algorithms, using various interactive guessing games and shuffling playing cards. Finally, in section 5.7, students will time the searching and sorting algorithms to analyze their efficiency and identify them as logarithmic, linear, or quadratic.

- **Lab: Pong App:** Given a working but primitive version of Pong, students will extend its functionality using if/else, procedures with parameters, using Mobile CSP section 5.8. Then, in section 5.10, students will find and fix (debug) errors contained in the Pong app.

- **Unit test and quiz**

**Enrichment Activities:**

- **Activity: Limits of Algorithms:** Students will complete Mobile CSP section 5.9, in which apps are used to experimentally classify algorithms experimentally as either logarithmic, linear, n log n, or quadratic. A video introduces the concepts of intractability and undecidability -- i.e., there are problems for which the best algorithms are incapable of solving the problem in a reasonable amount of time and there are problems which cannot be solved by means of an algorithm. Involves mathematical functions.

**Methods of Assessments/Evaluation:**

- Logo
- Pong App
- Mobile apps
- Google Site Reflection pages
- Mobile CSP exercises / quizzes
- Student responses / Oral evaluation
- Graded projects
- Quizzes

**Resources/Including Online Resources**

- Teacher Webpage
- Resources listed above in *Resources* section
Unit 5.5: Explore: Impact of a Computing Innovation Performance
Task #1

Approximate # Of Weeks: 2.5

Essential Questions:
1. How can the knowledge gained in this class be demonstrated and assessed?

Upon completion of this unit students will be able to:
1. Apply a creative development process when creating computational artifacts. (APCSP LO 1.1.1)
2. Create a computational artifact for creative expression. (APCSP LO 1.2.1)
3. Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
4. Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
5. Analyze the correctness, usability, functionality, and suitability of computational artifacts. (APCSP LO 1.2.5)
6. Explain the insight and knowledge gained from digitally processed data by using appropriate visualizations, notation, and precise language. (APCSP LO 3.1.3)
7. Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (APCSP LO 3.3.1)
8. Explain how computing innovations affect communication, interaction, and cognition. (APCSP LO 7.1.1)
9. Analyze the beneficial and harmful effects of computing. (APCSP LO 7.3.1)
10. Explain the connections between computing and realworld contexts, including economic, social, and cultural contexts. (APCSP LO 7.4.1)
11. Access, manage, and attribute information using effective strategies. (APCSP LO 7.5.1)
12. Evaluate online and print sources for appropriateness and credibility. (APCSP LO 7.5.2).

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- This activity is the first independent summative assessment from the College Board that will contribute to a student’s AP Exam score, and was practiced for in Unit 4.5 above. The students must complete this task on their own, following a rubric provided by the College Board.
This activity involves researching a computing innovation that has had considerable impact on the social, economic, or cultural areas of our lives, such as phone monitoring software, using sites such as the ACM Digital Library.

Students are also asked to cite their sources and avoid plagiarism.

When the research is completed, each student is asked prepare their own original digital artifact (e.g. music, image, video, infographic, presentation, program, web page) to express the effects of the chosen innovation.

**Enrichment Activities:**
- None.

**Methods of Assessments/Evaluation:**
- Explore: Impact of a Computing Innovation Performance Task #1
- Student responses / Oral evaluation
- Graded projects

**Resources/Including Online Resources**
- Teacher Webpage
- Resources listed above in *Resources* section
Unit 6: Using and Analyzing Data and Information

Approximate # Of Weeks: 3

Essential Questions:
1. How does continuous access to large amounts of data change how people and organizations make decisions?
2. How do computers put things in order and find things in a list?
3. What is the connection between data, information, knowledge, and wisdom?

Upon completion of this unit students will be able to:
1. Create a computational artifact for creative expression. (APCSP LO 1.2.1)
2. Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
3. Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
4. Use computers to process information, find patterns, and test hypotheses about digitally processed information to gain insight and knowledge. (APCSP LO 3.1.1)
5. Collaborate when processing information to gain insight and knowledge. (APCSP LO 3.1.2)
6. Explain the insight and knowledge gained from digitally processed data by using appropriate visualizations, notation, and precise language. (APCSP LO 3.1.3)
7. Extract information from data to discover and explain connections or trends. (APCSP LO 3.2.1)
8. Use large data sets to explore and discover information and knowledge. (APCSP LO 3.2.2)
9. Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. (APCSP LO 3.3.1)
10. Develop a correct program to solve problems. (APCSP LO 5.1.2)
11. Explain how programs implement algorithms. (APCSP LO 5.2.1)
12. Use abstraction to manage complexity in programs. (APCSP LO 5.3.1)
13. Employ appropriate mathematical and logical concepts in programming. (APCSP LO 5.5.1)
14. Explain how computing has impacted innovations in other fields. (APCSP LO 7.2.1)
15. Analyze the beneficial and harmful effects of computing. (APCSP LO 7.3.1)
16. Access, manage, and attribute information using effective strategies. (APCSP LO 7.5.1)
17. Evaluate online and print sources for appropriateness and credibility. (APCSP LO 7.5.2).
Interdisciplinary Standards

- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):

- Lab: Presidents Quiz App: Teacher and Mobile CSP section 6.2 will lead students through creating a basic quiz app that uses parallel lists and indexing to keep track of questions and answers. In section 6.3, students will add tally-keeping functionality. In section 6.5, students will use lists of lists to implement a multiple choice quiz.
- Lab: Android Mash App with Persistent Data: Using Mobile CSP sections 6.6, 6.7, and 6.8, students will revisit their Android Mash App. The concept of persistent data (i.e., data that is saved when an app closes, for use in future runnings) will be discussed, leading to the idea that scores from one game to the next are lost. We will use App Inventor's TinyDB component to keep persistent data and then use App Inventor's TinyWebDB component to keep persistent data on the web, so that data can be shared between devices.
- Activity: Big Data: In Mobile CSP sections 6.9 and 6.10, we will learn about Big Data, the scope and challenges involved in managing massive data sets. There will be a sequence of activities that use Google Fusion Tables to process and visualize a data set.
- Unit test and quiz

Enrichment Activities:

- Lab: Mobile Fusion Table App: Students will follow optional Mobile CSP section 6.11 to create a web viewer app to display Fusion Table data.

Methods of Assessments/Evaluation:

- Presidents Quiz App
- Android Mash App with Persistent Data
- Mobile apps
- Google Site Reflection pages
- Mobile CSP exercises / quizzes
- Student responses / Oral evaluation
- Graded projects
- Quizzes

Resources/Including Online Resources

- Teacher Webpage
- Resources listed above in Resources section
Unit 6.5: (TIME PERMITTING) Data Project

Approximate # Of Weeks: 1.5

Essential Questions:
1. How can the knowledge gained in Unit 5 be demonstrated and assessed?

Upon completion of this unit students will be able to:
1. Use computers to process information, find patterns, and test hypotheses about digitally processed information to gain insight and knowledge. (APCSP LO 3.1.1)
2. Collaborate when processing information to gain insight and knowledge. (APCSP LO 3.1.2)
3. Explain the insight and knowledge gained from digitally processed data by using appropriate visualizations, notation, and precise language. (APCSP LO 3.1.3)
4. Extract information from data to discover and explain connections or trends. (APCSP LO 3.2.1)
5. Use large data sets to explore and discover information and knowledge. (APCSP LO 3.2.2)

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- Students will work with a partner to identify and analyze a large data set that interests them. Students will work collaboratively to research, investigate and analyze a Big Data set of at least 1000 data values/cells. They will create 3-5 questions that they believe can be answered using the chosen data set. Students will then create visualizations where appropriate that illustrate the answers to their questions (e.g. charts, graphs, etc.). They will then produce a collaborative write-up that will allow someone else to understand their investigation and its process, give a 5-10 minute oral presentation with visuals (a PowerPoint with charts, graphs, etc.). When the project is complete, students will produce an individual write up that explains their project and the collaborative process used to complete the project.

Enrichment Activities:
- None.
Methods of Assessments/Evaluation:
- Data Project (collaborative write-up, oral presentation with visuals, individual write-up)
- Student responses / Oral evaluation
- Graded projects

Resources/Including Online Resources
- Teacher Webpage
- Resources listed above in Resources section
Unit 7: Communication through the Internet

Approximate # Of Weeks: 3

Essential Questions:
1. What is the Internet, how is it built, and how does it function?
2. What aspects of the Internet's design and development have helped it scale and flourish?
3. How is cybersecurity impacting the ever increasing number of Internet users?

Upon completion of this unit students will be able to:
1. Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
2. Use abstraction to manage complexity in programs. (APCSP LO 5.3.1)
3. Explain the abstractions in the Internet and how the Internet functions. (APCSP LO 6.1.1)
4. Explain characteristics of the Internet and the systems built on it. (APCSP LO 6.2.1)
5. Explain how the characteristics of the Internet influence the systems built on it. (APCSP LO 6.2.2)
6. Identify existing cybersecurity concerns, and potential options that address these issues with the Internet and the systems built on it. (APCSP LO 6.3.1)
7. Explain how computing innovations affect communication, interaction, and cognition. (APCSP LO 7.1.1)
8. Analyze the beneficial and harmful effects of computing. (APCSP LO 7.3.1)
9. Explain the connections between computing and economic, social, and cultural contexts. (APCSP LO 7.4.1)
10. Access, manage, and attribute information using effective strategies. (APCSP LO 7.5.1)
11. Evaluate online and print sources for appropriateness and credibility. (APCSP LO 7.5.2)

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- Activity: What is the Internet?: In Mobile CSP section 7.2, students will watch a 3-part lecture that describes what the Internet is, how it differs from the World Wide Web, and how its performance is measured. They will use various online tools to measure latency and bandwidth, and they will answer follow-up questions on new terminology. In section 7.5, the topic is explored more deeply,
including the concepts of packet switching, TCP/IP and the protocol hierarchy, as well as IP addresses and domain names.

- Lab: No Texting While Busy App: In Mobile CSP section 7.3, students will use App Inventor’s texting component to create an app that responds automatically to incoming text messages, while the user is busy (e.g., driving, etc).

- Lab: My Directions App: In Mobile CSP section 7.6, students will create the My Directions App, which will use the location sensor and the Google API to get directions to a preset list of locations.

- Activity: Cryptography: Teacher will lead the class in lectures, and students will also watch videos and perform interactive activities in Mobile CSP sections 7.7, 7.8, and 7.9 and also read Chapter 5 of Blown to Bits. Students will learn about classical cryptography, including Caesar cipher, substitution cipher, transposition cipher, Vigenere cipher, and frequency analysis, the Diffie-Hellman key exchange algorithm and public key cryptography (PKC). There will be activities including using interactive tools to encrypt, decrypt, and analyze secret messages, and interactive public key encryption activities. Class will have a discussion on our findings.

- Lab: Broadcast Hub: In Mobile CSP section 7.10, students work with an app designed so that users can text the word ‘join’ to a hub device and are included in the members list. When members text the list, their messages are broadcast to all members.

- Unit test and quiz

**Enrichment Activities:**
- Activity: Students will use the same online tools as above to measure bandwidth and latency at several public places (i.e., library, Starbucks, etc.). Findings will be presented to the class.
- Journal entry: Students will discuss the possible dangers of a group-messaging app like the Broadcast Hub App, and what sort of warnings / precautions should be given / taken when using such an app.

**Methods of Assessments/Evaluation:**
- No Texting While Busy App
- My Directions App
- Broadcast Hub App
- Mobile apps
- Google Site Reflection pages
- Mobile CSP exercises / quizzes
- Student responses / Oral evaluation
- Graded projects
- Quizzes

**Resources/Including Online Resources**
- Teacher Webpage
- Resources listed above in Resources section
Unit 7.5: Create: Programming Performance Task #2

Approximate # Of Weeks: 4

Essential Questions:
1. How can the knowledge gained in this class be demonstrated and assessed?

Upon completion of this unit students will be able to:
1. Create a computational artifact for creative expression. (APCSP LO 1.2.1)
2. Create a computational artifact using computing tools and techniques to solve a problem. (APCSP LO 1.2.2)
3. Create a new computational artifact by combining or modifying existing artifacts. (APCSP LO 1.2.3)
4. Collaborate in the creation of computational artifacts. (APCSP LO 1.2.4)
5. Develop an algorithm for implementation in a program. (APCSP LO 4.1.1)
6. Express an algorithm in a language. (APCSP LO 4.1.2)
7. Develop a program for creative expression, to satisfy personal curiosity or to create new knowledge. (APCSP LO 5.1.1)
8. Develop a correct program to solve problems. (APCSP LO 5.1.2)
9. Collaborate to develop a program. (APCSP LO 5.1.3)
10. Explain how programs implement algorithms. (APCSP LO 5.2.1)
11. Use abstraction to manage complexity in programs. (APCSP LO 5.3.1)
12. Evaluate the correctness of a program. (APCSP LO 5.4.1)
13. Employ appropriate mathematical and logical concepts in programming. (APCSP LO 5.5.1)

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- This activity is the second summative assessment from the College Board that will contribute to a student’s AP Exam score, and was practiced for in Unit 3.5 above. The students must complete this task, following a rubric provided by the College Board.
- Students will work with a partner to create a socially useful app that uses some combination of graphics, animation, simulation, location awareness, data persistence, and/or texting. As they develop their projects, students are instructed to keep track of significant errors and challenges that they encountered and how they solved or debugged them. After completing the project, they will complete an individual reflection.
• With their partners, students will brainstorm a project idea, develop drawing(s) of the User Interface and a rough storyboard of how their app will function. The app should be about as complex as MoleMash and/or Broadcast Hub.

• Teacher and students will discuss the feasibility of the app and if necessary make any changes to the plan.

• Students will present a short (2-3 minute) elevator pitch of their project ideas to the class. The pitch will include the name of app, kind of thing it is, the people who would use it, and the major distinguishing feature of the app.

• Other students will provide feedback: Is the app presented socially useful why or why not? What is a strength of the proposed app? What suggestions do you have to improve the app? Students should consider the feedback provided and make adjustments if warranted.

• Students will then work collaboratively to develop, test, and debug the app, making sure that it has:
  o code documentation;
  o appropriate use of data (i.e., variables, data persistence if necessary, etc.);
  o appropriate use of algorithms (i.e., sequence, selection, and repetition control structures);
  o appropriate use of abstraction (i.e., programmer defined procedures to handle certain subtasks, parameters where appropriate, etc.); and
  o appropriate use of some combination of graphics, animation, simulation, location awareness, data persistence, and/or texting.

• The students will create a collaborative and individual portfolio write up of their project, a one minute video demonstrating their app, and a 2-3 minute video presentation by stating their elevator pitch, walking the class through their portfolio write up, and providing a demo of their working app. This may include, but is not limited to: a live recording of the partners or a Google presentation/PowerPoint with a voiceover recording.

**Enrichment Activities:**

• None.

**Methods of Assessments/Evaluation:**

• Create: Programming Performance Task #2
• Student responses / Oral evaluation
• Graded projects

**Resources/Including Online Resources**

• Teacher Webpage
• Resources listed above in *Resources* section
Unit 8: After the AP Exam: Final Project

Approximate # Of Weeks: 5

Essential Questions:
1. How can the knowledge gained in this class be used in the real world?

Upon completion of this unit students will be able to:
1. Work in a collaborative group to demonstrate the knowledge gained in this course in creating an original project.

Interdisciplinary Standards
- 8.1.12 (A.1-3, C.1, D.1, D.4-5, E.2, F.1); 8.2.12 (B.1, C.1-2, C.4, C.6, D.1, D.3, E.1-4); 9.2.12 (C.1, C.3, C.5-6); 9.3.IT-PRG.1-8; 6.3.12.D.1; 1.1.12.D.2; NJSLSA (R4, R7, W4, W6, W10); RL.11-12 (4, 7); W.11-12 (4, 6, 10); Math.Practices.1-8

Activities (All STEAM Activities):
- As a culminating activity, students will work collaboratively to design, develop, document and present an original project, using most of the concepts we have used in this class. The final project will be pre-approved and graded according to a published rubric.

Enrichment Activities:
- None.

Methods of Assessments/Evaluation:
- Student responses / Oral evaluation
- Final project

Resources/Including Online Resources
- Teacher Webpage
- Resources listed above in Resources section