| **Overview** | | |
| --- | --- | --- |
| In this unit, students are introduced to JavaScript using the p5 library and web editor. They will use the p5 canvas coordinate system in order to draw 2-Dimensional shapes. Programming concepts covered in this unit include calling functions with different parameters, using system variables to make programs dynamic, and debugging. For the final project, students apply these concepts to create a culturally relevant digital artifact. They will document this project by using HTML and CSS to build a web page.  **Enduring Understandings**   * Understand the basics of computation (execution flow/sequence, function calls) * Understand the basics of 2D computer graphics: drawing on a canvas, the coordinate system, calling shape functions, and using parameters to control shape attributes. * Understand the application of variables to create dynamic programs * Understand how to debug programs to achieve desired output   **Goals**   1. **Get familiarized with p5:** Write and run sketches in the p5.js web editor, place figures in the coordinate system, call functions with different parameters, and interpret p5 online documentation. 2. **Use the Engineering Design Process:**  Identify a problem, brainstorm a solution, build a prototype, and iterate on the prototype to build a culturally relevant digital artifact. | | |
| **Blueprint Foundations Student Outcomes** | | |
| | **Concept** | **Practice** | | | | --- | --- | --- | --- | | *Analyze* | *Prototype* | *Communicate* | | Abstraction | Give examples of specific patterns in something I can see, do or touch.  Describe how I might use patterns to express an idea. | Describe different things I tried in order to achieve a goal.  Explain why I chose to include the specific components of my prototype over others. | Explain how I might help others identify patterns.  Explain why using patterns is necessary when creating with a computer. | | Algorithms | Describe more than one set of instructions that might complete a task.  Describe how instructions can have different outputs depending on inputs. | Explain why I used specific instructions to complete a task. | Compare and contrast my instructions with other instructions that complete the same task. | | Programming | Experiment with the commands of a programming language  Describe three ways a development environment helps me create a project.  Describe the tools and processes needed to collaborate on programming projects. | Explain why I chose specific commands to communicate my instructions.  Describe the changes I made after testing at least three parts of my program.  Explain how I used or remixed someone else’s project in my prototype and give them credit. | Discuss what can and cannot be done with a specific set of commands.  Teach another person how to use a development environment and the basics of programming.  Present the challenges, and benefits of using tools to program collaboratively. | | Networks | Explain what markup languages are and the role they play in creating websites. | Explain how I used at least three different markup tags to build a website. | Present my thoughts, ideas or interests through a website built using markup. | | | |
| **Suggested Duration** | | |
| Duration based class meeting 5 times a week with 45 min periods   * 3 weeks (including final project) ~11.25 hrs   Some classrooms may need more time to finish various activities in this unit. | | |
| **Prerequisites** | | |
| None - this is the start of the unit! While some students may have some background knowledge, no prior programming experience is assumed. | | |

| **Overview of Instructional Materials** | | | |
| --- | --- | --- | --- |
| Teachers should review these materials and use them as they apply to their classroom. This is the suggested implementation, but it should be modified to fit the student population, class period constraints, etc. | | | |
| **Sequence of Lessons** | | | |
| [U1L1](https://docs.google.com/document/d/1XpUVi67267CBu3T8NDD6y1lN4synlKOkGITYxkX7rZ8/edit?usp=sharing) | **Introduction to p5.js** (45 minutes)   * SWBAT:   + Describe p5.js   + Use the p5 canvas coordinate system * Unplugged Student Activity: Draw a robot using the p5 canvas coordinate system * Additional Materials:   + [Drawing Worksheet](https://drive.google.com/file/d/1fpkP_ULAhbsTFQAOq5CDDDtwx6f_wZR7/view?usp=sharing)   + Pens/Pencils   + Rulers | | |
| [U1L2](https://docs.google.com/document/d/1UDGiw-aLtJrO2QNEYrVoQmPXCaDZ3OC8eOBLIsG88_U/edit?usp=sharing) | **Using the p5.js Web Editor** (45 minutes)   * SWBAT:   + Use the p5.js web editor   + Describe basic p5 syntax * Student Activity: Experiment with p5 commands and record your findings | | |
| [U1L3](https://docs.google.com/document/d/12FegnYkP5jOTOPVvQiuFWhwP1Gkwbs2F1bPfS-m_BVo/edit?usp=sharing) | **Functions and Parameters** (45 minutes)   * SWBAT:   + Call functions with different parameters   + Use execution flow to layer shapes   + Leave comments on their code   + Consult the p5.js online documentation * Student Activity: Recreate a sketch in p5 by drawing rectangles and ellipses * Additional Materials:   + [Deconstruct Lines worksheet](https://docs.google.com/document/d/1Cv036F93vJYvO2nvALQmcurmwcKtIPt10lcBsMHcxhI/edit?usp=sharing) | | |
| [U1L4](https://docs.google.com/document/d/1e0sgIojihR5QE0gSTQvvrcmnA_HiGrubkAdrdQqZ-tY/edit?usp=sharing) | **fill() and stroke() functions** (90 minutes)   * SWBAT:   + Change shape color using fill() and stroke() functions   + Adjust outline of shapes using strokeWeight() function   + Use pseudocode to plan a p5 sketch * Student Activity: Plan a robot drawing in p5 using pseudocode, and then program it in the p5 web editor * Additional Materials:   + Robot Drawing from Lesson 1 | | |
| [U1L5](https://docs.google.com/document/d/1F1iObX-wWnBr305eYDrWRrnmWo2l6rV_86bIFiqrnUw/edit?usp=sharing) | **Built-in Variables in p5.js** (45 minutes)   * SWBAT:   + Explain what a variable is and how it is used   + Use built-in width and height variables to position shapes   + Use mathematical reasoning to position shapes with a given proportion to the canvas * Student Activity: Recreate a sketch by using built-in variables width and height * Additional Materials:   + [Optional Extension worksheet](https://docs.google.com/document/d/1R770fovAtw-2q3L7LyYEizwGUnBQF-Zs02xAUJdro9I/edit?usp=sharing) | | |
| [U1L6](https://docs.google.com/document/d/1AMxDIBFMqM5S8z1PshKzO_y5xxLQhqIR7MLBwQrUPhU/edit?usp=sharing) | **Complex Shapes in p5.js** (45 minutes)   * SWBAT:   + Use mouseX and mouseY to draw new shapes   + Consult the p5 online documentation   + Draw triangles, quadrilaterals, and other complex shapes * Student Activity: Add new features to the robot drawing by using triangle(), quad(), or beginShape() | | |
| [U1L7](https://docs.google.com/document/d/1jhweGxJp1WxwWlurkAu8l_m9Fm_JcfHSNtR59T_RTvo/edit?usp=sharing)  [U1L8](https://docs.google.com/document/d/1FfsGXUhMTnJJKGIF7Xl3By1QY2oUWbVIWMr9hz82eRg/edit?usp=sharing)  [U1L9](https://docs.google.com/document/d/18i86e-icO9mtI0xQTJmNclnUFO0k_eoV_EJMEnwlwQ8/edit?usp=sharing)  [U1L10](https://docs.google.com/document/d/17gTH2EtmfhEIZv6Rg1_UPq_m0F8buFMzRoPBEuuGEZc/edit?usp=sharing)  [U1L11](https://docs.google.com/document/d/1zOLp9qRlVA3E_0qVx5ZoLFrjjMMA6J4miBQB_kmkGFA/edit?usp=sharing) | **Final Project: Custom Emoji** (~5 class periods)   * Student Activity: Create a custom emoji that represents students’ cultures or their communities, following the Engineering Design Process. * Additional Materials:   + [Custom Emoji Project Packet](https://docs.google.com/document/d/1-9U2eTUzr5GXC7rDdp3gALNFa0FeTFdl7v8Z-j1oCU8/edit?usp=sharing)   + Pens/Pencils/Markers * Pacing:   + Background discussion: 25 minutes   + Initial brainstorm and peer feedback: 20 minutes   + Deconstruct design and plan with pseudocode: 45 minutes   + Code first prototype: 45 minutes   + Evaluate first prototype: 15 minutes   + Pseudocode for second prototype: 15 minutes   + Code second prototype: 30 minutes   + Presentations and feedback: 45 minutes | | |
| [U1L12](https://docs.google.com/document/d/13MYcbvtXjXE77rTQAMudKUKT3QMebWKhaYa7elaa-GM/edit?usp=sharing) | **Introduction to HTML** (45 minutes)   * SWBAT:   + Describe the structure of an .html file   + Add HTML tags and attributes to their p5 web pages   + Describe the differences between HTML and JavaScript * Student Activity: Use HTML to create a presentation page for their final projects. | | |
| [U1L13](https://docs.google.com/document/d/1kYCw3U6QvCW_KhyjrvxSenfuFZBaS13q_ECkLAnioWw/edit?usp=sharing) | **Introduction to CSS** (45 minutes)   * SWBAT:   + Use CSS to style a web page   + Distinguish between selectors, properties, and their values   + Describe the relationship between HTML, CSS, and JavaScript * Student Activity: Use CSS to style presentation pages for their final projects | | |
| [U1L14](https://docs.google.com/document/d/1mtQhlJ521A_2i1PStRJCf647uyziOz68YruQHEoPVhs/edit?usp=sharing) | **Final Project Reflection** (45 minutes)   * SWBAT:   + Give kind feedback and ask thoughtful questions   + Use feedback to reflect meaningfully on their work * Student Activity: In groups, rotate to view and leave feedback on each other’s final projects, and reflect on the process as a whole | | |