| **Overview** | | |
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| In this unit, students first learn to make their sketches more flexible and dynamic by using “custom” variables in place of hard-coded values. Next, they learn to make their sketches respond to actions taken by the user—moving and clicking the mouse, and pressing keys on the keyboard. Students will use if statements to refine user interaction and use logical operators to create compound conditionals. Lastly, they will learn to add images, text, and random values into their projects. For the final project, students apply these concepts to create a button clicking game. They will document this project by using HTML and CSS to build a web page.  **Enduring Understandings**   * Understand how conditional statements affect the execution flow of a program * Understand how mouse and keyboard events can facilitate user interaction * Understand how to generate and use random numbers * Understand how to load external media into a program | | |
| **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   * 4 weeks (including final project) ~15 hrs   Some classrooms may need more time to finish various activities in this unit. | | |
| **Prerequisites** | | |
| By the time you begin Unit 2, your students should be comfortable calling shape and color functions, understand how sequence and execution flow affects the output on the canvas, and know which protocols to follow when debugging their code. The syntax and logic for conditional statements is tricky, so students will need to be able to interpret the messages in the console and use other debugging methods in order to struggle productively! | | |

| **Overview of Instructional Materials** | | | |
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| 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** | | | |
| [U2L1](https://docs.google.com/document/d/1QlI4MLIjhaenLNctNWewAQSjCv633tLUiKo8csyl1FE/edit?usp=sharing) | **Variables** (45 - 90 minutes)   * SWBAT:   + Describe what a variable is and how it is used   + Declare and assign values to variables   + Use mathematical operations on variables   + Use pair programming to solve coding challenges * Unplugged Student Activity: Recreate a poster using variables in p5 * Additional Materials:   + [Planning Grid](https://docs.google.com/document/d/1-H-LyLza7iK9Aha6qt1v60w2YvOMpsteb_2pyDPNcZw/edit) for Extension Activity | | |
| [U2L2](https://docs.google.com/document/d/1j1SXFKl-z8-JJy6KdMc3IFzGQoVQ84tjRcrDSDbWc8Y/edit?usp=sharing) | **Conditional Statements** (45 minutes)   * SWBAT:   + Write a basic “if” statement   + Use “if” statements to update the background, fill, and parameters of shapes   + Make a sketch interactive by creating thresholds for mouseX and mouseY * Student Activity: The Sunset Lab, in which students use conditionals to make a sunset in p5 * Additional Materials:   + [Exit Slip](https://docs.google.com/document/d/1_8FanJ1Ar9Wwegw3x0HTYxEc8N4rLe5noKRJDWKyXf4/edit?usp=sharing) | | |
| [U2L3](https://docs.google.com/document/d/1BvbVoIF9wxAPBin-mbzeLPLpwxXXJmqLbEQE0OT6fZ0/edit?usp=sharing) | **Practice with Conditionals** (45 minutes)   * SWBAT:   + Write an “if” statement that contains multiple actions within the code block   + Use “if” statements to update the background, fill, and parameters of shapes   + Make a sketch interactive by creating thresholds for mouseX and mouseY * Student Activity: Guess My Conditional, in which students first design sketches that change depending on mouseX and mouseY position, and then attempt to recreate each other’s sketches. * Additional Materials:   + [Guess My Conditional worksheet](https://docs.google.com/document/d/1g6MPJ-GtbWF2kAdw_DUZFsFNFOKnem0YHMQxNkte67Q/edit?usp=sharing) | | |
| [U2L4](https://docs.google.com/document/d/1pd-SJZ5_WjUOZ6JAajiMzAahBASvNMVQ0xbdfkOmDbM/edit?usp=sharing) | **Else and Else if** (90 minutes)   * SWBAT:   + Write an “if...else” statement.   + Use “else” statements to draw shapes and change attributes of shapes.   + Use “else if” statements to draw a range of different shapes and attributes by creating thresholds for mouseX and mouseY. * Group Mini-Project: Create a traffic light sketch that changes colors based on mouse position * Additional Materials:   + Chart paper divided into sections for pseudocode   + Markers (especially red, yellow, and green) | | |
| [U2L5](https://docs.google.com/document/d/1ZHi5O6Xij_JZg_RsDafU4yAN190ViaNHCJya4szw8Es/edit?usp=sharing) | **Logical Operators** (45 minutes)   * SWBAT:   + Use && and | | to create a compound conditional statement   + Explain the difference between the logical AND and OR operators * Pair Programming Activity: Make a hover button * Additional Materials:   + [Exit Slip](https://docs.google.com/document/d/1GLjdjOmiOQC1cAPQZowCmxaCVBksxbt8ckm5O9OG18A/edit?usp=sharing) | | |
| [U2L6](https://docs.google.com/document/d/1T-sAW6KpcV3V3UUf9dwMSDggXJQZsZP8vLdQ6Ar6q6I/edit?usp=sharing) | **Add and Subtract with keyPressed()** (90 minutes)   * SWBAT:   + Use keyboard events to control a p5 sketch   + Use conditionals to refine user interaction   + Use assignment operators to increase and decrease variables * Group/Paired Mini-Project: Color Battle Game * Additional Materials:   + Chart paper divided into sections for pseudocode   + Markers | | |
| [U2L7](https://docs.google.com/document/d/16Ro3oILlpuKuWxk-a5C8ke6WhnLx48NtlUCePOhpejo/edit?usp=sharing) | **Randomize with mousePressed()** (90 minutes)   * SWBAT:   + Use mousePressed() to control a p5 sketch   + Assign random values to variables   + Use the console to get information about a program * Group/Paired Mini-Project: Make a click button * Additional Materials:   + Chart paper divided into sections for pseudocode   + Markers | | |
| [U2L8](https://docs.google.com/document/d/1kN8xQky-ZHWP2cGeygEkuUoThMu418Dz_OC7iA3mA8c/edit?usp=sharing) | **Intro to Animation** (45 minutes)   * SWBAT:   + Describe how frame rate affects the visual output on the p5 canvas   + Use the frameRate() function to adjust the draw loop()   + Describe how the random() function behaves in different scopes * Unplugged Student Activity: Post-it Flipbook * Additional Materials:   + Post-it pads   + Markers   + Small binder clips (optional)   + Example Flipbook (optional) | | |
| [U2L9](https://docs.google.com/document/d/1a4AZ6c31dniiJnGtRhiA_gIDYsyJik1Ofy1_l6eEA-0/edit?usp=sharing) | **Adding Images in p5** (45 minutes)   * SWBAT:   + Identify image properties (file type, dimensions, and size)   + Load images into p5 from local files   + Control image position and size on the p5 canvas * Unplugged Student Activity: Make a mood board using images found online | | |
| [U2L10](https://docs.google.com/document/d/1zEPyRPkgPe60CxOYieRiEMuVQA7szdFh9nq4TWIxtBE/edit?usp=sharing) | **Displaying Text in p5** (45 minutes)   * SWBAT:   + Explain what a string is and how it is used   + Create strings by using single or double quotes   + Concatenate strings   + Use the text() function to display messages on the canvas * Student Activity: Make a “bad game” that increases the score when a button is pressed, but does nothing else. | | |
| [U2L11](https://drive.google.com/open?id=1Q9XXL7kSx3B8mgi46xrlu2HCtxou8UwkFNgtZHQaNpk) | **Final Project: Button Game** (~6 class periods)   * Student Activity: Create a button game that facilitates meaningful interaction with the player (i.e., the player can understand how the game works based on the interface, and also find it fun to play) * Additional Materials:   + [Button Game Project Packet](https://drive.google.com/open?id=18u5A0ScuDc0vNAD7G0LVVtinED-n1qcx0pPpNouRrCk)   + Extra copies of pages 2, 4, and 7 (if using larger feedback groups)   + Pens/Colored Pencils/Markers * Pacing:   + Day 1: Explain instructions and rubric, begin game design   + Day 2: Finding images, writing pseudocode, beginning to code in p5   + Day 3: Coding game in p5   + Day 4: Testing and coding improvements in p5   + Day 5: Build Presentation Page using HTML and CSS   + Day 6: Peer Feedback and self-reflection | | |