**Lesson 9** Final Project: Emoji Sketch Day 1

**How do we debug our code?**

| **Overview** | |
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| In this lesson, students will begin coding their emojis using their prior knowledge from this unit. They will use their final project worksheets to record their process and debug their code. | |
| **Lesson Objectives** | |
| Students will be able to   * Demonstrate their understanding of p5’s coordinate system * Draw ellipses, rectangles, and other 2D shapes in p5 * Change shape attributes, including fill color and stroke * Follow debugging protocols | |
| **Suggested Duration** | |
| One period (45 minutes) | |
| **Blueprint Foundations Student Outcomes (**https://blueprint.cs4all.nyc/outcomes/) | |
| Abstraction  Analyze | **Describe how** I might use patterns to express an idea |
| Abstraction  Prototype | **Describe** different things I tried in order to achieve a goal. |
| Algorithms  Analyze | **Describe how** instructions can have different outputs depending on inputs. |
| Programming  Analyze | **Describe** ways a development environment helps me create a project |
| Programming  Prototype | **Describe the changes** I made after testing parts of my program. |
| **Vocabulary** | |
| * **Debugging**: The process of identifying and removing errors from a computer program. Admiral [Grace Hopper](https://news.yale.edu/2017/02/10/grace-murray-hopper-1906-1992-legacy-innovation-and-service) is credited with popularizing the term after she found a moth in her computer! | |
| **Planning Notes** | |
| * Take time before this lesson to assess worksheet pages 3 and 4 in which students:   + Decompose their freehand sketches into p5 shapes and place them on a grid.   + Use pseudocode to break down the project into discrete steps.   Use these assessments to identify which students may struggle to code their emojis and potentially pull students for small group instruction to review material.   * In this lesson, students will work on page 6 of the [final project packet](https://docs.google.com/document/d/1-9U2eTUzr5GXC7rDdp3gALNFa0FeTFdl7v8Z-j1oCU8/edit?usp=sharing), using page 5 as a reference.   + Students may need **extra copies** of page 6   + Consider modifying the fourth column on page 6 to say: “If no, what was the result? If yes, draw a happy emoji” or “…if yes, write yourself a compliment.” * Bring a rubber duck(or several) for debugging. | |
| **Resources** | |
| * [p5.js Debugging Guide](https://p5js.org/learn/debugging.html) * Coding Train Tutorial on [Errors and the Console](https://www.youtube.com/watch?v=LuGsp5KeJMM) | |
| **Assessments** | |
| * Assess the **Student Activity** and check for students’ ability to:   + Follow the layout of their designs based on the coordinate plane   + Record their coding process   + Follow debugging protocols * Assess student’s progress in the **Wrap Up**. Check for the ability to:   + Draw ellipses, rectangles, and other 2D shapes   + Adjust shape attributes like fill color and stroke | |

| **Do Now:** |
| --- |
| * Return collected worksheets to students. * Students should review their designs and pseudocode in preparation for today’s student activity, and take this time to make any updates or additions to these sections. |
| **Discussion: Debugging** |
| * Begin by asking students, what does it mean for a program to have a “bug”?   + Students may respond that the program is “broken” or “crashing” or otherwise isn’t working. While sometimes a bug might cause a program to stop running, the key for students to understand is that a “bug” is when they **want their code to do a specific thing**, **but the result is something different** than what they wanted. * Continue the discussion by asking students what kinds of bugs they run into and what they do when they get stuck. Write these ideas on the board.   + Introduce the “Rubber Duck Method.” Explain that programmers will read their code aloud to themselves or rubber ducks to catch their errors.   + Incorporate student responses to make an anchor chart of class debugging protocols, like the ones below. Stress that these should be followed **in order**:   FIRST:  Check to see if there are any error messages in the console. Look at the line number to figure out where the error happened. **Often, programmers get errors just because a function is slightly misspelled.**    SECOND:  Check the p5 reference page for more information.    THIRD  Use a rubber duck to read the code out loud to yourself.    FOURTH:  Comment out lines of code to find the problem. Change **one line of code at a time** to fix the error.    FIFTH:  Read your code out loud to a neighbor, or ask a peer for help.    SIXTH:  Ask a teacher for help. |
| **Teacher Demo: Process** |
| * Distribute page 5 of the final project worksheet. Explain to students that they will be using this as they code to document their process and help them debug errors. * Briefly demonstrate how students should fill out the table. The Step # should correspond to their pseudocode on page 4 of the worksheet. For example, make intentional errors while trying to draw an ellipse and fill out the table accordingly (see progression below):      | Step # | What were you trying to do? | Did it work?  (Y/N) | If no, what was the result? | | --- | --- | --- | --- | | 1 | Draw a pink circle in the center of the canvas | No | The canvas is blank. There is an error on line 8 that says, “elipse is not defined” |      | Step # | What were you trying to do? | Did it work?  (Y/N) | If no, what was the result? | | --- | --- | --- | --- | | 1 | Draw a pink circle in the center of the canvas | No | The canvas is blank. There is an error on line 8 that says, “elipse is not defined” | | 1 | Draw a pink circle in the center of the canvas | No | The circle is in the center, but it is purple |      | Step # | What were you trying to do? | Did it work?  (Y/N) | If no, what was the result? | | --- | --- | --- | --- | | 1 | Draw a pink circle in the center of the canvas | No | The canvas is blank. There is an error on line 8 that says, “elipse is not defined” | | 1 | Draw a pink circle in the center of the canvas | No | The circle is in the center, but it is purple | | 1 | Draw a pink circle in the center of the canvas | Yes |  | |
| **Student Activity: Emoji Drawing in p5** |
| * Students should take the rest of the period to begin coding their emojis in p5.   + Note: Make sure students **save their work as they code**. * Remind students to follow the debugging chart before asking you for help. * Circulate the room. If students are struggling, you may choose to pull them for small group instruction in order to review the material. |
| **Wrap Up** |
| * Make sure students save and share their sketches with you before they leave |
| **Extensions** |
| N/A |