**Lesson 1** Introduction to p5.js

**How can we break down a drawing into basic shapes in p5.js?**

| **Overview** | |
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| In this lesson students will be introduced to p5.js, the canvas, and its coordinate system through an unplugged activity. Before coding with p5.js, students will make a robot drawing using basic shapes on graph paper that represents the p5.js coordinate system. Students then will transfer their drawings to the p5.js canvas in Lesson 4. | |
| **Lesson Objectives** | |
| Students will be able to   * Describe p5.js and the projects they can create using p5 * Use the p5 canvas coordinate system | |
| **Suggested Duration** | |
| One period (45 minutes) | |
| **Blueprint Foundations Student Outcomes (**https://blueprint.cs4all.nyc/outcomes/) | |
| Abstraction  Analyze | **Give examples** of specific patterns in something I can see, do or touch. |
| 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. |
| **Vocabulary** | |
| * **p5.js**: A Javascript library that allows programmers to make digital art and interactive web pages. * **Unplugged Activity**: An activity that can be completed without the use of computers or other electronics. * **Interactivity**: The ability of a computer to respond to a person’s actions. * **Width**: Horizontal distance of a 2D shape * **Height**: Vertical distance of a 2D shape * **Rectangle**: A 2-Dimensional shape with four straight lines and four right angles * **Ellipse**: A 2-Dimensional oval or circle. * **Coordinate Plane**: A grid with an x and y axis that intersect at the origin (0,0) | |
| **Planning Notes** | |
| * Throughout the course, students will need to use design journals. Design journal can be a physical notepad or a digital document (e.g., Google Doc or Google Classroom questions). * Prepare the following materials for the unplugged activity:   + Print the [Drawing Worksheet](https://drive.google.com/file/d/1fpkP_ULAhbsTFQAOq5CDDDtwx6f_wZR7/view?usp=sharing) for each student   + Pens/ Pencils   + Rulers * At the end of class, make sure students save their worksheets because they will be using them in Lesson 4. | |
| **Resources** | |
| * Video tutorial: [1.2 Basics of Drawing](https://www.youtube.com/watch?v=D1ELEeIs0j8) | [Code](https://github.com/CodingRainbow/Rainbow-Code/tree/master/p5.js/1.1_p5.js_basics_of_drawing) * Getting Started With p5.js: Chapter 3 Draw * [Drawing Worksheet](https://drive.google.com/file/d/1fpkP_ULAhbsTFQAOq5CDDDtwx6f_wZR7/view?usp=sharing) | |
| **Assessments** | |
| * **Check in** during work time and assess students’ **worksheets**. Check for students’ understanding of   + The p5 canvas coordinate system.   + Deconstructing a drawing and shapes with specific information. * Assess students’ **design journals.** Check for their ability to   + Identify different shapes and their sizes on p5 canvas. | |

| **Do Now** |
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| * **[Design Journal]** Ask students to write all the 2D shapes that they can think of and draw them in their design journal. |
| **Discussion: What is p5.js?** |
| * Play this [video](http://hello.p5js.org/) to introduce what kind of projects are possible with p5.js. Note that the video is interactive, so move the mouse around when prompted to show students examples of interactivity. * After the video, ask students the following questions:   + What did you see in the video?   + What things do you think you can make with p5?   + What does it mean for a program to be interactive? * Briefly discuss interactivity with students. Ask students what types of actions a computer might **respond** to (e.g., typing, clicking, touch, voice commands, etc.) * Wrap up the discussion by explaining that p5.js is a JavaScript library for creating visual and interactive art in web browsers. Essentially, students will be coding in JavaScript, with the help of p5. * Show some student project examples:   + Unit 1: [Emoji](https://editor.p5js.org/Msqcoding/sketches/0o6caMIo2)   + Unit 2: [Button Game](https://editor.p5js.org/Ariana603/sketches/1VTkQlZN9) |
| **Student Activity: Unplugged activity - Draw a robot** |
| * Describe the rules of drawing in p5.   + When using p5 to create drawings and graphics, you need to create a “canvas” first. The canvas is the place where **visual output** is drawn. We call this drawing a “p5 sketch”.   + The p5 canvas uses a different coordinate system than the one you are used to: The origin is located in the top left. The x-values increase as you move to the right, however, the y-values increase as you move **down**. This is true not just in p5, but in all web design.     *Source: https://processing.org/tutorials/drawing/*   * Explain to students that they will first practice by making a drawing on a graph that has the p5.js coordinate system and writing instructions on how another person could draw them. * Handout the [Drawing Worksheet](https://drive.google.com/file/d/1fpkP_ULAhbsTFQAOq5CDDDtwx6f_wZR7/view?usp=sharing) and introduce the steps of the unplugged activity.   + Step 1: Students will draw a robot using rectangles and ellipses. Use only up to 5 shapes total. When drawing, follow the rules below:  | Draw rectangles along grid lines. | To draw an ellipse, put the center at two crossing lines. The distance to the left and right of (and above and below) the center should be equal. | | --- | --- |   Here is an example:     * + Step 2: Students will list each shape used in their drawings and provide the information of each shape in the instructions section.     - For a rectangle, they need to specify the x and y coordinates of the top left corner, width, and height.      * + - For an ellipse, they need to specify the x and y coordinates of the center, width, and height.     Here are example instructions:       * Wrap up the activity by asking the following questions to students:   + Share one new thing that you learned.   + What was challenging? Why?   + What elements would you add to your drawing if you had more time? |
| **Wrap Up** |
| * **[Design Journal]** Display the example drawing below on the screen and ask students to answer the following questions in their design journal. You may want to point out to students that each box goes up by 10, instead of 20.  |  | * How many shapes can you identify? * What is the (x,y) location of the mouth of the robot? * What are the width and height of the eyes? | | --- | --- | |
| **Extensions** |
| N/A |