



# **Unit 2: Computational Foundations of Data Science**

# Lesson 2.3: What is the role of Programming in Data Science?

In this lesson, students will be introduced to EduBlocks. They will work with the Mario Kart dataset and learn how to manipulate and filter the data.

**Duration:** 90 minutes

**Objective:** By the end of this lesson, students will know how to run, clone, and create an

EduBlocks program and how to filter the data.

Lesson Walkthrough: <u>Unit 2 Lesson 3 - Teacher Walkthrough</u>

# **CSTA Standards in this Lesson**

Identifier	Concept	Subconcept	Standards
3A-AP-13	Algorithms & Programming	Algorithms	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.
3A-AP-15	Algorithms & Programming	Control	Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made.
3A-AP-17	Algorithms & Programming	Modularity	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
3A-AP-18	Algorithms & Programming	Modularity	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
3A-AP-23	Algorithms & Programming	Program Development	Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs.
3A-CS-03	Computing Systems	Troubleshooting	Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.





3A-DA-09	Data & Analysis	Storage	Translate between different bit representations of real-world phenomena, such as characters, numbers, and images
			and images.

## Lesson activities

## Warmup - Conditional Statements (5 min)

(CSTA standards in this activity: 3A-AP-15)

 Students look at a dataset organized in a table and refresh their memory of index values and conditional statements.

# Introduction to EduBlocks (15 min)

(CSTA standards in this activity: 3A-AP-23)

- Introduce students to EduBlocks with the available slides.
- It's very important that students create an account and sign into it so that they can save their work.
- Make sure to note the **clone**, **save** and **rename** features which they should use for every program they work with today!

# Introduction to JSON format (15 min)

(CSTA standards in this activity: 3A-DA-09, 3A-AP-13)

- JSON is a structure for storing data.
  - syntax is comprised of pairs of keys and values
  - o **import json** block can be used to ready EduBlocks to use JSON-format data
  - the general format '[{"key":"value", "key2":"value2"}, {"key":"value3", "key2":"value4"}]' is reviewed in the slides with a Mario Kart example!
- Individual observations, or values within those observations, can be pulled with different print blocks as shown.
  - Students modify a given program to print car names instead of driver names.

# Mario Kart Drivers Program 1 - Use & Modify (20 min)

(CSTA standards in this activity: 3A-AP-17, 3A-AP-18)

- Students clone a program and use it to print the names of drivers. Some questions for class discussion:
  - What does this print out? Why do you think it prints out what it does?
  - What is the variable "i"? Do you think it matters what this variable is called? What if we named it something different?





- How many times does the loop run? Why do you think it runs this many times?
- Now, attach the larger chunk of code starting with "sum = 0" below the for loop.
  - Run your program. What does this part of the program seem to do?
  - What happens to the "sum" variable each time the program goes through the loop? What happens to the "counter" variable?
  - How do "sum" and "counter" get used to find the average weight? Is this how you would think about an average?
- Modify the chunk of code you just added so that the program calculates average acceleration instead of average weight.
  - o Think: what parts of the code need to change?
  - o Are there any parts of the code that can stay the same?

## Mario Kart Drivers Program 2 - Use, Modify, Create (25 min)

(CSTA standards in this activity: 3A-AP-17, 3A-AP-18)

- Students should open <u>this program</u>. As they did before, be sure to clone, save, and rename the project in your EduBlocks account. Some further questions for discussion below:
  - What prints out when you run this program? Is that what you would expect?
     (Something to think about: Why doesn't Mario's information print out, since he's the first one in the data?)
- Attach the chunk of code that starts with "for i in myJSON".
  - O Run the program again. What does this add?
  - What is the purpose of the purple for loop in this section of code?
  - What is the purpose of the green if statement in this section of code?
  - Modify the code to only print Daisy's speed value.
- Task for students: Create a new section on this program. The code should find the
  maximum speed value in the list of drivers, and then print out the name of the driver.
- Some things to consider:
  - How could you loop through the JSON data to find the maximum speed value?
  - O How could you use that speed value to find the driver who has it in the JSON?
  - What should happen if there is a tie?

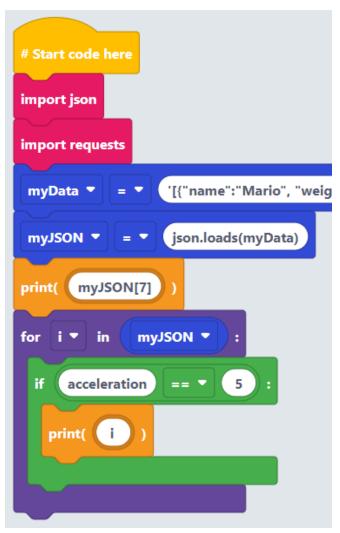
# Exit Ticket - Conditional Statements in EduBlocks (10 min)

(CSTA standards in this activity: 3A-CS-03)

• Students are given a program with several issues in it. They need to find the errors, explain what is wrong, and suggest solutions.







# Issues:

- The JSON has 7 values, but that means the max index is 6. There is no "myJSON[7]". To get Toadette's value, students could reference "myJSON[6]".
- o In the green if statement, "acceleration" is a bad reference. Instead, students need to reference "i['acceleration']".

# **Assessment:**

Assess student understanding through participation in class discussions and class activities.