

# Function Builder

## Learning Goals

1. Define a rule describing a set of inputs to determine the output
2. Predict outputs of a function using a given input
3. Construct functions to create a new function

## Instructions:

In this activity, the above questions are investigated. Complete this document by filling in data tables and writing complete responses.

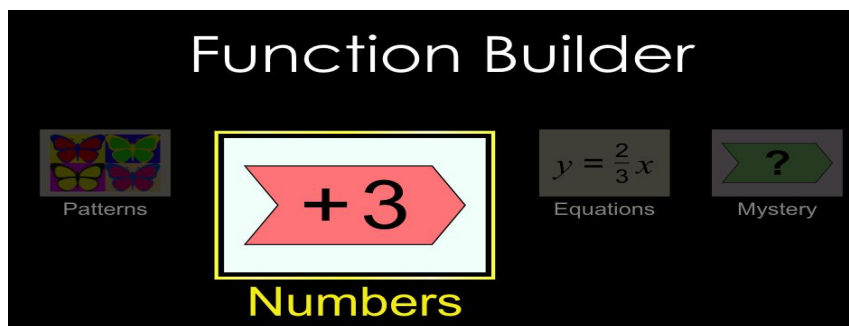
This investigation has three phases:

- Exploration
- Explanation
- Challenge

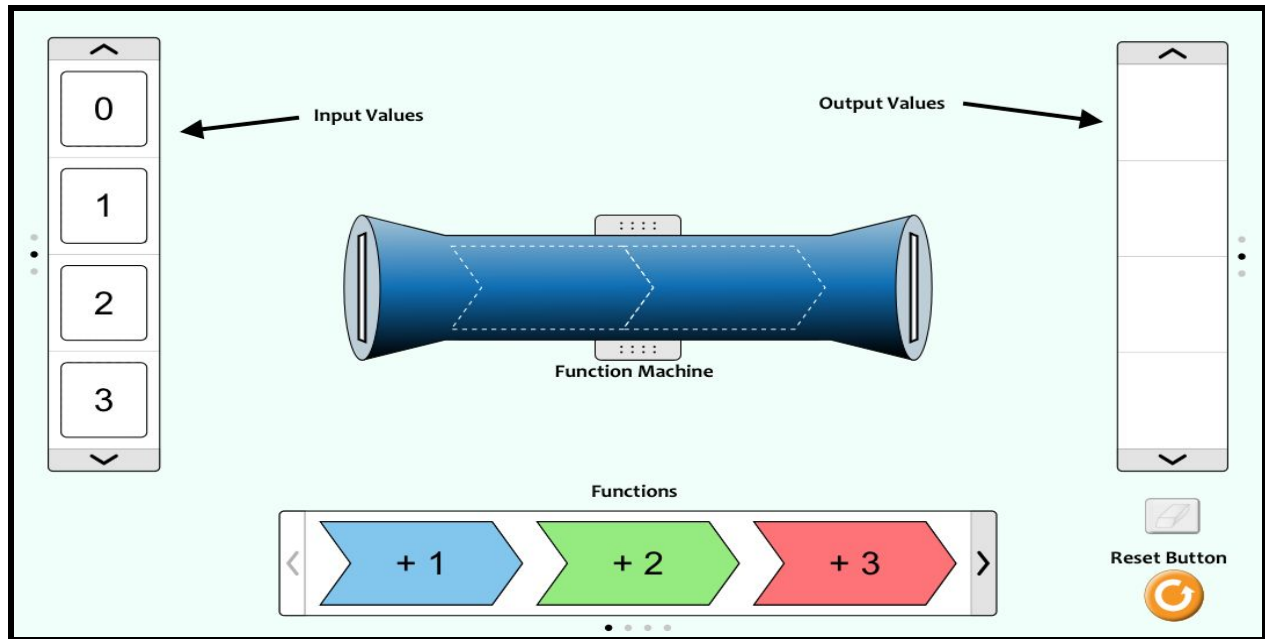
## Procedure:

In this activity, we will further our explore how to construct different totals using our function machine. The function machine adds, subtracts, multiplies, or divides one number to result in another.

1. To access the simulation:
  - a. Type this website in: **phet.colorado.edu**
  - b. In the search bar type in: **Function Builder (simulation)**
  - c. Click on the **play** button
  - d. Select the **“Numbers”** tab



- Your computer screen should now look like this. Take a minute to examine the different parts of the simulation before you explore.



**Explore**

- Using the input values on the left, drag and drop the number 2 into the function machine. Record the results below.
  - Input value = 2
  - Output value = \_\_\_\_\_
- Repeat step 3 by dragging and dropping positive numbers into the function machine. Record your output values in the table below for each trial.

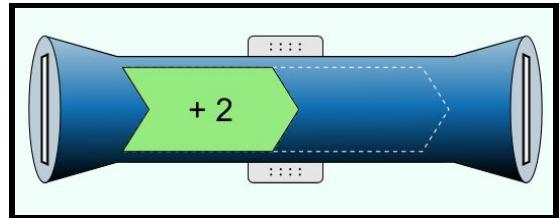
Input Value	Output Value

Describe your results for each trial. How do the numbers you input to the machine compare the output numbers?

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5. Using the **“Functions”**, select +2 and drop it into the function machine.



6. Drag the number 3 from the input values into the function machine. What is the output?

\_\_\_\_\_

7. Repeat step 6 by dragging and dropping positive numbers into the function machine. Record your output values in the table below for each trial.

Input Value	Function	Output Value
	+2	
	+2	

Describe your results for each trial. How do the numbers you input to the machine compare the output numbers?

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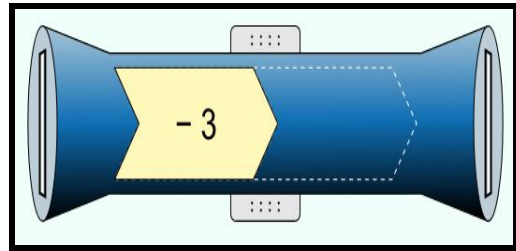
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**Explain: Part A**

A **rule** of a function can be described as how much you are increasing or decreasing your input value by. We calculate this by adding, subtracting, multiplying, or dividing the function and the input number.

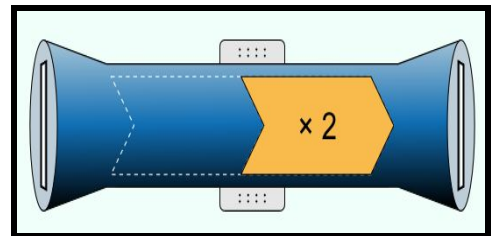
**Directions:** For each question set, determine the output value when given the function. Record your data in the table.

8. Determine the output values with a function of -3.



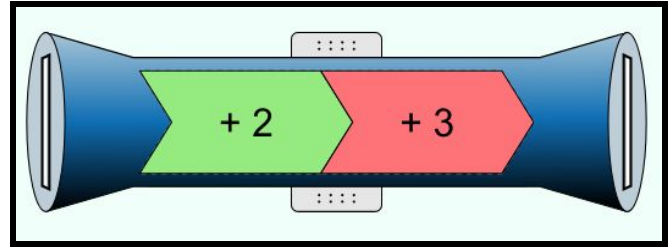
Input Value	Function	Output Values
	- 3	
	-3	

9. Click the orange “reset” button to clear your screen. Determine the output values with a function of x2.



Input Value	Function	Output Values
	x2	
	x2	

10. Click the orange “reset” button to clear your screen. Determine the output values with a function of +2 and +3.



What is the total function of your machine?  
How do you know?

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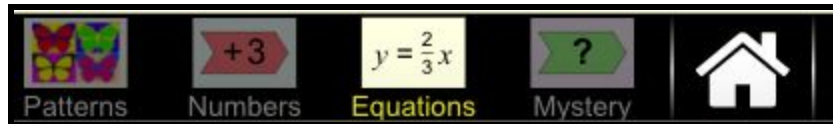


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Input Value	Function	Output Values

**Explain: Part B**

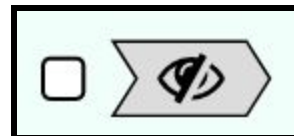
11. On the bottom of your screen, click on the “Equations” tab.



**Directions:**

- For this section of the simulation, you will team up with a partner.
- Each partner will insert a function: addition, subtraction, or multiplication.
- Once the function is set, click on the “hide” button to hide the function from view.

- Switch computers.



**For each question set:**

- Drag and drop your input values into the function machine. Record them in your table.
- Examine your output values and record them in the data table.
- Compare your input and output numbers to determine what the function of your machine is.
- Create a rule to describe your function of the machine. Explain why you chose this with evidence to support your claim.

12. Set A

Input Value	Function	Output Values

Rule: \_\_\_\_\_

Explanation: \_\_\_\_\_

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13. Set B

Input Value	Function	Output Values

Rule: \_\_\_\_\_

Explanation: \_\_\_\_\_

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14. Check your work. Once both of you have completed your challenges, discuss with your partner the rule you created based on the data and why. Together, partners will determine whether or not the function was accurately identified.

*Challenge*

**Now that you've had the opportunity to explore the the relationship between input and output values in regards to their functions, create your own function rules. These functions will be used throughout the week for our class to practice.**

- Create 2 basic problems with one function.
- Create 1 complex problem with two or more functions.

**Basic A**

Rule (Function): \_\_\_\_\_

Input Value	Function	Output Values

**Basic B**

Rule (Function): \_\_\_\_\_

Input Value	Function	Output Values

**Complex C**

Rule (Function): \_\_\_\_\_

Input Value	Function	Output Values



## Exit Ticket

1. What is a function of a table?

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2. John wants to purchase brownies at the bake sale. Each brownie costs \$2.00. If he purchases 4 brownies, how much will he to pay? Explain using words, numbers, or pictures.

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3. Determine the input and/or output values given the input values and function (rule).

Input Value	Function	Output Values
	$\times 3$	9
4	$\times 2$	
5	$\times 3$	

4. Determine the missing values given the input, output, and/or function.

Input Value	Function	Output Values
	$+3$	4
4		10
6	$\times 5$	

Explanation: \_\_\_\_\_

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