



Name: _____

Date: _____

Student Exploration: Function Machines 2

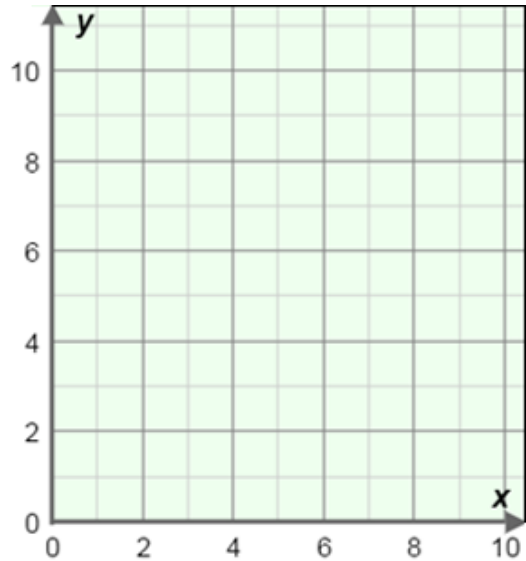
Vocabulary: function, input, output

Prior Knowledge Questions

(Do these BEFORE using the Gizmo.)

On the graph at right, plot the points listed below.

- A. (2, 4)
- B. (3, 8)
- C. (6, 1)
- D. (9, 7)
- E. (0, 3)



Gizmo Warm-up

While house-sitting for your uncle, you discovered his secret function machines. He is now back from his vacation. “So,” he bellows, “show me what you learned about my machines!”

1. In the *Function Machines 2* Gizmo, drag one of the six blank machines to the **FMP 500** (Function Machine Programmer 500) in the lower right part of the Gizmo. Program it to *Multiply by 9*.

2. Drag the machine to the blue stand. Click the “0” to drop it into the machine.

What happened? _____

3. Click the leftmost clipboard to open a table. Use the Gizmo to help you fill in the output values in the table to the right.

Input	Output
1	
2	
3	
5	
8	

4. Click **Close**, and then click **Reprogram A-F**. Use the Gizmo to find machine **A**’s function.

What is it? _____

Check your answer by dragging machine **A** to the **FMP 500** and selecting **Show function**.



Activity A: Patterns in Tables	<u>Get the Gizmo ready:</u>	Input	Output
	<ul style="list-style-type: none"> If the table is open, click Close. Click the Clear stands button. 	0	8
		1	9
		2	10

Seeing your interest in his machines, your uncle pulls some dusty notebooks of a shelf. The notebooks are filled with tables. He says, "Let's try to discover the patterns in these tables."

1. Program a machine to *Multiply by 4* in the **FMP 500**. Drag it to a stand and open the table.

A. Use the Gizmo to complete the table at the right.

B. What pattern do you see in the output? _____

C. Complete this description for the *Multiply by 4* machine:

If the input is 0, the output is _____.

As the input increases by 1, the output increases by _____.

Input	Output
0	
1	
2	
3	

2. Now program the machine to *Multiply by 5*. Use inputs of 0, 1, 2, and 3 to create a table. Then use your table to complete the description below:

If the input is 0, the output is _____.

As the input increases by 1, the output increases by _____.

3. Program a machine to *Add 6*. Drag it to a stand and open the table.

A. Use the Gizmo to complete the table at the right.

B. Complete this description:

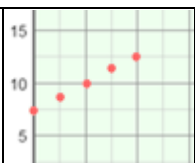
If the input is 0, the output is _____.

As the input increases by 1, the output increases by _____.

Input	Output
0	
1	
2	
3	

4. What are the differences between the tables for multiplication functions and the tables for addition functions? (Hint: Compare the descriptions you wrote in questions 1, 2, and 3.)



<p>Activity B:</p> <p>Graphing Functions</p>	<p><u>Get the Gizmo ready:</u></p> <ul style="list-style-type: none"> • If the table is open, click Close. • Click the Clear stands button. 	
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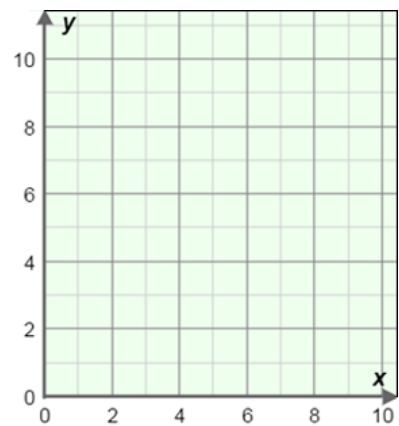
Your uncle says, "I've been thinking that it might be possible to take these function tables and graph them. Let's give it a try!"

1. Program a machine to *Add 4* in the **FMP 500**. Click the table clipboard. Use inputs of 0-3 to create a table.
 - A. Click the clipboard with the graph on it. Move your mouse over the four points to see their coordinates.
 - B. Each input-output pair is graphed as a point. The _____ is the *x*-coordinate and the _____ is the *y*-coordinate.

2. Set a machine to *Add 5*. Use inputs of 0-3 to create a table.

- A. Can you make the graph for this table on your own? Try it on the coordinate grid to the right.
- B. Now click the graph clipboard and check your graph.
- C. What pattern do you see in the points? _____

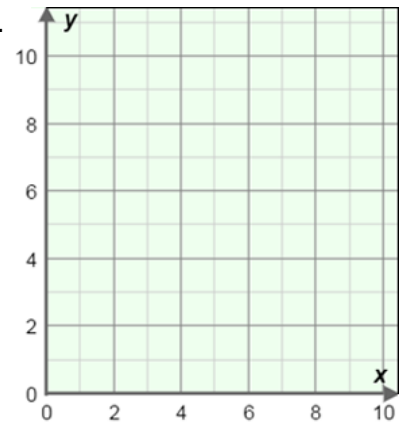
- D. How can you use the graph to find the output when the input is 4?



3. Use a *Multiply by 3* machine to create a table for inputs of 0-3.

- A. Before clicking the graph clipboard, try graphing the table values using the coordinate grid to the right.
- B. Now click the graph clipboard and check your graph.
- C. How is this graph similar to the graph in question 2?

- D. How is it different? _____



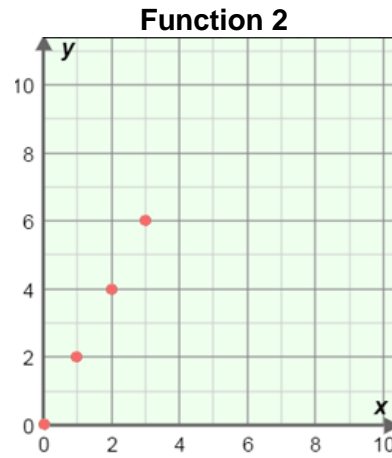
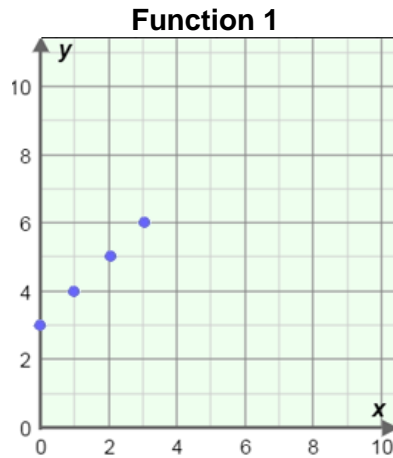
Activity C:
Graph Detective

Get the Gizmo ready:

- If the table or graph is open, click **Close**.
- Click the **Clear stands** button.



Your uncle thinks that it should be possible to identify a function from its graph. Is he right?



1. For each graph above, program a function machine in the **FMP 500** to match. (Hint: It might help to write down a table for each graph first.) Write down the two functions below.

Function 1: _____

Function 2: _____

2. For each function, complete the descriptions below. (Hint: Again, a table might be helpful.)

Function 1: If the input is 0, the output is _____.

As the input increases by 1, the output increases by _____.

Function 2: If the input is 0, the output is _____.

As the input increases by 1, the output increases by _____.

3. Draw a line through the points on each of the graphs.

A. Which line is steeper? _____

B. Go to question 2 and circle the part of each description that indicates steepness.

C. Your uncle challenges you to make the steepest graph you can. Try this, using the machine programmer to try out different functions. What function is the steepest?

