Function Notation

@BootstrapWorld

Function Notation (Definitions)

We've seen how functions like `gt` can be defined, and then applied to a number to create a green triangle. And once `gt` is defined, we can use it with many different numbers to create many different triangles - all without having to write out "solid", "green", etc.

But how does this function work?

Function Notation (Definitions)

When we apply a function to the inputs it needs, we substitute those inputs for the variables in the definition.

```
fun gt(size): triangle(size, "solid", "green") end
```

Function Application	Substituted Input	Final Product
`gt(10)`	`triangle(10, "solid", "green")`	
`gt(20)`	`triangle(20, "solid", "green")`	
`gt(30)`	`triangle(30, "solid", "green")`	
`gt(40)`	`triangle(40, "solid", "green")`	
`gt(50)`	`triangle(50, "solid", "green")`	

Function Notation (Definitions)

Math books use Function Notation to define functions, too, though most of the time their functions only work with numbers - and certainly not images!

```
fun f(x): x + 8 end
```

Function Application	Substituted Input	Final Product
$f(10)$	`10 + 8`	18
$f(20)$	`20 + 8`	28
$f(30)$	`30 + 8`	38
$f(40)$	`40 + 8`	48
$f(50)$	`50 + 8`	58

Function Notation (Definitions)

- Turn to Matching Examples and Definitions (Math) and Function Notation - Substitution.
- Look at each table and highlight what is changing from the first row to the following rows.
- Then, match each table to the function that defines it.

Function Notation (Definitions)

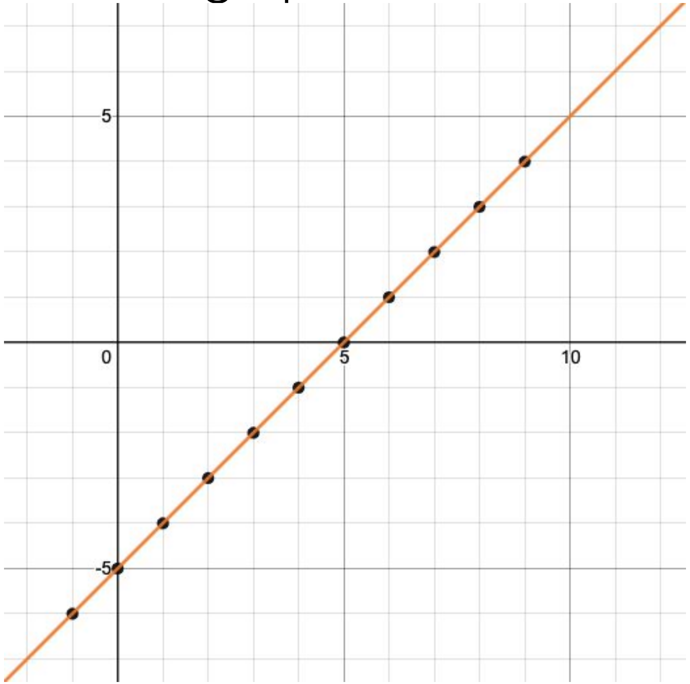
You can think of $f(3)$ as a question.

- What question is it asking you to evaluate?
- What is another way you can ask it?

Function Notation (Graphs)

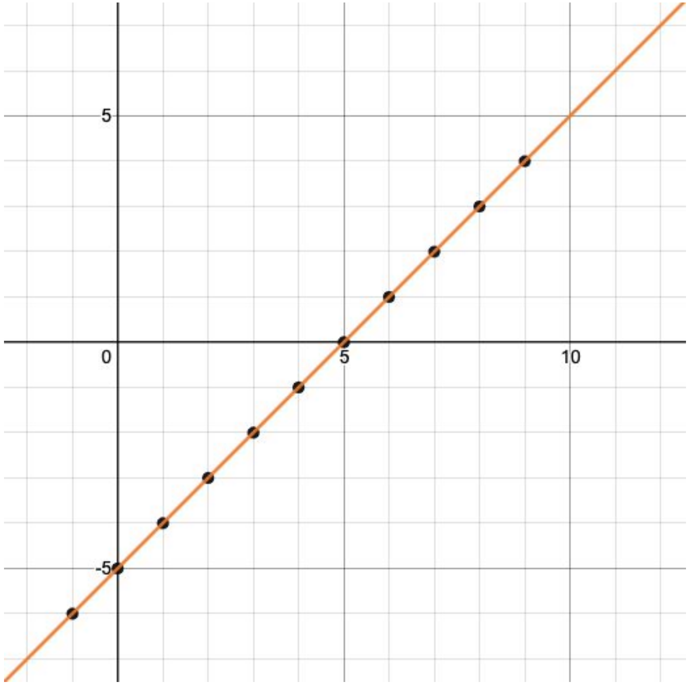
If $f(x) = x - 5$, what is the value of $f(7)$, and why?

Let's take a look at the graph of $f(x) = x - 5$...



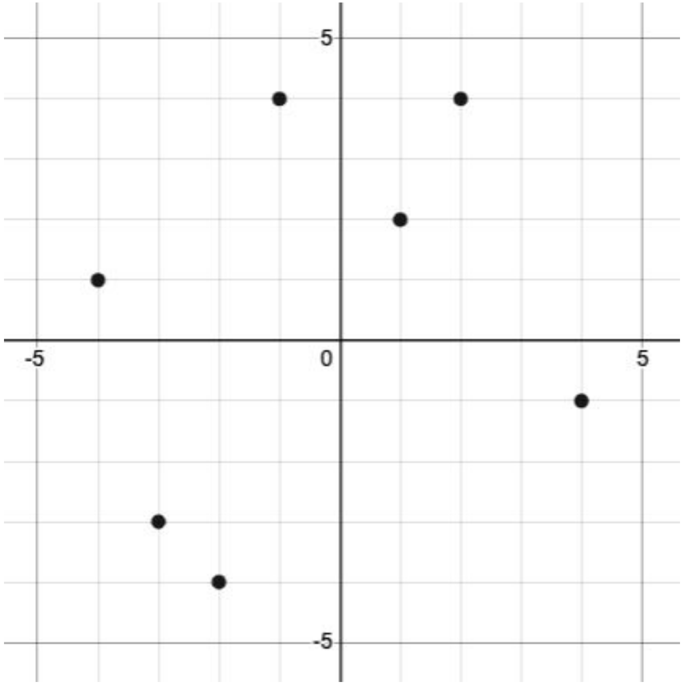
Function Notation (Graphs)

- How could we determine that `f(7) = 2` from looking at the graph, if we hadn't started with the function definition?
- What is the value of `f(3)`?



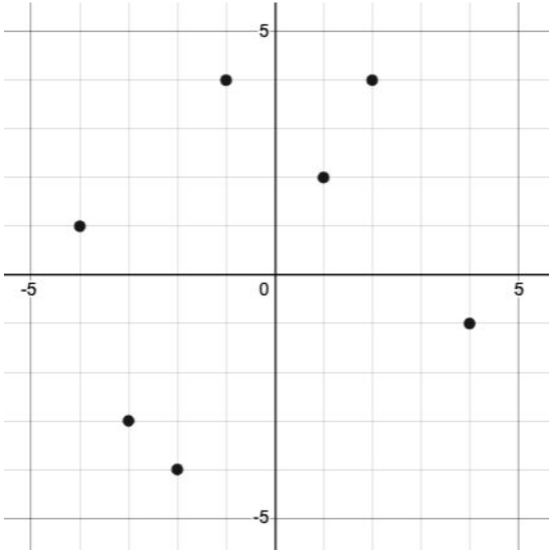
Function Notation (Graphs)

We don't need to know a function definition in order to use function notation to describe a value with an expression! Let's take a look at the scatterplot below.



Function Notation (Graphs)

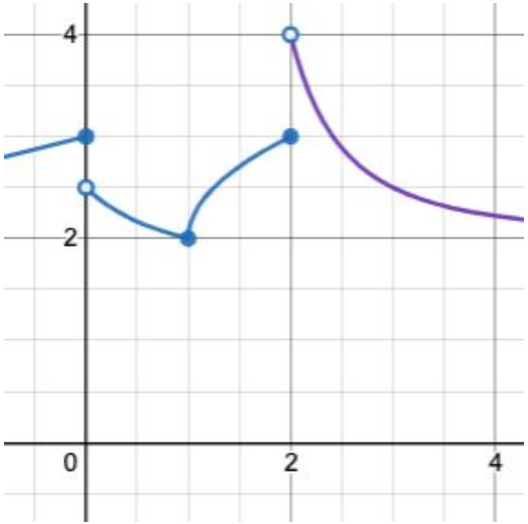
- From looking at the graph, what is the value of `f(-2)`?
- What is the value of `f(1)`?
- What is the value of `f(3)`?
- What other values on this graph could we describe using function notation?



Function Notation (Graphs)

This works for even more complex functions, which we haven't seen yet!

When evaluating an expression for a piecewise function, points on the graph marked with hollow circles are boundary points, but not part of the solution set, so we ignore them and focus on the solid points. For example, on the graph below, when evaluating $f(2)$, we ignore the hollow point at $(2,\ 4)$ and focus on the solid point at $(2,3)$, so $f(2) = 3$.



Function Notation (Graphs)

Complete Function Notation - Graphs.

If you're ready to engage with piecewise functions, try Function Notation - Piecewise Graphs.

Function Notation (Graphs)

Can you think of any values that it would be difficult to determine from one of these graphs?

Function Notation (Tables)

Let’s take a look at a table of input-output pairs that satisfy the function $f(x)=x-5$, and think about how could we have determined the value of $f(7)$ from looking at the table.

x	-10	-5	5	7	13
y	-15	-10	0	2	8

Function Notation (Tables)

Complete Function Notation - Tables

Function Notation (Tables)

What did you Notice?

What did you Wonder?

A few of the tables did not represent functions. Which ones?

How did the fact that those tables weren’t functions impact our ability to describe a value using function notation?