Unit 5, Lesson 2

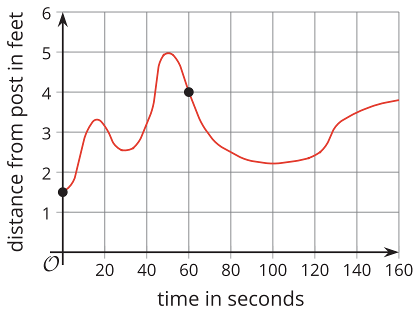
Function Notation

Let's learn about a handy way to refer to and talk about a function.

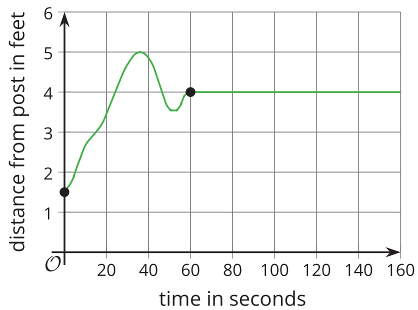
2.1 Back to the Post!

Here are the graphs of some situations you saw before. Each graph represents the distance of a dog from a post as a function of time since the dog owner left to purchase something from a store. Distance is measured in feet, and time is measured in seconds.

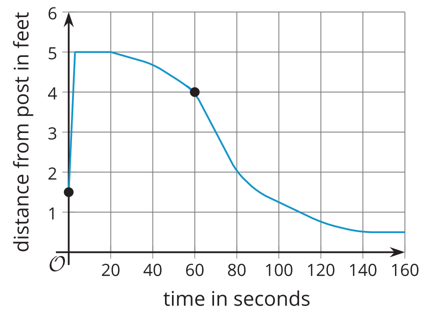
Day 1



Day 2



Day 3



1. Use the given graphs to answer these questions about each of the three days:
    a. How far away was the dog from the post 60 seconds after the owner left?

       Day 1: Day 2: Day 3:

    b. How far away was the dog from the post when the owner left?

       Day 1: Day 2: Day 3:

    c. The owner returned 160 seconds after he left. How far away was the dog from the post at that time?

       Day 1: Day 2: Day 3:

    d. How many seconds passed before the dog reached the farthest point from the post it could reach?

       Day 1: Day 2: Day 3:

2. Consider the statement, "The dog was 2 feet away from the post after 80 seconds." Do you agree with the statement?
3. What was the distance of the dog from the post 100 seconds after the owner left?

2.2 A Handy Notation

Let's name the functions that relate the dog's distance from the post and the time since its owner left: function f for Day 1, function g for Day 2, function h for Day 3. The input of each function is time in seconds, t.

1. Use **function notation** to complete the table.

	day 1	day 2	day 3
a. distance from post 60 seconds after the owner left			
b. distance from post when the owner left			
c. distance from post 160 seconds after the owner left			

2. Describe what each expression represents in this context:
   a. $f(15)$
   b. $g(48)$
   c. $h(t)$

3. The equation $g(120) = 4$ can be interpreted to mean: "On Day 2, 120 seconds after the dog owner left, the dog was 4 feet from the post."

   What does each equation mean in this situation?

   a. $h(40) = 4.6$
   b. $f(t) = 5$
   c. $g(t) = d$

2.3 Birthdays

Rule B takes a person's name as its input and gives their birthday as the output.

input	output
Abraham Lincoln	February 12

Rule P takes a date as its input and gives a person with that birthday as the output.

input	output
August 26	Katherine Johnson

1. Complete each table with three more examples of input-output pairs.
2. If you use your name as the input to B, how many outputs are possible? Explain how you know.
3. If you use your birthday as the input to P, how many outputs are possible? Explain how you know.
4. Only one of the two relationships is a function. The other is not a function. Which one is which? Explain how you know.
5. For the relationship that is a function, write two input-output pairs from the table using function notation.

Are you ready for more?

1. Write a rule that describes these input-output pairs:

   $F(\text{ONE}) = 3$ $\quad F(\text{TWO}) = 3$ $\quad F(\text{THREE}) = 5$ $\quad F(\text{FOUR}) = 4$

2. Here are some input-output pairs with the same inputs but different outputs:

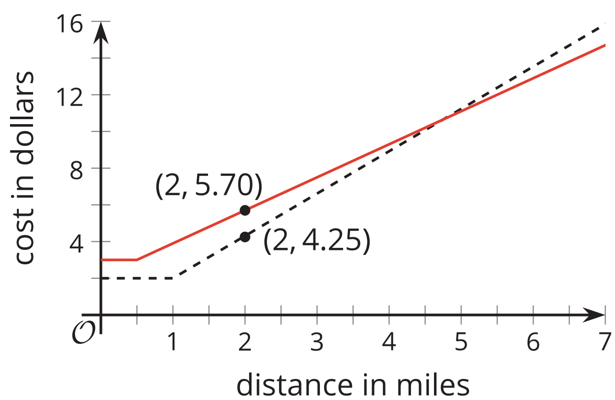
   $v(\text{ONE}) = 2$ $\quad v(\text{TWO}) = 1$ $\quad v(\text{THREE}) = 2$ $\quad v(\text{FOUR}) = 2$

   What rule could define function v?

Lesson 2 Summary

Here are graphs of two functions, each representing the cost of riding in a taxi from two companies—Friendly Rides and Great Cabs.

For each taxi, the cost of a ride is a function of the distance traveled. The input is distance in miles, and the output is cost in dollars.

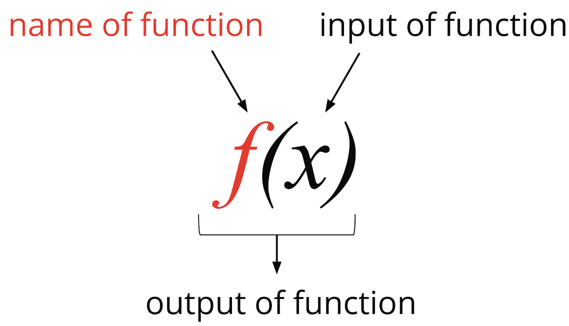


- The point $(2, 5.70)$ on one graph tells us the cost of riding a Friendly Rides taxi for 2 miles.
- The point $(2, 4.25)$ on the other graph tells us the cost of riding a Great Cabs taxi for 2 miles.

We can convey the same information much more efficiently by naming each function and using **function notation** to specify the input and the output.

- Let’s name the function for Friendly Rides function f.
- Let's name the function for Great Cabs function g.
- To refer to the cost of riding each taxi for 2 miles, we can write $f(2)$ and $g(2)$.
- To say that a 2-mile trip with Friendly Rides will cost \$5.70, we can write $f(2) = 5.70$.
- To say that a 2-mile trip with Great Cabs will cost \$4.25, we can write $g(2) = 4.25$.

In general, function notation has this form:



It is read "f of x" and can be interpreted to mean that $f(x)$ is the output of a function f when x is the input.

The function notation is a concise way to refer to a function and describe its input and output, which can be very useful. Throughout this unit and the course, we will use function notation to talk about functions.

