Lesson 4: Using Function Notation to Describe Rules (Part 1)

- Let's look at some rules that describe functions and write some, too.

4.1: Notice and Wonder: Two Functions

What do you notice? What do you wonder?

x	$f(x) = 10 - 2x$
1	8
1.5	7
5	0
-2	14

x	$g(x) = x^3$
-2	-8
0	0
1	1
3	27

4.2: Four Functions

Here are descriptions and equations that represent four functions.

$f(x) = 3x - 7$

$g(x) = 3(x - 7)$

$h(x) = \frac{x}{3} - 7$

$k(x) = \dfrac{x - 7}{3}$

A. To get the output, subtract 7 from the input, then divide the result by 3.

B. To get the output, subtract 7 from the input, then multiply the result by 3.

C. To get the output, multiply the input by 3, then subtract 7 from the result.

D. To get the output, divide the input by 3, and then subtract 7 from the result.

1. Match each equation with a verbal description that represents the same function. Record your results.

2. For one of the functions, when the input is 6, the output is -3. Which is that function: f, g, h, or k? Explain how you know.

3. Which function value—$f(x)$, $g(x)$, $h(x)$, or $k(x)$—is the greatest when the input is 0? What about when the input is 10?

Are you ready for more?

Mai says $f(x)$ is always greater than $g(x)$ for the same value of x. Is this true? Explain how you know.

4.3: Rules for Area and Perimeter

1. A square that has a side length of 9 cm has an area of 81 cm^2. The relationship between the side length and the area of the square is a function.

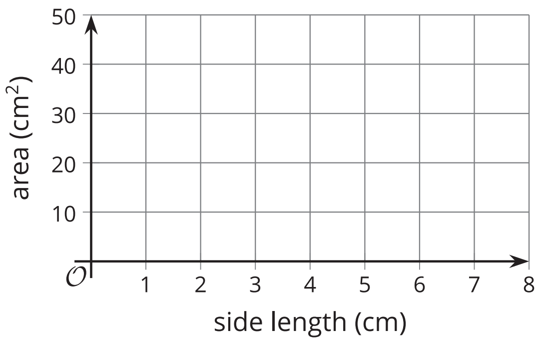
   a. Complete the table with the area for each given side length.

   Then, write a rule for a function, A, that gives the area of the square in cm^2 when the side length is s cm. Use function notation.

side length (cm)	area (cm^2)
1	
2	
4	
6	
s	

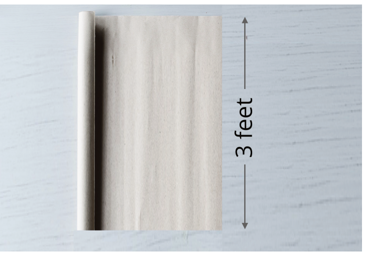
   b. What does $A(2)$ represent in this situation? What is its value?

c. On the coordinate plane, sketch a graph of this function.



2. A roll of paper that is 3 feet wide can be cut to any length.

a. If we cut a length of 2.5 feet, what is the perimeter of the paper?



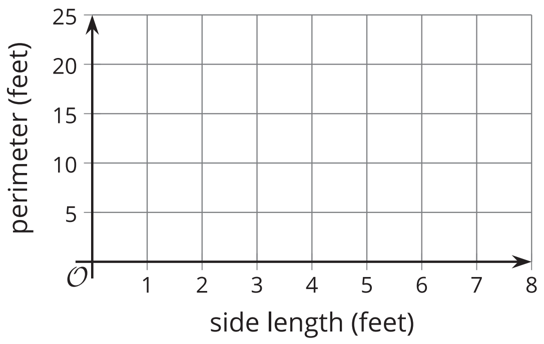
b. Complete the table with the perimeter for each given side length.

Then, write a rule for a function, P, that gives the perimeter of the paper in feet when the side length in feet is ℓ. Use function notation.

side length (feet)	perimeter (feet)
1	
2	
6.3	
11	
ℓ	

c. What does $P(11)$ represent in this situation? What is its value?

d. On the coordinate plane, sketch a graph of this function.



Lesson 4 Summary

Some functions are defined by rules that specify how to compute the output from the input. These rules can be verbal descriptions or expressions and equations. For example:

Rules in words:

- To get the output of function f, add 2 to the input, then multiply the result by 5.
- To get the output of function m, multiply the input by $\frac{1}{2}$ and subtract the result from 3.

Rules in function notation:

- $f(x) = (x + 2) \cdot 5$ or $5(x + 2)$
- $m(x) = 3 - \frac{1}{2}x$

Some functions that relate two quantities in a situation can also be defined by rules and can therefore be expressed algebraically, using function notation.

Suppose function c gives the cost of buying n pounds of apples at \$1.49 per pound. We can write the rule $c(n) = 1.49n$ to define function c.

To see how the cost changes when n changes, we can create a table of values.

pounds of apples, n	cost in dollars, $c(n)$
0	0
1	1.49
2	2.98
3	4.47
n	$1.49n$

Plotting the pairs of values in the table gives us a graphical representation of c.