# 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.

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

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, 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 of the four functions have the greatest value 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.

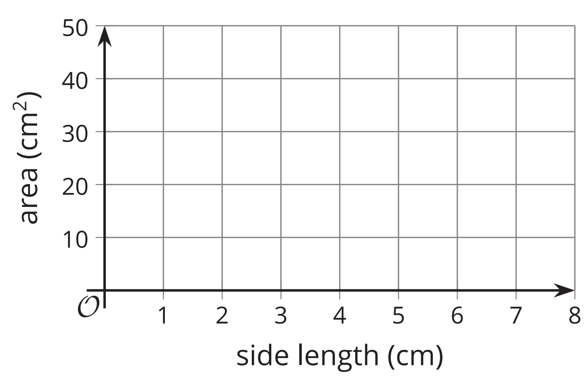
   a. Complete the table with the area for each given side length.

   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 | |
| $s$ | |

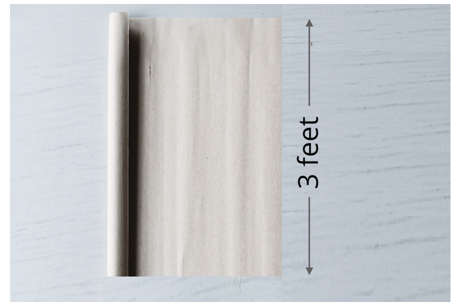
   b. What does $A(2)$ represent in this situation? What is its value?

   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?



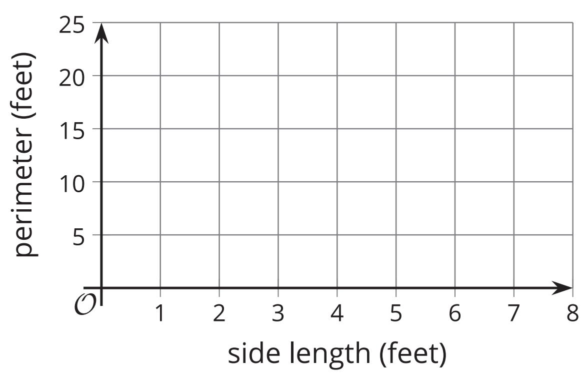

   b. Complete the table with the perimeter for each given side length.

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

| side length (feet) | perimeter (feet) |
|---|---|
| 1 | |
| 2 | |
| 6.3 | |
| 11 | |
| $\ell$ | |

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

Some functions are defined by rules that relate two quantities in a situation. These functions can also be expressed algebraically with 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 $c$.