# Evaluate Functions

*by Sophia*

WHAT'S COVERED

In this lesson, you will learn function notation and use it to evaluate functions. Specifically, this lesson will cover:



## 1. Evaluate Functions Using Function Notation

When a relationship meets the requirements of being a function, it can be written using function notation. For instance, $y = x^2$ is a function. In function notation, this is written $f(x) = x^2$.

When written this way, $x$ is considered the *input variable* and $f(x)$ is the *output variable*. In the example above, $x^2$ is the rule for computing the output.

Note, the letter $f$ is the name of the function. This could have been called $g(x) = x^2$ or $k(x) = x^2$, for instance.

EXAMPLE Consider the function $f(x) = x^2$. Use it to find $f(2)$, $f(-4)$, and $f(a+3)$.

| $f(x) = x^2$ | Solution |
|---|---|
| $f(2) = (2)^2$ <br> $= 4$ | $f(2) = 4$ |
| $f(-4) = (-4)^2$ <br> $= 16$ | $f(-4) = 16$ |
| $f(a+3) = (a+3)^2$ <br> $= (a+3)(a+3)$ <br> $= a^2 + 3a + 3a + 9$ <br> $= a^2 + 6a + 9$ | $f(a+3) = a^2 + 6a + 9$ |

HINT

For this function, remember to square the whole input! When you square ($a + 3$), you multiply it by itself.

TRY IT

Use the function $f(x) = x^2 - 4x + 2$ to answer the following problems.

**Find $f(1)$.** +

$$\begin{aligned} f(1) &= (1)^2 - 4(1) + 2 \\ &= 1 - 4 + 2 \\ &= -1 \end{aligned}$$

**Find $f(-3)$.** +

$$\begin{aligned} f(-3) &= (-3)^2 - 4(-3) + 2 \\ &= 9 + 12 + 2 \\ &= 23 \end{aligned}$$

**Find $f(a + 1)$.** +

$$\begin{aligned} f(a+1) &= (a+1)^2 - 4(a+1) + 2 \\ &= a^2 + 2a + 1 - 4a - 4 + 2 \\ &= a^2 - 2a - 1 \end{aligned}$$

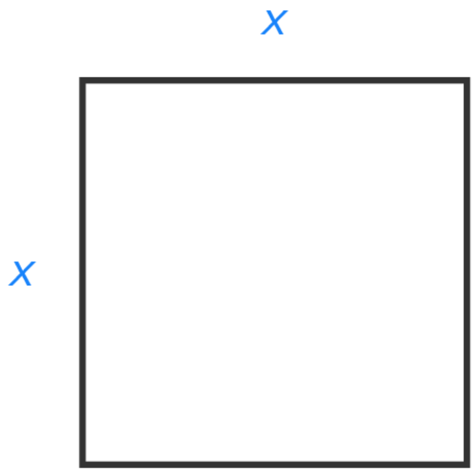
WATCH

Depending on which function is used, applying function notation can get very technical. Here is a video that helps guide you through a more complicated function.

# 2. Why Use Function Notation?

There are situations in which we want to compute two (or more) different values given a single input. This is where naming functions can be convenient.

EXAMPLE Suppose a square has sides with length $x$.




- The area of the square is $x^2$. Using function notation, we could write $A(x) = x^2$.
- The perimeter of the square is $4x$. Using function notation, we could write $P(x) = 4x$.
- The length of the diagonal is $x\sqrt{2}$. Using function notation, we could write $D(x) = x\sqrt{2}$.

Let's now say that the length of the square is 5 inches.

- The area is $A(5) = 5^2 = 25$ square inches.
- The perimeter of the square is $P(5) = 4(5) = 20$ inches.
- The length of the diagonal is $D(5) = (5)\sqrt{2} = 5\sqrt{2}$ inches.

The function names (*A, P,* and *D*) are important here since *A* is used for area, *P* is used for perimeter, and *D* is used for the length of the diagonal. Therefore, we can provide meaningful names for the output of a function rather than using *y* all the time.

HINT

The input variable doesn't necessarily have to be *x*. For example, let's say you are tracking the height of a projectile after *t* seconds. You might name the function $h(t)$.

SUMMARY

In this lesson, you learned that when a relationship is a function, function notation is used to emphasize the roles of the input and output values, and their relationship to each other. In this context, you can **evaluate functions using function notation**. You also learned **why we use function notation**, noting that naming functions can be convenient in situations in which we want to compute the outputs of two (or more) different functions given input values, such as determining the area, perimeter, and length of the diagonal of a square.

SOURCE: THIS WORK IS ADAPTED FROM CHAPTER 0 OF *CONTEMPORARY CALCULUS* BY DALE HOFFMAN.