Graphing Functions

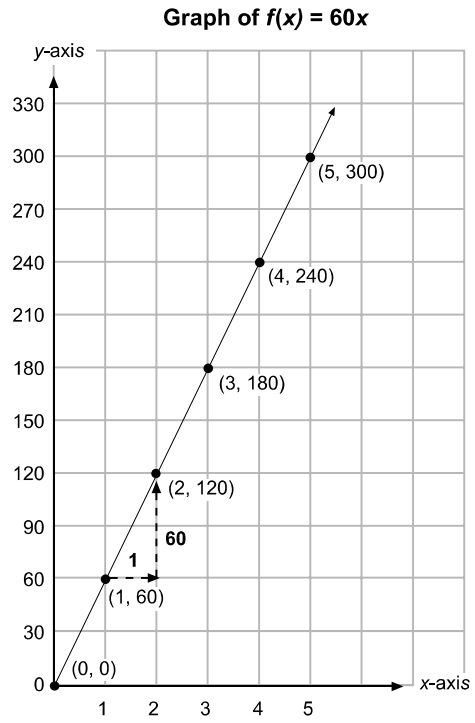
We graph functions in the same way we do equations. We can still identify **slopes** and ***y*-intercepts** from functions whose graph is a **line**. Remember the slope-intercept form $y = mx + b$? Well, if a function is expressed as $f(x) = mx + b$, it is a **linear function**. A *linear function* is an equation whose graph is a nonvertical *line*.

Sometimes a graph will pass through the **origin**. That happens when $f(0) = 0$ or when the point (0, 0) is in the relation.

As we know, the set

{(0, 0), (1, 60), (2, 120), (3, 180), (4, 240), (5, 300)}

can be called a relation (which is any set of ordered pairs). These ordered pairs could be graphed by hand on a coordinate grid or on a graphing calculator. A function is a relation in which each value of x is paired with a unique value of y. This relation is also a function because its graph is a *nonvertical* line.

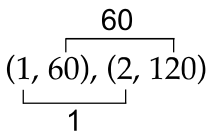


equation: $y = 60x$

slope: 60 or $\frac{60}{1}$

Think about This!

- As the first *coordinate* increases by 1, the second coordinate increases by 60.

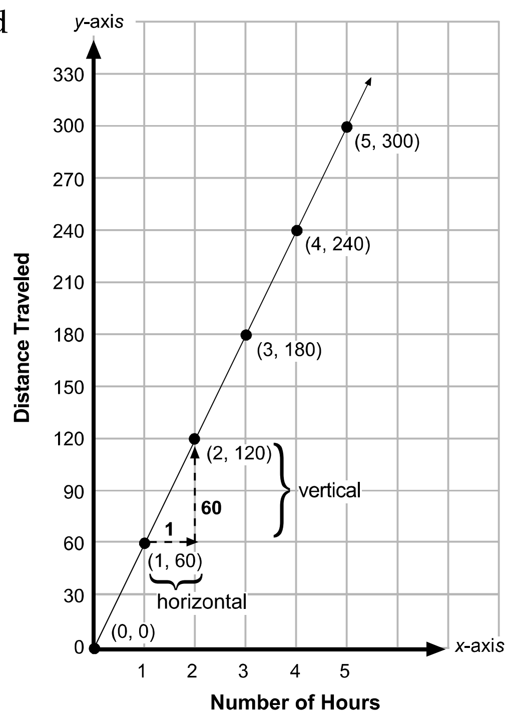


- If these points were plotted, they would lie in a line.
- An equation for the line would be $y = 60x$.
- The line will pass through the origin so the ***x*-intercept** is (0, 0) and the *y***-**intercept is (0, 0).

Remember: The x-intercept is the value of x on a graph when y is zero. The line passes through the ***x*-axis** at this point. The y-intercept is the value of y on a graph when x is zero. The line passes through the ***y*-axis** at this point.

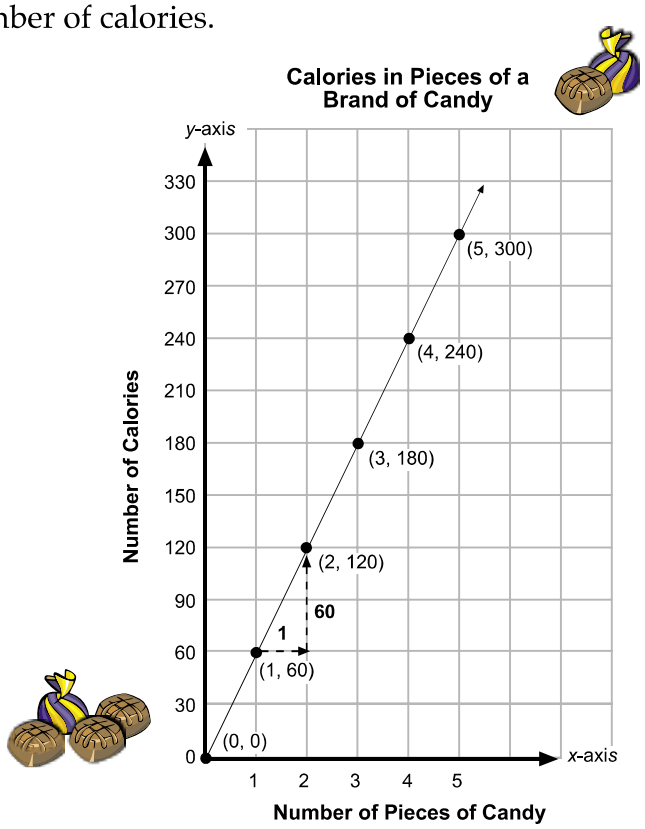
- The slope of the line will be 60 or $\frac{60}{1}$ because for each increase of 1 in x, there is an increase of 60 in y. From any given point on the line, a **horizontal** (⟷) movement of 1 unit followed by a vertical (↕) movement of 60 units will produce another point on the line.
- If the ordered pairs are describing the distance traveled at a rate of 60 miles per hour, then x could represent the number of hours and y would represent the distance traveled.

Distance Traveled at a Rate of 60 Miles per Hour



From the function $f(x) = 60x$ or its graph, we can predict how far we could travel in 8 hours at 60 mph. If $f(x) = 60x$ and $x = 8$, $f(8) = 60(8)$. We could travel 480 miles in 8 hours.

- If the ordered pairs are describing the number of calories in a certain brand of candy, then x could represent the number of pieces of candy and y would represent the number of calories.



What function could be written to describe the graph above?

The function would be

$$f(x) = 60x$$

because the relationship between x and y in each ordered pair indicates that x times $60 = y$.

Linear Relations in the Real World

As you look ahead and consider the cost of higher education, you will find that *tuition costs* tend to represent a *linear relationship*. Universities tend to have a *fixed price for each semester hour of credit*. There is often a difference in the fixed price for a semester hour of undergraduate credit and a semester hour of graduate credit. Special areas of study may have increased costs. The following set of practices deals with costs involved in higher education. You will likely find technology, such as computer programs and some calculators support the making of tables and graphs, which are often used when considering **data** to be displayed when making comparisons.

More about the Slope of a Line

You are a member of a private club that offers valet parking for its members. The club charges you \$3.00 to have the parking attendant park and retrieve your car and \$2 per hour for parking. A set of ordered pairs for this situation would include the following.

$$\{(1, 5), (2, 7), (3, 9), (4, 11), (5, 13)\}$$

If x represents the number of hours your car is parked, then y would represent the cost.

The equation for this line would be $y = 2x + 3$.

In function notation, $f(x) = 2x + 3$.

valet parking for members