

## Find $y$ given $x$ and the Equation of a Line

### Learning Outcomes

1. Find the value of  $y$  given  $x$  and the equation of a line.
2. Use a line to make predictions.

A line can be thought of as a function, which means that if a value of  $x$  is given, the equation of the line produces exactly one value of  $y$ ; This is particularly useful in regression analysis where the line is used to make a prediction of one variable given the value of the other variable.

### Example 1

Consider the line with equation:

$$y = 3x - 4$$

Find the value of  $y$  when  $x$  is 5.

#### Solution

Just replace the variable  $x$  with the number 5 in the equation and perform the arithmetic:

$$y = 3(5) - 4 = 15 - 4 = 11$$

### Example 2

A survey was done to look at the relationship between a woman's height,  $x$  and the woman's weight,  $y$ . The equation of the regression line was found to be:

$$y = -220 + 5.5x$$

Use this equation to estimate the weight in pounds of a woman who is 5' 2" (62 inches) tall.

#### Solution

Just replace the variable  $x$  with the number 62 in the equation and perform the arithmetic:

$$y = -220 + 5.5(62)$$

We can put this into a calculator or computer to get:

$$y = 121$$

Therefore, our best prediction for the weight of a woman who is 5' 2" tall is that she is 121 lbs.

### Exercise

A biologist has collected data on the girth (how far around) of pine trees and the pine tree's height. She found the equation of the regression line to be:

$$y = 1.3 + 2.7x$$

Where the girth,  $x$ , is measured in inches and the height,  $y$ , is measured in feet. Use the regression line to predict the height of a tree with girth 28 inches.



<https://youtu.be/cS95PIUKZ6I>

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