

Why Solve for "Y"?

Name: _____

KEY

The process of taking an equation with two or more variables in it and solving so that one of the variables is by itself is called **isolating a variable**. Instead of getting a number, which often happens when solving equations, we get a new formula. The formula expresses the value of one variable in terms of the others. That is, it tells us how to get the value of one variable when we know the others.

One common use of this skill is to help graph lines. For example, $3x - 2y = 6$ is the equation of a line given in **standard form**. When graphing, we commonly use the slope-intercept form ($y = mx + b$), since the slope m and the y -intercept b are clearly visible in the equation. **In order to change the equation from standard form to slope-intercept form, we must isolate the variable y .** In other words, we must solve the equation for y in terms of x .

Let's investigate this idea and develop a process for *isolating a variable*.

1. We will begin our investigation with the equation $3x - 2y = 6$.

a. Substitute the value $x = 4$ into the equation $3x - 2y = 6$. Isolate the variable y . (Solve the equation for y .) Show each step clearly.

$$\begin{array}{r} 3(4) - 2y = 6 \\ 12 - 2y = 6 \\ -12 \quad -12 \\ \hline -2y = -6 \\ \frac{-2y}{-2} = \frac{-6}{-2} \\ y = 3 \end{array}$$

b. Substitute the value $x = -6$ into the equation $3x - 2y = 6$. Isolate the variable y . (Solve the equation for y .) Show each step clearly.

$$\begin{array}{r} -18 - 2y = 6 \\ +18 \quad +18 \\ \hline -2y = 24 \\ \frac{-2y}{-2} = \frac{24}{-2} \\ y = -12 \end{array}$$

c. Now solve the equation $3x - 2y = 6$ for y without knowing a value for x . Leave your answer in terms of x . (Leave the variable x in the final answer). Show each step clearly.



$$\begin{array}{r} 3x - 2y = 6 \\ -3x \quad -3x \\ \hline -2y = -3x + 6 \\ \frac{-2y}{-2} = \frac{-3x + 6}{-2} \\ y = \frac{3}{2}x - 3 \end{array}$$

Isolating a variable works exactly like solving a normal equation in one variable, except that occasionally you need to add or subtract a variable or an expression rather than just a number.

Use this principle to solve each of the following for the variable y .

2. $3x + y = 1$

$$y = -3x + 1$$

3. $3x + 2y = 6$

$$y = -\frac{3}{2}x + 3$$