

Balancing Equations (addition/subtraction)

An **equation** is a mathematical statement which says that two quantities are different expressions of the same thing.

Ex. $3 + 4 = 7$

Here $(3 + 4)$ is equated to being the same thing as seven.

Ex. $3 + x = 7$

Here $(3 + x)$ is equated to being the same thing as seven. But what does x equal? (Obviously, $x = 4$, since we've already done the problem)

But what if $y + x = 7$? You can't be sure of what the numbers are, can you?

Aren't there more than one pair of numbers that can add together to get seven? (yes).

How then can we find out what x is?

There is a method to isolate the variable x on one side of the equation, and everything else on the other side. Consider if you will, a teeter-totter (scale, or balance). In order for it to remain level, there must be the same weight added to one side as to the other. If one side has more weight than the other, then it is no longer balanced.

So, apply this to an equation. **Whatever we do to one side of the equation we must do to the other side.**

Reconsider: $3 + x = 7$

Recall, that there are negative numbers, and that when a negative and a positive number of the same magnitude are added, they equal 0.

Ex. $(-3) + 3 = 0$

Now, the way to isolate x , is to remove other quantities from the same side, to the other side of the equation.

Ex. $3 + x = 7$ ← original statement
 $\frac{-3}{-3} \quad \frac{-3}{-3}$ ← what you do to one side, you must do to the other
 $-3 + 3 + x = 7 - 3$
 $0 + x = 4$, $x = 4$ ← simplified

Ex. $x - 3 = 7$
 $\frac{+3}{+3} \quad \frac{+3}{+3}$
 $x - 3 + 3 = 7 + 3$
 $x + 0 = 10$
 $x = 10$

Ex. $y + x = 7$
 $\frac{-y}{-y} \quad \frac{-y}{-y}$
 $-y + y + x = 7 - y$
 $0 + x = -y + 7$, $x = -y + 7$

- 1.) $x + 4 = 0$
- 2.) $2x - 6 = 0$
- 3.) $4x + 2 = 0$
- 4.) $5x + 8 = 3$
- 5.) $3x - 9 = 5$
- 6.) $4y + x = 0$
- 7.) $3y - x = 0$
- 8.) $9y + 3x = 0$
- 9.) $2x^2 - 2x = 3$
- 10.) $5y - 4x = 5$