

TOPIC: SOLVING EQUATIONS

First of all, we need to keep in mind that when we are solving equations, we are trying to find the value of the variable x that works for the equation. In other words find a solution to the equation. For example, if I had to solve $x + 5 = 8$, I need to tell myself that I am trying to find a number that adds to 5 that makes the equation equal to an 8.

We all know this one is easy, and we all know that the number 3 will work even just by eyeballing the equation. But if I were to write the steps in solving the equation, it would have been as follows:

$$x + 5 = 8$$

(Remember we are trying to solve for the variable x . This in turn would mean that I would need to make sure that whatever steps I do, in the end I would come up with an equation showing $x = \text{some number}$.)

So we have $x + 5 = 8$. In order to isolate the x variable, we need to get rid of the 5 on the left hand side of the equation. To do that, I would add a (-5) to both sides of the equation. In other words subtract 5 on both sides and then simplify.

$$x + 5 + (-5) = 8 + (-5)$$

$$x + 0 = 8 - 5$$

$$x = 3.$$

And so the solution is $x = 3$.

Are we doing alright so far?

Now let's look at another example. The objective is the same, we want to get x by itself.

Let's say we have $3x - 4 = 2 - (x/2)$

And we want to solve for the variable x . This will take several steps since the equation involves fractions.

We need to remember that whatever we do to one side of the equal sign, will have to be done to the other side of the equal sign as well, to keep it balanced. We will also use the Addition Rule in solving equations.

So, for the first step, I will try to get only $3x$ on the left hand side of the equation.

In order to do that, I need to get rid of (-4). I will add the opposite of (-4), which is a +4, to both sides of the equation.

$$3x - 4 + 4 = 2 - (x/2) + 4$$

$$3x + 0 = 2 + 4 - x/2$$

$$3x = 6 - x/2$$

Now I want to get all the x terms together on one side of the equal sign and all the constants on the other side of the equal sign. I will add x/2 to both sides of the equation and simplify.

$$3x = 6 - x/2$$

$$3x + x/2 = 6 - x/2 + x/2$$

$$3x + x/2 = 6.$$

Now that we have the x variables on one side, we need to combine them (in general it would mean combine like terms).

I also see that I have a fraction in the expression. I am going to try and eliminate the fractions so that I have a simpler equation without fractions.

Since I see that the x is divided by a 2, I will have to do the opposite, which is to multiply the entire equation by 2. In doing so we will have

$$3x * (2) + (x/2 * (2)) = 6 * 2$$

Each term has to be multiplied by 2. Not just one of the them, but all of them. And after simplifying we get

$$6x + x = 12$$

Now combine 6x and x to get

$$7x = 12.$$

Now we still need to get the variable x by itself. We do not want a '7 times x', but only "a 1 times x.". So I would need to get rid of the 7 in 7x.

Since 7 is multiplied to x, we will choose the opposite operation which is division. Divide both sides by 7 to get

$$x = 12/7.$$

Tip: We normally have to keep at our goal of trying to isolate the unknown variable. The operations that we have to decide on, most of the time will end up being the operation that is opposite to what we see in the equation.