
CHAPTER 1

INTRO TO PRE ALGEBRA

LESSON 1: WHAT IS X?

Pre Algebra can be quite simple, once you get past the big mystery of "What is x?" Many people get lost in math as soon as the letter "x" gets involved. Let me solve the mystery for you. The letter "x" is just a question mark! For example, look at this simple equation, $2 + 3 = 5$. Now look at the algebra equation below. Can you guess how much "x" is?



$$2 + x = 5$$

The answer is 3. To be exact, $x = 3$. Can you solve this problem?

$$x + 3 = 5$$

How much is x? $x = 2$. Math people don't usually say, "How much is x?" Instead they say, "Solve for x."

Since you know $2 + 3 = 5$, it is easy to solve for x in the problems above. It's not always that simple. Sometimes you have to use algebra to get the answer. Here is how you would figure out the problem above with algebra, if you couldn't solve it in your head. It's easy to do, if you remember the steps.

First I will show you the math below. It's OK if you don't understand all of it. I will go over each step in great detail.

$$\begin{array}{r} x + 3 = 5 \\ \underline{-3 - 3} \\ x = 2 \end{array}$$

First of all, the big trick in algebra is to "GET X BY ITSELF!" That means, we want all the numbers on one side of the equal sign and x on the other side. That way we

are left with $x = \textit{something}$, and that *something* is your answer. Look at the algebraic equation below.

$$x + 3 = 5$$

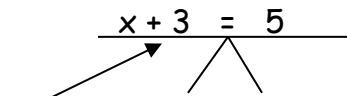
In the problem above, we need to *get x by itself*. That means we need to put the 3 on the other side of the equal sign. That's what I mean by having all the numbers on one side of the equal sign and the x on the other side; by itself.

In algebra, the way to move that 3 over to the other side is by doing the *opposite operation*. *Operation* is a fancy word for plus, minus, multiply, or divide. The word *opposite* means to undo something. For example the opposite of "off" is "on," they undo each other. The opposite of "up" is "down," they undo each other too.

The opposite of addition is subtraction. For example, let's say your sister "added" onions to your pizza. You want to "undo" that, so you "subtract" the onions from the pizza. You just got rid of something that was added by doing the *opposite operation*. Let's get back to using algebra to solve the simple problem below.

$$x + 3 = 5$$

We have to do the *opposite operation*, to move + 3 to the other side. The opposite of plus 3, is minus 3. Let's minus 3. That will make the x all by itself on that side of the equal sign. Think of the equal sign as the center of a scale. You must keep each side balanced. So if you subtract 3 from one side, you must do that to the other side, so you don't tip the scale.

When you -3 from here 

You tip the scale. 

So put the -3 on the other side.

$$\begin{array}{r} x = 5 - 3 \\ \hline \end{array}$$

Now both sides are balanced.

So far, all we have done is subtracted 3, to get x by itself and then put that -3 on the other side.

Here is how you write the math, to show subtracting 3 from both sides. This math is solved vertically ↓ from top to bottom. Bring the x straight down because it didn't change.

$$\begin{array}{r} \downarrow x + 3 = 5 \\ \underline{-3 \quad -3} \\ x \quad = \end{array}$$

Next in line is +3 - 3. That is the same thing as 3 - 3, which is 0 or nothing, so it goes away. Bring down the equal sign and subtract 5 - 3.

$$\begin{array}{r} \cancel{x + 3} = 5 \\ \underline{\cancel{-3} \quad \cancel{-3}} \\ x \quad = 2 \end{array}$$

The answer is $x = 2$. That was a long explanation for a small problem, so let's make sure you get the main points.

To solve for x: First, get x by itself. To do that you need to do the opposite operation. That's how you move a number away from x. Next, whatever you do on one side of the equal sign, you **MUST** do on the other side of the equal sign; so your scale doesn't tip. Then just do the math.

Look at this next one. We will slowly go over each step again.

$$x - 10 = 20$$

Step 1:

Get x by itself. We need to move the -10 to the other side to get x by itself. This is minus 10, so we need to do the *opposite* to make it disappear. The opposite is plus 10. The math is $-10 + 10 = 0$. It disappears!

Step 2:

Whatever you do to one side of the equal sign you **MUST** do to the other side, so you don't tip the scale. Add 10 to both sides, and solve the math vertically.

$$\begin{array}{r} x - 10 = 20 \\ +10 \quad +10 \\ \hline \end{array}$$

Bring the x straight down, it is unchanged. Do the math $-10 + 10 = 0$ and $20 + 10 = 30$.

$$\begin{array}{r} x - \cancel{10} = 20 \\ +\cancel{10} \quad +10 \\ \hline x \quad \quad = 30 \end{array}$$

Look back at the original equation, $x - 10 = 20$. Can you see why $x = 30$? Put "30" in place of the x. You get $30 - 10 = 20$. That's why $x = 30$.

Here's a short cut. To make it even easier, you don't have to write down the opposite math; we just end up crossing it off anyway. Instead, **just swing the number over to the other side and change the sign to the opposite sign**. We will do those last two problems again with this easy, short cut way.

$$\begin{array}{l} x + 3 = 5 \\ x = 5 - 3 \\ x = 2 \end{array}$$

Swing the 3 over and change the sign to a minus.
Do the math.
That is much faster.

Here is the second problem, a little easier.

$$\begin{aligned}
 x - 10 &= 20 \\
 x &= 20 + 10 \\
 x &= 30
 \end{aligned}$$

Move the 10 to the other side and change the sign to +.
Do the math $20 + 10$.

You can use which ever method is easier for you. Write down the opposite math or just swing the number to the other side and change the + or - sign.
Take a look at this next example.

$$x - 10 = -3$$

Start by swinging that 10 over to the other side and changing the sign to make it +10. But you may be wondering, which is the correct way to write that?

Like this?

$$x = -3 + 10$$

Or like this?

$$x = 10 - 3$$

Surprisingly, you end up with the same answer; either way, they both equal 7. But make sure you are transferring the signs correctly too. We will try to solve this next example, two different ways.

$$\begin{array}{ccc}
 & 12 + x = -4 & \\
 \swarrow & & \searrow \\
 x = -4 - 12 & \text{or} & x = -12 - 4 \\
 x = -16 & & x = -16
 \end{array}$$

Not $12 - 4 = 8$

Either way you get the same answer. Just make sure you don't accidentally write $12 - 4$; it is **NEGATIVE** $12 - 4$.

Try some on your own. As you complete the next worksheet, remember the 2 steps.

Step 1: Get x by itself.

Step 2: Whatever you do to one side, you must do to the other side.

Name: _____

Date: _____

WORKSHEET 3-1

Solve for x.

1. $4 + x = 24$

2. $x + 14 = 21$

3. $2 + x = 12$

4. $x + 72 = 172$

5. $x - 33 = 54$

6. $9 + x = 62$

7. $4 + x = 0$

8. $x + 25 = 100$

9. $x - 8 = 176$

10. $10 + x = 310$

11. $x + 38 = 44$

12. $x - 8 = 34$

13. $x - 8 = 5$

14. $x - 14 = -2$

15. $9 + x = -1$

16. $11 + x = -7$

17. $4 + x = 2$

18. $x - 3 = 27$

19. $x + 36 = 36$

20. $4 + x = -26$

21. $-33 = 7 + x$

22. Eric had 57 baseball cards. He gave his brother a small handful of them. Now he only has 43 cards left. How many cards did Eric give to his brother?

$$43 + x = 57$$

23. Mike has 9 gallons of paint. He needs a total of 17 gallons to paint the house. How many more gallons does he need?

$$9 + x = 17$$