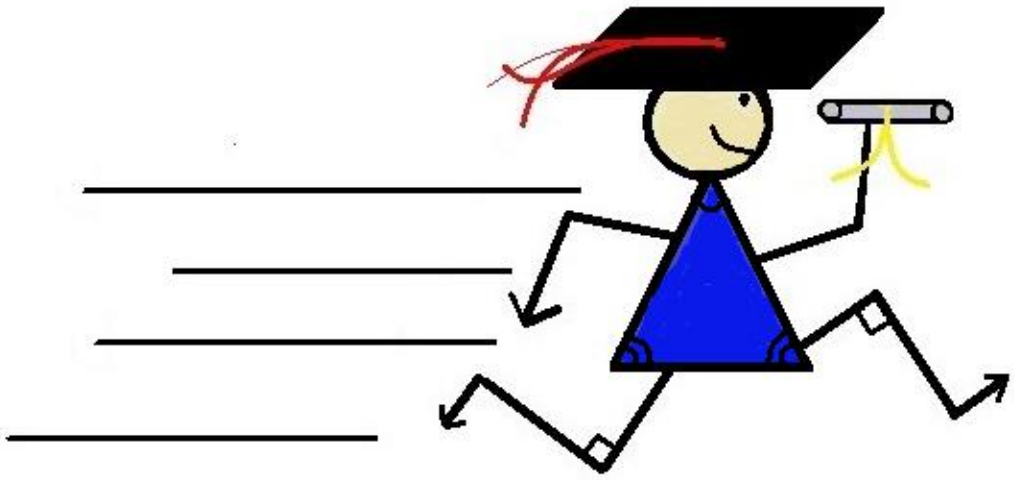
Chapter 1

Intro to Pre algebra



Learn Math Fast

Lesson 1: What is x?

Pre-algebra can be quite simple, once you get past the big mystery of "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 now? x = 2. Math people usually don't 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, but 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, the big trick in algebra is to "GET X BY ITSELF!" That means, we want all the numbers to be on one side of the equal sign and just x on the other side, all by itself. That way we are left with x = *something*, and that *something* is your answer. Look at the algebraic *equation* below. An *equation* is a math statement that says, "This equals that."

$$x + 3 = 5$$

To start, we need to *get x by itself*. That means we need to move the 3 over to 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, all by itself.

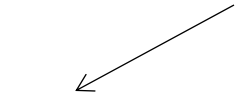
In algebra, the only way to move that 3 over to the other side is by doing the *opposite operation*. *Operation* is a fancy word for plus, minus, multiply,

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. They are *opposite operations*. 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.

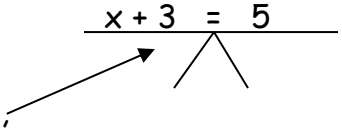
$$x + 3 = 5$$

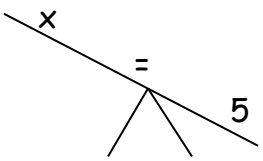
We have to do the *opposite operation,* to move + 3 to the other side. The opposite of "plus 3" is "minus 3," so let's minus 3 from this side of the equal sign.

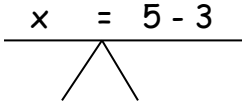


$$x + 3 = 5$$
$$\underline{\quad -3}$$

That way, x will be all by itself. But, if we minus 3 from that side of the equal sign, then we HAVE TO minus 3 from the other side, too. Think of the equal sign as the center point of a scale. You must keep each side balanced. If you subtract 3 from one side, you must do that to the other side, so you don't tip the scale.

If you minus 3 from here, 

you'll tip the scale. 

Put the "minus 3" on the other side. 

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, one section at a time. Bring the x straight down because it didn't change.

$$\begin{array}{rcl} x + 3 & = & 5 \\ -3 & & -3 \\ \hline x & = & \end{array}$$

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.

$$\begin{array}{rcl} x + \cancel{3} & = & 5 \\ \cancel{-3} & & -3 \\ \hline x & = & 2 \end{array}$$

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

The first step is to get x all 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 then 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.

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

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 ended up crossing it out anyway. Instead, **just swing the number over to the other side and change the sign to the opposite sign**. I'll show you what I mean. We will do those last two problems again with this easy short cut way.

x + 3 = 5	Swing the 3 over and change the sign to a minus.
x = 5 – 3	Do the math; 5 – 3 = 2.
x = 2	That is much faster.

Here is the second problem, a little easier.

x – 10 = 20	Move the 10 to the other side and change the sign to +.
x = 20 + 10	Do the math; 20 + 10.
x = 30	You just solved for x. The answer is x = 30.

You can use whichever 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, but first change the sign to make it +10. 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 will end up with the same answer either way; they both equal 7. The important part is to make sure you are transferring the signs correctly. Let's try another one.

$$12 + x = -4$$

This time we need to move this 12. What is it, positive or negative 12? Since there is no sign in front, it must be positive. So, if it is a positive 12, then we need to do the opposite to get rid of it. I will subtract 12 from both sides of the equation.

$$\begin{array}{rr} 12 + x = & -4 \\ -12 & -12 \end{array}$$

So, let's see, how should we write that? Negative 4 minus 12 or negative 12 minus 4?

$$12 + x = -4$$

Not 12 – 4 = 8

or

$$x = -4 - 12$$
$$x = -16$$

$$x = -12 - 4$$
$$x = -16$$

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

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

Step 1: Use an opposite operation to 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?

$$9 + x = 17$$

Lesson 1a: Solve for x with Fractions

Now that you've had a chance to work with "x" a little bit, I'm going to make the problems a little more interesting. The math is the same, but I will throw in some fractions, mixed numbers and negative numbers.

Again, the math is the same. You still need to get x by itself, and you still need to make sure you do the same thing to both sides of the equation. Let's try one together.

The first thing we need to do is get that x by itself.

$$\frac{1}{3} + x = -\frac{2}{3}$$

To do that, we need to subtract that $\frac{1}{3}$ from the left-hand side of the equal sign. I'll subtract it from that side, and of course, whatever we do to one side of the equal sign, we must do to the other side, too. I will subtract $\frac{1}{3}$ from both sides to get x by itself.

$$\frac{1}{3} + x = -\frac{2}{3} \quad -\frac{1}{3}$$

Now x is by itself →

$$x = -\frac{2}{3} - \frac{1}{3}$$

$$x = -\frac{3}{3}$$

$$x = -1$$

Do you see how the math is the same? It's just a little more complicated. Now I'll throw in a negative mixed number.

$$-3\frac{5}{8}+x=\frac{1}{2}$$

Where do we start? We have to get that x by itself. The only number on that side of the equal sign is a negative number, so let's do the opposite math and ADD $3\frac{5}{8}$. And whatever we do to one side, we have to do to the other side, too. After adding $3\frac{5}{8}$ to both sides, I'm left with this:

$$x=\frac{1}{2}+3\frac{5}{8}$$

In order to add these together, I will need to get a common denominator. That's no problem; I'll turn $\frac{1}{2}$ into $\frac{4}{8}$. Now it's easy to add them together.

$$x=\frac{4}{8}+3\frac{5}{8}$$

$$x=3\frac{9}{8}$$

$$x=4\frac{1}{8}$$

Now you try one. This time we will use decimal numbers.

$$.85+x=-1.35$$

Do you know what to do? That's right, you need to get rid of the .85. Is it positive or negative? It is positive. OK, then let's subtract it from both sides or just swing it over to the other side and change the sign.

$$.85+x=-1.35-.85$$

$$x=-1.35-.85$$

Now all we have to do is the math. So, let's see…a negative number minus a positive number…that's like owing $1.35 and then someone comes along and takes another 85 cents from you. Now you have even less money. I'll add the two numbers together and call it negative.

$$x = -2.20$$

Give it a try for yourself on the next worksheet. If you are having difficulties working with negative numbers or fractions, read volume two of the *Learn Math Fast System*.

Name:_____ Date:_____

WORKSHEET 3-1a

Solve for x.

1.	$-3 + x = -12$	2.	$x - 14 = -28$	3.	$12 + x = 4$
4.	$10 + x = 5$	5.	$x + 8 = -48$	6.	$62 = x + 9$
7.	$-44 = x - 18$	8.	$x + 25 = -100$	9.	$x - 10 = -17$
10.	$x + 5 = -55$	11.	$x + 7 = -12$	12.	$8 + x = -20$
13.	$x - 27 = -15$	14.	$-\frac{1}{2} + x = -.5$	15.	$-.75 + x = .25$
16.	$x + .3 = -5.3$	17.	$\frac{1}{2} + x = 5$	18.	$x - \frac{1}{4} = -6\frac{3}{4}$

19. Sarah is trying to break the record for doing the most one-handed cartwheels on a balance beam without falling. Right now, the record is 71, so she needs to get to 72 to break the record. She has done 15 cartwheels, so far. How many more does she need to do to break the record? Use algebra to solve for x in the equation below.

$$15 + x = 72$$

20. Robin needs to keep track of the water level at Lake Welch. At the end of the summer, the water level was low. It measured 30 inches below the desired level. After a week of rain, the water level rose and is now only 16 inches below the desired level. How many inches did it rain? Use algebra to solve for x.

$$-30 + x = -16$$