Basic Algebra - Why Are There Letters in My Math??

Why Are There Letters?

Remember when you had math problems like this: $3 + \underline{\quad} = 10$
This problem could be read, "Three plus something equals 10."

Algebra uses letters to replace the $\underline{\quad}$. So the same problem can be written like this: $3 + x = 10$

The problem could be read, "Three plus something equals 10." or "Three plus x equals 10." The "x" just stands for "something". We used x here, but we could use any letter. The letter is called the **variable**.

In algebra, our goal is to find out what number can replace the variable to make the equation true. In the example above, we know that $3 + 7 = 10$. So the answer would be $x = 7$. (Replacing the x with a 7 makes the equation true.)
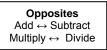
Solving Equations

1. An equation has two sides, separated by an equal sign (=).

2. Your goal in algebra is to get the variable on one side of the equation by itself. For example, when you get $x = 7$, you know you have solved the equation.

3. You can add, subtract, multiply, or divide terms (except 0) to one side of the equation, as long as you do the same thing to the other side.

4. To get the variable by itself on one side, you have to get rid of whatever else is on the same side of the equation as the variable.

5. To get rid of something, do the opposite. Remember to do it to both sides.

> For example, $x + 3 = 10$ We want to get the x by itself, so we need to get rid of the +3. To get rid of +3, we subtract 3 from both sides.

$$
\begin{array}{rl}
x + 3 = & 10 \\
-3 \quad & -3 \\
\hline
x + 0 = & 7 \\
x \quad\;\; = & 7
\end{array}
$$

Opposites
Add ↔ Subtract
Multiply ↔ Divide

We're finished because we have the variable by itself on one side of the equation!
The answer is $x = 7$

6. Check your answer by plugging in to the original equation for x to make sure the equation is true.

$7 + 3 = 10$ True! So your answer of $x = 7$ was correct!

Two Step Equations

The same rules apply for two step equations. You want to get the variable alone on one side of the equation. Whatever you do to one side, you have to do to the other side.

> For two-step equations, *first* get rid of whatever is added or subtracted on the variable side of the equation. *Second* get rid of whatever is multiplied or divided.

For example: $5x - 4 = 11$

Step 1: Get rid of the minus 4 by adding 4 to both sides

$$
\begin{array}{rl}
5x - 4 = & 11 \\
+4 \quad & +4 \\
\hline
\end{array}
$$

We are left with $5x \;\;= 15$

Step 2: Solve for x by dividing both sides by 5

$$
\frac{5x}{5} = \frac{15}{5}
$$

$$
x = 3
$$

Sample Algebra Problems

Fold the paper so the answers do not show. Solve the equations. Though you may be able to solve these equations in your head, write out each step.

1. $x + 3 = 10$

2. $x - 5 = 20$

3. $7x = 14$

4. $\dfrac{x}{4} = 3$

5. $7 + y = 12$

6. $10 - y = 6$

7. $6y = 42$

8. $\dfrac{y}{10} = 2$

9. $3x + 7 = 22$

10. $7x - 12 = 30$

11. $\dfrac{x}{12} + 5 = 8$

12. $\dfrac{x}{4} - 6 = 3$

Answers:

1. $x = 7$

2. $x = 25$

3. $x = 2$

4. $x = 12$

5. $y = 5$

6. $y = 4$

7. $y = 7$

8. $y = 20$

9. $x = 5$

10. $x = 6$

11. $x = 36$

12. $x = 36$