

Basic Algebra

In basic algebra, letters represent numbers. It is important to collect same letters together when possible.

For example: $3x + 2x + 6x$ should be written as **11x** (there are 11 x's altogether)

$5y - 3y$ should be written as **2y**

$1x$ is usually written as **x** (the 1 is assumed)

If you are given the value (number) for the letter, you can substitute that value for the letters to answer the equation.

For example: Solve $3x + 2$ when $x = 4$

Simply substitute 4 for the x and solve.

$$\begin{aligned} &3x + 2 \\ &3(4) + 2 \\ &12 + 2 \\ &= \mathbf{14} \end{aligned}$$

An equation is **solved** when the unknown letter is isolated on one side of the equal sign. When isolating x , the equation must be kept balanced. To maintain balance, you must always do the same thing to both sides of the equation.

For example: $x + 3 = 10$

3 is being added to x , so do the opposite to both sides and subtract 3 from both sides to isolate x . On the left side, $3 - 3$ is 0, leaving just the x on the left.

$$\begin{aligned} x + 3 &= 10 \\ -3 &\quad -3 \\ \mathbf{x} &= \mathbf{7} \end{aligned}$$

Practice: a) Solve $x - 6 = 4$

6 is being subtracted from x so add 6 to both sides to isolate x . Again,

$-6 + 6 = 0$, leaving just x on the left.

$$\begin{aligned} x - 6 &= 4 \\ x - 6 \boxed{+6} &= 4 \boxed{+6} \\ \mathbf{x} &= \mathbf{10} \end{aligned}$$

b) Solve $4x = 20$

x is being multiplied by 4 so the opposite of multiply is divide (by 4) on both sides.

$$4x = 20$$

$$\frac{4x}{4} = \frac{20}{4}$$

$$\mathbf{x = 5}$$

c) Solve $\frac{y}{6} = 5$

y is being divided by 6 so the opposite of divide by 6 is multiply by 6 on both sides.

$$\frac{y}{6} = 5$$

$$\frac{y}{6} (6) = 5(6)$$

$$\mathbf{y = 30}$$

d) Solve $4x + 3x + 2 = 5 + 4$

Collect like terms first!

$$7x + 2 = 9$$

Now isolate the x by subtracting 2 from both sides

$$7x + 2 = 9$$

$$7x + 2 \boxed{-2} = 9 \boxed{-2}$$

$$7x = 7$$

Divide by the number of x's to isolate the x on the left

$$\frac{7x}{7} = \frac{7}{7}$$

$$\mathbf{x = 1}$$

Algebra Practice

Solve the following:

1. $3x + 9x - 8x =$
2. $7y - 3y + 2y =$
3. $Z - 3 = 25$
4. $3x + 4 = 13$ (isolate $3x$ first)
5. $5x + 6 = 31$ (isolate $5x$ first)
6. $2x + 4$, when $x = 3$
7. $M - 2s = 40$, when $M = 4s$
8. $N \div 5 = 60$

Answers:

1. $4x$
2. $6y$
3. $Z = 28$
4. $X = 3$
5. $X = 5$
6. 10
7. $s = 20$
8. $N = 300$

