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.

$3(4) + 2 = 12 + 2 = 14$

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.

$x + 3 = 10$
$-3 -3$
$x = 7$

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.

$x - 6 = 4$
$x - 6 +6 = 4 +6$
$x = 10$
b) Solve \(4x = 20\)

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

\[
\frac{4x}{4} = \frac{20}{4}
\]

\(x = 5\)

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.

\[
\frac{y}{6} = 5
\]

\[
\frac{y}{6} \cdot 6 = 5 \cdot 6
\]

\(y = 30\)

d) Solve \(4x + 3x + 2 = 5 + 4\)

Collect like terms first!

\(7x + 2 = 9\)

Now isolate the \(x\) by subtracting 2 from both sides

\[
7x + 2 = 9
\]

\[
7x + 2 - 2 = 9 - 2
\]

\(7x = 7\)

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

\[
\frac{7x}{7} = \frac{7}{7}
\]

\(x = 1\)
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. \(N ÷ 5 = 60\)

Answers:

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