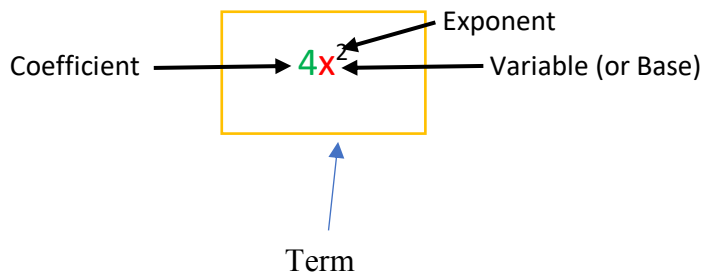


Simplifying and Combining Like Terms



* Write the coefficients, variables, and exponents of the following:

	Coefficients	Variables	Exponents
$8c^2$			
$9x$			
y^8			
$12a^2b^3$			

Like Terms: Terms that have identical variable parts (same variable(s) and same exponent(s)).

When simplifying using addition and subtraction, you combine “like terms” by keeping the “like term” and adding or subtracting the numerical coefficients.

Examples:

$3x + 4x = 7x$

$13xy - 9xy = 4xy$

$12x^3y^2 - 5x^3y^2 = 7x^3y^2$

Can you simplify?

$4x + 4y$

$11x^2 - 7x$

$6x^3y + 5xy^3$

Simplify the following:

1) $7x + 5 - 3x$	2) $6w^2 + 11w + 8w^2 - 15w$	3) $6x + 4 + 15 - 7x$
4) $12x - 5 + 7x - 11$	5) $2x^2 - 3x + 7 - 3x^2 + 4x - 7$	6) $11a^2b - 12ab^2$

WORKING WITH THE DISTRIBUTIVE PROPERTY

Example: $3(2x - 5) + 5(3x + 6) =$

Since in the order of operations, multiplication comes before addition and subtraction, we must get rid of the multiplication **before** you can combine like terms. We do this by using the **distributive property**:

$$3(2x - 5) + 5(3x + 6) =$$

$$3(2x) - 3(5) + 5(3x) + 5(6) =$$

$$6x - 15 + 15x + 30 =$$

Now you can combine the like terms:

$$6x + 15x = 21x$$

$$-15 + 30 = 15$$

Final answer:

$$3(2x - 5) + 5(3x + 6) = 21x + 15$$

Practice Examples:

Solving Equations

Golden Rule of Algebra:

“Do unto one side of the equal sign as you will do to the other...”

****Whatever you do on one side of the equal sign, you MUST do the same exact thing on the other side.** If you multiply by -2 on the left side, you have to multiply by -2 on the other. If you subtract 15 from one side, you must subtract 15 from the other. You can do whatever you want (to get the x by itself) as long as you do it on both sides of the equal sign.

Solving Single Step Equations:

To solve **single step** equations, you do the *opposite* of whatever the operation is. The opposite of addition is subtraction and the opposite of multiplication is division.

Solve the following equations for x:

1) $x + 5 = 12$	2) $x - 11 = 19$	3) $22 - x = 17$
4) $5x = -30$	5) $\frac{x}{-5} = 3$	6) $\frac{2}{3}x = -8$
7) $x + 15 = 28$	8) $15 - x = 21$	9) $\frac{x}{4} = 5$

10) $6 + x = 34$

11) $9x = 45$

12) $7 + x = 19$

Solving Multi-Step Equations:

$$3x - 5 = 22$$

$$\begin{array}{r} +5 \quad +5 \\ 3x - 5 = 22 \\ \hline 3x \quad = 27 \end{array}$$

$$\begin{array}{r} 3 \quad 3 \\ 3x \quad = 27 \\ \hline x \quad = 9 \end{array}$$

To get the x by itself, you will need to get rid of the 5 and the 3.

Get rid of addition and subtraction first.

Use the opposite order of PEMDAS

Then, we get rid of multiplication and division.

We check the answer by putting it back in the original equation:

Check:

$$3x - 5 = 22$$

We have that $x = 9$

$$3(9) - 5 = 22$$

$$27 - 5 = 22$$

$$22 = 22 \text{ (It checks!)}$$

Solve the **Multi-Step** Equations and check:

1) $9x - 11 = -38$ Check:	2) $160 = 7x + 6$ Check:
3) $32 - 6x = 53$ Check:	4) $\frac{3}{4}x - 11 = 16$ Check:
5) $4x - 7 = -23$ Check:	6) $12x + 9 = -15$ Check:
7) $21 - 4x = 45$ Check:	8) $\frac{x}{7} - 4 = 4$ Check:
9) $\frac{-x}{5} + 3 = 7$ Check:	10) $26 = 60 - 2x$ Check:

Equations with more than one x on the same side of the equal sign:

You need to simplify (combine like terms) and then use the same steps as a multi-step equation.

$$9x + 11 - 5x + 10 = -15$$

$$9x - 5x = 4x$$

$$11 + 10 = 21$$

1st – combine like terms

$$4x + 21 = -15$$

Now it looks like a multistep equation that we already did

$$\underline{-21} \quad \underline{-21}$$

Use subtraction to get rid of the addition.

$$\frac{4x}{4} = \frac{-36}{4}$$

Now divide to get rid of the multiplication

$$x = -9$$

We check the answer by putting it back in the original equation:

Check:

$$9x + 11 - 5x + 10 = -15$$

We have that $x = -9$

$$9(-9) + 11 - 5(-9) + 10 = -15$$

$$-81 + 11 + 45 + 10 = -15$$

$$-70 + 55 = -15$$

$$-15 = -15 \text{ (It checks!)}$$

Solve the Multi-Step Equations and check:

1) $15x - 24 - 4x = -79$ Check:	2) $102 = 69 - 7x + 3x$ Check:
3) $3(2x - 5) - 4x = 33$ Check:	4) $3(4x - 5) + 2(11 - 2x) = 43$ Check:
5) $9(3x + 6) - 6(7x - 3) = 12$ Check:	6) $7(4x - 5) - 4(6x + 5) = -91$ Check:

Equations with x's on BOTH sides of the equal sign:

You need to "Get the x's on one side and the numbers on the other." Then you can solve.

Example:

$$\begin{array}{r} 12x - 11 = 7x + 9 \\ -7x \quad -7x \\ \hline 5x - 11 = 9 \\ \quad +11 \quad +11 \\ \hline 5x = 20 \\ \frac{5x}{5} = \frac{20}{5} \\ x = 4 \end{array}$$

Move the x's to one side.
Now it looks like a multistep equation that we did in the 1st section.
Add to get rid of the subtraction.
Now divide to get rid of the multiplication

We check the answer by putting it back in the original equation:

Check:

$$\begin{array}{l} 12x - 11 = 7x + 9 \\ 12(4) - 11 = 7(4) + 9 \\ 48 - 11 = 28 + 9 \\ 37 = 37 \quad (\text{It checks!}) \end{array}$$

We have that $x = 4$

Solve the Multi-Step Equations and check:

1) $11x - 3 = 7x + 25$ Check:	2) $22 - 4x = 12x + 126$ Check:
3) $\frac{3}{4}x - 12 = \frac{1}{2}x - 6$ Check:	4) $5(2x + 4) = 4(3x + 7)$ Check:
5) $12(3x + 4) = 6(7x + 2)$ Check:	6) $3x - 25 = 11x - 5 + 2x$ Check:

Solving Multi-Step Equations (multiple variables = same side)

1- $15x - 24 - 4x = -79$

$$\begin{array}{r} 11x - 24 = -79 \\ +24 = +24 \\ \hline 11x = -55 \\ 11 \quad 11 \end{array}$$

$x = -5$

2- $102 = 69 - 7x + 3x$

$$\begin{array}{r} 102 = 69 - 4x \\ -69 = -69 \\ \hline 33 = -4x \\ -4 \quad -4 \end{array}$$

$-8.25 = x$

3- $3(2x - 5) - 4x = 33$

$$\begin{array}{r} 6x - 15 - 4x = 33 \\ 2x - 15 = 33 \\ +15 \quad +15 \\ \hline 2x = 48 \\ 2 \quad 2 \end{array}$$

$x = 24$

4- $3(4x - 5) + 2(11 - 2x) = 43$

$$\begin{array}{r} 12x - 15 + 22 - 4x = 43 \\ 8x + 7 = 43 \\ -7 \quad -7 \\ \hline 8x = 36 \\ 8 \quad 8 \end{array}$$

$x = 4.5$

5- $9(3x + 6) - 6(7x - 3) = 12$

$$\begin{array}{r} 27x + 54 - 42x + 18 = 12 \\ -15x + 72 = 12 \\ -72 \quad -72 \\ \hline -15x = -60 \\ -15 \quad -15 \end{array}$$

$x = 4$

6- $7(4x - 5) - 4(6x + 5) = -91$

$$\begin{array}{r} 28x - 35 - 24x - 20 = -91 \\ 4x - 55 = -91 \\ +55 \quad +55 \\ \hline 4x = -36 \\ 4 \quad 4 \end{array}$$

$x = -9$

Answers:

1- $11x - 3 = 7x + 25$

$$\begin{array}{r} -7x \quad -7x \\ 4x - 3 = 25 \\ +3 \quad +3 \\ \hline 4x = 28 \\ 4 \quad 4 \end{array}$$

$x = 7$

2- $22 - 4x = 12x + 126$

$$\begin{array}{r} +4x \quad +4x \\ 22 = 16x + 126 \\ -126 \quad -126 \\ \hline -104 = 16x \\ 16 \quad 16 \end{array}$$

$x = -6.5$

3- $\frac{3}{4}x - 12 = \frac{1}{2}x - 6$

4- $5(2x + 4) = 4(3x + 7)$

$$\begin{array}{r}
 -\frac{1}{2}x \quad -\frac{1}{2}x \\
 \frac{1}{4}x - 12 = -6 \\
 +12 \quad +12 \\
 \left(\frac{4}{1}\right)\frac{1}{4}x = 6\left(\frac{4}{1}\right)
 \end{array}$$

$x = 24$

$$\begin{array}{r}
 10x + 20 = 12x + 28 \\
 -10x \quad -10x \\
 20 = 2x + 28 \\
 -28 \quad -28 \\
 \hline
 -8 = 2x \\
 2 \quad 2
 \end{array}$$

$-4 = x$

5- $12(3x + 4) = 6(7x + 2)$

$$\begin{array}{r}
 36x + 48 = 42x + 12 \\
 -36x \quad -36x \\
 48 = 6x + 12 \\
 -12 \quad -12 \\
 \hline
 36 = 6x \\
 6 \quad 6
 \end{array}$$

$6 = x$

6- $3x - 25 = 11x - 5 + 2x$

$$\begin{array}{r}
 3x - 25 = 13x - 5 \\
 -3x \quad -3x \\
 -25 = 10x - 5 \\
 +5 \quad +5 \\
 \hline
 -20 = 10x \\
 10 \quad 10
 \end{array}$$

$-2 = x$
