

Combining Like Terms

There are different problems with variables in algebra:

- **Evaluate** (We substitute in values in simplify to one number).
- **Simplify** (We keep variables and simplify to variables).
- **Solve** (We solve an equation by finding a value for a variable).

We looked at evaluating and now we will look at simplifying problems containing variables. Part of simplification is combining like terms.

Terms, in an algebra problem, are separated by plus or minus.

Examples:

1. $4x + 5y - 3$ (three terms)
2. $6x^2y^3$ (one term)
3. $5x - 10$ (two terms)

Parts of a term: $-3x^2$

The -3 is the **coefficient** or numerical coefficient. Note: The sign is included.

The x is the variable.

The 2 is the **exponent**.

In the example, $5x - 10$, the first term, $5x$, is called a **variable term** because it contains a variable. The second term, -10 , is called a **constant term** because it contains no variable and thus remains the same or constant.

Variables in algebra usually represent real items. We might use d for dogs and c for cats. If we have five dogs and three cats we can't add them, thus we can only say we have five dogs and three cats. In algebra we would write:

$$5d + 3c .$$

If we had five dogs and another four dogs we could simplify the problem and say we have nine dogs.

$$5d + 4d = 9d .$$

If the variables in each term are the same, these terms are called **like term**. If there are exponents on the variables, the exponents have to be the same. The following table shows expression of like terms and non-like terms.

Expression	Like Terms ? (Yes or No)	Explanation
$5d + 4d$	Yes	Each term has the same variable d .
$5d + 3c$	No	One term has d , the other has c .
$3xy - 5xy + 10xy$	Yes	Each term has the same variables x and y .
$3x^2y - 5xy$	No	The first term has an x^2 , and the second term has just x .

Only like terms can be added or subtracted. These two operations are known as combining like terms.

Steps to Simplify by Combining Like Terms

1. Write original problem.
2. Move like terms together. Move the sign with the term.
3. Add or subtract the coefficients and leave the variables and their exponents alone.

Examples:

1. $5x + 8x = 13x$

2. $5x + 10y + 8x = 5x + 8x + 10y$ (Note: We first move x terms together).
 $= 13x + 10y$

3. $5x + 12 - 20 = 5x + 12 - 20$
 $= 5x - 8$ (Note: Only the constant terms of $12 - 20$ can be combined).