

2-2-1 Variables and Like Terms

"Algebra is what we use when we don't know what we are talking about." Anonymous

If we need to add two numbers to get 45, but we don't know what the numbers are, we can put a variable in place of the numbers. $x + y = 45$

Variables: A variable holds a place for a number. Any letter can be used.

$$\square + 6$$

Put 5 in the box.
The result is 11.

Put 234 in the box.
The result is 240.

Remember in grade school when the teacher asked you to put a number in a box and then find the answer. The box acted like a variable.

Now use $x+6$

If we put a 5 in for x
the result is 11.

If we put 234 in the place of x the
result is 240.

$x + 6$ is an expression. Other expressions are $3-7y$, $2t-3s+6r^2$, and $ab-4c$

An **expression** does not contain an equal sign. It could have numbers and variables combined by different mathematical operations.

$$\square + 127 = 481$$

You had to find what
went in the box.

Remember grade school again. This time the teacher had you find what was missing. Instead of putting a number in the box, you found the one answer that fit.

In algebra the box becomes a
variable.

$x+127 = 481$
We must find what x is.

An **equation** contains an equal sign. If there is an equal sign we might be able to solve for the variable.

An equation has an expression on one side of the equal sign and another expression on the other side.

Example: $2x-6 = 5x+2$
expression *expression*

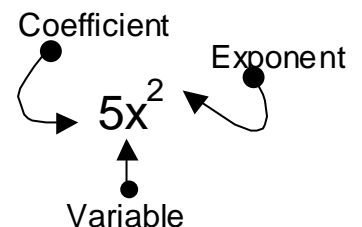
A **term** is part of an expression that is added or subtracted.

In the expression $3x^2+4x+3$; $3x^2$, $4x$ and 3 are terms.

Each term has three parts, a coefficient, variable, and an exponent.

A coefficient is the number in the front of the variable.

An exponent is the power to which the variable is raised.



Sometimes the coefficient or the exponent is 1. When an expression is written a coefficient of 1 isn't written down. It is just understood.

$7x^3$	$-8x^2$	$2x$
Coefficient 7	Coefficient - 8	Coefficient 2
Exponent 3	Exponent 2	Exponent 1

	Coefficient	Exponent
$-3x^2+7x+x^5$		
First term	-3	2
Second term	7	1
Third term	1	5

Fill out the table for the following expression:

$$13x^6 - 9x^5 + 8x^4 + x^3 - x^2 + 7x$$

	Coefficient	Exponent
First term		
Second term		
Third term		
Fourth term		
Fifth term		

One of these term is not like the others. Which one is different?

$3x^2$	$2x^3$
$2x^2$	$7x^2$

To be like, the only thing that can be different in terms is the coefficient.

$5x^2y^3$ and $5x^3y^2$ are not like terms, but $3m^2n^3$ and $7m^2n^3$ are like terms.

The best thing about like terms is that they can be combined: added or subtracted.

Example: $3x + 5x = 8x$ or $8y^2s - 3y^2s = 5y^2s$ Notice on this example, there are two variables. A term can have more than one variable. The exponents of each must match to combine.

Practice: Combine the following like terms. A few examples have been done for you.

- a) $13x^6 - 9x^6$ $7f^6 + f^6$ $5kl^3 + kl^3$
- b) $m^3 - x^2 + 7m^3$ $w^2 + 7m^3 + 4m^3$ $r^2s + s^2r + 4s^2r$
 Answer: $w^2 + 11m^3$ or $11m^3 + w^2$
- c) $r^2 + s^2 + 4s^2 + 7r^2$ $a^2 + 3b^2 + 4b^2 + 7a^2 + 5a^2$ $x + 3y + 5y + 7x - 2x$
- d) $3\alpha + 5\alpha$ $e^3 + e^2 + 4e^3 + 4e^2$ $st^2 + 5st^2 + 3s^2t + 5s^2t$
 (α is a Greek Letter.) Answer: $6st^2 + 8s^2t$
- e) $8d^3 + 12d^2$ $231z - 82z^2$ $15rs^2 + 10r^2s + 7r^2s^2$
- f) $3ba + 4b^2a + 5 + 5b^2 - b^2a - 2b^2 + 3$ $3pq + 4p^2q + 5pq^2 + pq - p^2q + 8pq^2$
- g) $4v^2 + 6w - 2v^2 - 3w - v^2 + w - v^2 - 4w$ $9lk^2 + l^2k + 6l^2k + l^2k^2 + 7l^4k^2 - 2l^2k$
 Answer: 0
- h) $5x + 7y + 8z + 54 + 3x + 4x - 2y + 3z + 32$ $2x^2 + 3x + 5x^3 + 2x^3 + 7x - 3x + 2x^3$
- i) $10m^2n - 7m^2n + 6m^3n - 3m^3n + 2m^3n$ $15j^3 + 2i^3 - 7j^3 + j^2 + j + i^2 + 23$