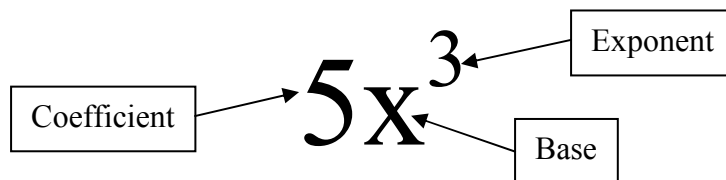


## Rules for Exponents and Variables

Every variable term is made up of three parts: the base, the coefficient, and the exponent.

Example: In  $5x^3$ , the base is "x," the coefficient is "5," and the exponent is "3."

In the term "y," the coefficient and exponent are understood to be 1 each. The base is "y."



**Addition:**

In order to add (or subtract) variables, the bases must be the same and the exponents must be the same.

$$\text{Example: } 3x^2 + 5y^4 + x^2 + 8y + 4y + 2y^4 + a^2 = 4x^2 + 7y^4 + 12y + a^2$$

**Multiplication:**

When you multiply variables, if the bases are the same, you will multiply the coefficients and add the exponents. The rule is expressed algebraically as  $x^m(x^n) = x^{m+n}$

$$\text{Example: } 4x^2(7x^3) = 28x^5$$

**Division:**

When you divide variables, the bases must be the same. You then divide the coefficients and subtract the exponents (numerator exponent minus denominator exponent.)

This expressed algebraically as  $\frac{x^m}{x^n} = x^{(m-n)}$

$$\text{Example: } \frac{14x^3y^5}{7xy^2} = 2x^2y^3$$

**Exponentiation:**

When you raise a variable with an exponent to another exponent, you will use parentheses, to enclose the beginning term. The final exponent will affect the exponents of every term inside the parentheses. You will multiply the exponents. This is expressed algebraically as:  $(x^m)^n = x^{m(n)}$

$$\text{Example: } (3x^2y^5z^4)^3 = 27x^6y^{15}z^{12}$$

Some important facts about exponents:

- Zero raised to any power is zero (e.g.  $0^5 = 0$ )
- One raised to any power is one (e.g.  $1^5 = 1$ )
- Any number raised to the zero power is one (e.g.  $7^0 = 1$ )
- Any number raised to the first power is that number (e.g.  $7^1 = 7$ )