

# MATH REVIEW: ALGEBRAIC OPERATIONS

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An understanding of basic algebra is required for chemistry. In an algebraic equation, there is an unknown quantity that has a value which is represented by an equation. The unknown quantity is normally expressed by a letter usually  $x$ . If an equation has more than one unknown, they are usually assigned the letters  $y$  or  $z$ .

To solve an algebraic equation, the unknown quantity must be isolated on one side of the equation and the rest of the terms on the other side. In solving an equation, the basic rule that applies is that *whatever is done to one side of the equation must be done to the other side*.

As a test, you should be able to solve the following problems:

## 1. Equations with one unknown:

Solve for  $x$ :

a)  $2x + 8 = 4$

b)  $\frac{5x}{12} = \frac{9}{16}$

c)  $3x^2 = 48$

## 2. Equations with two unknowns.

Solve for  $x$ :

a)  $2xy - 4 = 12$

b)  $2x^2 + 4y = 20$

## 3. Typical equations encountered in Chemistry

a) The equation for density is

$$d = \frac{m}{v}$$

where  $d$  is density,  $m$  is mass, and  $v$  is volume.

Solve for  $v$ .

b) The ideal gas law equation is

$$PV = nRT$$

where  $P$  is pressure,  $V$  is volume,  $n$  is the number of moles,  $R$  is the gas constant, and  $T$  is the temperature.

i) Solve for  $P$

ii) Solve for  $T$

iii) If  $n = g/M$ , substitute in the ideal gas law equation and solve for  $M$  (where  $g$  is the mass in grams and  $M$  is the molecular weight or molar mass of the substance)

c) Molarity is defined as:

$$M = \frac{\text{mol}}{V}$$

where mol is moles of substance and V is the volume in Liters

Moles are defined as:

$$\text{mol} = \frac{g}{MW}$$

where g is the mass in grams and MW is the molecular weight (or molar mass) of the substance.

Volume in Liters is defined as:

$$L = \frac{\text{mL}}{1000 \text{ mL/L}}$$

where mL is the volume in milliliters and 1000 is the conversion factor for ml to Liters.

Combine these three equations into a single equation for Molarity.