Proportions

- A proportion is an equation of the form $\frac{a}{b} = \frac{c}{d}$, where $b \neq 0$ and $d \neq 0$
- If we compare quantities with units, we must be sure we are comparing them in the right order.
  - For example

$$\frac{32\ g}{2\ mol} = \frac{16\ g}{1\ mol}$$ ✓

$$\frac{32\ g}{2\ mol} = \frac{1\ mol}{16\ g}$$ ✗

- The following is a proportion because we know that the two fractions are equivalent to each other.

$$\frac{1}{2} = \frac{3}{6}$$

- But how else can we prove that both sides of the equation are equal?
  - Get rid of the fractions by multiplying by the denominators. A process known as cross multiplication.

$$(\cancel{2} \cdot 6)\frac{1}{\cancel{2}} = \frac{3}{\cancel{6}}(2 \cdot \cancel{6})$$

$$(6)1 = 3(2)$$

$$6 = 6$$

- We can use this method to solve for any missing variable.
  - For example:

$$\frac{x}{4} = \frac{2}{5}$$

  - Cross multiply

$$5x = 2(4)$$

  - Solve for x.

$$5x = 8$$

$$x = \frac{8}{5} = 1.6$$

- Another example

$$\frac{2}{x} = \frac{4}{3}$$

$$(3)2 = 4x$$

$$6 = 4x$$

$$x = \frac{6}{4} = 1.5$$