We will use the method of dimensional analysis, sometimes called the factor-label method. ... or, the "drag and drop" method!

Dimensional analysis uses conversion factors to change between one unit and another

What's a conversion factor? A simple equality.

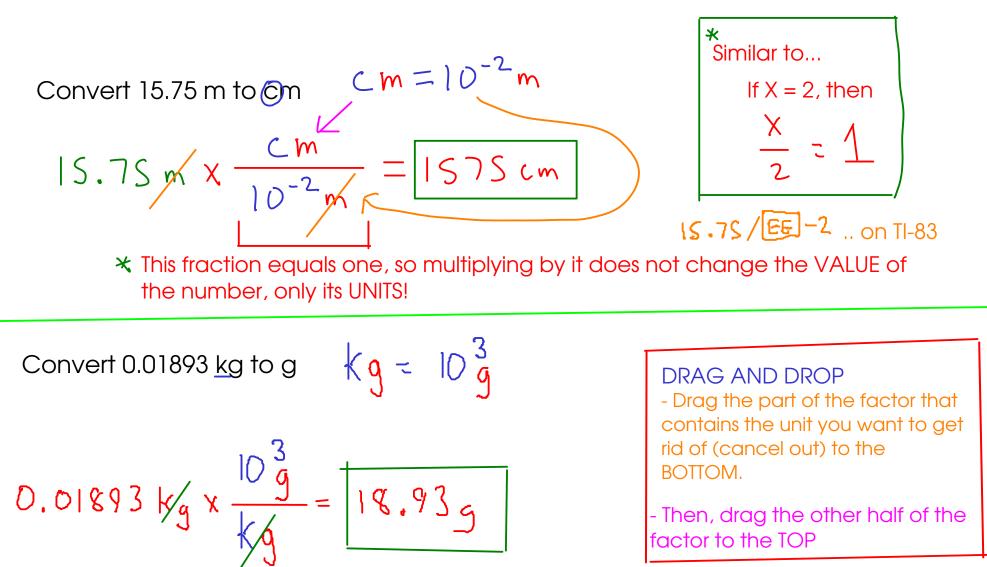
$$12 in = 1 f f$$

Conversion factors in metric

In the metric system, conversion factors between units may always be made from the metric prefixes!

For example, "kilo-" means 
$$10^3$$
  
 $K = 10^3$   
 $So$   
 $\frac{Kg}{Kg} = 10\frac{3}{g}$   
 $\frac{Ks}{Ks} = 10\frac{3}{s}$   
 $\frac{Km}{Km} = 10\frac{3}{m}$   
 $\frac{KL}{KL} = 10^3L$ 

How do we actually USE a conversion factor?



Convert 14500 mg to kg mg = 
$$10\frac{3}{9}$$
 kg =  $10\frac{3}{9}$   
14500 mg x  $\frac{10\frac{3}{9}}{mg}$  x  $\frac{kg}{10\frac{3}{9}}$  = 0.0145 kg

Convert 0.147 cm<sup>2</sup> to m<sup>2</sup> 
$$Cm = 10^{-2}$$

$$0.1417 (m^{2} \times \frac{10^{-2}}{Cm} \times \frac{10^{-2}}{Cm} = \frac{1.47 \times 10^{-5} m^{2}}{(0.0000147 m^{2})}$$

For squared and cubed units, you should use each conversion factor two (for squared) or three (for cubed) times to cancel. Think of it this way ...

$$(m^2 = Cm \times Cm)$$
  $(m^3 = Cm \times Cm \times Cm)$ 

... and it should make sense!

8.45 kg to mg 
$$Kg = 10^{3}g$$
  $Mg = 10^{6}g$   
8.45 kg x  $\frac{10^{3}g}{Kg} \times \frac{Mg}{10^{6}g} = \frac{845000000 \text{ mg}}{(8.45 \times 10^{9} \text{ mg})}$ 

88100 kHz to MHz  

$$KH_{2} = S^{-1} (Frequency)$$

$$KH_{2} = 10^{6}H_{2}$$

$$MH_{2} = 10^{6}H_{2}$$

$$MH_{2} = 10^{6}H_{2}$$

$$KH_{1} \times \frac{10^{3}H_{2}}{KH_{2}} \times \frac{MH_{2}}{10^{6}H_{2}} = \frac{88.1 MH_{2}}{88.1 MH_{2}}$$

Convert 38.47 in to m, assuming 2.54 cm = 1 in  
2.54 cm = in Cm = 
$$10^{-2}$$
m  
38.47 if x  $\frac{2.54}{10}$  x  $\frac{10^{-2}}{5m}$  = 0.9771 m

Convert 12.48 km to in

$$2.54$$
 cm = in Km = 10<sup>3</sup> m cm = 10<sup>2</sup> m

$$12.48 \, \mu m \times \frac{10^3 m}{10^7 m} \times \frac{10^7 m}{10^7 m} \times \frac{10^7 m}{10^7 m} \times \frac{10^7 m}{2.54 m} = \frac{191300 \text{ in}}{191300 \text{ in}}$$

- two related concepts that you must understand when working with measured numbers!

## <u>Accuracy</u>

- how close a measured number is to the CORRECT (or "true") value of what you are measuring

## - "Is it right?"

- checked by comparing measurements against a STANDARD (a substance or object with known properties)

## Precision

- how close a SET of measured numbers are to EACH OTHER
- "Can I reproduce this?"
- checked by repeated measurements