Converting from one unit to another

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

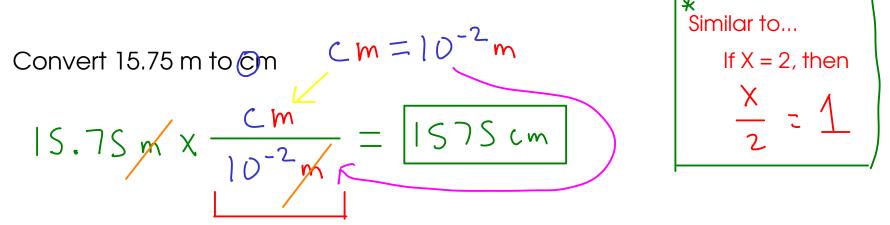
What's a conversion factor? A simple equality.

Conversion factors in metric

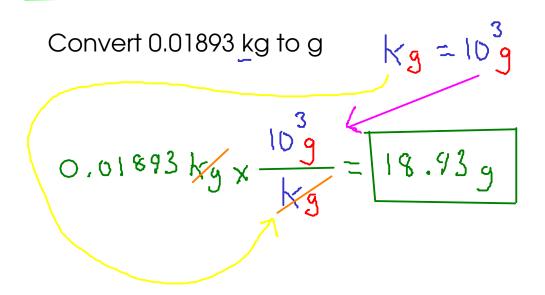
In the metric system, conversion factors between units may always be made from the metric prefixes!

For example, "
$$K_{10}$$
" means 10^{3}
 $K = 10^{3}$
 $K_{m} = 10^{3}$
 $K_{g} = 10^{3}$

How do we actually USE a conversion factor?



* This fraction equals one, so multiplying by it does not change the VALUE of the number, only its UNITS!



DRAG AND DROP

- Drag the part of the factor that you want to cancel out to the BOTTOM
- Then, drag the other half of the factor to the TOP

convert 14500 mg to kg
$$\frac{mg}{10^3} = \frac{10^3}{9}$$
 $\frac{Kg}{10^3} = \frac{10^3}{9}$ $\frac{10^3}{9} \times \frac{10^3}{10^3} = \frac{0.0145 \, \text{Kg}}{10^3}$

Convert 0.147 cm² to m²
$$(m = 10^{-2} \text{m})$$

 $0.147 \text{ cm}^2 \times \frac{10^{-2} \text{m}}{\text{cm}} \times \frac{10^{-2} \text{m}}{\text{cm}} = 1.47 \times 10^{-5} \text{m}^2$

$$(0.3000147 \text{ m}^2)$$

We have to convert BOTH PARTS of the squared unit, so we use the factor TWICE.

For CUBED units, apply the factors THREE times.

8.45 kg to mg
$$Kg = 10\frac{3}{9}$$
 $Mg = 10\frac{-6}{9}$

88100 KHz to MHz KHz=103Hz MHz=106Hz

Convert 38.47 in to m, assuming 2.54 cm = 1 in

$$38.47 \text{ in } \times \frac{2.54 \text{ cm}}{\text{in}} \times \frac{10^{-2} \text{m}}{\text{cm}} = 0.9771 \text{ m}$$

Convert 12.48 km to in
$$2.54 \text{ cm} = 10^{-2} \text{m}$$

$$\sqrt{m} = 10^{3} \text{m}$$

$$12.48 \, \text{km} \times \frac{10^3 \text{m}}{\text{Km}} \times \frac{\text{cm}}{10^{-2} \text{m}} \times \frac{\text{in}}{2.54 \, \text{cm}} = 491300 \, \text{in}$$

$$4,913 \times 10^5 \, \text{in}$$

Accuracy and Precision

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

Accuracy

- 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