Converting from one unit to another

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

Dimensional analysis uses <u>conversion factors</u> to change between one unit and another

What's a conversion factor? A simple equality.

Example

$$12 \text{ in} = 1 \text{ ft}$$

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

$$Km = 10^3 m$$

$$K_g = 10^3 g$$

$$K_s = 10^3 s$$

$$K.L = 10^3 L$$

Just apply the prefix to the base unit!

How do we actually USE a conversion factor?

$$cm = 10^{-2} m$$

Convert 15.75 m to cm

$$15.75 \, m \times \frac{cm}{10^{-2} \, m} = \boxed{1575 \, cm}$$

Put what you want to cancel on the bottom, then ...

... put what it equals on the top!

Convert 0.01893 kg to g

$$Kg = 10^{3} g$$

$$0.01893 \, kg \times \frac{10^{3} \, g}{Kg} = \boxed{18.93 \, g}$$

Convert 14500 mg to kg

$$mg = 10^{-3} g \qquad kg = 10^{3} g$$

$$14500 \, mg \times \frac{10^{-3} g}{mg} \times \frac{kg}{10^{3} g} = \boxed{0.0145 \, kg}$$

Convert 0.147 mm to μm

↑—micro-

$$mm = 10^{-3} m \qquad \mu m = 10^{-6} m$$

$$0.147 \, mm \times \frac{10^{-3} m}{mm} \times \frac{\mu m}{10^{-6} m} = \boxed{147 \, \mu m}$$

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

$$2.54 \text{ cm} = 1 \text{ in} \qquad \text{cm} = 10^{-2} \text{ m}$$

$$38.47 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{10^{-2} \text{ m}}{\text{cm}} = \boxed{0.9771 \text{ m}}$$

Even though English units are involved, we can solve this problem the same way we solved the previous problem where only metric units were used!

For nurses, one use of this method is for drug calculations.

Example: A patient is ordered 40 mg of codeine phosphate by subcutaneous injection. 50 mg in 1 mL liquid is available. How much of this liquid should be adminstered?

$$50 \text{ mg drug} = 1 \text{ mL}$$

This is a conversion factor. Use it like you would use any other conversion factor.

$$40 \text{ mg drug} \times \frac{1 \text{ mL}}{50 \text{ mg drug}} = \boxed{0.8 \text{ mL}}$$