Basic Math - Scientific Notation

- Scientific Notation is a convenient method for expressing very large or very small numbers
- It expresses a number in the form: $N \times 10^n$ where N is between 1 and 10 & n is a positive or negative integer
- To find *n*, count the number of places the decimal point must be moved to give the coefficient *N*. If the decimal point must be moved to the *left*, n is *positive*, if to the *right*, n is *negative*.

Basic Math - Scientific Notation

- Let's do some examples to illustrate. Express the following numbers in scientific notation

$$25.43 = 2.543 \times 10^1$$

$$5719 = 5.719 \times 10^3$$

$$0.0819 = 08.19 \times 10^{-2}$$

Basic Math - Scientific Notation

- We might also see numbers that look like the following examples

$$12.3 \times 10^3 = (1.23 \times 10^1) \times 10^3$$
$$= 1.23 \times 10^{(1+3)}$$
$$= 1.23 \times 10^4$$

$$0.037 \times 10^{-4} = (3.7 \times 10^{-2}) \times 10^{-4}$$
$$= 3.7 \times 10^{[-2+(-4)]}$$
$$= 3.7 \times 10^{-6}$$

Basic Math - Prefixes

» A prefix on a unit tells us something about how big a number is. Some common prefixes are shown below.

tera = 10^{12}	giga = 10^{9}	mega = 10^{6}
kilo = 10^{3}	milli = 10^{-3}	micro = 10^{-6}
nano = 10^{-9}	pico = 10^{-12}	

Basic Math - Units

» A number without units is pretty useless. Some common units are shown below .

meter	liter	gram
joule	calorie	hectare
ton	tonne	watt

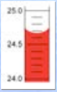
Basic Math - Precision & Accuracy

» Precision and accuracy are NOT the same thing, though many people use them interchangeably

Example

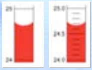
We measure the temperature of a bucket of water using two different thermometers. One thermometer has a mark every degree; the other thermometer has markings every tenth of a degree.

We would predict the temperature to be?



We would predict the temperature to be?

Basic Math - Precision & Accuracy



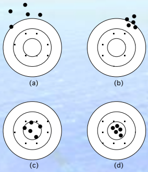
» Which thermometer is more precise?

the one on the right is more precise

Which thermometer is more accurate?

both are equally accurate

Basic Math - Precision & Accuracy



Basic Math - Unit Conversion

» Uses the units associated with numbers as a guide in working out the arithmetic. Units associated with numbers undergo the same kinds of mathematical operations as the numbers themselves.

Example

How many *kg* are there in 175 *lb*?

You can always start by looking at the units involved; in this case we have lbs and want kg

$$lbs \times \left(\frac{conversion}{factor}\right) = kg$$

$$\frac{\text{unit you want on top of factor}}{\text{unit you want to get rid of on bottom}}$$

Basic Math - Unit Conversion

Example How many *kg* are there in 175 *lb*?

You can always start by looking at the units involved; in this case we have *lbs* and want *kg*

$$lbs \times \left(\frac{conversion}{factor}\right) = kg$$

$$lbs \times \left(\frac{kg}{lbs}\right) = kg$$

$$lbs \times \left(\frac{1\ kg}{2.205\ lbs}\right) = kg$$

$$175\ lbs \times \left(\frac{1\ kg}{2.205\ lbs}\right) = 79.4\ kg$$

Basic Math - Unit Conversion

Example How many yd^2 are there in 27 ft^2?

You can always start by looking at the units involved; in this case we have ft^2 and want yd^2

$$ft \times \left(\frac{conversion}{factor}\right) = yd$$

$$ft \times \left(\frac{yd}{ft}\right) = yd$$

$$ft^2 \times \left(\frac{yd}{ft}\right)^2 = yd^2$$

$$ft^2 \times \left(\frac{1\ yd}{3\ ft}\right)^2 = yd^2$$

$$27\ ft^2 \times \frac{1\ yd^2}{9\ ft^2} = 3\ yd^2$$