Activity 1: Scientific Notation and the Metric System

Why?

- In science we often deal with numbers that are sometimes very large (ex. the distance to the sun from the earth is 93,000,000 miles) or very small (ex. the size of a bacterial cell is .000001 meters). Working with such numbers can be cumbersome, so a method of uniform representation is helpful.
- A system of units is important to help represent various sizes and physical descriptions of matter. The standard system of units for science is the Metric System as it is very uniform and based on a decimal system (ie. units of ten for all measurements).

Learning Objectives

- Be able to convert numbers into scientific notation and work with these numbers in that format.
- Understand the basic measurement of length, mass and volume in the Metric System.
- Convert units between English and Metric standards.
- Express one Metric measurement in terms of another (ex. How many cm's are in 1 m?)

Success criteria

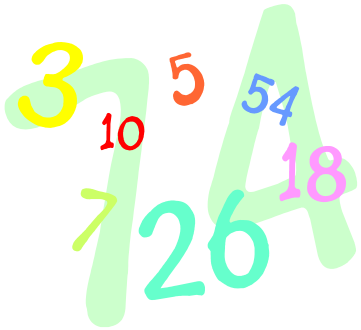
- Quickly place numbers into scientific notation.
- Transfer English measurements into metric.
- Easily transform one metric measurement into another unit scale.

New Concepts

- Exponential notation format, metric designations

Vocabulary

- meter (m), gram (g), liter (L)
- kilo, deca, deci, centi, milli, micro, nano



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Scientific Notation

The following basic rules are to be followed when applying scientific notation to a number **larger** than one:

1. Any non-zero numbers (as well as zeros between non-zero numbers) will make up the **coefficient**.
   ex. 340500. = **3.405** x 10^5
2. The second portion of the notation is the "10" with an exponent and is called the **base**.
   ex. 340500. = 3.045 x **10^5**
3. Count the spaces from the existing decimal point to a place one numeral to the left of the last non-zero number. This number of spaces will be your exponent.

Try placing the following numbers into Scientific Notation:

8730 _____

619035 _____

4538901 _____

235 _____

1743975432 _____

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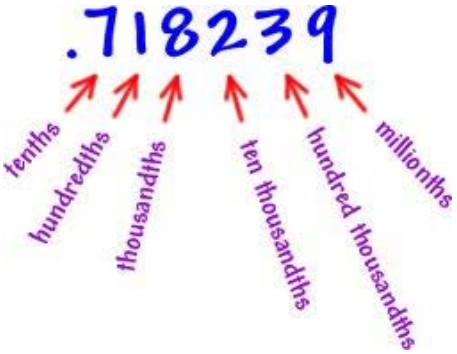

http://thesprinklesfiles.pbworks.com/w/page/20454106/What-The-Scots-Have-Done-For-Us

The following basic rules are to be followed when applying scientific notation to a number **smaller** than one:

1. Any non-zero numbers (as well as zeros between non-zero numbers) to the **RIGHT** of the decimal point will make up the **coefficient**.

   ex. 0.00000187 = **1.87** x 10^{-6}

2. The second portion of the notation is the "10" with an exponent and is called the **base**.

   ex. 0.00000187 = 1.87 x **10^{-6}**

3. Count the spaces from the existing decimal point to a place one numeral to the right of the first non-zero number. This number of spaces will be your exponent and is designated with a negative sign to denote a place marker to the right.

Try placing the following numbers into Scientific Notation:

0.895 _____

0.0345 _____

0.23005 _____

0.0000010 _____

0.000589 _____

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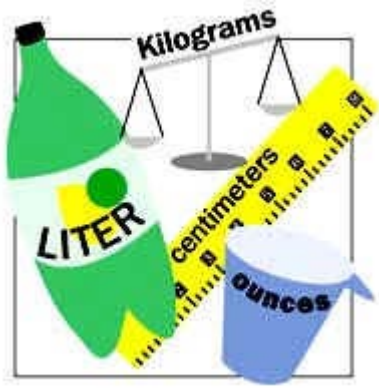
Metric System

The metric system is currently the unit system of choice in all major countries except the United States. For scientific purposes it is always used. First developed in the 1790's by the French Academy of Science, the metric system is actually called "SI" now for "Systeme International d'Unites". The system is based on units of ten and makes for a very uniform and easy to remember naming regimen for measurement parameters such as length, mass and volume.

<u>The basic units are as follows</u>:	<u>English equivalents</u>:
Length – meter (m)	1m = 3.3 ft or 1.1 yds
Mass – gram (g)	1000g = 2.2 lbs
Volume – liter (L)	1L = 1.1 qt or 0.26 gallons



Convert the following English measurements into the requested Metric units:

Ex. How many grams are in 4 lbs? (use conversion factor 1000g/2.2 lbs)

4 lbs x $\frac{1000g}{2.2\ lbs}$ = $\frac{4000}{2.2}$ = 1818.2g (note **lbs** units cancel leaving only **g**)

http://www.beverlyschools.org/memorial/di/math.htm

6 lbs = _____ g

3 gallons = _____ L

12 ft. = _____ m

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The following prefixes are used to indicate when the base unit is multiplied or divided by units of tens:

Name	Unit	Example
kilo (k)	x1,000	1 kg = 1000g
deca (da)	x10	1 dag = 10g
deci (d)	÷10	1 dg = 0.1g
centi (c)	÷100	1 cm = 0.01m or 100cm = 1m
milli (m)	÷1,000	1 mm = 0.001m or 1000mm = 1m
micro (μ)	÷1,000,000	1 μm = 0.000001m or 1000μm = 1mm
nano (n)	÷1,000,000,000	1nm = 0.000000001m or 1000nm = 1μm

Convert the following metric measurements into the requested units:

1 m = _____ mm

1mm = _____ cm

0.5L = _____ mL

1g = _____ μg

1ng = _____mg

DONE!

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