Scientific Notation

- Scientific notation is expressed as a number between 1 and 9, raised to a power of 10.
- numbers GREATER than 1 have a positive exponent
  - > example: 16,200,000
  - > scientific notation: 1.62×10^{7} 1.62E7
- numbers SMALLER than 1 have a negative exponent
  - > example: 0.000000568
  - > scientific notation: 5.68×10^{-7}

Nov 22-9:29 AM

Practice

Put the following numbers into scientific notation

1. 1,257 1.257×10^{3}
2. 56,000 5.6×10^{4}
3. 0.000253 2.53×10^{-4}
4. 0.00000000000458 4.58×10^{-12}

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Practice

1. Select the largest of the following numbers.
   a. 3.21×10^{-4}
   b. 5.76×10^{4}
   c. 9.10×10^{-8}
   d. 7.24×10^{3}
2. Write the following number in proper scientific notation: 0.0000378

3.78×10^{-5}

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Dimensional Anaylsis

-- using conversion factors to go from one unit to another

-- **CONVERSION FACTOR**: a fraction that is equal to 1

ex: $\frac{12 \text{ inches}}{1 \text{ foot}} = 1 = \frac{1 \text{ foot}}{12 \text{ inches}}$

$\frac{1000 \text{mL}}{1 \text{L}}$

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Dimensional Anaylsis

1. Start with your known value and unit.
2. Determine the desired unit to convert to.
3. To cancel units, you must put them on the opposite side of the fraction.
4. Continue to cancel units until you have reached the desired unit.

$$\frac{5x}{7} \times \frac{2}{5x}$$

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Practice

Convert 3 days to seconds

$$3\,\text{days} \times \frac{24\,\text{hrs}}{1\,\text{days}} \times \frac{60\,\text{min}}{1\,\text{hrs}} \times \frac{60\,\text{secs}}{1\,\text{min}} = 259{,}200\,\text{sec}$$

2.592×10^5 sec

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Practice

22.4 kg/L to kg/mL

$$\frac{22.4\,\text{kg}}{1\,\text{L}} \times \frac{1\,\text{L}}{1000\,\text{mL}} = .0224\ \text{kg/mL}$$

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Practice

Traveling at 65 miles/hour, how many minutes will it take to drive 350 miles to Rapid City?

$\frac{65\,\text{mile}}{1\,\text{hr}}$

$$350\,\text{miles} \times \frac{1\,\text{hr}}{65\,\text{miles}} \times \frac{60\,\text{min}}{1\,\text{hr}} = 323.08\,\text{min}.$$

$= 320$ min.

Nov 22-9:42 AM

CHECK FOR UNDERSTANDING

1. Which is larger, kilograms or grams?
2. Which SI unit would you use to measure the volume of a cup of coffee?
3. Calculate the following. Round the answer to the correct number of sig figs.
   a. 123.8 + 35.6 – 18.26 =_____
   b. 93.2 x 86.013 x 0.056 =_____
4. Round the following numbers to the number of sig figs given in parentheses:
   a. 706.5 (1) _____
   b. 429.6 (3) _____
5. Solve the following problems using dimensional analysis. Make sure the answer has the proper number of sig figs.:
   a. 15 mg to g
   b. 18.9 L to mL
6. If a group of students gets lab results of 25.6 g, 25.8 g and 25.3 g for three trials and the accepted value is 26.0 g, are their results accurate, precise or both? Why?

Nov 21-8:27 AM

Accurate- how close a value is to the accepted value

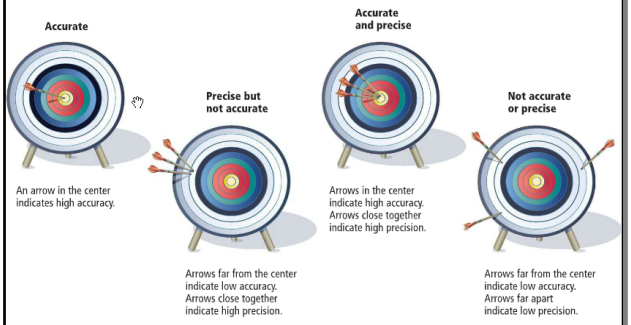
Precise- how close a series of values are to one another

Figure 10 An archery target illustrates the difference between accuracy and precision. An accurate shot is located near the bull's-eye; precise shots are grouped closely together.

View an **animation about precision and accuracy.**

Concepts In Motion

Apply *Why is it important to measure the same data more than once?*



Nov 29-6:54 AM

Density = mass/volume

$1mL = 1cm^3$

D = m/v

$\frac{g}{mL} = \frac{g}{cm^3}$

– what it should be – what you got in lab

$$\text{Percent Error} = \frac{|\text{accepted} - \text{observed}|}{\text{accepted}} \times 100$$

Nov 29-6:56 AM