Significant Figures

1. Why are significant figures important?

   Significant figures indicate the degree of certainty that a value has. Your measurements and calculations can only be as precise as the least precise instrument. More digits carried does not mean a more correct answer, if you are using more digits than the instrument used accounts for.

2. How many significant figures are in the following numbers

   a. 30,100 - Three
      Only the 301 - the zeroes following the 1 are place holders

   b. 30,000. – Five
      All of the digits are significant as indicated by the decimal following the final zero.

   c. 50,000 – One
      Only the 5 is significant as there is no decimal. The rest of the zeroes are place holders.

   d. 0.00030 – Two
      Everything after the first non-zero integer in a decimal is significant.

   e. 2.54 exactly – Infinite
      There is no uncertainty in an exact number.

   f. 5.82×10^3 – Three
      In scientific notation, the number preceding the x 10 contains all the significant figures.

3. Rules for carrying over significant figures

a. Addition/Subtraction

Based on number that has fewest decimal places.

i. How many significant figures would the answer have for 5.42 +13.159 = 18.579

As 5.42 is only certain to the hundredths rather than thousandths the answer must be reported as

18.58

b. Multiplication/Division

Based on the value that has the smallest number of digits.

i. How many significant figures would the answer have for (53298) x (432) = 23024736

As 432 has only 3 sig figs the answer must be reported as:

2.30×10^7 or $230. \times 10^5$

4. What is dimensional analysis?

Conversion from one set of units to another.

5. Perform the following calculation

a. 32 cm^3 = ____ L

$$32\ cm^3 \frac{mL}{cm^3} \frac{L}{1000mL} = 0.032L$$

b. 100.0 yards = ____cm

$$100.0\ \text{yards} \times \frac{3\ \text{ft}}{1\ \text{yard}} \times \frac{12\ \text{inch}}{1\ \text{ft}} \times \frac{2.54\ \text{cm}}{1\ \text{inch}} = 9144\text{cm}$$

all conversions used were exact, so none of them limit the number of digits the answer must have.

c. 5 m^3 = _____ cm^3

$$5\ m^3 \times \frac{(100)^3\ cm^3}{1\ m^3} = 5{,}000{,}000\ cm^3$$

d. 455 seconds = ___ minutes

$$455\ \text{seconds} \times \frac{1\ \text{minute}}{60\ \text{seconds}} = 7.58\ \text{minutes}$$

e. 25.6°C = _____ K

25.6°C + 273.15 = 298.7 K