## Significant Digits

## Rules for Significant Digits:

1. Leading zeros are not significant. eg. 0.001 has only one sig dig
2. Trailing zeros are not significant. eg. 1000 has only one sig dig
3. Trailing zeros after a decimal are significant. eg. 0.0100 has 3 sig digs
4. Numbers obtained by counting are exact and have an infinite number of sig digs. eg. 5 apples
5. Numbers that are defined or used for conversions have an infinite number of sig digs. eg. 1 dozen is exactly $12, \quad 1 \mathrm{~m}=100 \mathrm{~cm}, \quad 1000 \mathrm{~mL}=1 \mathrm{~L}$
6. All other digits in a number, including zeros between other digits are significant. eg. 5036 has 4 sig digs, 10.490 has 5 sig digs

## Calculation Rules:

1. When adding or subtracting, the answer will have the same number of decimal places as the number with the least number of decimal places.
eg. $1.2 \mathrm{~cm}+4.25 \mathrm{~cm}=5.4 \mathrm{~cm}$ ( 1 decimal place)
2. When multiplying or dividing, the answer will have the same number of sig digs as the number with the least number of sig digs.
eg. density $=$ mass $\div$ volume
$=19.38 \mathrm{~g} \div 20 \mathrm{~mL}$
$=0.969 \mathrm{~g} / \mathrm{mL}$
$=1 \mathrm{~g} / \mathrm{mL}$ ( 1 sig dig because the value 20 mL has only 1 sig dig )
3. You can only round off a number once. eg. 1.448 rounded to 2 sig digs is 1.4
4. When performing calculations involving more than one step, carry one more sig dig than you will have in your final answer. Round off to the correct number of sig digs only in the final answer.

## Scientific (Exponential) Notation:

If a number can not be expressed in expanded form with the appropriate number of sig digs, then convert the number to scientific notation. All of the digits in scientific notation are significant.
eg. convert 630 miles to feet ( 1 mile $=5280 \mathrm{ft}$ )
630 miles has 2 sig digs, so our final answer can only have 2 sig digs

$$
\begin{aligned}
\therefore 630 \text { miles } \times 5280 \mathrm{ft} / \mathrm{mile} & =3326400 \mathrm{ft} \\
& =3.3 \times 10^{6} \mathrm{ft}(2 \text { sig digs })
\end{aligned}
$$

