

Basic Units & Derived Units

Base Unit - only one measurement needs to be taken

e.g. Length - meter

Mass - kg

Time - sec

Derived Units - are made from a combination of measurements

Volume - Space - 3 dimensions

Area - Surface - 2 dimensions

Metric Prefixes

1. 0.009 seconds is 9 thousandths of a second, and is simply written as 9ms or 9 milliseconds
2. **Conversion Factor** - a ratio used to convert a quantity of one measurement to another measurement (example: grams into pounds)
3. The conversion factor must equal one.

$$\frac{1000\text{m}}{1\text{km}}$$

$$\frac{1000\text{g}}{1\text{kg}}$$

$$\frac{1000\text{mm}}{1\text{m}}$$

4. A simple 4 step process to convert using conversion factors:
 1. Put the unit that is known over 1.
 2. Find the conversion factor that uses your known unit and the unknown unit.
 3. Put the unit you want to get rid of on the bottom of the new fraction.
 4. Cancel out the units and multiply.

Sometimes you have to use more than one conversion factor to get to the desired unit.

How many kilograms are in 65 oz?

$$\frac{65 \cancel{\text{oz}}}{1} \times \frac{28 \cancel{\text{g}}}{1 \cancel{\text{oz}}} \times \frac{1 \cancel{\text{lb}}}{454 \cancel{\text{g}}} \times \frac{1 \text{ kg}}{2.2 \cancel{\text{lb}}} = \frac{1820 \text{ kg}}{998.8} = 1.8 \text{ kg}$$

How many tablespoons (T) are in 3 liters?

$$\frac{3 \cancel{\text{L}}}{1} \times \frac{1000 \cancel{\text{ml}}}{1 \cancel{\text{L}}} \times \frac{1 \text{ T}}{15 \cancel{\text{ml}}} = \frac{3000 \text{ T}}{15} = 200 \text{ T}$$

Limits of Measurements

1. **Precision** – how exact a measurement is
2. **Significant Figures** – all of the digits that are known in a measurement, plus the last digit that is estimated
e.g. 3.555 meters → 4 significant figures
3.5 meters → has 2 significant figures
3. The fewer the significant figures, the less precise it is.
4. Precision is limited by the least precise measurement used in the calculation.

e.g. $2.922 \text{ m} \times 3.5 \text{ m} = 10.227 \text{ m}^2$

However, since 3.5 m has only 2 significant figures, you must round using 2 significant figures (the least amount of the measurements you multiplied). So the answer becomes 10 m^2 .

5. **Accuracy** – the closeness of a measurement to the actual value of what is being measured