N2 – Dimensional Analysis

Also known as "Unit Conversion"

Target: I can use dimensional analysis to convert not just the numbers in a measurement but also the units

Remember - Canceling Units

One on top cancels with one on the bottom

$$\frac{XY}{X} = Y$$
 $\frac{15 \text{ cm}^3}{5 \text{ cm}} = 3 \text{ cm}^2$

Conversion Factors

A relationship between how many of one thing equals how many of another thing

$$12in = 1ft$$

$$1000m = 1km$$

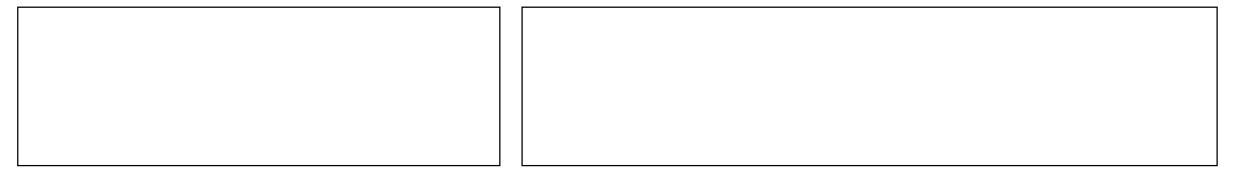
You can rewrite as fractions:

Conversion Factors

You can flip conversion factors too

12in = 1ft 24hrs = 1,440min

Just depends on what you are doing



Using Conversion Factors

If you multiply by a conversion factor, you are just multiplying by 1...your answer LOOKS DIFFERENT because of the unit but is the same SIZE MEASURMENT. (12in/1ft or 1ft/12in)

85 inches x

Using Conversion Factors

You can use multiple conversion factors — "a frog hopping across a pond on lily pads"

Convert 3.6mi into cm.

(1cm=0.3937in, 12in=1ft, 1mi=5,280ft)

You try one...

Convert 15 years into minutes

$$15yy's \, x \frac{365days}{1 \, yr} x \frac{24hrs}{1 \, ddy} \, x \frac{60min}{1hr} = 7.9x \cdot 10^6 min$$

Line Method

Keeps work neat, tidy, takes less space, easier to grade, a very typical way to show conversions in chemistry. I will always use the line method!

Convert 15 years into minutes

$$15yrs x \frac{365days}{1 yr} x \frac{24hrs}{1 day} x \frac{60min}{1hr} = 7.9x10^6 min$$

Dimensional Analysis with "Derived/Double Units"

Some units are combinations of two or more other units. Like miles per hour (mi/hr). Fix the top unit, then go back and fix the bottom unit Convert 20mi/hr into in/sec.

Dimensional Analysis - Squared, Cubed (etc) Units

If you have a unit that is raised to a power, then the conversion factors used will also need to be raised to that power. The number AND the unit.

1 in = 2.54cm but
$$1in^2 = (2.54cm)^2$$

1 ft = 12in but $1ft^3 = (12in)^3$

$$5in^2$$
 $(2.54cm)^2$ = 32.258 cm² $(1ih)^2$

You try one...

Convert 30km/day into ft/min (1m=39.37in)

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$$= 68.4 \frac{ft}{min}$$

YouTube Link to Presentation

https://youtu.be/fhj5d5zZa-4