

# 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

$$\frac{\cancel{x}y}{\cancel{x}} = y$$

$$\frac{15 \cancel{\text{cm}}^3}{5 \cancel{\text{cm}}} = 3 \text{ cm}^2$$

# Conversion Factors

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

$$12\text{in} = 1\text{ft}$$

$$24\text{hrs} = 1,440\text{min}$$

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

*You can rewrite as fractions:*

$$\frac{12\text{in}}{1\text{ft}} = 1$$

$$\frac{24\text{hr}}{1,440\text{min}} = 1$$

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

# Conversion Factors

*You can flip conversion factors too*

$$12\text{in} = 1\text{ft} \qquad 24\text{hrs} = 1,440\text{min}$$

*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 MEASUREMENT. (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

$$15 \cancel{\text{yrs}} \times \frac{365 \cancel{\text{days}}}{1 \cancel{\text{yr}}} \times \frac{24 \cancel{\text{hrs}}}{1 \cancel{\text{day}}} \times \frac{60 \text{min}}{1 \cancel{\text{hr}}} = 7.9 \times 10^6 \text{min}$$

## 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

$$15 \text{ yrs} \times \frac{365 \text{ days}}{1 \text{ yr}} \times \frac{24 \text{ hrs}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ hr}} = 7.9 \times 10^6 \text{ min}$$



# **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.*

$$1 \text{ in} = 2.54\text{cm} \quad \text{but} \quad 1\text{in}^2 = (2.54\text{cm})^2$$

$$1 \text{ ft} = 12\text{in} \quad \text{but} \quad 1\text{ft}^3 = (12\text{in})^3$$

$$\frac{5\cancel{\text{in}}^2}{(1\cancel{\text{in}})^2} \frac{(2.54\text{cm})^2}{1} = 32.258 \text{ cm}^2$$

**You try one...**

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

## You try one...

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

<del>30km</del>	<del>1000m</del>	<del>39.37in</del>	1foot	<del>1day</del>	<del>1hr</del>
<del>1day</del>	<del>1km</del>	<del>1m</del>	<del>12in</del>	<del>24hr</del>	60min

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

# YouTube Link to Presentation

- <https://youtu.be/fhj5d5zZa-4>