Dimensional Analysis

Dimensional Analysis

- DA is a method for converting units (unit conversions)
- Units are a critical part of describing every measurement.
- Before you can work with units mathematically, you frequently must convert from one unit to another.
- DA <u>does not</u> do your math for you, but it makes sure you get your multiplications and divisions straight.

What's the method?

- Write the term to be converted, (both number and unit) as a fraction
- Make a fraction of the conversion formula, such that
 - if the unit in step 1 is in the numerator, that same unit in step 2 must be in the denominator.
 - if the unit in step 1 is in the denominator, that same unit in step 2 must be in the numerator.
- Us as many conversion formulas as needed until you get the desired units.

What's the method?

- Cancel units (to make sure you end up with the desired units)
- · Multiply everything on top
- Multiply everything on bottom
- Divide the top by the bottom
- Round to the correct number of significant digits.

$$15 \text{ mi} = \frac{?}{\text{km}} \text{ km}$$

$$= \frac{15 \text{ mi}}{1} \frac{|5280 \text{ m}|}{|1 \text{ mi}|} \frac{|12 \text{ m}|}{|1 \text{ m}|} \frac{|2.54 \text{ m}|}{|1 \text{ m}|} \frac{|1 \text{ m}|}{|100 \text{ m}|} \frac{|1 \text{ km}|}{|1000 \text{ m}|}$$

$$= \frac{15*5280*12*2.54*1*1 \text{ km}}{1*1*1*1*100*1000}$$

$$= \frac{2,414,016 \text{ km}}{100,000}$$

$$= 24.1 \text{ km}$$

Or if you knew the conversion factor 1 mi = 1.6 km
$$15 \text{ mi} = \frac{2}{15 \text{ mi}} \text{ km}$$

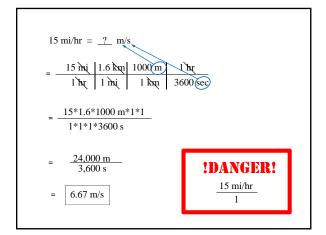
$$= \frac{15 \text{ mi}}{1 \text{ lini}} \frac{1.6 \text{ km}}{1 \text{ lini}}$$

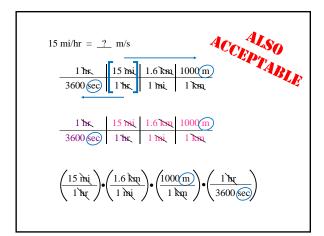
$$= \frac{15*1.6 \text{ km}}{1*1}$$

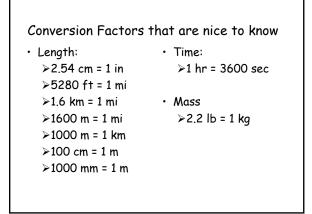
$$= 24 \text{ km}$$

Dimensional Analysis

- Two factor conversions
 - >15 mi/hr = <u>?</u> m/s
- Use the same method as one factor.







Go Forth and DA