**Introduction to Unit Analysis**

In unit analysis, this same concept is applied to units of measurement in order to perform conversions and other calculations using units of measurement.

Example: Set up a conversion from minutes to days.

|  |  |
| --- | --- |
|  | The goal is to start with the units of minutes and converting to days. |
|  | Decide what units are needed to cancel. Minutes are in the numerator. Therefore, multiply by a fraction that has minutes in the denominator |
|  | The goal is to get days in the numerator so multiply by another fraction that has days in the numerator. |
|  | Complete the two fractions by using known conversion factors – a ratio of equivalent measures. There is a known relationship between minutes and hours and hours and days so the blanks can be filled in with hours. Right now the focus is on units so numbers have not been used yet. |
|  | The common units of hours and minutes in the numerator and denominator “cancel”. This leaves days which shows that the conversion is set up correctly. |

**Practice with Units**

1. Arrange the following conversion factors into a unit analysis problem that will give a result of cups/gallon. Use only the units below (**NO NUMBERS**).

fluid ounces (fl. oz) per gallon fluid ounces per cup



1. Arrange the following conversion factors into a unit analysis problem that will give a result of $/miles.

miles/gallon $/gallon



Note about terminology: The word “per” means division. So “miles/gallon” literally means miles divided by gallons or miles per gallon. The mathematical word for this is “**ratio**” which means a comparison by division.

1. Arrange the following units and conversion factors in a unit analysis problem that will convert number of miles to inches.

|  |  |  |  |
| --- | --- | --- | --- |
| Miles | Feet/mile | Inches/feet | Inches |

 

Now we will use this concept to do an actual conversion. The units tell us how to set up a problem. Once we have the set-up, numbers can be inserted.

1. Using your set-up in #3, convert 4 miles to inches using the conversion factors given below.

12 inches = 1 foot

5280 feet = 1 mile

1. Using unit analysis, convert 20 kilometers per hour to meters per second.

1 kilometer = 1,000 meters

1 hour = 60 minutes

1. minute = 60 seconds
2. Using unit analysis and the conversion factors below, convert 80 miles per hour to kilometers per second.

1 kilometer = 0.621 miles

1 hour = 60 minutes

1 minute = 60 seconds