

**G302 In-Class Exercise**  
**Unit Algebra / Equation Problem Set**

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**Part 1 - Unit Conversion**

Here are some common conversion factors that you will need to solve the problems:

1 m = 100 cm      1 kg = 1000 g      1 m = 3.28 ft      1 yr = 365 day 1 min = 60 sec  
1 m = 1000 mm      1 km = 1000 m      1 km = 0.62 mi      1 day = 24 hr  
1 g = 1000 mg 1 in = 2.54 cm 1 mi = 5280 ft      1 hr = 60 min      speed of light =  $3 \times 10^8$  m/sec

Using the attached metric and English measurement unit conversion tables, complete the following conversions.

**SHOW ALL OF YOUR MATH WORK AND UNIT ALGEBRA IN THE SPACE PROVIDED.**

2.05 m = \_\_\_\_\_ cm

$2 \times 10^9$  ft = \_\_\_\_\_ mi

1.50 m = \_\_\_\_\_ mm

126,765,000 ft = \_\_\_\_\_ km

5.4 g = \_\_\_\_\_ mg

72° C = \_\_\_\_\_ ° F

$6.8 \times 10^{12}$  cm = \_\_\_\_\_ mi

8° F = \_\_\_\_\_ ° C

4214.6 cm = \_\_\_\_\_ m

0°C = \_\_\_\_\_ °F

321.5 g = \_\_\_\_\_ kg

212°F = \_\_\_\_\_ °C

5.3 in = \_\_\_\_\_ cm

$5.7 \times 10^{45}$  sec = \_\_\_\_\_ years

109.4 m = \_\_\_\_\_ ft

$9.8 \times 10^{20}$  days = \_\_\_\_\_ years

1 mi = \_\_\_\_\_ km

$2.0 \times 10^{31}$  in = \_\_\_\_\_ km

123.4 mi = \_\_\_\_\_ km

If 1 inch equals 2000 ft on a map; points A and B are 7.8 inches apart on the map. How far apart are points A and B on the ground in feet? Now how about in miles?

1234 km = \_\_\_\_\_ mi

1054 lb = \_\_\_\_\_ kg

If 1 light-year is the distance traveled in 1 earth year at the speed of light, how many kilometers would you travel at the speed of light in 3.2 years? How many miles?

$2 \times 10^5$  in = \_\_\_\_\_ mi

## Part 2. Solving Equations

A. The density of a substance is defined by its mass divided by its volume. The equation has the following form:

$$D = M / V$$

where D is density in gm/cm<sup>3</sup>, M = mass in grams, and V is volume in cm<sup>3</sup>

1. You measure the mass of a substance as 2356 gm. Its volume is 534 cm<sup>3</sup>, calculate its density in gm/cm<sup>3</sup>. **SHOW THE FORMULA AND ALL OF YOUR MATH WORK!**
2. The density of a substance is 9.8 gm/cm<sup>3</sup>. If you had a volume of 3.8 cm<sup>3</sup> of the substance, what would be the corresponding mass in grams? Hint: Rearrange the density equation to solve for mass. **SHOW THE FORMULA AND ALL OF YOUR MATH WORK!**
3. The density of a substance is 2.5 gm/cm<sup>3</sup> and you possess 15.3 grams of that material. What will be its corresponding volume in cm<sup>3</sup>. Hint: Rearrange the density equation to solve for mass. **SHOW THE FORMULA AND ALL OF YOUR MATH WORK!**

B. The velocity of moving objects (for example your car while driving) is measure as a rate of motion, according to the following equation:

$$V = d / t$$

where V is velocity (m/sec), d is distance (m), and t is time (sec).

4. You drive your car between two cities that are 123 miles apart. It takes you 4 hours to get there. Calculate your average velocity in mi/hr. **SHOW THE FORMULA AND ALL OF YOUR MATH WORK!**
5. Using the velocity you caculated in 4 above, what was your velocity in m/sec? Hint: you will have to use a distance and time conversion factor. **SHOW THE FORMULA AND ALL OF YOUR MATH WORK!**
6. You are driving a car at a velocity of 10 m/sec for a distance of 12 km. How long did it take you to get there? Answer in hours. **SHOW THE FORMULA AND ALL OF YOUR MATH WORK!**

A rock is rolling down the road, the following distance and time data was collected. Plot the data on the graph below, draw a best fit line, and determine the equation of the line.

Dist_m	Time_sec
0	0
10	1.2
20	2.4
30	3.6
40	4.8
50	6
60	7.2
70	8.4
80	9.6
90	10.8
100	12

