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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 = 3×10^8 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 = 205 cm $2.05\,m \times \frac{100\,cm}{1\,m}$

1.50 m = 1500 mm $1.50\,m \times \frac{1000\,mm}{1\,m}$

5.4 g = 5400 mg $5.4\,g \times \frac{1000\,mg}{1\,g}$ =

6.8×10^{12} cm = 1.1×10^9 mi $6.8\,cm \times \frac{1\,km}{1 \times 10^5\,cm} \times \frac{1\,mi}{0.62\,km}$

4214.6 cm = 42.146 m $4214.6\,cm \times \frac{1\,m}{100\,cm}$

321.5 g = 0.3215 kg $321.5\,g \times \frac{1\,kg}{1000\,g}$

5.3 in = 13.462 cm $5.3\,in \times \frac{2.54\,cm}{1\,in}$ =

109.4 m = 358.8 ft $109.4\,m \times \frac{3.28\,ft}{1\,m}$ =

1 mi = 1.61 km $1\,mi \times \frac{1.6\,km}{0.62\,mi}$

123.4 mi = 198 km $123.4\,mi \times \frac{1.6\,km}{0.62\,mi}$

1234 km = 765 mi $1234\,km \times \frac{0.62\,mi}{1\,km}$

1054 lb = 479.1 kg $1054\,lb \times \frac{1\,kg}{2.2\,lb}$

2×10^5 in = 3.16 mi $2 \times 10^5\,in \times \frac{1\,ft}{12\,in} \times \frac{1\,mi}{5280\,ft}$

2×10^9 ft = 378787 mi $2 \times 10^9\,ft \times \frac{1\,mi}{5280\,ft}$

126,765,000 ft = 38,723 km $126{,}765{,}000\,ft \times \frac{1\,mi}{5280\,ft} \times$

72° C = 161.6 °F $\frac{1.6\,km}{1\,mi}$ =

8° F = -27.5 °C

0°C = 212 °F

212°F = 100 °C

5.7×10^{45} sec = 1.81×10^{38} years $5.7 \times 10^{45}\,sec \times \frac{1\,min}{60\,sec} \times \frac{1\,hr}{60\,min} \times \frac{1\,day}{24\,hr} \times \frac{1\,yr}{365.25\,d}$

9.8×10^{20} days = 2.68×10^{18} years $9.8 \times 10^{20}\,days \times \frac{yr}{365.25\,d}$ =

2.0×10^{31} in = 5.07×10^{26} 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?

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?

Part 2. Solving Equations

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

$$D = M / V$$

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

1. You measure the mass of a substance as 2356 gm. It's volume is 534 cm^3, calculate it's density in gm/cm^3. SHOW THE FORMULA AND ALL OF YOUR MATH WORK!

$$\frac{2356\ g}{534\ cm^3} = 4.41\ g/cm^3$$

2. The density of a substance is 9.8 gm/cm^3. If you had a volume of 3.8 cm^3 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!

$D = \frac{M}{V}$ $D \cdot V = M$ $\quad M = 9.8\ g/cm^3 \times 3.8\ cm^3 = 37.24\ g$

3. The density of a substance is 2.5 gm/cm^3 and you possess 15.3 grams of that material. What will be it's corresponding volume in cm^3. Hint: Rearrange the density equation to solve for mass. SHOW THE FORMULA AND ALL OF YOUR MATH WORK!

$$V = \frac{M}{D} = \frac{15.3\ g}{2.5\ g/cm^3} = 6.12\ cm^3$$

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!

$$V = d/t = \frac{123\ mi}{4\ hr} = 30.75\ \frac{mi}{hr}$$

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!

$$30.75\ \frac{mi}{hr} \times \frac{5280\ ft}{mi} \times \frac{3.28\ m}{3.28\ ft} \times \frac{1\ hr}{60\ min} \times \frac{1\ min}{60\ sec} = 13.6\ m/s$$

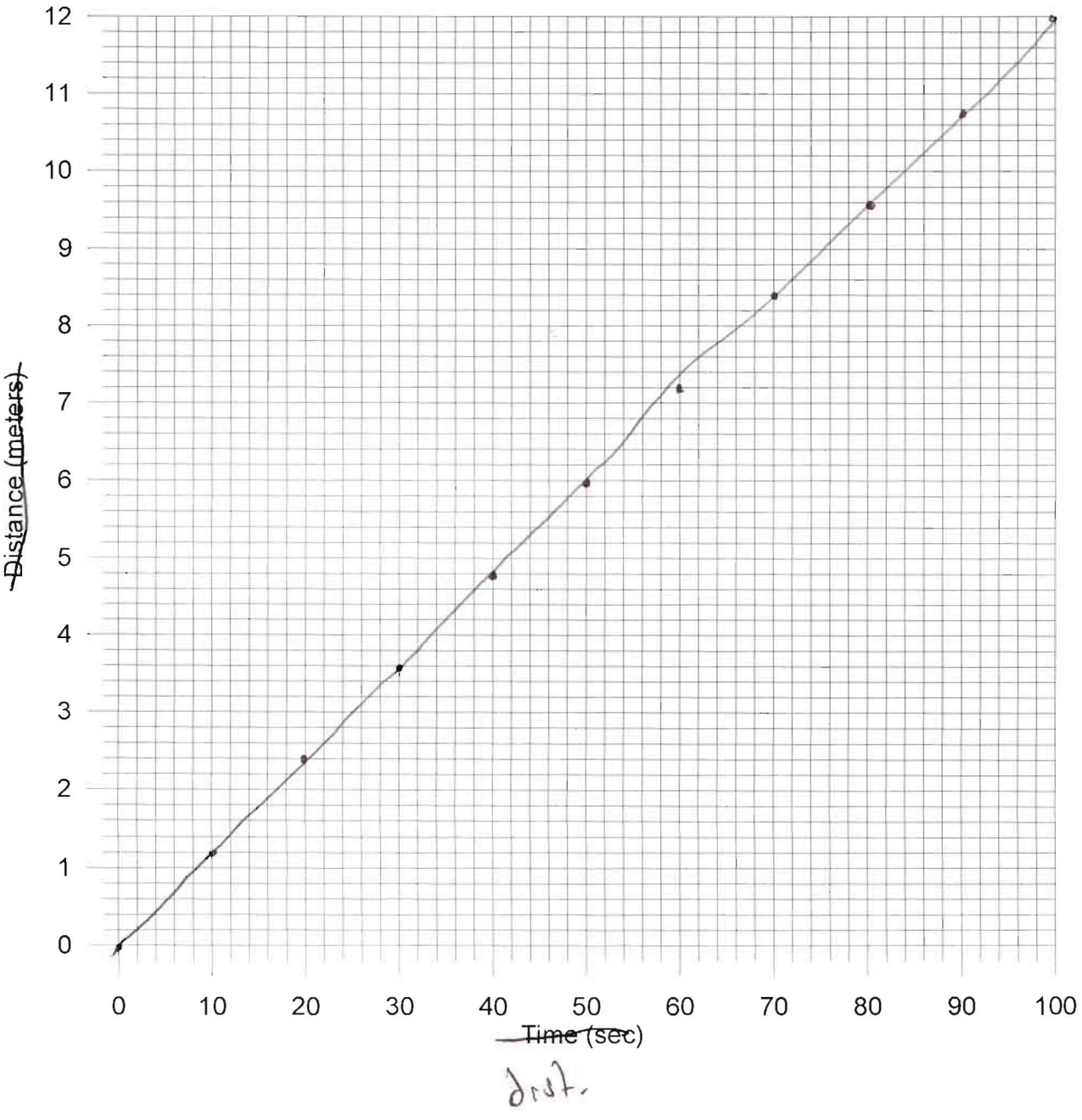
6. You are driving a car at a velocity of 10 m/sec for a distance of 12 km. How long did it take you to get there? Answer in hours. SHOW THE FORMULA AND ALL OF YOUR MATH WORK!

$V = \frac{d}{t}$ $\quad t = \frac{d}{V}$ $\quad t = \frac{12\ km}{(10\ m/sec \times \frac{1\ km}{1000\ m})} = 1200\ seconds \times \frac{1\ min}{60\ sec} \times \frac{1\ hr}{60\ min}$

$0.33\ hr.$

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



Time

dist.