

Dimensional Analysis (factor labeling) practice problems: Must show each step on the way to the answer. The purpose of these problems is to practice writing out the factor labeling setup. You will be responsible for knowing how to do these type of questions on a quiz.

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|------------------|------------------|---|---|
| 1 inch = 2.54 cm | 1 lb. = 454 g | 1 qt = 0.946 L | 1 cc = 1 cm ³ = 1 mL |
| 1 mi = 5280 ft | 1 lb = 16 ounces | 4 qt = 1 gal | 1 cubic inch = 16.39 cm ³ |
| 1 ft = 12 inches | 1 yd = 3 ft | 1 ft ³ = 0.0283 m ³ | 10,000 cm ² = 1 m ² |
| | | | 1 GRAM = 0.035 OZ |

For all problems, please show your factor labeling setup and give your answer to the correct sig. fig.

a. Convert 3598 grams into pounds

$$\frac{3598 \cancel{g}}{1} \times \frac{1 \cancel{LB}}{454 \cancel{g}} = \boxed{7.93 \text{ LBS}}$$

b. Convert 231 grams into ounces

$$\frac{231 \cancel{g}}{1} \times \frac{1 \cancel{LB}}{454 \cancel{g}} = \frac{1602}{1 \cancel{LB}} = \boxed{8.14 \text{ OZ.}}$$

c. A beaker contains 578 mL of water. What is the volume in quarts? (1 L = 1000 mL)

$$\frac{578 \cancel{mL}}{1} \times \frac{1 \cancel{L}}{1000 \cancel{mL}} = \frac{1 \cancel{QT}}{0.946 \cancel{L}} = \boxed{.61 \text{ QT}}$$

d. A box measures 3.12 ft in length, 0.0455 yd in width, and 7.87 inches in height. What is its volume in cm³?

$$(L) \frac{3.12 \cancel{FT}}{1} \times \frac{12 \cancel{IN}}{1 \cancel{FT}} \times \frac{2.54 \cancel{CM}}{1 \cancel{IN}} = 95.16 \text{ CM (L)} \times \frac{7.87 \cancel{IN}}{1 \cancel{IN}} \times \frac{2.54 \cancel{CM}}{1 \cancel{IN}} = 19.99 \text{ CM} \times 95.16 \text{ CM} = \boxed{7908 \text{ CM}^3}$$

e. NPP for a corn crop in Iowa was 0.0094 g/cm²/day. Convert this to kg/m²/year.

$$\frac{0.0094 \cancel{g}}{1 \cancel{CM}^2 / \cancel{DAY}} \times \frac{1 \cancel{KG}}{1000 \cancel{g}} \times \frac{100 \cancel{CM}^2}{1 \cancel{M}^2} \times \frac{1 \cancel{YR}}{365 \cancel{DAYS}} = \boxed{2.5 \times 10^{-6} \text{ KG/M}^2 / \text{YEAR}}$$

1. According to the Guinness Book of Records the heaviest baby ever born weighed 29 lbs 4 oz. (29.25 lbs). What was the baby's mass in kg? (1 lb = 0.4536 kg)

$$\frac{29.25 \cancel{LBS}}{1} \times \frac{.4536 \cancel{KG}}{1 \cancel{LBS}} = \boxed{13.27 \text{ KG}}$$

2. Your cross country skis are 210 cm long. What is their length in inches? (1 inch = 2.54 cm)

$$\frac{210 \cancel{CM}}{1} \times \frac{1 \cancel{IN}}{2.54 \cancel{CM}} = \boxed{82.68 \text{ IN.}}$$

3. A condor has a wing span of 3.05 m. What is the wing span in feet? (1 ft = 0.3048 m)

$$\frac{3.05 \cancel{M}}{1} \times \frac{1 \cancel{FT}}{0.3048 \cancel{M}} = \boxed{10.00 \text{ FT}}$$

4. In Europe gasoline is sold by the liter. Assume that it takes 14 gallons of gasoline to fill the tank of a compact car. How many liters of gasoline will it take? (1 gal = 3.7854 L)

$$\frac{14 \cancel{GAL}}{1} \times \frac{3.7854 \cancel{L}}{1 \cancel{GAL}} = 52.99 \text{ OR } \boxed{53 \text{ LITERS}}$$

5. Some owls maintain territories of up to 3 acres. How many owls could live in a large wooded area of 20 hectares? (1 hectare = 1 sq. dekameter = 100 m² = 2.47 acres)

$$\frac{20 \cancel{HA}}{1} \times \frac{2.47 \cancel{A}}{1 \cancel{HA}} = 49.4 \text{ ACRES} \times \frac{1 \cancel{OWL}}{3 \cancel{ACRES}} = 16.46 = \boxed{17 \text{ OWLS}}$$

6. Ruth Palladium (RuPd) bought 10 acres of land and built a house on 2.0 acres. RuPd wanted to raise sheep on the remaining 8.0 acres. If it takes 1/8 (0.125) hectare to raise one sheep, how many sheep can be raised on the 8 acres.

$$\frac{1}{8} \text{ ACRE} = 1 \text{ SHEEP} = 8 \text{ SHEEP / ACRE} \times 8 \text{ ACRES} = \boxed{64 \text{ SHEEP}}$$

7. One 1.6 oz. of package of cinnamon and spice instant oatmeal contains 34 g of carbohydrates. If you had instant oatmeal 6.0 days a week, how many ounces of carbohydrate would you consume in a week? (16 oz = 1 lb = 454 G = 256 Drams = 7000 Grains)

$$\underline{34 \text{ g / PACKAGE}} \times 6 \text{ DAYS} = \underline{204 \text{ g CARBS}}$$

8. Many candy bars have 9 g of fat per bar. If during a "chocolate attack" you ate one pack of candy (0.6 dekabars), how many ounces of fat would you have eaten? There are approximately 9 Calories per gram of fat, how many Calories is this? (1 deka = 10¹)

- 6 DEKA BARS $\frac{10 \text{ BARS}}{1 \text{ DEKA BAR}} = 60 \text{ BARS}$ $60 \text{ BARS} \times 9 \text{ g FAT / BAR} = 540 \text{ g FAT}$ $540 \text{ g FAT} \times 9 \text{ CAL/g} = 4860 \text{ CAL}$

9. If the Recommended Daily Allowance (RDA) for vitamin C is 60 mg per day and there are 70 mg of vitamin C per 100 g of orange, how many 3.0 oz. oranges would you have to eat each week to meet this requirement?

$$3 \text{ oz} \times \frac{1 \text{ g}}{0.35 \text{ oz}} = 85.7 \text{ g / ORANGE} = \frac{70 \text{ mg}}{85.7 \text{ g}} \times \frac{1 \text{ DAY}}{1 \text{ ORANGE}} = \underline{6-7 \text{ ORANGES / WEEK}}$$

10. How many miles could you drive for \$7.90 if the gas mileage of your car is 14 km/liter of gas and the price is \$1.29/gal? (1.61 km/mile, 4 qt/gal, 1.1 qt/L)

$$\frac{14 \text{ km}}{1 \text{ L}} \times \frac{1 \text{ m}}{1.61} = 8.7 \text{ mi/L}$$

$$\frac{8.7 \text{ mi}}{1 \text{ L}} \times \frac{1 \text{ L}}{1.1 \text{ qt}} \times \frac{4 \text{ qt}}{1 \text{ GAL}} = 31.6 \text{ mi/GAL}$$

$$\frac{1.29 \text{ $}}{1 \text{ GAL}} \times 7.90 \text{ $} = 6.16 \text{ GAL}$$

$$6.16 \text{ GAL} \times 31.6 \text{ mi/GAL} = 193 \text{ mi}$$

After determining your ecological footprint, you discovered that your energy consumption is very high. Your family uses 6,896,551 Btu's (British Thermal Unit) of electrical power per month. and how much was your electric bill?

- 1 Btu = 0.00029 kWh
- 1 kW costs \$0.16

$$6,896,551 \text{ BTU} \times 0.00029 = 2000 \text{ kW}$$

302 = _____ GRAMS
1 GRAM = 0.035 OZ

2000 kW \times \$0.16 / kW = \$320.00