

Dimensional analysis problem solving rules:

- 1) Rewrite all **givens** of a problem including all unit(s) and description. If the given is stated as an equivalency, rewrite as a ratio. Abbreviate all units and description to make entries more compact.
- 2) Read the problem again and figure out the “find”. State the find as: “? Unit(s) + description”. The unit(s) may have to be shown as a ratio.
- 3) Know the quantities of measure for each unit. (mass, length, volume, time, temperature, count). We choose to place a “given” ratio according to the quantities of measure of the “find” units.
- 4) Start the dimensional analysis set up now.

$$? \text{ unit(s) desc.} = \frac{\quad}{\quad} \frac{\quad}{\quad} \frac{\quad}{\quad} \frac{\quad}{\quad}$$

The hardest thing about a dimensional analysis problem is to translate given quantities and show an organized set up.

### Problems

Note: Report final numerical answers with correct SF and unit:

Translate and rewrite these givens:

- a. 60. miles per hour
- b. 5 apples in each kilogram **or** 5 apples per kilogram
- c. 350 mg aspirin in each tablet **or** each tablet contains 350 mg aspirin
- d. one pound of bananas cost \$1.25 **or** costs \$1.25 per pound of bananas
- e. the daily requirement of potassium is 3500 mg **or** a person must consume 3500 mg of potassium per day.
- f. the density of gold is 19.3 g/mL **or** each mL of gold weighs 19.3 g
- g. 13% body fat by mass (% is defined as
- h. 6.0% sugar in candy (by mass) Note: “%” means per 100 (exact)
- i. 12% alcohol in gasoline (by volume)

- 1) A car travels a distance of 65 km in 2.3 hours. Calculate its speed in miles per hour.
- 2) Each pound of grapes cost \$3.50. How many pounds of grapes can you buy with \$65 ?
- 3) A patient must take 25 mg of a certain drug per kilogram of body mass. If each tablet contains 230 mg of the drug and the patient weighs 155 lb, calculate total number of tablets the patient must take.
- 4) Each person should take 55 mg of vitamin C per day. If one orange contains 24 mg of vitamin C, how many oranges should the person consume?
- 5) What volume (cm<sup>3</sup>) does 17.9 lb of gold occupy? Density of gold is 19.3 g/mL
- 6) A person is measured and contains 25% body fat by mass. If person’s total body mass is 165 lb,
  - a. Calculate total mass of fat (lb) in the body.
  - b. If running can help the person lose 725 Calories per hour, how long should the person run in order to lose 1.5 lb fat? There are 9 Calories in each gram of fat.
- 7) In Halloween 155 lb of candy was offered to kids. Calculate the total mass (lb) of sugar if candies contain 17.5% sugar.
- 8) A gasoline contains 12% alcohol by volume. Calculate total volume of gasoline (gal) which contains 1500 mL of alcohol.
- 9) A piece of wood occupies a volume of 120 cm<sup>3</sup>. Convert this volume to in<sup>3</sup>.

Answers:

- 1) 18 mi/hr
- 2) 19 lb
- 3) 7.6 tablets
- 4) 2.3 oranges
- 5) 421 cm<sup>3</sup>
- 6) 41 lb fat, 8 hr
- 7) 27.1 lb
- 8) 3.3 gal
- 9) 7.3 in<sup>3</sup>