

Dimensional Analysis Worksheet KEY

1. Use Dimensional Analysis to solve the following problems.

- a. How many seconds old are you? (Express with 2 sig figs in scientific notation.) [assume 22 yrs old]

$$\frac{22 \cancel{\text{yr}}}{1} \times \frac{365 \cancel{\text{d}}}{1 \cancel{\text{yr}}} \times \frac{24 \cancel{\text{h}}}{1 \cancel{\text{d}}} \times \frac{3600 \cancel{\text{s}}}{1 \cancel{\text{h}}} = 693,792,000 = 690,000,000 = 6.9 \times 10^8$$

- b. Convert the distance from school to home from miles to inches. (2 sig figs in sci. not..) [assume 5.2 mi.]

$$\frac{5.2 \cancel{\text{mi}}}{1} \times \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mi}}} \times \frac{12 \cancel{\text{in}}}{1 \cancel{\text{ft}}} = 329,472 = 330,000 = 3.3 \times 10^5 \text{ in}$$

- c. How many kilometers is it from school to home? (Express with 2 sig figs in scientific notation.)

$$\frac{5.2 \cancel{\text{mi}}}{1} \times \frac{1.609 \cancel{\text{km}}}{0.621 \cancel{\text{mi}}} = 8.32 = 8.3 \text{ km}$$

- d. A person's weight is 154 pounds. Convert this to kilograms. (1 lbs. = 454 grams)

$$\frac{154 \cancel{\text{lb}}}{1} \times \frac{454 \cancel{\text{g}}}{1 \cancel{\text{lb}}} \times \frac{1 \cancel{\text{kg}}}{1000 \cancel{\text{g}}} = 69.916 = 69.9 \text{ kg}$$

2. Solve using the conversion factors that are listed in the table below.

- a. Your cruise ship is leaving for a 610-league adventure. How many nautical miles is this?

$$\frac{610 \cancel{\text{leagues}}}{1} \times \frac{5280 \cancel{\text{yd}}}{1 \cancel{\text{league}}} \times \frac{3 \cancel{\text{ft}}}{1 \cancel{\text{yd}}} \times \frac{1 \text{ naut. mile}}{6076 \cancel{\text{ft}}} = 1590.256748 = 1600 \text{ naut. miles}$$

- b. Later the ship is discovered at 38 fathoms deep under water. Convert this to meters.

$$\frac{38 \cancel{\text{fathoms}}}{1} \times \frac{6 \cancel{\text{ft}}}{1 \cancel{\text{fathom}}} \times \frac{12 \cancel{\text{in}}}{1 \cancel{\text{ft}}} \times \frac{2.54 \cancel{\text{cm}}}{1 \cancel{\text{in}}} \times \frac{1 \text{ m}}{100 \cancel{\text{cm}}} = 69.4944 = 69 \text{ m}$$

- c. Fortunately you survived! You are stranded on a deserted island that is located 12.5 degrees north of the equator. How many kilometers is this?

$$\frac{12.5 \cancel{\text{degrees}}}{1} \times \frac{69,047 \cancel{\text{mi}}}{1 \cancel{\text{degree}}} \times \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mi}}} \times \frac{12 \cancel{\text{in}}}{1 \cancel{\text{ft}}} \times \frac{2.54 \cancel{\text{cm}}}{1 \cancel{\text{in}}} \times \frac{1 \text{ m}}{100 \cancel{\text{cm}}} \times \frac{1 \text{ km}}{1000 \cancel{\text{m}}} = \frac{138,900,469}{100,000} = 1390 \text{ km}$$

- d. If you are rationed to 32 gills of fresh water a day. How many liters is this?

$$\frac{32 \cancel{\text{gills}}}{1} \times \frac{1 \cancel{\text{pt}}}{4 \cancel{\text{gills}}} \times \frac{1 \cancel{\text{qt}}}{2 \cancel{\text{pt}}} \times \frac{1 \text{ L}}{1.06 \cancel{\text{qt}}} = 3.77358 \dots = 3.8 \text{ L}$$

- f To reach the top of a palm tree for a coconut you will have to climb 7.4 meters. How many hands is this?

$$\frac{7.4 \cancel{\text{m}}}{1} \times \frac{100 \cancel{\text{cm}}}{1 \cancel{\text{m}}} \times \frac{1 \cancel{\text{in}}}{2.54 \cancel{\text{cm}}} \times \frac{1 \text{ hand}}{4 \cancel{\text{in}}} = 72.83464 \dots = 73 \text{ hands}$$

- g The island is rich with hot chile peppers. You can collect 1.6 pecks a day. How many liters could you collect in 1 week?

$$\frac{1.6 \cancel{\text{pecks}}}{1} \times \frac{32 \cancel{\text{qt}}}{1 \cancel{\text{peck}}} \times \frac{1 \cancel{\text{L}}}{1.06 \cancel{\text{qt}}} \times \frac{7 \cancel{\text{d}}}{1 \cancel{\text{week}}} = 84.52830 \dots = 85 \text{ L/week}$$

e. $\frac{3.5 \text{ T.S.}}{1} \times \frac{36 \text{ mi}^2}{1 \text{ T.S.}} \times \frac{(5280)^2 \text{ ft}^2}{1 \text{ mi}^2} \times \frac{1 \text{ yd}^2}{9 \text{ ft}^2} = 3.9 \times 10^8 \text{ yd}^2$