Practice - Dimensional Analysis

Answer the following questions, referring to your "Conversion" notes.

Key on 2nd ABS

1. What is a conversion factor?

Ratio equal to 1 that relates two units.

2. Create a conversion factor that relates nickels and dollars.

20 nickels = $1.00, so $\frac{20 \text{ nickels}}{\$1.00}$ or $\frac{\$1.00}{20 \text{ nickels}}$

3. Why do we use dimensional analysis in science class?

Gives us organization & efficiency to complex problems.

Commonly Used Equivalences				
1 inch = 2.54 cm	1 mile = 5280 ft	1 day = 24 hrs	1 m = 100 cm	1 people = 2 hands
1 person = 2 eyes	1 min = 60 sec	1 yr = 365 days	1 atm = 760 mm Hg	1 hand = 5 fingers
1 mile = 1.61 km	1 hour = 60 min	1 km = 1000 m	1 m = 1000 mm	1 ft = 12 in
1 dozen = 12	2 quarters = 5 dimes	1 cm = 10 mm	760 mm Hg = 101.325 kPa	

*Use the above relationships to determine the needed conversion factors to solve the problems below (You **MUST** show proper set-ups, just like we did in your notes!!!!)*

1. 47.0 inches = ___?___ ft

$$47.0 \text{ in} \times \frac{1 \text{ ft}}{12 \text{ in}} = \boxed{3.9 \text{ ft}}$$

2. 2.30 miles = ___?___ km

$$2.30 \text{ mi} \times \frac{1.61 \text{ Km}}{1 \text{ mi}} = \boxed{3.70 \text{ Km}}$$

3. 4.75 hrs = ___?___ min

$$4.75 \text{ hrs} \times \frac{60 \text{ min}}{1 \text{ hr}} = \boxed{285 \text{ min}}$$

4. 87.0 min = ___?___ days

$$87.0 \text{ min} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ day}}{24 \text{ hrs}} = \boxed{0.0604 \text{ days}}$$

5. 7.32 atm = ___?___ kPa

$$7.32 \text{ atm} \times \frac{760 \text{ mmHg}}{1 \text{ atm}} \times \frac{101.325 \text{ kPa}}{760 \text{ mmHg}} = \boxed{741.70 \text{ kPa}}$$

6. 734 sec = ___?___ years

$$734 \text{ sec} \times \frac{1 \text{ min}}{60 \text{ sec}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ day}}{24 \text{ hr}} \times \frac{1 \text{ yr}}{365 \text{ days}} = \boxed{2.38 \times 10^{-5} \text{ yr}}$$

or .0000238 yrs

7. 95.0 mm = ___?___ yards

$$95.0\,mm \times \frac{1\,cm}{10\,mm} \times \frac{1\,in}{2.54\,cm} \times \frac{1\,ft}{12\,in} \times \frac{1\,yd}{3\,ft} = \boxed{0.104\ yards}$$

8. 47 miles/hour = ___?___ m/sec

$$\frac{47\,miles}{1\,hr} \times \frac{1.61\,Km}{1\,mile} \times \frac{1000\,m}{1\,Km} \times \frac{1\,hr}{60\,min} \times \frac{1\,min}{60\,sec} = \boxed{21\ m/s}$$

9. 70.0 mm/sec = ___?___ miles/yr

$$\frac{70.0\,mm}{1\,sec} \times \frac{1\,m}{1000\,mm} \times \frac{1\,Km}{1000\,m} \times \frac{1\,mile}{1.61\,Km} \times \frac{60\,sec}{1\,min} \times \frac{60\,min}{1\,hr} \times \frac{24\,hr}{1\,day} \times \frac{365\,days}{1\,yr} = \boxed{1.38 \times 10^{3}\ mi/yr}$$

10. 2.0 min/ft = ___?___ hrs/mile

$$\frac{2.0\,min}{1\,ft} \times \frac{1\,hr}{60\,min} \times \frac{5280\,ft}{1\,mile} = \boxed{176\ hrs/mile}$$

Imagine a day when the United States converts over to the SI system of measure. All the old measuring devices like rulers, cups/spoons, and scales are thrown out and replaced with meter sticks, graduated cylinders, and balances. You head to the kitchen and grab your favorite recipe (your mom's bland stew), but before you begin cooking, you have a little math to do…

Kitchen Equivalences			
1 quart = 4 cups	1 tablespoon =3 teaspoons	1 gallon = 128 fluid oz	1 pound = .45 kg
1 cup = 236.59 mL	1 teaspoon = 4.93 mL	1 fluid oz = 29.57 mL	

Convert the following. Show your work using dimensional analysis. Remember, graduated cylinder measure in mL and balances measure in g.

English Units	Show Work Using Dimensional Analysis	Metric Units (mL or g)
1/4 cup extra-virgin olive oil	$\frac{1\,cup}{4} \times \frac{236.59\,mL}{1\,cup} = 59.15$	59.15 mL
1 quart all-purpose flour	$1\,quart \times \frac{4\,cups}{1\,quart} \times \frac{236.59\,mL}{1\,cup} =$	946.36 mL
3 tablespoons butter	$3\,Tblspn \times \frac{3\,teaspoon}{1\,Tblspn} \times \frac{4.93\,mL}{1\,teaspoon} =$	44.37 mL
~~2 to~~ 3 pounds beef chuck	$3\,lbs \times \frac{.45\,kg}{1\,lb} \times \frac{1000\,g}{1\,kg} =$	1350 g
1/2 gallon chicken broth	$\frac{1\,gal}{2} \times \frac{128\,fl\,oz}{1\,ga} \times \frac{29.57\,mL}{1\,fl\,oz} =$	1892.48 mL
1/4 teaspoon ground cloves	$\frac{1\,teaspoon}{4} \times \frac{4.93\,mL}{1\,teaspoon} =$	1.23 mL