Purpose:

Apply the six steps of Dimensional Analysis

WARMUP :

Practice punching this into your calculator:

$$3.14 \text{ units } x \left(\frac{0.0380}{5}\right) x \left(\frac{8}{3}\right) = 0.0636$$

Tips for Dimensional Analysis

$$3.14 \text{ units } x \left(\frac{???}{???}\right) x \left(\frac{???}{???}\right) =$$

1. Write the number and unit that is 'given'. This is what you're starting with.
2. Write something sort of like the image above.
3. After the equals sign write just a word: the unit that is your goal for the conversion
4. Important: No numbers yet! Just write words on top and bottom of the parentheses. Choose words that will cancel so completely that just your goal unit remains.
5. Now, write digits in the tops and bottoms that will make each parentheses become "ONE"
6. To put it into your calculator punch top number ☐ top number ☐
   top number ☐ bottom number ☐ bottom number ☐

Goof-Proof Your Calculation:

✓ each set of parentheses contains ONE

✓ carefully cross off the top and bottom units to make sure everything cancels except the unit you are converting to

We will solve four examples with dimensional analysis today:

1) If aluminum is 2.70 g/mL, what is the volume of a 7.4 kg aluminum boat propeller?
2) If football spikes have 12 grommets per one shoe, how many grommets are there in the starting lineup of the Detroit Lions?
3) If you eat 3.5 marshmallows an hour for 80 minutes, how many marshmallows will you eat?
4) For a piece of aluminum that is 880 liters, find its mass in kilograms.

FIRST SET THE PROBLEMS UP . Write units *before* writing any numbers. If you choose your units correctly they will all cancel except the unit you want to keep.

$$7.4 \text{ kg} \times \left(\frac{g}{kg} \right) \times \left(\frac{mL}{g} \right) = \quad mL$$

$$11 \text{ players} \times \left(\frac{shoes}{player} \right) \times \left(\frac{grommets}{shoe} \right) = \quad grommets$$

$$80 \text{ minutes} \times \left(\frac{hours}{minutes} \right) \times \left(\frac{marsh mallows}{hours} \right) = \quad marsh mallows$$

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$$730 \text{ liters} \times \left(\frac{mL}{liters} \right) \times \left(\frac{grams}{mL} \right) =$$

Now write numbers that would make each thing in parentheses "ONE".

$$7.4 \text{ kg} \times \left(\frac{1000 \text{ g}}{1 \text{ kg}}\right) \times \left(\frac{1 \text{ mL}}{2.70 \text{ g}}\right) = 2741 \text{ mL}$$

$$11 \text{ players} \times \left(\frac{2 \text{ shoes}}{1 \text{ player}}\right) \times \left(\frac{12 \text{ grommets}}{1 \text{ shoe}}\right) = 264 \text{ grommets}$$

$$80 \text{ minutes} \times \left(\frac{1 \text{ hours}}{60 \text{ minutes}}\right) \times \left(\frac{3.5 \text{ marshmallows}}{1 \text{ hours}}\right) = 4.6 \text{ marshmallows}$$

$$880 \text{ liters} \times \left(\frac{1000 \text{ mL}}{1 \text{ liters}}\right) \times \left(\frac{2.70 \text{ g}}{1 \text{ mL}}\right) \left(\frac{1 \text{ kg}}{1000 \text{ g}}\right) = 2376 \text{ kg}$$

Dimensional Analysis Sr.

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visit http://genest.weebly.com

Name
Date
Come for assistance and cheerful encouragement after
school Tues, Thurs, every day at lunch

ANSWERS

Notice there is a helpful data table on the bottom of page 2 for problems marked with an asterisk*

1) $5.5 \times \left(\dfrac{8}{0.44}\right) = $ 100

2) $5.5 \times \left(\dfrac{1.06}{76}\right) x \left(\dfrac{49}{3}\right) = $ 1.25

3) ~~Sports team switcharound: use the data in the box below to create two conversion factors for each sport.~~

football/futbol teams start 11 players	golf teams have 4 players
softball teams start 9 players	curling teams have 3 players
basketball teams start 5 players	chess is competitively played as a team of 1 player

4) Fill in the blanks to make a true statement

    a. _11_ players = _1_ football teams

    b. _1_ golf teams = _4_ players

5) Which of these ratios are 'ONE'? In the box below each if the factor is true write True! if the factor is incorrect rewrite it so it isn't.

$\dfrac{1\ year}{365.25\ days}$	$\dfrac{1\ player}{4\ golf\ team}$	$\dfrac{6\ players}{2\ curling\ teams}$	$\dfrac{1\ inch}{12\ feet}$	$\dfrac{1\ gram\ copper*}{1\ mL\ copper}$
true!	$\dfrac{4\ playess}{1\ golf\ team}$	true!	$\dfrac{1\ foot}{12\ inches}$ oR $\dfrac{12\ inches}{1\ foot}$	use the chart on page two: $\dfrac{8.96\ grams\ Copper}{1\ mL\ Copper}$

6) Finish each **"For every..."** sentence based on what you know about sports teams

    a. For every one basketball team there would be ___5___ players

    b. For every one gram of iron there would be __~~7.87~~__ TYPO grams iron. *(see the back)

7) Problem: If 3 football teams at a small college needed to switch in the winter to make basketball teams, how many could they make?

3 football teams $\times \left(\dfrac{11 \text{ Players}}{1 \text{ football teams}}\right) \times \left(\dfrac{1 \text{ Basketball Teams}}{5 \text{ PLAYERS}}\right) = 6.6$ Basketball teams

8) Problem: If your gym class had 2.25 golf teams and it wanted to form curling teams for the next lesson, how many could they make?

2.25 ~~curling~~ GOLF teams $\times \left(\dfrac{4 \text{ PLAYERS}}{1 \text{ GOLF TEAM}}\right) \times \left(\dfrac{1 \text{ CURLING TEAM}}{3 \text{ PLAYERS}}\right) = 3$ curling teams

9) Which of these ratios are 'ONE'? In the box below each if the factor is one write One! if the factor is not one rewrite **the ratio in any way you wish** so that it becomes equal to one.

$\dfrac{2x^2}{2x}$	$\dfrac{x^2 - 6x + 9}{(x-3)(x-3)}$	$\dfrac{6 \text{ players}}{2 \text{ softball teams}}$	$\dfrac{10 \text{ grams}}{1 \text{ kilogram}}$	$\dfrac{4.54 \text{ mL Aluminum} *}{1 \text{ gram Aluminum}}$
$\dfrac{2x^2}{2x^2}$	One!	MANY POSSIBLE ANSWERS $\dfrac{3 \text{ players}}{1 \text{ softball team}}$	$\dfrac{1000 \text{ grams}}{1 \text{ kilogram}}$	$\dfrac{2.70 \text{ grams Al}}{1 \text{ mL Al}}$

$\left(\dfrac{4.54 \text{ mL}}{12.26 \text{ g}}\right)$

$\dfrac{4.54 \text{ g Titanium}}{1 \text{ mL Titanium}}$

10) Problem: If your best friend gave you 1.65 liters of Krazy Glue for your 16th birthday, how many milliliters did they give you? (remember that there are 1000 mL in a L)

1.65 liters $\times \left(\dfrac{1000 \text{ milliliters}}{1 \text{ liters}}\right) = 1650 \text{ mL}$

11) *Problem: Tomorrow you might eat lunch in the cafeteria and you might find a 452 gram aluminum object. Assuming it is pure aluminum with no hollow spaces, what is the volume in mL?

452 g Al $\times \left(\dfrac{1 \text{ mL Aluminum}}{2.70 \text{ g Al}}\right) = 167 \text{ mL}$

use these numbers for the homework problems earlier on this sheet

Element	density[g/mL]
Aluminum	2.70
Titanium	4.54
Zinc	7.13
Tin	7.31
Iron	7.87
Nickel	8.90
Copper	8.96

Wow, that was a strange and new worksheet. You should consider coming at lunch. Also consider coming after school on Tuesday or Thursday. Also, ask questions during homework check. Learning DOESN'T happen the day before a test, it happens when you figure out homework.