

Dimensional Analysis

Saturday, August 18, 2012
8:51 AM

Steps for problem solving:

1. Read the problem. Read the whole problem.
2. Estimate an answer.
3. Isolate the unknown with its units.
4. Write down all the information that is given in correct dimensional analysis format. The division line must be horizontal, not diagonal.
5. If additional conversion factors are needed, provide them or look them up.
6. Set up the problem in dimensional analysis format.
7. Use your calculator to do the arithmetic.
8. Check your answer for units, reasonableness, and significant digits.

SAMPLE PROBLEMS: Work as a group on scratch paper. When you have had your answers to the sample problems checked by the teacher, work the assignment problems.

1. The record long jump is 349.5 in. Convert this to meters. There are 2.54 cm in an inch.
2. A car is traveling 55.0 miles per hour. Convert this to meters per second. One mile is equal to 1.61 km.
3. How many mg are there in a 5.00 grain aspirin tablet? 1 grain = 0.00229 oz. There are 454 g/lb. There 16.0 oz/lb.
4. Mercury has a mass density of 13.54 g/mL. How many milliliters would 100. grams occupy?
5. In 1980, the US produced 18.4 billion (10^9) pounds of phosphoric acid to be used in the manufacture of fertilizer. The average cost of the acid is \$318/ton. (1 ton = 2000 lb) What was the total value of the phosphoric acid produced?

ASSIGNMENT: 5 pts each

Work the following in your class composition notebook.

Solve the following problems using dimensional analysis. Write the equalities used and all possible conversion factors. Show your work using dimensional analysis, write answers using the correct number of significant figures, and label all answers with the correct unit.

ENGLISH AND METRIC EQUIVALENTS

Length	Mass	Fluid Volume
1 in = 2.54 cm	1 lb = 454 g	1 L = 1.06 qt
1 ft = 12 inches	1 kg = 2.21 lb	4 qts = 1 gal

1 mile = 5280 feet	1 lb = 16 oz	1 qt = 2 pints
1 mile = 1.61 km		1 pint = 2 cups
1 m = 1.09 yd		1 tsp. = 5 mL

1. The month of September has 30 days. How many seconds are represented by this number?
2. A family of four would like to take a ski vacation this December but are worried about the expense of traveling due to the high cost of gasoline. A roundtrip flight is priced at \$492.00 per person. The expected cost of gasoline will average \$4.50 per gallon. The driving distance from their home to the ski resort is 1,118 miles. The family mini van averages 22 mpg. All family members are drivers so there will be no overnight hotel stays until they reach their destination. How much will it cost to travel by plane? By van? How much will be saved by choosing the less expensive mode of transportation?
3. On the planet Zizzag, city Astric is 35.0 digs from city Betrek. The latest in teenage transportation is a Zeka which can travel a maximum of 115 millidigs/zip. On Zizzag the planet turns once on its axis each dyne. Their time system divides each dyne into 25.0 Zips. How many dynes will it take Pezzi to get from Astric to Betrek to see his girlfriend? There is no telephone communication on Zizzag. Do you think this relationship will last?
4. While prospecting in the North Woods, Joe found a gold nuggett which had a mass density of 19.2 g/cm³. When dropped it into water in a graduated cylinder, the water level increased by 15.0 mL. How many grams of gold did Joe have? (Hint: 1 cm³ = 1 mL)
5. A cheetah has been clocked at 112 km/h over a 100 m distance. What is this speed in m/s?

BONUS - 10 pts

An electric current of 10.0 amperes is passed through a solution of gold(III) chloride for a period of 0.500 hours. After this period of time, how much gold has plated out on the cathode? There are 96,500 coulombs/mol of electrons. A mol of gold has a mass of 197 g/mol. An ampere is equal to 1 coulomb/second. It is necessary to transfer 3.00 mol electrons/mol gold.