

Sections 2A,2B: Homework Solutions

August 31, 2005

2A Homework Problems

7. Does the following make sense:

I drove really fast—my speed was 50 miles.

Solution:

This statement **does not make sense**. One can not travel at a speed of “50 miles.” The units for speed need to be in some distance per time (i.e. miles per hour).

□

13. Evaluate the following

$$\text{a. } \frac{4}{3} \times \frac{1}{2} = \frac{4}{6} = \frac{2}{3} \quad \text{b. } \frac{4}{3} + \frac{1}{2} = \frac{8}{6} + \frac{3}{6} = \frac{11}{6}$$

$$\text{c. } \frac{4}{3} \div \frac{1}{2} = \frac{4}{3} \cdot \frac{2}{1} = \frac{8}{3} \quad \text{d. } \frac{4}{3} - \frac{1}{2} = \frac{8}{6} - \frac{3}{6} = \frac{5}{6}$$

□

21. Identify the units in the following sentence and state then both in words and mathematically.

The installation cost of floor tile, found by dividing the total cost of the installation in dollars by the area of the room in square feet.

Solution:

The units for the installation cost of floor tile will be in dollars per square feet, or mathematically:

$$\frac{\$}{\text{ft}^2}$$

□

29. Convert 18 yards into feet.

Solution:

$$18 \text{ yards} = 18 \text{ yards} \cdot \frac{3 \text{ ft}}{1 \text{ yards}} = 54 \text{ ft}$$

□

30. Convert 18 yards into inches.

Solution:

$$18 \text{ yards} = 18 \text{ yards} \cdot \frac{3 \text{ ft}}{1 \text{ yards}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} = 648 \text{ in}$$

36. There are 8 ounces in a cup, 4 cups in a quart, and 4 quarts in a gallon. Using a chain with these conversions, convert 6 gallons into ounces.

Solution:

$$6 \text{ gal} = 6 \text{ gal} \cdot \frac{4 \text{ qt}}{1 \text{ gal}} \cdot \frac{4 \text{ cups}}{1 \text{ qt}} \cdot \frac{8 \text{ ounces}}{1 \text{ cup}} = 768 \text{ ounces}$$

□

48. A cargo container is 50 feet long, 10 feet wide, and 8 feet tall. Find its volume in cubic feet and in cubic yards.

Solution:

In cubic feet, we multiply the three lengths together to find a total volume of 4000 ft^3 .

We convert to cubic yards via the following calculation:

$$4000 \text{ ft}^3 = 4000 \text{ ft}^3 \cdot \left(\frac{1 \text{ yd}}{3 \text{ ft}}\right)^3 = 4000 \text{ ft}^3 \cdot \frac{1 \text{ yd}^3}{27 \text{ ft}^3} \approx 148.1 \text{ yd}^3$$

□

53. How many Japanese yen can be bought for \$100?

Solution:

Using the table on page 90, we find:

$$100\$ = 100\$ \cdot \frac{117.9 \text{ yen}}{1\$} = 11790 \text{ yen}$$

□

54. How many Canadian dollars can you buy for \$100?

$$100\$ = 100\$ \cdot \frac{1.336 \text{ can}}{1\$} = 133.6 \text{ can}$$

□

2B Homework Problems

Simplify the following:

19. $10^6 \times 10^5 = 10^{6+5} = 10^{11}$

20. $10^4 \times 10^{-3} = 10^{4-3} = 10^1 = 10$

21.

$$\frac{10^6}{10^5} = 10^{6-5} = 10^1 = 10$$

22.

$$\frac{10^4}{10^{-3}} = 10^{4-(-3)} = 10^7$$

33. $10^8 + 10^5 = 100100000$

38. A boat is moving at 30 knots (nautical miles per hour). What is its speed in miles per hour?

Solution:

$$30 \text{ knots} = 30 \frac{\text{naut miles}}{1 \text{ hour}} \cdot \frac{6076.1 \text{ feet}}{1 \text{ naut miles}} \cdot \frac{\text{miles}}{5280 \text{ feet}} \approx 34.52 \frac{\text{miles}}{\text{hour}}$$

□

52. Convert 150 pounds to kilograms.

Solution:

$$150 \text{ lbs} = 150 \text{ lbs} \cdot \frac{1 \text{ kg}}{2.205 \text{ lbs}} \approx 68.03 \text{ kg}$$

□

66. Your electric bill states that you used 970 kilowatt-hours of energy in September.

(a) Determine your total electrical energy use in joules.

$$970 \text{ kWh} = 970 \text{ kWh} \cdot \frac{3.6 \cdot 10^6 \text{ joules}}{1 \text{ kWh}} \approx 3.49 \cdot 10^9 \text{ joules}$$

□

77. Mauna Kea, the highest mountain on the island of Hawaii, rises 13,796 feet above sea level. It extends an additional 18,200 feet from sea level to its base on the ocean floor. How tall is Mauna Kea from its base to its peak in feet, miles, and kilometers. Compare its total extent to the height of Mt. Everest (29,023). Would it be fair to call Mauna Kea the highest mountain in the world?

Solution:

Adding, we determine the total height of Mauna Kea to be 31,996 ft. Applying standard conversion factors we find:

$$31996 \text{ ft} = 31996 \text{ lbs} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} \approx 6.06 \text{ miles}$$

$$6.06 \text{ miles} = 6.06 \text{ lbs} \cdot \frac{1.6093 \text{ km}}{1 \text{ mile}} \approx 9.75 \text{ km}$$

The total height of this mountain is indeed greater than Mt. Everest. Whether you consider it to be the highest mountain in the world or not is purely subjective.

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80. You purchase a 14-karat gold chain that weights 15 grams. How much gold have you purchased in grams?

Solution:

We first find what the total percentage of pure gold is in a 14-karat object by the formula given in the lecture notes.

Solution:

$$14 \text{ karat} = \left(\frac{14}{24} \cdot 100 \right) \% \text{ pure} \approx 58.3\% \text{ pure}$$

Then we multiply the total weight of the chain by this percentage to find we have purchased

$$15 \cdot .583 = 8.745$$

grams of gold.

□

84. You have an 1800-watt dryer, which you use for an average of 10 minutes per day. Your utility company charges 9 cents per kilowatt-hour of energy. How much does it cost to run the hair dryer each day? each year?

Solution:

Since one watt is one joule per second, we find in 10 minutes we use

$$\frac{1800 \text{ joule}}{1 \text{ s}} \cdot \frac{60 \text{ s}}{1 \text{ min}} \cdot 10 = 1080000 \text{ joules}$$

Converting to kilowatt-hours we obtain

$$1080000 \text{ joules} = 1080000 \text{ joules} \cdot \frac{1 \text{ kWh}}{3 \cdot 10^6 \text{ joules}} = .3 \text{ kWh}$$

We determine the total cost per day to be $9/.3 = 2.7$ cents and the cost per year to be $365 \cdot 2.7 = 985.5$ cents or \$9.86.

□