

Math Review and Conversion Practice

Name Key

Date _____ Period _____

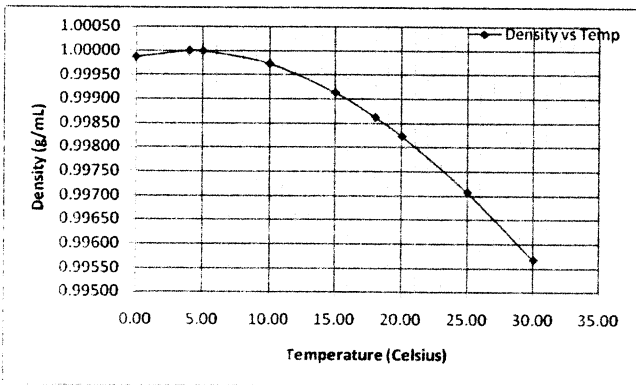
1. Change each decimal to a percent or percent to a decimal.

- a. .32 32% b. .006 $.6\%$ c. .0015 $.15\%$
 d. .4% $.004$ e. 19% $.19$ f. 23% $.0023$

2. Solve the following:

- a. 18 is what percent of 45? $18 = x(45)$
 $x = .4 = 40\%$
 b. What percent of 25 is 10?
 $10 = x(25)$ $x = .4 = 40\%$
 c. 15 is 20% of what number?
 $15 = .2(x)$ $x = 75$
 d. What is 250% of 12?
 $x = 2.50(12) = 30$
 e. 70% of what number is 35?
 $35 = .7(x)$ $x = 50$
 f. What is the percent decrease from 200 to 180?
 $(200 - 180) / 200 = x$ $x = .1 = 10\%$
 g. What is the percent increase in rainfall from Jan. (2.5") to Feb. (4.0")
 $(4.0 - 2.5) / 2.5 = x$ $x = .6 = 60\%$

3. Given the graph below of the density of water as a function of temperature:



a) At what temperature is the water the densest?

Approx 4°C (3.98°C)

b) At what temperature is the water density changing the slowest?

Same Approx 4°C Instantaneous Slope = 0

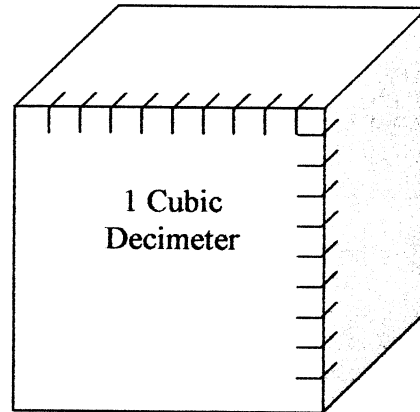
c) How many digits of precision for density and temperature can be reported from information on this graph? Temp. = tenths place

density = ten-thousandths place

d) What is the density of the water at 288.15K?

$288.15\text{K} - 273.15 = 15^\circ\text{C} \approx .9992\text{ g/cm}^3$

4. The figure below represents a cube with a volume of one cubic decimeter. Given that the mass density of water at exactly 3.98°C is exactly 1 kg/L, answer the following:



a. The length of one side of the cube is

.001 hm = 10 cm

b. The combined area of all the sides of this cube is

$(1\text{dm})(1\text{dm})(6) = 6\text{dm}^2$
6 $\text{dm}^2 =$.06 m^2 $6\text{dm}^2 \left(\frac{1\text{m}}{10\text{dm}}\right)^2$

c. The volume of the cube is

1 L = 1,000 cm^3

d. The mass of such a volume of water at 3.98°C is

1 kg = 1×10^6 mg
 $1\text{L} \left(\frac{1\text{kg}}{\text{L}}\right) = 1\text{kg}$

5. Solve the following:

a. Express the sum of 50.7mm, 47.5cm and 8.01m in meters.

$$\begin{array}{r} 8.01\text{ m} \\ .0507\text{ m} \\ .475\text{ m} \\ \hline 8.5357\text{ m} \end{array}$$

8.54 m

b. Express 1.549μm (micrometers) in km.

$$1.549 \times 10^{-9} \text{ km} \quad 1.549 \mu\text{m} \left(\frac{1 \text{ km}}{10^9 \mu\text{m}} \right)$$

c. Given PV = nRT, solve for n

$$n = \frac{PV}{RT}$$

d. Given Fd = mv²/2, solve for v

$$v = \pm \sqrt{\frac{2Fd}{m}}$$

e. Given L = L₀(1 - v²/c²), solve for L₀

$$L_0 = \frac{L}{\left(1 - \frac{v^2}{c^2}\right)}$$

f. Given xy/m = (R + t)/2, solve for m

$$m = \frac{2xy}{(R+t)}$$

g. Given F = Gm₁m₂/r², solve for m₁.

$$m_1 = \frac{Fr^2}{Gm_2}$$

h. What happens to F in the above equation if r is reduced to 1/2 its original value (assume all other values are constant).

F quadruples b/c r is squared

i. Compute and determine final units for
 $(1.2 \times 10^{-2} \text{ cm} + 2.1115 \text{ cm} - .1 \text{ cm})(6.997 \text{ g})$
 (.0300 cm³)

$$\frac{(2.0235 \text{ cm})(6.997 \text{ g})}{.0300 \text{ cm}^3} = 471.94765 = 4.7 \times 10^2 \text{ g/cm}^2$$

6. Suppose you obtain the following data for a measurement:

Trial	Mass
1	23.26g
2	23.18g
3	22.95g

If the accepted value for the mass is 23.20g find:

a. the relative error for Trial 3

$$\frac{|\text{accepted} - \text{measured}|}{\text{accepted}} = \frac{|23.20 \text{ g} - 22.95 \text{ g}|}{23.20 \text{ g}} = .0108 = 1.1\%$$

b. the absolute error for Trial 1

$$\frac{\text{measured}}{\text{accepted}} = \frac{23.26 \text{ g}}{23.20 \text{ g}} = 1.00258... = 100.3\%$$

c. the average mass of the three trials.

$$\frac{(23.26 \text{ g} + 23.18 \text{ g} + 22.95 \text{ g})}{3} = 23.13 \text{ g}$$

7. Perform the following conversions in the order given showing conversion ratios and dimensional analysis:

Example: Convert 5.3in/s to yds/hr via in/s → ft/s → yds/s → yds/min → yds/hr

Answer:

$$5.3 \text{ in/s} \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \left(\frac{1 \text{ yd}}{3 \text{ ft}} \right) \left(\frac{60 \text{ s}}{1 \text{ min}} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) = 5.3 \times 10^2 \text{ yds/hr}$$

a. Convert 50.23mi to cm via mi → ft → in → cm

$$50.23 \text{ mi} \left(\frac{5280 \text{ ft}}{1 \text{ mi}} \right) \left(\frac{12 \text{ in}}{1 \text{ ft}} \right) \left(\frac{2.54 \text{ cm}}{1 \text{ in}} \right) = 8.084 \times 10^6 \text{ cm}$$

b. Convert .298ft/s to m/hr via ft/s → in/s → cm/s → m/s → m/min → m/hr

$$.298 \frac{\text{ft}}{\text{s}} \left(\frac{12 \text{ in}}{1 \text{ ft}} \right) \left(\frac{2.54 \text{ cm}}{1 \text{ in}} \right) \left(\frac{1 \text{ m}}{100 \text{ cm}} \right) \left(\frac{60 \text{ s}}{1 \text{ min}} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) = 326.989 = 327 \text{ m/hr}$$

c. Convert 2.44x10⁻³ kg m/s² to g cm/s² via kg m/s² → g m/s² → g cm/s²

$$2.44 \times 10^{-3} \frac{\text{kg m}}{\text{s}^2} \left(\frac{1000 \text{ g}}{1 \text{ kg}} \right) \left(\frac{100 \text{ cm}}{1 \text{ m}} \right) = 244 \text{ g cm/s}^2$$

d. Convert 6.490x10³ L/min to ft³/hr via L/min → dm³/min → cm³/min → in³/min → ft³/min → ft³/hr

$$6.490 \times 10^3 \frac{\text{L}}{\text{min}} \left(\frac{1 \text{ dm}^3}{1 \text{ L}} \right) \left(\frac{1000 \text{ cm}^3}{1 \text{ dm}^3} \right) \left(\frac{1 \text{ in}}{2.54 \text{ cm}} \right)^3 \left(\frac{1 \text{ ft}}{12 \text{ in}} \right)^3 \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) = 13,751.53 \text{ ft}^3/\text{hr} = 1.375 \times 10^4 \text{ ft}^3/\text{hr}$$