

6) Bars of silver ($D = 10.49 \text{ g/cm}^3$), gold ($D = 19.32 \text{ g/cm}^3$), and platinum (21.45 g/cm^3) are all kept as long term investments. If the bars are manufactured to have the same mass, which bars would occupy the most space (volume)?

7) Equal volumes of honey ($D = 1.36 \text{ g/cm}^3$), vegetable oil ($D = 0.91 \text{ g/cm}^3$), and water (1.00 g/cm^3) are massed on a balance. Which one would you predict having the largest mass? Explain your answer.

8) Draw a picture showing what happens to the density of air particles in a piston when the top of the piston is compressed to a smaller volume.

9) The volume of a liquid that fills a flask is 750 cm^3 . The mass of the liquid is 525 g. What is the liquid's density? Is it most likely to be water ($D = 1.0 \text{ g/cm}^3$), gasoline ($D = 0.70 \text{ g/cm}^3$), or ethanol ($D = 0.79 \text{ g/cm}^3$)?

- 10)** Outer space is often described as a vacuum, but there is always some matter present. In the space 300 km above Earth's surface, there is as little as 1.58×10^{-12} g of matter in a 500.0 cm^3 volume of space. Based on this data, what is the density of the matter in space?
- 11)** The largest ruby in the world is 10.9 cm long, 9.10 cm wide, and 5.80 cm thick, giving it an overall volume of 575 cm^3 . If the density of ruby—a form of aluminum oxide—is 3.97 g/cm^3 , what is the mass of the largest ruby?
- 12)** Moon rocks are samples of the moon's crust that were collected and returned to Earth by crew members of the various Apollo missions. Many of the moon rocks are made of basalt, a light, volcanic rock with a density of about 2.7 g/cm^3 . If a moon rock has a mass of 432 g, what is its volume?
- 13)** Although both diamond and graphite consist of pure carbon, they have very different densities. This is because of differences in the way the carbon atoms in each substance are arranged. If you had a diamond with a mass of 1.5 g and a density of 3.51 g/cm^3 , what would its volume be?

- 14) Osmium, a hard, heavy metal used to make durable alloys, has a density of 22.5 g/cm^3 the greatest density of any element. If a sample of osmium has a volume of 43.2 cm^3 what is its mass?
- 15) Magnesium is a fairly light metal that is combined with other elements to form lightweight alloys for use in airplanes. The big advantage of magnesium is that it has a relatively low density of 1.74 g/cm^3 . If a sample of magnesium has a mass of 9.56 g , what is its volume?
- 16) The element iridium is more resistant to corrosion than any other metal. It also has a slightly smaller density than osmium: 22.42 g/cm^3 . Suppose you have a sample of iridium with a volume of 34.17 cm^3 . What is the mass of this sample?
- 17) A neutron star, which is the remnant of an exploded massive star, consists of neutrons packed together with a total density of $3.03 \times 10^{14} \text{ g/cm}^3$. If you had a 1.40 cm^3 sample of this matter (about the size of a sugar cube), what would its mass be?

18) Gasoline, which is a mixture of several hydrocarbon compounds, has one of the lowest densities of any liquid. Given that 0.70 g/cm^3 is the density of gasoline, determine the volume of 2770 g of gasoline.

19) How is temperature defined in chemistry? Why was the Celsius temperature scale developed?

20) Why do we use the Kelvin temperature scale in the SI system (and not the Celsius scale)?

21) What is the difference between a quantitative measurement and a qualitative measurement?

22) A student estimated a mass to be 250 g, but upon carefully measuring it, found the actual mass to be 240 g. What is the percent error?

23) A student measured the temperature of boiling water and got an experimental reading of 97.5 °C. What is the percent error? (Hint: What is the actual boiling point of water?)

24) An experimental measurement was taken of 10.4 mL and the actual measurement was 9.7 mL. What is the percent error?

25) The experimental calculation of the specific heat of aluminum was found to be 0.155 cal/(g °C), but the actual value was given as 0.185 cal/(g °C). What is the percent error?

26) If the experimental mass is determined to be 62.5 grams and the accepted value is 65.2 grams, solve for the percent error.

27) What is the difference between accuracy and precision?

28) Compare and contrast the accuracy and precision of the results of Students A, B, and C in the following data table.

Student Melting Point Data			
	Student A	Student B	Student C
Trial 1	183.5°C	190.0°C	181.2°C
Trial 2	185.9°C	183.3°C	182.0°C
Trial 3	184.6°C	187.1°C	181.7°C
Mean	184.7°C	186.8°C	181.6°C
Sucrose Melting Point (accepted value) 185°C			

29) Determine the number of significant figures in the following measurements.

a) 2.03	b) 1.0	c) 0.00860	d) 1.0030
e) 1.0030	f) 967,000	g) 5.10	h) 0.000065
i) 0.005670	j) 780	k) 0.0224	l) 0.90
m) 54,000	n) 780.0	o) 0.4900	p) 670,004
q) 30.4	r) 500,000,000	s) 0.00881	t) 20.040
u) 7.080×10^{-7}	v) 4.0×10^{-4}	w) 1.080×10^{12}	x) 2.80×10^4

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30) What is the difference between certain and uncertain digits in any measurement?

31) What are the rules for rounding significant figures?

32) Perform the following calculations, and round your answer to the proper number of significant figures.

a) $32.567 + 135.0 + 1.4567 = ?$	b) $23.7 \times 3.8 = ?$
c) $43.678 \times 64.1 = ?$	d) $1.678 / 0.42 = ?$
e) $246.24 - 238.273 = ?$	f) $28.367 / 3.74 = ?$

g) $658.0 + 23.5478 + 1345.29 = ?$	h) $81.04 \times 0.010 = ?$

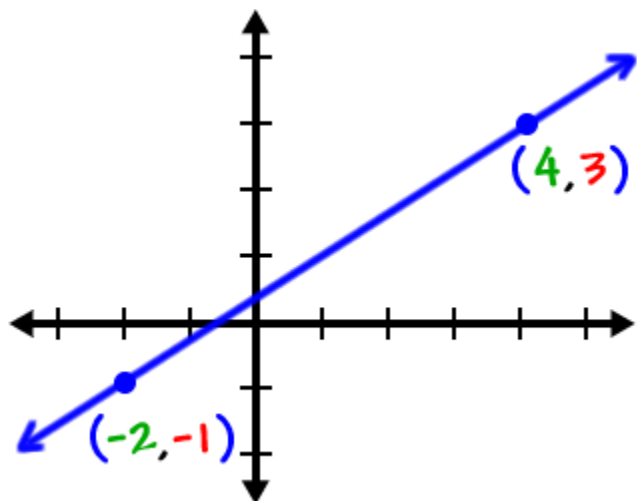
33) When is most appropriate to use a circle graph, a bar graph, and a scatter plot?

34) A census taker is representing the percentage of males and females in Pittsburgh. What type of graph would be most appropriate?

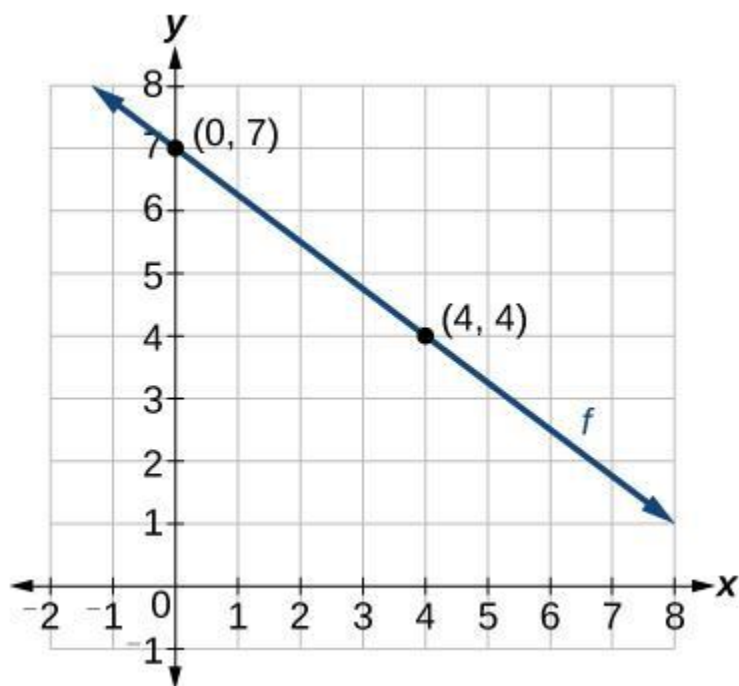
35) A forester is counting the number of trees in Western Pennsylvania that are of different species. What type of graph would be most appropriate?

36) What is the difference between interpolation and extrapolation?

37) Calculate the slope of the following line.

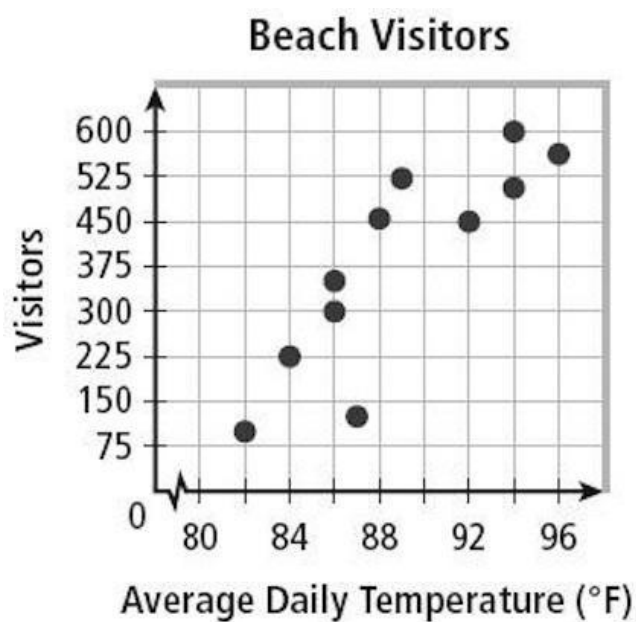


38) Calculate the slope of the following line.

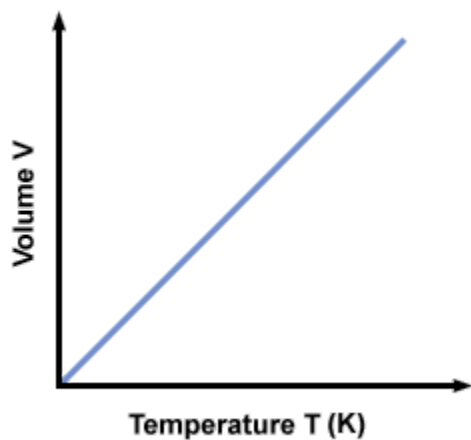


39) Why do we use lines of “best fit” in science? Does a line of “best fit” necessarily need to touch every data point? Explain why.

40) Draw a line of “best fit” for the following scatter plot.



41) Explain the relationship between temperature and volume in the following graph. Then, identify the independent and dependent variable.



42) What are the two parts of any measurement in scientific notation?

43) Convert the following measurements from standard notation to scientific notation.

230	5601
14,100,000	56,000,000
0.5	0.45013
0.089	0.00026
0.000000698	12 thousandths

44) Convert the following measurements from scientific notation to standard notation.

1.5×10^3	6.54×10^{-2}
2.501×10^{-7}	3.00×10^8
6.6×10^{-1}	7.54×10^{-6}
2.56×10^9	1.001×10^2
2002×10^3	0.005×10^{-5}

45) Perform the following calculations involving numbers in scientific notation.

$(5.67 \times 10^{-3})(1.66 \times 10^4)$	$(6.0 \times 10^5)(5.44 \times 10^3)$
$(7.8 \times 10^{-2}) / (9.00 \times 10^{-5})$	$(4.008 \times 10^{-4})(1.02 \times 10^{-6})$
$(9.0251 \times 10^2) / (5.6 \times 10^6)$	$(7.4 \times 10^9) / (3.67 \times 10^6)$

46)

Convert 102. mg to g.	Convert 5.0 km to m.
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Convert 6.8×10^{-7} s to ns.	Convert 5.6×10^2 Gg to g.
Convert 45.6 mL to kL.	Convert 7.005×10^5 μm to km.
Convert 600.7 ks to ms.	Convert 1.8×10^9 mg to Mg.

Convert 9.3 Gm to nm.	Convert 4.5 μs to Ms.
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47) Perform the following unit conversions and retain the proper number of significant figures in your answer.

a) Convert 8.7 μm to m.

b) Convert 71 Mg to g.

c) Convert 4,000 mm to km.

d) Convert 5 miles to cm. (5,280 feet = 1 mile; 1 mile = 12 inches; 1 inch = 2.54 cm)

e) Convert 5,450 seconds to days

f) Convert 45 bushels to cups. (1 bushel = 64 pints; 1 pint = 2 cups)