SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Decide whether the statement makes sense. Explain your reasoning.

1) I drove really far, almost 200 kilometers per hour.

Answer: Does not make sense. Kilometers per hour are a unit of speed, not distance. If you drive fast but only for a short period of time, you will not go far. (Explanations will vary.)

2) We will need 1800 cubic feet of carpeting to cover the floors in our three–story house.

Answer: Does not make sense. Carpeting covers the area of the floors, not volume. (Indeed, if it covered the volume of the rooms, there wouldn't be any space left for people or furniture.) Cubic feet are a measure of volume, not area. (Explanations will vary.)

3) The boat leaked and started filling with water. There must be 50 gallons of water in it already.

Answer: Makes sense. Gallons are a measure of volume and, depending on the size of the boat, 50 gallons could be a reasonable quantity of water. (Explanations will vary.)

4) I donated 64 fluid ounces of blood today.

Answer: Does not make sense. The units are fine, but 64 fluid ounces are equivalent to 4 pints. A typical blood donation is one pint; donating four pints would be dangerous. (Explanations will vary.)

5) I got pulled over by a police officer for speeding. I was going 150 kiloliters per second.

Answer: Does not make sense. Kiloliters are a unit of volume, and speed is measured in units of distance divided by time. (Explanations will vary.)

6) The container was big enough to hold a barrel of water, but it wasn't big enough to hold a barrel of petroleum.

Answer: Makes sense. A barrel of liquid and a barrel of petroleum are two distinct measures of volume. A barrel of liquid, such as water, is 31 gallons, but a barrel of petroleum is 42 gallons. If the container were 31–41 gallons, it could hold a barrel of water but not a barrel of petroleum. (Explanations will vary.)

7) To convert from Kelvin to Celsius, you subtract 273.15. For example, –100 K = –373.15 °C.

Answer: Does not make sense. The general formula is correct, but the numbers don't make sense. A temperature of 0 K is the coldest possible temperature, known as absolute zero. A temperature of –100 K is theoretically impossible. (Explanations will vary.)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Evaluate.

8) $\frac{1}{7} + \frac{1}{6}$

A) $\frac{42}{13}$ B) $\frac{13}{21}$ C) $\frac{13}{84}$ D) $\frac{13}{42}$

Answer: D

9) $\frac{1}{2} - \frac{1}{4}$

A) $\frac{1}{2}$ B) $-\frac{1}{4}$ C) $-\frac{1}{2}$ D) $\frac{1}{4}$

Answer: D

10) $\frac{2}{19} \times \frac{19}{9}$

A) $\frac{1}{9}$ B) $\frac{2}{19}$ C) $\frac{9}{2}$ D) $\frac{2}{9}$

Answer: D

11) $\frac{4}{3} \div \frac{1}{7}$

A) $\frac{8}{21}$ B) $\frac{14}{3}$ C) $\frac{28}{3}$ D) $\frac{4}{21}$

Answer: C

12) $\frac{3}{4} + \frac{5}{3}$

A) $\frac{24}{29}$ B) $\frac{29}{6}$ C) $\frac{29}{12}$ D) $\frac{12}{29}$

Answer: C

13) $\frac{9}{5} - \frac{1}{4}$

A) 2 B) $\frac{8}{5}$ C) $\frac{31}{20}$ D) $\frac{41}{20}$

Answer: C

14) $\frac{3}{2} \times \frac{1}{1}$

A) $\frac{3}{2}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) 1

Answer: A

15) $\frac{5}{2} \div \frac{2}{5}$

A) $\frac{4}{25}$ B) $\frac{25}{4}$ C) 1 D) $\frac{5}{2}$

Answer: B

16) $\frac{1}{3} + \frac{1}{4} + \frac{1}{5}$

A) $\frac{49}{60}$ B) $\frac{43}{60}$ C) $\frac{47}{60}$ D) $\frac{3}{4}$

Answer: C

17) $\frac{1}{4} \times \frac{1}{5} \times \frac{1}{6}$

A) $\frac{1}{26}$ B) $\frac{15}{2}$ C) $\frac{1}{120}$ D) $\frac{1}{60}$

Answer: C

Write as a common fraction.

18) 0.5

A) $\frac{1}{2}$ B) $\frac{5}{9}$ C) $\frac{5}{11}$ D) $\frac{1}{20}$

Answer: A

19) 0.746

A) $\frac{373}{50}$ B) $\frac{373}{500}$ C) $\frac{373}{5000}$ D) $\frac{373}{5}$

Answer: B

20) 0.52

A) $\frac{1}{4}$ B) $\frac{5}{2}$ C) $\frac{26}{5}$ D) $\frac{13}{25}$

Answer: D

21) 0.0002

A) $\frac{1}{50}$ B) $\frac{1}{500}$ C) $\frac{1}{5000}$ D) $\frac{1}{50000}$

Answer: C

22) 3.98

A) $\frac{199}{50}$ B) $\frac{389}{100}$ C) $\frac{199}{5}$ D) $\frac{199}{500}$

Answer: A

23) 4.2

A) $\frac{12}{5}$ B) $\frac{21}{5}$ C) $\frac{6}{25}$ D) $\frac{21}{50}$

Answer: B

Convert the common fraction into decimal form. If necessary, round to the nearest thousandth.

24) $\frac{11}{2}$

A) 4.5 B) 22 C) 5.5 D) 6.5

Answer: C

25) $\frac{10}{11}$

A) 0.769 B) 1 C) 0.09 D) 0.909

Answer: D

26) $\frac{2}{7}$

A) 0.286 B) 0.333 C) 0.283 D) 0.291

Answer: A

27) $\frac{19}{49}$

A) 0.388 B) 0.298 C) 0.548 D) 2.579

Answer: A

28) $\frac{102}{79}$

A) 1.291 B) 0.775 C) 1.101 D) 1.401

Answer: A

29) $\frac{615}{895}$

A) 0.687 B) 0.497 C) 0.694 D) 0.797

Answer: A

30) $\frac{330}{66}$

A) 6 B) 6.6 C) 4 D) 5

Answer: D

Solve the problem.

31) $10^5 \times 10^9$

A) 10^{45} B) 10^{14} C) 10^{19} D) 10^{16}

Answer: B

32) $10^5 \times 10^{-3}$

A) 10^{-15} B) 10^{-8} C) 10^2 D) 10^8

Answer: C

33) $\frac{10^5}{10^9}$

A) 10^{14} B) 10^4 C) 10^{-4} D) 10^{45}

Answer: C

34) $\frac{10^9}{10^{-6}}$

A) 10^{15} B) 10^{-54} C) 10^3 D) 10^{-15}

Answer: A

35) $10^{-15} \times 10^{-3}$

A) 10^{45} B) 10^{-12} C) 10^{18} D) 10^{-18}

Answer: D

36) $\frac{10^{-11}}{10^{-7}}$

A) 10^{4} B) 10^{-18} C) 10^{-4} D) 10^{-77}

Answer: C

37) $10^{4} + 10^{9}$

A) 1,000,010,000 B) 1,000,100,000 C) 10,000,000,000,000 D) 100,010,000

Answer: A

38) $10^{10} - 10^{3}$

A) 10,000,001,000 B) 1,000,001,000 C) 10,000,000 D) 9,999,999,000

Answer: D

39) A swimming pool 4 meters deep, 15 meters long, and 8 meters wide is filled with water. What is the area of the water's surface?

A) 32 m^2 B) 480 m^3 C) 120 m^2 D) 60 m^2

Answer: C

40) A swimming pool 3 meters deep, 14 meters long, and 6 meters wide is filled with water. What volume of water does the pool contain?

A) 18 m^2 B) 84 m^2 C) 252 m^3 D) 273 m^3

Answer: C

41) A packing crate measures 4 feet by 12 feet by 7 feet. What is the area of its smallest side?

A) 28 ft^2 B) 336 ft^3 C) 84 ft^2 D) 48 ft^2

Answer: A

42) A warehouse is 42 yards long and 26 yards wide with a height of 13 yards. What is the volume of the warehouse?

A) 1092 ft^2 B) 14,196 ft^3 C) 1092 yd^2 D) 14,196 yd^3

Answer: D

43) A column has a circular base with an area of 6 square feet and is 14 feet tall. What is its total volume?

A) 504 ft^3 B) 504π ft^3 C) 84 ft^3 D) 84π ft^3

Answer: C

Identify the units you would expect for the given quantity.

44) A speed found by dividing a distance measured in meters by a time measured in seconds.

A) seconds per meter B) square meters C) meters per second D) meter–seconds

Answer: C

45) The price of gravel, found by dividing its total cost in dollars by its total weight in tons.
A) dollars per ton B) cubic tons C) tons per dollar D) ton–dollars

Answer: A

46) The gas mileage of a car, when you travel 5522 kilometers using 11 gallons of gas.
A) $/gal B) gal/km C) km/gal D) 50

Answer: C

47) The amount of electricity utilized, calculated by multiplying power in kilowatts by time in hours.
A) kilowatts per hour B) kilowatt–hours
C) kilowatts per second D) hours per kilowatt

Answer: B

48) The price of pudding, found by dividing its cost in dollars by its weight in ounces.
A) dollar–ounces B) ounce–dollars C) dollars per ounce D) ounces per dollar

Answer: C

49) The density of a meteor, found by dividing its mass in kilograms by its volume in cubic meters.
A) kg/m^2 B) kg^3/m C) kg/m^3 D) m^3/kg

Answer: C

Carry out the indicated unit conversion. Round your answer, if appropriate.

50) Convert a distance of 54 feet into yards.
A) 21 yards B) 36 yards C) 162 yards D) 18 yards

Answer: D

51) Convert a weight of 16 pounds into ounces; there are 16 ounces in 1 pound.
A) 512 ounces B) 128 ounces C) 320 ounces D) 256 ounces

Answer: D

52) 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.
A) 768 ounces B) 96 ounces C) 1536 ounces D) 192 ounces

Answer: A

53) Convert a distance of 11 miles into yards; there are 1760 yards in a mile.
A) 1936 yards B) 19,360 yards C) 20,680 yards D) 20,020 yards

Answer: B

54) A car is driving at 180 miles per hour. What is its speed in miles per minute?
A) 3 miles per minute B) 240 miles per minute
C) 648,000 miles per minute D) 10,800 miles per minute

Answer: A

55) Convert a lot size of $\frac{2}{9}$ acre to square feet (1 acre = 43,560 ft^2).

A) 968 square feet B) 9790 square feet C) 979 square feet D) 9680 square feet

Answer: D

56) Use a chain of conversions with familiar measures of time to convert 8 weeks into seconds.
A) 4,838,400 seconds B) 80,640 seconds C) 201,600 seconds D) 691,200 seconds
Answer: A

Solve the problem.

57) Find a conversion factor between square feet and square yards. Write it in three forms.
A) 1 $yd^2 = (3\ ft)^2 = 9\ ft^2$ B) 1 $yd^3 = (3\ ft)^3 = 27\ ft^3$
C) 1 $ft^2 = (3\ yd)^2 = 9\ yd^2$ D) 1 $ft^3 = (3\ yd)^3 = 27\ yd^3$
Answer: A

58) How many square inches are in 6 square yards?
A) 864 $in.^2$ B) 72 $in.^2$ C) 216 $in.^2$ D) 7776 $in.^2$
Answer: D

59) A field is 150 yards long and 90 yards wide. Find its area in square feet.
A) 364,500 ft^2 B) 40,500 ft^2 C) 121,500 ft^2 D) 13,500 ft^2
Answer: C

60) Find a conversion factor between cubic inches and cubic yards. Write it in three forms.
A) 1 $in.^3 = (36\ yd)^3 = 46{,}656\ yd^3$ B) 1 $yd^2 = (36\ in.)^2 = 1296\ in.^2$
C) 1 $yd^3 = (3\ ft)^3 = 27\ ft^3$ D) 1 $yd^3 = (36\ in.)^3 = 46{,}656\ in.^3$
Answer: D

61) There are 1000 meters in 1 kilometer. Find a conversion factor between cubic meters and cubic kilometers. Write it in three forms.
A) 1 $m^3 = (1000\ km)^3 = 1{,}000{,}000\ km^3$ B) 1 $km^2 = (1000\ m)^2 = 1{,}000\ m^2$
C) 1 $km^3 = (1000\ m)^3 = 100{,}000\ m^3$ D) 1 $km^3 = (1000\ m)^3 = 1{,}000{,}000{,}000\ m^3$
Answer: D

62) How many cubic inches are in 19 cubic feet?
A) 24,624 $in.^3$ B) 32,832 $in.^3$ C) 2736 $in.^3$ D) 886,464 $in.^3$
Answer: B

63) How many cubic furlongs are in a cubic mile? (1 mile = 8 furlongs)
A) 64 cubic furlongs B) 4096 cubic furlongs
C) 8 cubic furlongs D) 512 cubic furlongs
Answer: D

Answer the following question involving a conversion within the USCS system.

64) The baby weighs 8.2 pounds. How many ounces is that?
A) 0.51 ounces B) 131.2 ounces C) 82 ounces D) 98.4 ounces
Answer: B

65) The container holds 4 gallons of water. How many fluid ounces is that?
A) 1024 fl oz B) 128 fl oz C) 256 fl oz D) 512 fl oz
Answer: D

66) If a horse ran 4 furlongs, how many yards did it run?

A) 880 yd B) 7040 yd C) 3520 yd D) 21,120 yd

Answer: A

67) A boat is moving at 48 miles per hour. What is its speed in knots (nautical miles per hour)?

A) 55.2 knots B) 39.7 knots C) 41.7 knots D) 57.2 knots

Answer: C

68) How many gallons are in 79 barrels of petroleum?

A) 1.9 gal B) 2449 gal C) 4108 gal D) 3318 gal

Answer: D

69) How many quarts are in 57 barrels of water?

A) 7068 qt B) 1767 qt C) 9576 qt D) 2394 qt

Answer: A

70) The customer bought a peck of flour. How many cubic inches of flour did he buy?

A) 537.6 $in.^3$ B) 33.6 $in.^3$ C) 268.8 $in.^3$ D) 67.2 $in.^3$

Answer: A

State how much larger or smaller the first unit is than the second.

71) nanometer, meter

A) Smaller by a factor of 10^9 B) Larger by a factor of 10^6

C) Larger by a factor of 10^9 D) Smaller by a factor of 10^6

Answer: A

72) gram, milligram

A) Larger by a factor of 10^6 B) Smaller by a factor of 10^6

C) Smaller by a factor of 10^3 D) Larger by a factor of 10^3

Answer: D

73) centiliter, microliter

A) Smaller by a factor of 1000 B) Smaller by a factor of 10,000

C) Larger by a factor of 10,000 D) Larger by a factor of 1000

Answer: C

74) square decimeter, square kilometer

A) Smaller by a factor of 10^3 B) Smaller by a factor of 10^8

C) Smaller by a factor of 10^6 D) Smaller by a factor of 10^4

Answer: B

75) gigagram, microgram

A) Larger by a factor of 10^{15} B) Larger by a factor of 10^{18}

C) Larger by a factor of 10^{12} D) Larger by a factor of 10^9

Answer: A

76) cubic micrometer, cubic meter

A) Smaller by a factor of 10^6

B) Smaller by a factor of 10^{18}

C) Smaller by a factor of 10^9

D) Smaller by a factor of 10^{12}

Answer: B

Convert the measurement to the units specified. Round your answer to the nearest tenth.

77) 23 feet to meters

A) 7 meters B) 21 meters C) 9.1 meters D) 75.4 meters

Answer: A

78) 8 kilometers to yards

A) 67,976.8 yards B) 22,658.9 yards C) 26,247.9 yards D) 8749.3 yards

Answer: D

79) 17 liters to gallons

A) 18 gallons B) 16.1 gallons C) 4.5 gallons D) 64.3 gallons

Answer: C

80) 15 cubic inches to milliliters

A) 245.7 milliliters B) 0.5 milliliters C) 0.9 milliliters D) 443.6 milliliters

Answer: A

81) 2500 square yards to square meters

A) 2286 square meters

B) 2090.3 square meters

C) 2735 square meters

D) 2992.1 square meters

Answer: B

82) 34 pounds to grams

A) 75 grams B) 15.4 grams C) 74,970 grams D) 15,422.4 grams

Answer: D

83) 93 kilometers per hour to miles per hour

A) 149.7 miles per hour

B) 128.6 miles per hour

C) 67.9 miles per hour

D) 57.8 miles per hour

Answer: D

Convert the temperature, as indicated. Round your answer to hundredths, if appropriate.

84) 70°F, into Celsius

A) 56.67°C B) 38.89°C C) 38.00°C D) 21.11°C

Answer: D

85) 20°C, into Fahrenheit

A) 52°F B) 68°F C) 43.1°F D) 4°F

Answer: B

86) 90°F, into Celsius

A) 50.00°C B) 32.22°C C) 104.40°C D) 58.00°C

Answer: B

87) -10°C, into Fahrenheit
A) 26.4°F B) -50°F C) 14°F D) 22°F
Answer: C

88) 280 K, into Celsius
A) 206.85°C B) -117.59°C C) 6.85°C D) 106.85°C
Answer: C

89) -80°C, into Kelvin
A) 93.15 K B) 193.15 K C) 129.15 K D) -353.15 K
Answer: B

Use the following table of exchange rates to solve the problem. Round your answer when appropriate.

Currency	Dollars per Foreign	Foreign per Dollar
British pound	**1.624**	**0.6158**
Canadian dollar	**1.005**	**0.9950**
European euro	**1.320**	**0.7576**
Japanese yen	**0.0120**	**83.33**
Mexican peso	**0.07855**	**12.73**

90) Which is worth most, 1 British pound, 1 Canadian dollar, 1 European euro, or 1 dollar?
A) 1 European euro B) 1 Canadian dollar C) 1 dollar D) 1 British pound
Answer: D

91) How many Mexican pesos can you buy for $180?
A) 2.16 pesos B) 14,999.4 pesos C) 14.139 pesos D) 2291.4 pesos
Answer: D

92) You return from a trip with 3400 Japanese yen. How much are your yen worth in dollars?
A) $2575.84 B) $283,322 C) $267.07 D) $40.80
Answer: D

93) A fresh juice stand in Montreal sells a large glass of orange juice for 4.40 Canadian dollars. If you buy 5 glasses, how much have you spent in (U.S.) dollars?
A) $29.04 B) $21.89 C) $16.67 D) $22.11
Answer: D

Solve the problem.

94) A supermarket in Japan sells soy milk for 382 yen per liter. If there are 83.21 yen per dollar, then what is the price in dollars per quart?
A) $3.65 per quart B) $4.34 per quart C) $4.85 per quart D) $4.59 per quart
Answer: B

95) A piece of land in Ottawa with an area of 0.5 square kilometers is priced at 5800 Canadian dollars. If there are 0.9965 Canadian dollars per (U.S.) dollar, then what is the price in dollars per square mile?
A) $30,147.74 per square mile B) $4494.76 per square mile
C) $18,733.45 per square mile D) $29,937.07 per square mile
Answer: A

96) Recently, one U.S. dollar was worth about 0.6158 British pounds. How much would a car have cost in U.S. dollars that cost 8930 British pounds?

A) $4384.63 B) $14,501.46 C) $16,817.33 D) $5499.09

Answer: B

97) Recently, one U.S. dollar was worth about 12.73 Mexican pesos. How much would 335 U.S. dollars be worth in Mexican pesos?

A) $29.94 B) $3768.75 C) $4264.55 D) $26.32

Answer: C

Use units to help you answer the question. If necessary, round your answer to two decimal places.

98) A community garden contains 25 rectangular plots each measuring 4 yd by 10 yd. What is the total area available for gardening?

A) 1025 yd^2 B) 700 yd^2 C) 40 yd^2 D) 1000 yd^2

Answer: D

99) A stockbroker sold 35 shares of stock for $40.31 each. What was the total amount of the sale?

A) $1410.96 B) $1410.75 C) $1410.85 D) $1410.95

Answer: C

100) Suppose you could spend $5 every hour, night and day. How much could you spend in a year? (Assume that there are 365 days in a year.)

A) $2,628,000 B) $8760 C) $7200 D) $43,800

Answer: D

101) You are buying carpet to cover a room that measures 12 feet by 17 feet. The carpet costs $27.50 per square yard. How much will the carpet cost?

A) $741.82 B) $1870.00 C) $623.33 D) $204.00

Answer: C

102) Assuming that your heart beats 70 times per minute, how many times does your heart beat in 6 days?

A) 201,600 B) 36,288,000 C) 25,200 D) 604,800

Answer: D

103) Assume that you breathe once every 10 seconds. How many breaths do you take in 3 weeks?

A) 260,480 B) 181,440 C) 3024 D) 25,920

Answer: B

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Decide whether the statement makes sense. Explain your reasoning.

104) I figured out the distance we had traveled by dividing our speed by the amount of time we had traveled.

Answer: Does not make sense. Dividing speed by time does not yield distance. Multiplying speed by time yields distance. For example, 10 mi/hr × 2 hr = 20 mi. (Explanations will vary.)

105) I figured out the number of seconds in a week by multiplying 7 by 24 by 60 by 60.

Answer: Makes sense. $1 \text{ wk} \times \frac{7 \text{ days}}{1 \text{ wk}} \times \frac{24 \text{ hr}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{60 \text{ sec}}{1 \text{ min}} = (7 \times 24 \times 60 \times 60)$ seconds, since all the other units cancel. There are 604,800 seconds in a week. (Explanations will vary.)

106) To convert square yards to square inches, I multiplied by 12^2 or 144.

Answer: Does not make sense. There are 12 inches per foot, but there are 36 inches per yard. To convert square yard to square inches, multiply by 36^2 or 1296. (Explanations will vary.)

107) My friend wants to lose 15 pounds, but I think that's too much. I think 10 kilograms would make more sense.

Answer: Does not make sense. 10 kilograms is about 22 pounds. If 15 pounds is too much, then certainly 22 pounds is too much. (Explanations will vary.)

108) I can walk on my hands for 5 meters before falling down, but my goal is to walk a full decimeter without losing my balance.

Answer: Does not make sense. A decimeter is a tenth of a meter, and this person can already travel 50 times that. Perhaps he wants to be able to walk on his hands for a full decameter, or 10 meters. (Explanations will vary.)

109) I found a rock at the bottom of our swimming pool. It had a mass of 500 grams and a volume of 1000 cubic centimeters, so its density was 0.5 g/cm^3.

Answer: Does not make sense. The calculation is correct, and the units are fine, but an object with a density under 1 g/cm^3 would not sink in water. (Explanations will vary.)

110) Our utility company charges 10 cents per joule for the energy we use.

Answer: Does not make sense. The units are fine, but the magnitude is ridiculous. A regular 100–watt bulb consumes energy at a rate of 100 joules per second. If the utility charged 10 cents per joule, it would cost $1 just to keep a 100–watt bulb on for a single second. That's $86,400 a day! (Explanations will vary.)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use units to help you answer the question. If necessary, round your answer to two decimal places.

111) A paint mixture contains 5 gallons of base for every gallon of color. In 108 gallons of paint, how many gallons of color are there?

A) 90 gal B) 36 gal C) 54 gal D) 18 gal

Answer: D

112) Your car gets 33 miles per gallon of gasoline, and you drive at an average speed of 44 miles per hour. How much gas do you use in an hour?

A) 1.45 gal B) 1.33 gal C) 0.75 gal D) 0.69 gal

Answer: B

113) Suppose water flows from a shower at a rate of 0.32 cubic feet per minute. Do you use more water by taking a 12–minute shower or by filling a bathtub with 0.4 cubic yards of water, and by how much?

A) Shower uses an additional 3.44 ft^3 of water B) Bath uses an additional 3.44 ft^3 of water

C) Bath uses an additional 6.96 ft^3 of water D) Shower uses an additional 6.96 ft^3 of water

Answer: C

114) An acre is equal to 43,560 square feet, and there are 5280 feet in a mile. If a farm has the shape of a rectangle measuring 0.9 miles by 1.5 miles, what is the area of the farm in acres?

A) 11.14 acres B) 864 acres C) 0.16 acres D) 1050 acres

Answer: B

Decide which of the two given prices is the better deal.

115) You can buy hair product in a 12–ounce bottle for $2.88 or in a 8–ounce bottle for $1.76.
A) 12–ounce bottle for $2.88 B) not enough information
C) equal value D) 8–ounce bottle for $1.76
Answer: D

116) You can buy laundry product in a 30–ounce bottle for $6.00 or in a 24–ounce bottle for $4.08.
A) not enough information B) 24–ounce bottle for $4.08
C) 30–ounce bottle for $6.00 D) equal value
Answer: B

117) The same kind of water is sold in two types of bottle. Which type has the lower unit price?
Five 10–oz bottles for $2.30
Seven 12–oz bottles for $4.20
A) Five 10–oz bottles B) equal value
C) Seven 12–oz bottles D) not enough information
Answer: A

Solve the problem.

118) A 14–gram object has a volume of 35 cubic centimeters. Find its density.
A) 490 g–cm^3 B) 21 cm^3 C) 0.4 g/cm^3 D) 2.5 cm^3/g
Answer: C

119) What is the cost of lighting a 500–watt outdoor light for 8 hours, if electricity costs 7.5¢ per kilowatt–hour?
A) 45 cents B) 60 cents C) 30 cents D) 67 cents
Answer: C

120) Suppose a necklace is made from 18–karat gold and weighs 54 grams. Find the weight, in grams, of the pure gold in the necklace.
A) 18 grams B) 40.5 grams C) 6 grams D) 54 grams
Answer: B

121) A certain land area is 540,000 square miles, and it holds a population of 64.1 million people. Calculate the population density.
A) 842 people/mi^2 B) 119 people/mi^2 C) 84 people/mi^2 D) 1187 people/mi^2
Answer: B

122) An average 12–ounce can of beer contains about 15 grams of alcohol. Consider a person with approximately 4 liters (4000 milliliters) of blood, who quickly drinks two cans of beer. If all the alcohol were immediately absorbed into the bloodstream, what blood alcohol content would we find?
A) 0.075 g/100 ml B) 0.375 g/100 ml C) 0.0375 g/100 ml D) 0.75 g/100 ml
Answer: D

123) Your electrical bill states that you used 800 kilowatt–hours of energy in January. Determine your total electrical energy use, in joules.
A) 2,880,000,000 joules B) 288,000,000 joules
C) 256,000,000 joules D) 2,560,000,000 joules
Answer: A

124) Your electrical bill states that you used 870 kilowatt–hours of energy in September. Determine your average power use, in watts.

A) 1169.4 watts B) 1329.2 watts C) 1450 watts D) 1208.3 watts

Answer: D

125) You find a 4–pound nugget that is 20% gold. What is its purity in karats?

A) 9.6 karats B) 24 karats C) 20 karats D) 4.8 karats

Answer: D

126) An object has a total volume of 5 liters (which is 5000 cubic centimeters) and a mass of 4 kilograms. What is its density? Will it sink or float in water?

A) 0.8 g/cm^3; sink B) 1.25 g/cm^3; sink C) 0.8 g/cm^3; float D) 1.25 g/cm^3; float

Answer: C

127) You burn 300 Calories will exercising for 40 minutes. What is your average power while exercising, in watts?

A) 627.6 watts B) 418.4 watts C) 784.5 watts D) 523 watts

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Decide whether the statement makes sense. Explain your reasoning.

128) If you complete the four–step problem–solving process carefully and thoroughly, then you will have no uncertainty about your final answer.

Answer: Does not make sense. The four–step process is a useful guide to problem solving, but the four steps offer only general advice. Following them will not automatically lead to a unique solution, since some questions do not lend themselves to unique solutions. This is fairly obvious when the question is one of politics or policy. For example, what is the best way to improve the economy? Different experts will recommend different–even contradictory–things (e.g., raise taxes, lower taxes), and no single best answer may be available. The same is true of mathematical problems, particularly when the information provided is incomplete or lacks context. Nonunique solutions often occur because not enough information is available to distinguish among a variety of possibilities. (Explanations will vary.)

129) It is not recommended that you use approximations to solve a problem, because then your solution is only an approximation.

Answer: Does not make sense. Most real problems involve approximate numbers to begin with, so an approximation is often good enough for a final answer. In other cases, an approximation will reveal the essential character of a problem, making it easer to reach an exact solution. Approximations also provide a useful check. If you come up with an "exact solution" that isn't close to the approximate one, something may have gone wrong. (Explanations will vary.)

130) Whether it's a problem in mathematics or something else, I always find it's best to complete the work by looking back to check, interpret, and explain my solution.

Answer: Makes sense. This is essentially step 4 in the four–step process. Although you may be tempted to think you have finished after you find a result in step 3, this final step is the most important. After all, a result is not very useful if it is wrong or misinterpreted or cannot be explained to others. (Explanations will vary.)

Solve the problem.

131) A traffic counter consists of a thin black tube stretched across a street or highway and connected to a "brain box" at the side of the road. The device registers one "count" each time a set of wheels (that is, wheels on a single axle) rolls over the tube. A normal automobile (two axles) registers two counts, and a light truck (three axles) registers three counts. Suppose that, during a one–hour period, a particular counter registers 41 counts on a residential street on which only two–axle vehicles (cars) and three–axle vehicles (light trucks) are allowed. How many cars and light trucks passed over the traffic counter? Find all the possible solutions to the problem.

Answer: 1 car and 13 light trucks; 4 cars and 11 light trucks; 7 cars and 9 light trucks; 10 cars and 7 light trucks; 13 cars and 5 light trucks; 16 cars and 3 light trucks; 19 cars and 1 light truck

132) Paul and Saul ran a 50–meter race. When Paul crossed the finish line, Saul had run only 48 meters. Then they ran a second race, with Paul starting 2 meters behind the starting line. Assuming that both runners ran at the same pace as in the first race, who won the second race?

Answer: Paul

133) Two bicyclists, 42 miles apart, begin riding toward each other on a long straight avenue. One cyclist travels 15 miles per hour and the other 20 miles per hour. At the same time, Spot (a greyhound), starting at one cyclist, runs back and forth between the two cyclists as they approach each other. If Spot runs 38 miles per hour and turns around instantly at each cyclist, how far has he run when the cyclists meet?

Answer: 45.6 mi

134) Suppose that you begin with a red bucket containing 12 red marbles and a yellow bucket containing 12 yellow marbles. You move three marbles from the red bucket to the yellow bucket, and then you move any four marbles from the yellow bucket to the red bucket. Which is greater, the number of yellow marbles in the red bucket or the number of red marbles in the yellow bucket?

Answer: The number of yellow marbles in the red bucket is greater.

135) Suppose that 8 turns of a wire are wrapped around a pipe with a length of 60 inches and a circumference of 4 inches. What is the length of the wire?

Answer: 68 in.

136) Suppose that China's population policy is modified so that every family could have children until either a boy is born or two children are born, whichever comes first. Assuming that every family chooses to have as many children as possible under this policy, and that boys and girls are equally likely, how many children would be born in a typical group of 1000 families?

Answer: 1500

137) A curved bridge rises over a river, so that the two endpoints of the bridge are 160 yards apart horizontally. You walk across the bridge with a device to measure its length and discover that the walking distance is 168 yards. Approximately how high does the bridge rise above the horizontal?

Answer: 25.6 yards

138) A curved bridge rises over a canyon. The two endpoints of the bridge are one mile apart horizontally. The bridge rises to a height of 353 feet above the horizontal. Approximately what is the walking distance along the bridge, in feet?

Answer: 5327 feet

139) Cheddar cheese comes in 2–pound bags, and mozzarella cheese comes in 5–pound bags. Using entire bags, you make a 47–pound mixture of cheese. How many bags of each type of cheese did you use? Find all the possible solutions to the problem.

Answer: 1 bag cheddar and 9 bags mozzarella; 6 bags cheddar and 7 bags mozzarella; 11 bags cheddar and 5 bags mozzarella; 16 bags cheddar and 3 bags mozzarella; 21 bags cheddar and 1 bag mozzarella.

140) Suppose that you have 10 white socks and 6 black socks in a clothes dryer. How many socks must you withdraw from the dryer (without looking) to be certain of having a pair of white socks?

Answer: 8 socks

141) You are considering buying 15 silver coins that look alike, but you have been told that one of the coins is a lightweight counterfeit. How can you determine the lightweight coin in a maximum of three weighings on a balance scale?

Answer: Answers may vary. One possible answer: Separate the coins into three sets of five coins. Weigh two of the sets. The lightweight coin is in the lighter of the two sets, or if the two sets balance, it is in the third set. Now weigh two pairs of coins from the lightweight set of five coins. If they balance, the fifth coin is the lightweight coin; otherwise, weigh the coins in the lightweight pair to find the lightweight coin.

142) It takes you 84 seconds to walk from the first (ground) floor of a building to the fourth floor. How long will it take to walk from the first floor to the 8th floor (at the same pace, assuming that all floors have the same height)?

Answer: 196 seconds

143) A father and son are in a terrible car accident. The father is killed. The son, badly injured, is brought to the hospital for emergency surgery. The surgeon takes one look at the patient and exclaims, "That's my son!" How is this possible?

Answer: The surgeon is a woman. She is the mother of the patient.

144) A trader bought a stock for $70 and then sold it for $80. He bought it back for $89 and then sold it again for $99. How much did he gain or lose on these transactions?

Answer: He gained $20 on the transactions.

145) Three boxes are labeled "CDs," "DVDs," and "CDs & DVDs." Each label is wrong. Bey selecting just one item from just one box, how can you determine the correct labeling of the boxes?

Answer: Select an item from the box labeled "CDs & DVDs." Since the label is wrong, it must be either a box of CDs or a box of DVDs. First assume that the item you selected is a CD. This box is therefore a box of CDs and should be labeled "CDs." Since the box labeled "DVDs" is also labeled incorrectly, it must be either a box of CDs or a box of both CDs and DVDs. Since you have already identified the first box as a box of CDs, the second box must therefore be a box of CDs and DVDs and should be labeled "CDs & DVDs." Finally, the box incorrectly labeled "CDs" should have the remaining label, "DVDs." Now assume that the item you selected is a DVD. By similar reasoning, this box should be labeled "DVDs," the box incorrectly labeled "CDs" should be labeled "CDs & DVDs," and the box incorrectly labeled "DVDs" should be labeled "CDs."

146) There are 20 bags filled with coins that all look alike. The coins in 19 of the bags are authentic and weigh 10 ounces each. The coins in one of the bags are counterfeit and weigh 11 ounces each. With only one weighing on a scale, how can you determine which bag contains the counterfeit coins?

Answer: Label the bags 1–20 and choose one coin from bag 1, two coins from bag 2, three coins from bag 3, and so on. Weigh all the coins you chose together, a total of 210 coins. If all the coins were authentic, they would would weigh 2100 oz, since 210 coins × 10 oz/coin = 2100 oz.
However, 1–20 of the coins are counterfeit, and each (11–oz) counterfeit coin will add an extra ounce to the weight. If the actual weight is 2101, there must be one counterfeit coin, and since one coin was chosen from bag 1, bag 1 must have the counterfeit coins. If the actual weight is 2102, bag 2 must have the counterfeits; if the actual weight is 2103, bag 3 must have the counterfeits, etc. In general:
(Actual weight, in oz) – 2100 = the number of the bag with the counterfeit coins.

147) There is a large jar of marbles, containing red, blue, yellow, black, and white marbles. How many marbles must you draw (without looking) from the jar to be sure of getting at least three of one color?

Answer: 11 marbles

148) Abe, Boris, Cal, and David all proposed to Ellie on Friday. Abe proposed at 5:00, Boris proposed at 6:00, Cal proposed at 7:00, and David proposed at 8:00. Ellie accepted the last of the four proposals. Some clues: (1) The times may be A.M. or P.M. (2) Boris proposed before Abe (3) At least one suitor proposed between the proposals of Cal and David. (4) Cal did not propose between Boris and Al. Whose proposal did Ellie accept?

Answer: Cal's proposal

149) How do you measure 6 minutes with a 7–minute hourglass and a 5–minute hourglass? Assume that the hourglasses can only measure 7–minute and 5–minute intervals, respectively, and cannot be used to measure other time intervals.

Answer: Answers may vary. One possibility: Start both hourglasses simultaneously. When the 5–minute hourglass runs out, immediately turn it upside down and start the timing of the 6–minute interval. There will be 2 minutes of time left in the 7–minute hourglass. When it runs out, immediately turn both hourglasses upside down. There will be 2 minutes of time left in the 5–minute hourglass (the 2 minutes that ran down before it was flipped). When it runs out, immediately turn the 7–minute hourglass upside down. There will be 2 minutes of time left in it (again, the 2 minutes that ran down before it was flipped). When it runs out, the timing of the 6–minute interval is complete (2 + 2 + 2 minutes = 6 minutes). Incidentally, if you continue in this fashion, you can measure any interval of an even number of minutes using these two hourglasses. Of course, some intervals (e.g., 10 minutes, 14 minutes) can be measured much more simply using just one hourglass.