1.2 SI Units of Length, Mass, and Time
1.   **MC** How many base units are there in the SI: (a) 3, (b) 5, (c) 7, or (d) 9? (c)
2.   **MC** The only SI standard represented by material standard is the (a) meter, (b) kilogram, (c) second, (d) electric charge. (b)
3.   **MC** Which of the following is *not* an SI base quantity: (a) mass; (b) weight; (c) length; or (d) time? (b)

1.3 More about the Metric System
9.   **MC** The prefix *giga-* means (a) 10^{-9}, (b) 10^9, (c) 10^{-6}, (d) 10^6. (b)
10.   **MC** The prefix *micro-* means (a) 10^6, (b) 10^{-6}, (c) 10^3, (d) 10^{-3}. (b)
11.   **MC** A new technology is concerned with objects the size of what metric prefix? (a) *nano-* (b) *micro-* (c) *mega-* (d) *giga-* (a)
18.   ●● A sailor tells you that if his ship is traveling at 25 knots (nautical miles per hour), it is moving faster than the 25 mi/h your car travels. How can that be? 1 nautical mi = 6076 ft

1.4 Unit Analysis

22.   **CQ** Can unit analysis tell you whether you have used the correct equation in solving a problem? Explain. no
25.   ● Show that the equation $x = x_o + vt$ is dimensionally correct, where v is velocity and x and x_o are lengths,
28.   ●● You are told that the volume of a sphere is given by $V = \pi d^3/4$, where V is the volume and d is the diameter of the sphere. Is this equation dimensionally correct? (Use SI unit analysis to find out.) yes; $m^3 = m^3$
29.   ●● The correct equation for the volume of a sphere is $V = 4\pi r^3/3$, where r is the radius of the sphere. Is the equation in Exercise 28 correct? If not, what should it be when expressed in terms of d? no; $V = \pi d^3/6$
and t is time. (length) = (length) + (length)
38.   ●●● Einstein's famous mass–energy equivalence is expressed by the equation $E = mc^2$, where E is energy, m is mass, and c is the speed of light. (a) What are the SI base units of energy? (b) Another equation for energy is $E = mgh$, where m is mass, g is the acceleration due to gravity, and h is height. Does this equation give the same units as in part (a)? (a) $kg \cdot m^2/s^2$ (b) yes

1.5 Unit Conversions
46.   **IE** ● (a) If you wanted to express your height with the largest number, you would use (1) meters, (2) feet, (3) inches, (4) centimeters. Why? (b) If you are 6.00 ft tall, what is your height in centimeters? (a) (4) cm (b) 183 cm
47.   ● If the capillaries of an average adult were unwound and spread out end to end, they would extend to a length over 40 000 mi (Fig. 1.9). If you are 1.75 m tall, how many times your height would the capillary length equal? 37 000 000 times
51.   ●● If blood flows with an average speed of 0.35 m/s in the human circulatory system, how many miles does a blood cell travel in 1.0 h? 0.78 mi
53.   **IE** ●● (a) Which of the following represents the greatest speed: (1) 1 m/s; (2) 1 km/h; (3) 1 ft/s; or (4) 1 mi/h? (b) Express the speed 15.0 m/s in mi/h. (a) (1) 1 m/s (b) 33.6 mi/h
63.   ●●● The Roman Coliseum used to be flooded with water to recreate ancient naval battles. Assuming the floor of the Coliseum to be 250 m in diameter and the water to have a depth of 10 ft, (a) how many cubic meters of water are required? (b) How much mass would this water have in kilograms? (c) How much would the water weigh in pounds? (a) 1.5×10^5 m^3 (b) 1.5×10^8 kg (c) 3.3×10^8 lb

1.6 Significant Figures
69.   **CQ** Are all the significant figures reported for a measured value accurately known? Explain. no
72.   ● Using a meterstick, a student measures a length and reports it to be 0.8755 m. What is the smallest division on the meterstick scale? 0.001 m, or 1 mm
(b) 469 cm^2
80.   ●● Express the following calculations to the proper number of significant figures: (a) $12.634 + 2.1$; (b) $13.5 - 2.134$; (c) $\pi(0.25 \text{ m})^2$; (d) $\sqrt{2.37/3.5}$. (a) 14.7 (b) 11.4 (c) 0.20 m^2 (d) 0.82

81.   **IE** ●●● In doing a problem, a student adds 46.9 m and 5.72 m and then subtracts 38 m from the result. (a) How many decimal places will the final answer have: (1) zero; (2) one; or (3) two? Why? (b) What is the final answer? (a) (1) zero (b) 15 m

1.7 Problem Solving

83.   **MC** An important step in problem solving before mathematically solving an equation is (a) checking units, (b) checking significant figures, (c) checking with a friend, (d) checking to see if the result will be reasonable. (a)

84.   **MC** An important final step in problem solving before reporting an answer is (a) saving your calculations, (b) reading the problem again, (c) seeing if the answer is reasonable, (d) checking your results with another student. (c)

95.   ●● Two chains of length 1.0 m are used to support a lamp, as shown in ▼ Fig. 1.21. The distance between the two chains is 1.0 m along the ceiling. What is the vertical distance from the lamp to the ceiling? 0.87 m

96.   ●● Tony's Pizza Palace sells a medium 9.0-in. (diameter) pizza for $7.95, and a large 12-in. pizza for $13.50. Which pizza is the better buy? 12-in. better buy; 9.0-in.: $8.0\,\text{in.}^2/\$$, 12-in.: $8.4\,\text{in.}^2/\$$

102.   ●● The average number of hairs on the normal human scalp is 125 000. A healthy person loses about 65 hairs per day. (New hair from the hair follicle pushes the old hair out.) (a) How many hairs are lost in one month? (b) Pattern baldness (top-of-the-head hair loss) affects about 35 million men in the United States. With an average of 15% of the scalp bald, how many hairs are lost per year by one of these "bald is beautiful" people? (a) 1950 hairs (b) 2.0×10^4 hairs

Comprehensive Exercises

106.   **IE** A car is driven 13 mi east and then a certain distance due north and ends up at a position 25° north of east of its initial position. (a) The distance traveled by the car due north is (1) less than, (2) equal to, (3) greater than 13 mi. Why? (b) What distance does the car go due north? (a) (1) less than (b) 6.1 mi

109.   On a certain night, an observer on the Earth determines that the angle between the direction to Mars and the direction to the Sun is 50°. On that night, assuming circular orbits, determine the distance to Mars from the Earth using the known radii of the orbits of both planets. 3.0×10^8 km