Chapter 01: Introduction

MULTIPLE CHOICE

NARRBEGIN: 1.3
1.3 Dealing with Numbers
NARREND

1. Which one of the choices below represents the preferred practice regarding significant figures when adding the following: 12.4 + 14 + 67.37 + 4.201?
   a. 98
   b. 98.0
   c. 97.97
   d. 97.971

   ANS: A PTS: 1 DIF: 1

2. Which one of the choices below represents the preferred practice regarding significant figures when multiplying the following: $10.5 \times 8.9 \times 3.11$?
   a. 290.6295
   b. 290.63
   c. 291
   d. 290

   ANS: D PTS: 1 DIF: 1

3. Calculate $(0.82 + 0.042) \times (4.49 \times 10^3)$, keeping only significant figures.
   a. 3870.8
   b. 3870
   c. 3879
   d. 3900

   ANS: D PTS: 1 DIF: 1

4. The length and width of a standard sheet of paper is measured, and then the area is found by calculation to be 93.500 in^2. The number of significant figures in the width measurement must be at least:
   a. 5
   b. 4
   c. 3
   d. 2

   ANS: A PTS: 1 DIF: 1

5. The number 0.0001070 has how many significant figures?
   a. 2
   b. 3
   c. 4
   d. 7

   ANS: C PTS: 1 DIF: 2

6. Multiplying a 4 significant figure number by a 3 significant figure number and then dividing the product by a six significant figure number yields a number with how many significant figures?
   a. 7/6
   b. 3
   c. 2
   d. 13

   ANS: B PTS: 1 DIF: 2

7. Modern electroplaters can cover a surface area of 55.0 m^2 with one troy ounce of gold (volume = 1.611 cm^3). What is the thickness of the electroplated gold?
   a. 3.64×10^{-7} m
   b. 1.46×10^{-9} m
   c. 1.83×10^{-6} m
   d. 2.93×10^{-8} m

ANS: D PTS: 1 DIF: 3

8. The basic function of an automobile's carburetor is to atomize the gasoline and mix it with air to promote rapid combustion. Assume that 40 cm^3 of gasoline is atomized into *N* spherical droplets. Each droplet has a radius of 2.0×10^{-5} m. Find the total surface area of these *N* spherical droplets.
   a. 60,000 cm^2
   b. 24,000 cm^2
   c. 20,000 cm^2
   d. 2800 cm^2

   ANS: A PTS: 1 DIF: 3

9. A circle has an area of 2.0 m^2. A second circle has triple the radius of the first. The area of the second circle is _____ times that of the first.
   a. 27
   b. 9.0
   c. 3.0
   d. 0.67

   ANS: B PTS: 1 DIF: 2

10. tripling the radius of a sphere results in increasing its volume by a factor of
   a. 27π
   b. 27
   c. 9
   d. 3

   ANS: B PTS: 1 DIF: 2

11. Two numbers, one with 4 significant figures and the other with 3 significant figures, are combined using the math operations given below. Which operation can give a result with fewer than 3 significant figures?
   a. addition
   b. subtraction
   c. multiplication
   d. division

   ANS: B PTS: 1 DIF: 2

NARRBEGIN: 1.4

1.4 Physical Quantities and Units of Measure

NARREND

12. A room in a house has a floor area of 160 ft^2. Which of the following is most likely the approximate volume of the room?
   a. 4000 m^3
   b. 400 m^3
   c. 40 m^3
   d. 4 m^3

   ANS: C PTS: 1 DIF: 2

13. In 1983 the standard meter was redefined to what it is currently. What was the previous definition from 1960 based on?
   a. specific alloy bar housed at Sevres, France
   b. wavelength of light emitted by certain krypton atoms
   c. distance from the Earth's equator to the North Pole
   d. the distance light travels in a certain fraction of a second

   ANS: B PTS: 1 DIF: 1

14. The current standard definition for the second has been based on which of the following?
   a. characteristic frequency of the light from cesium atoms
   b. average solar day
   c. sidereal day

d. Greenwich Civil Time

ANS: A PTS: 1 DIF: 1

15. In mechanics, physicists use three basic quantities to derive additional quantities. Mass is one of the three quantities. What are the other two?
a. length and force
b. power and force
c. length and time
d. force and time

ANS: C PTS: 1 DIF: 1

16. The prefixes which are abbreviated p, n, and T represent which of the following?
a. 10^{-2}, 10^{-6}, and 10^{15}
b. 10^{-9}, 10^{6}, and 10^{10}
c. 10^{-12}, 10^{-9}, and 10^{12}
d. 10^{-15}, 10^{-6}, and 10^{15}

ANS: C PTS: 1 DIF: 1

17. The ratio M/m of the prefixes M and m has what value?
a. 10^{3}
b. 10^{6}
c. 10^{9}
d. 10^{18}

ANS: C PTS: 1 DIF: 2

18. One year is about _____ seconds while one day is exactly _____ seconds.
a. 3.16×10^{7}, 86,400
b. 5.26×10^{5}, 86,400
c. 3.16×10^{7}, 8640
d. 1.04×10^{6}, 36,000

ANS: A PTS: 1 DIF: 2

19. On planet Q the standard unit of volume is called the guppy. Space travelers from Earth have determined that one liter = 38.2 guppies. How many guppies are in 200 liters?
a. 70.2 guppies
b. 9.74 guppies
c. 5.24 guppies
d. 7640 guppies

ANS: D PTS: 1 DIF: 2

20. On planet Z, the standard unit of length is the foose. Ann the Astronaut is 5.90 feet tall on Earth. She lands on planet Z and is measured to be 94 foosi tall. Her partner Rachael is 83 foosi tall. How tall is Rachael on Earth?
a. 5.2 feet
b. 5.5 feet
c. 5.8 feet
d. 6.3 feet

ANS: A PTS: 1 DIF: 2

21. A furlong is a distance of 220 yards. A fortnight is a time period of two weeks. A horse is running at a speed of 4.00 yards per second. What is his speed in furlongs per fortnight?
a. 2200 furlongs/fortnight
b. 4980 furlongs/fortnight
c. 11,000 furlongs/fortnight
d. 22,000 furlongs/fortnight

ANS: D PTS: 1 DIF: 2

22. A cereal box has the dimensions of 0.19 m × 0.28 m × 0.080 m. If there are 3.28 feet per meter, then what is the volume of the box in cubic feet?
a. 0.0043 cubic feet
b. 0.15 cubic feet
c. 0.046 cubic feet
d. 0.0014 cubic feet

ANS: B PTS: 1 DIF: 2

23. The distance to the Andromeda Galaxy is estimated at about 2×10^6 light years. A light year is the distance traveled by light in one year; if the speed of light is 3×10^8 m/s, about how far is it from our galaxy to Andromeda? (1 year = 3.15×10^7 s)
    a. 10×10^{15} m
    b. 1×10^{18} m
    c. 2×10^{22} m
    d. 6×10^{12} m

    ANS: C PTS: 1 DIF: 2

24. A cement truck can pour 40 cubic yards of cement per hour. Express this in ft^3/min.
    a. 2/3 ft^3/min
    b. 18 ft^3/min
    c. 6 ft^3/min
    d. 2.0 ft^3/min

    ANS: B PTS: 1 DIF: 2

25. Water flows into a swimming pool at the rate of 12 gal/min. The pool is 16 ft wide, 32 ft long and 6.0 ft deep. How long does it take to fill? (1 U.S. gallon = 231 cubic inches)
    a. 32 hours
    b. 64 hours
    c. 48 hours
    d. 24 hours

    ANS: A PTS: 1 DIF: 2

26. When NASA was communicating with astronauts on the moon, the time from sending on the Earth to receiving on the moon was 1.28 s. Find the distance from Earth to the moon. (The speed of radio waves is 3.00×10^8 m/s.)
    a. 240,000 km
    b. 384,000 km
    c. 480,000 km
    d. 768,000 km

    ANS: B PTS: 1 DIF: 2

27. The mass of the Sun is 2.0×10^{30} kg, and the mass of a hydrogen atom is 1.67×10^{-27} kg. If we assume that the Sun is mostly composed of hydrogen, how many atoms are there in the Sun?
    a. 1.2×10^{56} atoms
    b. 3.4×10^{56} atoms
    c. 1.2×10^{57} atoms
    d. 2.4×10^{57} atoms

    ANS: C PTS: 1 DIF: 2

28. The information on a one-gallon paint can is that the coverage, when properly applied, is 270 ft^2. One gallon is 231 in^3. What is the average thickness of the paint in such an application?
    a. 0.0036 in.
    b. 0.0059 in.
    c. 0.043 in.
    d. 0.053 in.

    ANS: B PTS: 1 DIF: 3

29. Which of the following conversion factors is not exact?
    a. 12 in. = 1 ft
    b. $2.54 \times 10^{-2}\,\mathrm{m} = 1\,\mathrm{in.}$
    c. $1\,\mathrm{in.}^2 = 6.45 \times 10^{-4}\,\mathrm{m}^2$
    d. $1\,\mathrm{kg} = 1000\,\mathrm{g}$

    ANS: C PTS: 1 DIF: 1

NARRBEGIN: 1.5

1.5 Dimensions and Units

NARREND

30. When SI units are plugged into an equation, it is found that the units balance. Which of the following can we expect to be true for this equation?
    a. The equation will be dimensionally correct.
    b. The equation will be dimensionally correct except sometimes in cases when the right-hand side of the equation has more than one term.
    c. The equation will not be dimensionally correct.
    d. All constants of proportionality will be correct.

    ANS: A PTS: 1 DIF: 1

31. Which formula is dimensionally consistent with an expression yielding a value for velocity? (v is velocity, x is distance, and t is time)
    a. v/t^2
    b. vx^2
    c. v^2/t
    d. v^2t/x

    ANS: D PTS: 1 DIF: 1

32. Which expression is dimensionally consistent with an expression that would yield a value for time^{-1}?(v is velocity, x is distance, and t is time)
    a. v/x
    b. v^2/x
    c. x/t
    d. v^2t

    ANS: A PTS: 1 DIF: 1

33. If the displacement of an object, x, is related to velocity, v, according to the relation $x = Av$, the constant, A, has the dimension of which of the following?
    a. volume
    b. length
    c. time
    d. area

    ANS: C PTS: 1 DIF: 1

34. The speed of a boat is often given in knots. If a speed of 5 knots were expressed in the SI system of units, the units would be:
    a. m
    b. s
    c. m/s
    d. kg/s

    ANS: C PTS: 1 DIF: 1

35. If v is velocity, x is position, and t is time, then which equation is not dimensionally correct?
    a. $t = x/v$
    b. $t^{-2} = v^2/x^2$
    c. $v = t/x$
    d. $t^2 = 2x^2/v^2$

    ANS: C PTS: 1 DIF: 1

36. Suppose an equation relating position, x, to time, t, is given by $x = bt^3 + ct^4$, where b and c are constants. The dimensions of b and c are respectively:
    a. T^3, T^4.
    b. $1/T^3$, $1/T^4$.
    c. L/T^3, L/T^4.
    d. $L^2 \times T^3$, $L^2 \times T^4$.

    ANS: C PTS: 1 DIF: 2

37. Areas always have dimensions _____ while volumes always have dimensions _____.
    a. m^2, m^3
    b. L^2, L^3
    c. Both a and b are correct.
    d. No answer is correct because of the “always.”

ANS: B PTS: 1 DIF: 1

38. The unit *slug* has what dimensions?
    a. L
    b. M
    c. L/T^2
    d. T/L^2

    ANS: B PTS: 1 DIF: 1

39. Volume can be measured in units of m^3. Which of the following unit combinations also result in volume?
    a. ft^2/m
    b. $cm \cdot ft$
    c. $cm^2 \cdot in.$
    d. $m^2 \cdot cm \cdot ft$

    ANS: C PTS: 1 DIF: 1

NARRBEGIN: 1.6

1.6 Algebra and Simultaneous Equations

NARREND

40. Note the expression: $y = x^2$. Which statement is most consistent with this expression?
    a. if *y* doubles, then *x* quadruples
    b. *y* is greater than *x*
    c. if *x* doubles, then *y* doubles
    d. if *x* doubles, then *y* quadruples

    ANS: D PTS: 1 DIF: 1

41. Note the expression: $y = A/x^2$. Which statement is most consistent with this expression?
    a. *y* is less than *A*
    b. if *x* is doubled, *y* is multiplied by a factor of four
    c. if *x* is halved, *y* is multiplied by a factor of four
    d. *y* is greater than *x*

    ANS: C PTS: 1 DIF: 2

42. For which of the values below is $x > x^3$?
    a. $x = -1.5$
    b. $x = 0$
    c. $x = 1.0$
    d. $x = 1.5$

    ANS: A PTS: 1 DIF: 1

NARRBEGIN: 1.7

1.7 Trigonometry

NARREND

43. Consider the cosine of any angle between 35° and 40°. If the angle were doubled, what would happen to the cosine of the angle.
    a. It would halve.
    b. It would decrease to less than half its original value.
    c. It would decrease but be more than half its original value.
    d. In different cases, it could do any of the above.

    ANS: B PTS: 1 DIF: 2

44. A high fountain of water is in the center of a circular pool of water. You walk the circumference of the pool and measure it to be 170 meters. You then stand at the edge of the pool and use a protractor to gauge the angle of elevation of the top of the fountain. It is 51°. How high is the fountain?

a. 17 m
b. 23 m
c. 30 m
d. 33 m

ANS: D PTS: 1 DIF: 3

45. A right triangle has sides 5.0 m, 12 m, and 13 m. The largest angle not 90° of this triangle is nearest:

a. 21°.
b. 23°.
c. 67°.
d. Not attainable since this is not a right triangle.

ANS: C PTS: 1 DIF: 2

46. If $\varphi = 90° - \theta$, what is the value of $\sin^2 \varphi + \sin^2 \theta$?

a. 0
b. 1
c. –1
d. The answer depends on θ.

ANS: B PTS: 1 DIF: 2

47. A triangle has sides of lengths 14 cm and 50 cm. If the triangle is a right triangle, which of the following could be the length of the third side?

a. 26 cm
b. 36 cm
c. 48 cm
d. 64 cm

ANS: C PTS: 1 DIF: 2

48. A train slowly climbs a 600-m mountain track which is at an angle of 10.0° with respect to the horizontal. How much altitude does it gain?

a. 86.8 m
b. 104 m
c. 106 m
d. 492 m

ANS: B PTS: 1 DIF: 2

49. If θ and ϕ are each first quadrant angles, which of the following must be true if $\sin \theta = \cos \phi$?

a. $\theta + \phi = \pi$ rad
b. $\theta + \phi = 90°$
c. $\theta - \phi = \frac{\pi}{2}$ rad
d. $\theta = \phi$

ANS: B PTS: 1 DIF: 2

50. Suppose the interior angles of a triangle are ϕ_1, ϕ_2, and ϕ_3, with $\phi_1 > \phi_2 > \phi_3$. Which side of the triangle is the shortest?

a. The side opposite ϕ_1.
b. The side opposite ϕ_2.
c. The side opposite ϕ_3.
d. More information is needed unless the triangle is a right triangle.

ANS: C PTS: 1 DIF: 2

NARRBEGIN: 1.8
1.8 Vectors
NARREND