Chapter 2

Chapter Opener

**Math in the Real World (p. 61)**

distance = rate \times time
\[ = \frac{10.5 \text{ meters}}{1 \text{ second}} \times 10 \text{ seconds} \]
\[ = 105 \text{ meters} \]
The athlete ran about 105 meters.

**Prerequisite Skills Quiz (p. 62)**

1. A numerical expression consists only of numbers and operations. A variable expression consists of numbers, operations, and at least one variable.

2. \[ \begin{align*}
3.8 & \quad \frac{3.8}{10} & \quad \frac{3.8}{10} \\
+ & \quad .7 & \quad \frac{.7}{10} & \quad \frac{.7}{10} \\
& \quad & \quad & \quad \\
& \quad 4.5 & \quad \frac{4.5}{20} & \quad \frac{4.5}{20} \\
\times & \quad & \quad & \quad \\
& \quad 9.4 & \quad \frac{9.4}{20} & \quad \frac{9.4}{20} \\
& \quad & \quad & \quad \\
& \quad 2.20 & \quad \frac{2.20}{51.70} & \quad \frac{2.20}{51.70} \\
\end{align*} \]

3. \[ 3.8 \frac{3.8}{10} + \frac{.7}{10} \]

4. \[ 4.5 \times \frac{9.4}{20} + \frac{2.20}{51.70} \]

5. \[ 2.1 \bar{6}93 \]

6. Expression: \[ x + 7 \]

7. Expression: \[ \frac{x}{4} \]

8. \[ -19 + 12 = -7 \]

9. \[ 8 - (-20) = 8 + 20 = 28 \]

10. \[ 6(-7) = -42 \]

Lesson 2.1

2.1 Checkpoint (pp. 64–65)

1. \[ 17 + 36 + 13 \]
   \[ = (36 + 17) + 13 \]
   \[ = 36 + (17 + 13) \]
   \[ = 36 + 30 \]
   \[ = 66 \]
   Commutative property of addition
   Associative property of addition
   Add 17 and 13.
   
2. \[ 8(-3)(5) \]
   \[ = (-3)(8)(5) \]
   \[ = (-3)(40) \]
   \[ = -120 \]
   Commutative property of multiplication
   Multiply 8 and 5.
   Multiply -3 and 40.
   
3. \[ 3.4 + 9.7 + 7.6 \]
   \[ = (3.4 + 9.7) + 7.6 \]
   \[ = (9.7 + 3.4) + 7.6 \]
   \[ = 9.7 + (3.4 + 7.6) \]
   \[ = 9.7 + 11 \]
   \[ = 20.7 \]
   Use order of operations.
   Commutative property of addition
   Associative property of addition
   Add 3.4 and 7.6.

4. \[ 5x^2y = 5(-6)^2(20) \]
   Substitute -6 for \(x\) and 20 for \(y\).
   \[ = 5(36)(20) \]
   Evaluate power.
   \[ = [5(36)](20) \]
   Use order of operations.
   \[ = [(36)5](20) \]
   Commutative property of multiplication
   \[ = (36)(5)(20) \]
   Associative property of multiplication
   \[ = (36)(100) \]
   Multiply 5 and 20.
   \[ = 3600 \]
   Multiply 36 and 100.

5. \[ m + 5 + 9 = (m + 5) + 9 = m + (5 + 9) = m + 14 \]

6. \[ 6(4k) = (6\cdot 3)(k) = 18k \]

7. \[ 4 + x + (-1) = (4 + x) + (-1) \]
   \[ = (x + 4) + (-1) \]
   \[ = x + [4 + (-1)] \]
   \[ = x + 3 \]

8. \[ (2r)(-5) = (2)(-5)r = (2\cdot -5)(r) = -10r \]

9. \[ z^4 \cdot 1 = z^4 \] illustrates the identity property of multiplication.

10. 100 centimeters = 1 meter
    
    Factor 1: \[ \frac{100 \text{ centimeters}}{1 \text{ meter}} \]
    
    Factor 2: \[ \frac{1 \text{ meter}}{100 \text{ centimeters}} \]
    
    Use factor 2.
    
    \[ 400 \text{ centimeters} = 400 \text{ centimeters} \cdot \frac{4 \text{ meter}}{100 \text{ centimeters}} \]
    \[ = 4 \text{ meters} \]

2.1 Guided Practice (p. 66)

1. \[ 4 + (3 + 9) = (4 + 3) + 9 \]
   Associative property of addition

2. First, use order of operations to get \[ 5 \cdot 17 \cdot 2 = (5 \cdot 17) \cdot 2 \]. Next, use the associative property of multiplication to get \[ 5 \cdot (17 \cdot 2) \]. Use the commutative property of multiplication to obtain \[ 5 \cdot (2 \cdot 17) \]. Finally, use the associative property of multiplication of get \[ (5 \cdot 2) \cdot 17 \]. Multiply: \[ 10 \cdot 17 = 170 \].

3. \[ (26 + 18) + 34 \]
   \[ = (18 + 26) + 34 \]
   \[ = 18 + (26 + 34) \]
   \[ = 18 + 60 \]
   \[ = 87 \]
   \[ = 78 \]
   Commutative property of addition
   Associative property of addition
   Add 26 and 34.
   Add 18 and 60.

4. \[ -4(9)(-5) \]
   \[ = -4(5)(9) \]
   \[ = -4(5)(9) \]
   Commutative property of multiplication
   \[ = 20(9) \]
   Multiply -4 and -5.
   \[ = 180 \]
   Multiply 20 and 9.
5. (3.45)(6.26)(0)  
   = (3.45)(0)(6.26)  
   Commutative property  
   of multiplication  
   = 0(6.26)  
   Multiply 3.45 and 0.  
   = 0  
   Multiply 0 and 6.26.  

6. When \( x = 5 \) and \( y = -2 \);  
   \( 33xy = 33(5)(-2) = 33(-10) = -330 \)  

7. When \( x = 5 \) and \( y = -2 \);  
   \( x \cdot 11 \cdot y^2 = (5) \cdot (11)(-2)^2 \)  
   \[ = 5 \cdot 11 \cdot 4 \]  
   \[ = 5 \cdot (11 \cdot 4) \]  
   \[ = 5 \cdot (4 \cdot 11) \]  
   \[ = (5 \cdot 4) \cdot 11 \]  
   \[ = 20 \cdot 11 \]  
   \[ = 220 \]  

8. When \( x = 5 \) and \( y = -2 \);  
   \( x^2 + y^3 + 15 = (5)^2 + (-2)^3 + 15 \)  
   \[ = 25 + (-8) + 15 \]  
   \[ = 25 + (-8) + 15 \]  
   \[ = (-8 + 25) + 15 \]  
   \[ = -8 + (25 + 15) \]  
   \[ = -8 + 40 = 32 \]  

9. \( x + 6 + 11 = (x + 6) + 11 = x + (6 + 11) = x + 17 \)  

10. \( 9(-5a) = [9(-5)](a) = -45a \)  

11. \( -2 + y + 8 = (-2 + y) + 8 \)  
    \[ = [y + (-2)] + 8 \]  
    \[ = y + [(-2) + 8] \]  
    \[ = y + 6 \]  

12. \( n + q = q + n \)  
    Commutative property  
    of addition  

13. \( -4ab = -4ba \)  
    Commutative property  
    of multiplication  

14. \( (3 \cdot 8) \cdot 2 = 3 \cdot (8 \cdot 2) \)  
    Associative property  
    of multiplication  

15. The wrong conversion factor was used.  

   Instead, use \( \frac{1}{16} \text{ pound} \)  
   \( \frac{1}{16} \text{ ounces} \)  
   \( 80 \text{ ounces} = 80 \frac{1}{16} \text{ ounces} \cdot \frac{1}{16} \text{ pound} = 5 \text{ pounds} \)  

2.1 Practice and Problem Solving (pp. 66–68)  

16. \( 32 + 16 + 8 \)  
   \[ = (32 + 16) + 8 \]  
   Use order of operations.  
   \[ = (16 + 32) + 8 \]  
   Commutative property of addition  
   \[ = 16 + (32 + 8) \]  
   Associative property of addition  
   \[ = 16 + 40 \]  
   Add 32 and 8.  
   \[ = 56 \]  
   Add 16 and 40.  

17. \( 15(-9)(2) \)  
   \[ = [15(-9)][2] \]  
   Use order of operations.  
   \[ = ((-9)15)(2) \]  
   Commutative property  
   of multiplication  
   \[ = (-9)(15)(2) \]  
   Associative property  
   of multiplication  
   \[ = (-9)(30) \]  
   Multiply 15 and 2.  
   \[ = -270 \]  
   Multiply \(-9\) and 30.  

18. \( 7 + 1 + 0 = 7 + 0 \)  
   Identity property of multiplication  
   \[ = 7 \]  
   Identity property of addition  

19. \( 45 + 29 + 55 \)  
   \[ = (45 + 29) + 55 \]  
   Use order of operations.  
   \[ = (29 + 45) + 55 \]  
   Commutative property of addition  
   \[ = 29 + (45 + 55) \]  
   Associative property of addition  
   \[ = 29 + 100 \]  
   Add 45 and 55.  
   \[ = 129 \]  
   Add 29 and 100.  

20. When \( a = 9 \) and \( b = -4 \);  
    5ab = 5(9)(-4) = 5(-4)(9) = -20(9) = -180  

21. When \( a = 9 \) and \( b = -4 \);  
    \( b(25a^2) = (-4)(25)(9)^2 \)  
    \[ = (-4)(25)(81) \]  
    \[ = (-4)(25)(81) \]  
    \[ = -100(81) \]  
    \[ = -8100 \]  

22. When \( a = 9 \) and \( b = -4 \);  
    \( 11 + 4b + a = 11 + 4(-4) + 9 \)  
    \[ = 11 + (-16) + 9 \]  
    \[ = [11 + (-16)] + 9 \]  
    \[ = (-16) + 11 + 9 \]  
    \[ = (-16) + (11 + 9) \]  
    \[ = (-16) + 20 \]  
    \[ = 4 \]  

23. When \( a = 9 \) and \( b = -4 \);  
    \( 3a + b^2 + 13 = 3(9) + (-4)^2 + 13 \)  
    \[ = 3(9) + 16 + 13 \]  
    \[ = 27 + 16 + 13 \]  
    \[ = (27 + 16) + 13 \]  
    \[ = (16 + 27) + 13 \]  
    \[ = 16 + (27 + 13) \]  
    \[ = 16 + 40 \]  
    \[ = 56 \]  

24. \( x + 17 + 12 = (x + 17) + 12 = x + (17 + 12) = x + 29 \)  

25. \( 3 + j + (-9) = (3 + j) + (-9) \)  
    \[ = (j + 3) + (-9) \]  
    \[ = j + [3 + (-9)] \]  
    \[ = j + (-6) \]  
    \[ = j - 6 \]  

26. \( -8(6c) = [-8(6)]c = -48c \)
Chapter 2 continued

27. \((5y)(26) = 5[26y] = 5[26](y) = 130y\)
28. \(mn + 0 = mn\) \hspace{0.5cm} \text{Identity property of addition}
29. \(19 \cdot 5^3 = 5^3 \cdot 19\) \hspace{0.5cm} \text{Commutative property of multiplication}
30. \((2x + 3y) + z = 2x + (3y + z)\) \hspace{0.5cm} \text{Associative property of addition}
31. \((-7)(1) = -7\) \hspace{0.5cm} \text{Identity property of multiplication}
32. \(5280\text{ feet} = 1\text{ mile}\)
   \[
   \text{Factor 1:} \quad \frac{5280\text{ feet}}{1\text{ mile}} \quad \text{Factor 2:} \quad \frac{1\text{ mile}}{5280\text{ feet}}
   \]
   Use factor 1.
   
   \[4\text{ miles} = 4\text{ miles} \cdot \frac{5280\text{ feet}}{1\text{ mile}} = 21,120\text{ feet}\]

33. \(1\text{ kilogram} = 1000\text{ grams}\)
   \[
   \text{Factor 1:} \quad \frac{1\text{ kilogram}}{1000\text{ grams}} \quad \text{Factor 2:} \quad \frac{1000\text{ grams}}{1\text{ kilogram}}
   \]
   Use factor 2.
   
   \[7.5\text{ kilograms} = 7.5\text{ kilograms} \cdot \frac{1000\text{ grams}}{1\text{ kilogram}} = 7500\text{ grams}\]

34. \(60\text{ seconds} = 1\text{ minute}\)
   \[
   \text{Factor 1:} \quad \frac{60\text{ seconds}}{1\text{ minute}} \quad \text{Factor 2:} \quad \frac{1\text{ minute}}{60\text{ seconds}}
   \]
   Use factor 2.
   
   \[360\text{ seconds} = 360\text{ seconds} \cdot \frac{1\text{ minute}}{60\text{ seconds}} = 6\text{ minutes}\]

35. \(1\text{ square foot} = 144\text{ square inches}\)
   \[
   \text{Factor 1:} \quad \frac{1\text{ square foot}}{144\text{ square inches}} \quad \text{Factor 2:} \quad \frac{144\text{ square inches}}{1\text{ square foot}}
   \]
   Use factor 1.
   
   \[432\text{ square inches} = 432\text{ square inches} \cdot \frac{1\text{ square foot}}{144\text{ square inches}} = 3\text{ square feet}\]

36. The total number of calories is the sum of the three sources.
   \[144 + 108 + 56 = (144 + 108) + 56 = (108 + 144) + 56 = 108 + (144 + 56) = 108 + 200 = 308\]
   There are 308 Calories in a breakfast sandwich.

37. The total amount of money is the product of the hours worked each day, the wage per hour, and the number of days in a work week.
   \[4 \cdot 7 \cdot 5 = (4 \cdot 7) \cdot 5 = (7 \cdot 4) \cdot 5 = 7 \cdot (4 \cdot 5) = 7 \cdot 20 = 140\]
   You earn $140 each week.

38. \(1\text{ ton} = 2000\text{ pounds}\)
   \[
   \text{Factor 1:} \quad \frac{1\text{ ton}}{2000\text{ pounds}} \quad \text{Factor 2:} \quad \frac{2000\text{ pounds}}{1\text{ ton}}
   \]
   Use factor 2.
   
   \[110\text{ tons} = 110\text{ tons} \cdot \frac{2000\text{ pounds}}{1\text{ ton}} = 220,000\text{ pounds}\]
   Argentinosaurus weighed about 220,000 pounds.

39. \(1\text{ square yard} = 9\text{ square feet}\)
   \[
   \text{Factor 1:} \quad \frac{1\text{ square yard}}{9\text{ square feet}} \quad \text{Factor 2:} \quad \frac{9\text{ square feet}}{1\text{ square yard}}
   \]
   Use factor 1.
   
   \[2808\text{ square feet} = 2808\text{ square feet} \cdot \frac{1\text{ square yard}}{9\text{ square feet}} = 312\text{ square yards}\]
   A regulation tennis court has an area of 312 square yards.

40. No. Sample answer: You have to put on your socks before you put on your shoes.

41. \(1.25 + 1.38 + 0.75\)
   \[= (1.25 + 1.38) + 0.75\]
   Use order of operations.
   \[= (1.38 + 1.25) + 0.75\]
   Commutative property of addition
   \[= 1.38 + (1.25 + 0.75)\]
   Associative property of addition
   \[= 1.38 + 2\]
   Add 1.25 and 0.75.
   \[= 3.38\]
   Add 1.38 and 2.

42. \(44 + 19 + 16 + 31\)
   \[= (44 + 19) + 16 + 31\]
   Use order of operations.
   \[= 44 + (19 + 16) + 31\]
   Associative property of addition
   \[= 44 + (16 + 19) + 31\]
   Commutative property of addition
   \[= (44 + 16) + 19 + 31\]
   Associative property of addition
   \[= 60 + 19 + 31\]
   Add 44 and 16.
   \[= 60 + (19 + 31)\]
   Use order of operations.
   \[= 60 + 50\]
   Add 19 and 31.
   \[= 110\]
   Add 60 and 50.
43. \(4(20)(25)(-5) = 4[(20)(25)](-5)\)  
\(= 4[(25)(20)](-5)\)  
\(= [4(25)](20)(-5)\)  
\(= 100(20)(-5)\)  
\(= 2000(-5)\)  
\(= -10,000\)

44. When \(x = -5, y = 3, z = 2;\)
\(x^2yz^2 = (-5)^2(3)(2)^2\)
\(= (25)(3)(4)\)
\(= [(25)(3)](4)\)
\(= (3)(25)(4)\)
\(= 3(100)\)
\(= 300\)

45. When \(x = -5, y = 3, z = 2;\)
\(15yxyz = 15(3)(-5)(2)\)
\(= [15(3)](-5)(2)\)
\(= 15(3)(-10)\)
\(= [15(3)](-10)\)
\(= 3(15)(-10)\)
\(= 3(-150)\)
\(= -450\)

46. When \(x = -5, y = 3, z = 2;\)
\(2x + 9y + 5z = 2(-5) + 9(3) + 5(2)\)
\(= -10 + 27 + 10\)
\(= (-10 + 27) + 10\)
\(= [27 + (-10)] + 10\)
\(= 27 + (-10 + 10)\)
\(= 27 + 0\)
\(= 27\)

47. a. \(4.7 + 8.5 + 6.3 = (4.7 + 8.5) + 6.3\)
\(= (8.5 + 4.7) + 6.3\)
\(= 8.5 + (4.7 + 6.3)\)
\(= 8.5 + 11\)
\(= 19.5\)

The sum of the surveyor’s measurements is 19.5 meters.

b. Mean: \(\frac{4.7 + 8.5 + 6.3}{3} = \frac{19.5}{3} = 6.5\)

The mean depth is 6.5 meters.

48. a. \(5 \text{ yards} = 5 \text{ yards \times} \frac{3 \text{ feet}}{1 \text{ yard}} \times \frac{12 \text{ inches}}{1 \text{ foot}}\)
\(= 3 \times 12\)
\(= 3 \times 5 \times 12\)
\(= 3 \times 60\)
\(= 180\)

A swordfish is 180 inches long.

b. \(5 \times 3 \times 12 = (5 \times 3) \times 12\)
\(= (3 \times 5) \times 12\)
\(= 3 \times (5 \times 12)\)
\(= 3 \times 60\)
\(= 180\)

A swordfish is \(\frac{180}{10} = 18\) times as long as a mackerel.

49. a. 8 - 3 = 5

b. 3 - 8 = -5

c. 10 ÷ 5 = 2

d. 5 ÷ 10 = \frac{1}{2}

Sample answer: Subtraction and division are not commutative or associative operations because changing the order or grouping in an expression gives a different result.

50. \(\frac{a}{1} = a\)

51. a. $12 - $4 = $8

b. The profit on each box is $8.

c. If each member sells 25 boxes, the total profit is $2000.

52. a. The sum of the numbers in each pair is 101.

b. There are 100 pairs of numbers.

c. If \(S\) is the sum of the integers 1 through 100, then \(S = 100 \times 101 = 10,100\).

d. The sum of the integers 1 through 100 is \(S\), or \(S = 10,100 \div 2 = 5050\).

Sample answer: You must divide by 2 because you only want to add one set of the integers.

2.1 Mixed Review (p. 68)

53. \(3^4 = 3 \times 3 \times 3 = 81\)

54. \(2^3 = 2 \times 2 \times 2 \times 2 = 32\)

55. \(10^3 = 10 \times 10 \times 10 = 1000\)

56. \(2 + 3\times 8 = 2 + 24 = 26\)
Chapter 2 continued

57. \[ 7 + 6^2 + 9 = 7 + 36 + 9 = 7 + 4 = 11 \]
58. \[ 19 + 5 \cdot 11 - 4 = 19 + 55 - 4 = 74 - 4 = 70 \]
59. \[
\begin{align*}
\text{Total cost} &= \text{Cost per box of spaghetti} \times \text{Number of boxes of spaghetti} + \text{Cost per jar of sauce} \times \text{Number of jars of sauce} \\
&= \$1.19 \times 3 + \$2.39 \times 4 \\
&= \$3.57 + \$9.56 \\
&= \$13.13
\end{align*}
\]
The total cost of the items is $13.13.

60–63.

60. Begin at the origin. Move 4 units to the right, then 3 units up. Point P is located in Quadrant I.
61. Begin at the origin. Move 2 units to the right, then 2 units down. Point Q is located in Quadrant IV.
62. Begin at the origin. Move 5 units to the left. Point R is located on the x-axis.
63. Begin at the origin. Move 1 unit to the left, then 4 units down. Point S is located in Quadrant III.

2.1 Standardized Test Practice (p. 68)

64. B
65. H

Student Reference: Perimeter and Area

Checkpoint (p. 70)

1. \[ P = 2l + 2w = 2(11) + 2(7) = 22 + 14 = 36 \text{ ft} \]
2. \[ P = 4s = 4(8.5) = 34 \text{ m} \]
3. \[ P = a + b + c = 27 + 22 + 24 = 49 + 24 = 73 \text{ in.} \]
4. \[ A = s^2 = 18^2 = 324 \text{ in.}^2 \]
5. \[ A = lw = 30 \times 20 = 600 \text{ cm}^2 \]
6. \[ A = \frac{1}{2}bh = \frac{1}{2} \times 10 \times 6 = 5 \times 6 = 30 \text{ m}^2 \]
7. \[ P = 2l + 2w = 2(84) + 2(50) = 168 + 100 = 268 \text{ ft} \]
\[ A = lw = 84 \times 50 = 4200 \text{ ft}^2 \]
8. a. Square A: \[ P = 4s = 4(3) = 12 \text{ ft} \]
\[ \text{Square B: } P = 4s = 4(6) = 24 \text{ ft} \]
b. Square A: \[ A = s^2 = 3^2 = 9 \text{ ft}^2 \]
\[ \text{Square B: } A = s^2 = 6^2 = 36 \text{ ft}^2 \]
c. Sample answer: The perimeter of square B is twice as large as the perimeter of square A. The area of square B is 4 times as large as the area of square A.

Lesson 2.2

2.2 Checkpoint (p. 72)

1. \[ 3(8 + 5) = 3(8) + 3(5) = 24 + 15 = 39 \]
2. \[ (2 + 9)2 = 2(2) + 9(2) = 4 + 18 = 22 \]
3. \[ 6(11 - 4) = 6(11) - 6(4) = 66 - 24 = 42 \]
4. \[ 4 - 13 \cdot (-5) = 3 \cdot (-5) - 14 \cdot (-5) \\
\quad = -15 - (-70) \\
\quad = -15 + 70 \\
\quad = 55 \]
5. \[ 4(105) = 4(100 + 5) = 4(100) + 4(5) = 400 + 20 = 420 \]
6. \[ 3(97) = 3(100 - 3) = 3(100) - 3(3) = 300 - 9 = 291 \]
7. \[ 5(2.9) = 5(3 - 0.1) = 5(3) - 5(0.1) = 15 - 0.5 = 14.5 \]
8. \[ 8(7.02) = 8(7 + 0.02) \\
\quad = 8(7) + 8(0.02) \\
\quad = 56 + 0.16 \\
\quad = 56.16 \]
9. \[ 8(x + 2) = 8x + 8(2) = 8x + 16 \]
10. \[ (7 - 9)(-4) = 7(-4) - (-4) \\
\quad = -28 - (-4)t \\
\quad = -28 + 4t \\
\quad = 4t - 28 \]
11. \[ 9(3m + 5) = 9(3m) + 9(5) = 27m + 45 \]
12. \[ -2(6y - 4) = -2(6y) - (-2)(4) \\
\quad = -12y - (-8) \\
\quad = -12y + 8 \]

2.2 Guided Practice (p. 73)

1. The distributive property is illustrated by the statement \[ 3(4 - 9) = 3(4) - 3(9). \]
2. No; Sample answer: By the distributive property, \[ 2(x + 1) = 2x + 2(1) = 2x + 2. \]
\[ 2x + 2 \neq 2x + 1, \text{ so } 2(x + 1) \text{ and } 2x + 1 \text{ are not equivalent variable expressions}. \]
3. \[ 3(96) = 3(100 - 4) = 3(100) - 3(4) = 300 - 12 = 288 \]
4. \[ 6(103) = 6(100 + 3) = 6(100) + 6(3) = 600 + 18 = 618 \]
5. \[ 2(8.95) = 2(9 - 0.05) \\
\quad = 2(9) - 2(0.05) \\
\quad = 18 - 0.1 \\
\quad = 17.9 \]
6. \[ 4(7.09) = 4(7 + 0.09) \\
\quad = 4(7) + 4(0.09) \\
\quad = 28 + 0.36 \\
\quad = 28.36 \]
7. \[ 2(x - 6) = 2x - 2(6) = 2x - 12 \]
8. \[ (y + 1)(-3) = y(-3) + 1(-3) \\
\quad = -3y - (-3) \\
\quad = -3y + 33 \]
9. \[ 5(4x + 9) = 5(4x) + 5(9) = 20x + 45 \]
10. \[ -4(2n - 7) = -4(2n) - (-4)(7) \\
\quad = -8n - (-28) \\
\quad = -8n + 28 \]
11. \( A = \text{length} \times \text{width} = (20 + 1)r \times 15 \)
   \[ A = \text{Area of living room} + \text{Area of game room} = \text{length} \times \text{width} + \text{length} \times \text{width} = 20 \times 15 + r \times 15 = 300 + 15r \]
   \[ (20 + 1)r = 20(15) + r(15) = 300 + 15r \]

2.2 Practice and Problem Solving (pp. 74–75)

12. \( 2(5 + 3) = 2(5) + 2(3) = 10 + 6 = 16 \)
13. \( 5(9 - 3) = 5(9) - 5(3) = 45 - 15 = 30 \)
14. \( (4 \times 10^7) = 4 \times 10^7 - 10^7 = 28 - 70 = -42 \)
15. \( (7.2 + 1.9)^2 = 7.2(2) + 1.9(2) = 14.4 + 3.8 = 18.2 \)
16. \( -10(18 + 8) = -10(18) + (-10)(8) = -180 + (-80) = -260 \)
17. \( (6 + 21)(-3) = 6(-3) + 21(-3) = -18 + (-63) = -81 \)
18. \( (12 - 7)(-4) = 12(-4) - 7(-4) = -48 + 28 = -20 \)
19. \( 6(-2.3 + 3.8) = 6(-2.3) + 6(3.8) = -13.8 + 22.8 = 9 \)
20. \( 4(98) = 4(100 - 2) = 4(100) - 4(2) = 400 - 8 = 392 \)
21. \( 7(109) = 7(100 + 9) = 7(100) + 7(9) = 700 + 63 = 763 \)
22. \( (211)(-3) = (200 + 11)(-3) = 200(-3) + 11(-3) = -600 + (-33) = -633 \)
23. \( -5(396) = -5(400 - 4) = -5(400) - (-5)(4) = -2000 - (-20) = -2000 + 20 = -1980 \)
24. \( 8(3.1) = 8(3 + 0.1) = 8(3) + 8(0.1) = 24 + 0.8 = 24.8 \)
25. \( 2(1.99) = 2(2 - 0.01) = 2(2) - 2(0.01) = 4 - 0.02 = 3.98 \)
26. \( -6(10.95) = -6(11 - 0.05) = -6(11) - (-6)(0.05) = -66 - (-0.3) = -66 + 0.3 = -65.7 \)
27. \( (4.02)(-9) = (4 + 0.02)(-9) = 4(-9) + 0.02(-9) = -36 + (-0.18) = -36.18 \)
28. \( 4(x - 2) = 4(x) - 4(2) = 4x - 8 \)
29. \( 3(y + 9) = 3(y) + 3(9) = 3y + 27 \)
30. \( -2(3 - r) = -2(3) - (-2)(r) = -6 - (-2r) = -6 + 2r = 2r - 6 \)
31. \( (s + 20)(-7) = s(-7) + 20(-7) = -7s + (-140) = -7s - 140 \)
32. \( 6(2p + 1) = 6(2p) + 6(1) = 12p + 6 \)
33. \( -5(5q - 4) = -5(5q) - (-5)(4) = -25q - (-20) = -25q + 20 \)
34. \( 9(11 - 6m) = 9(11) - 9(6m) = 99 - 54m = -54m + 99 \)
35. \( (-2n - 3)(-8) = (-2n)(-8) - 3(-8) = 16n - (-24) = 16n + 24 \)
36. \( \text{Number of players in the NBA} = \text{of teams} \left( \frac{\text{Number of healthy players}}{\text{of injured players}} \right) \)
   \[ = 29(12 + 3) = 29(12) + 29(3) = 348 + 87 = 435 \]
A maximum of 435 players can be in the NBA.
37. \( 295 \text{ in./year} = 300 \text{ in./year} \); so the total snowfall will be about \( 5(300) = 1500 \) in.;
   \( \text{Total snowfall} = \text{Inches of snow} \times \text{Number in 5 years} \times \text{each year} \) of years
   \[ = 295 \times 5 = (300 - 5)5 = 300(5) - 5(5) = 1500 - 25 = 1475 \]
   In 5 years, the total snowfall will be about 1475 inches.
The estimation is close to the answer.
38. \( A = \ell w = (3x - 2)4 = 3x(4) - 2(4) = 12x - 8 \)
The area is \((12x - 8)\) square units.
39. \( A = \frac{1}{2}bh \)
   \[ = \frac{1}{2} \cdot 18(5a + 7) = 9(5a + 7) = 9(5a) + 9(7) = 45a + 63 \]
The area is \((45a + 63)\) square units.
Chapter 2 continued

40. \( A = \frac{1}{2}bh \)
    \[ = \frac{1}{2}(6 - 2y)13 \]
    \[ = \left[ \frac{1}{2}(6) - \frac{1}{2}(2y) \right]13 \]
    \[ = (3 - y)13 \]
    \[ = 3(13) - y(13) \]
    \[ = 39 - 13y \]
    \[ = -13y + 39 \]

The area is \((-13y + 39)\) square units.

41. \( 5(7 + 2 + 4) = 5(7) + 5(2) + 5(4) \)
    \[ = 35 + 10 + 20 \]
    \[ = 45 + 20 \]
    \[ = 65 \]

42. \(-3(9 - 1 + 6) = -3(9) - (-3)(1) + (-3)(6) \)
    \[ = -27 - (-3) + (-18) \]
    \[ = -27 + 3 + (-18) \]
    \[ = -24 + (-18) \]
    \[ = -42 \]

43. \( (21 - 11 - 3)4 = 21(4) - 11(4) - 3(4) \)
    \[ = 84 - 44 - 12 \]
    \[ = 40 - 12 \]
    \[ = 28 \]

44. a. \( W = 1.9(a + b + c) \)
    \[ = 1.9(a) + 1.9(b) + 1.9(c) \]
    \[ = 1.9a + 1.9b + 1.9c \]

b. When \( a = 132, b = 91, \) and \( c = 85; \)
    \[ W = 1.9a + 1.9b + 1.9c \]
    \[ = 1.9(132) + 1.9(91) + 1.9(85) \]
    \[ = 250.8 + 172.9 + 161.5 \]
    \[ = 585.2 \]

The weight of the pumpkin is approximately 585 pounds.

45. a. \( W = 4400(40 - d) \)
    \[ = 4400(40) - 4400(d) \]
    \[ = 176,000 - 4400d \]
    \[ = -4400d + 176,000 \]

b. When \( d = 15; \) \( W = -4400d + 176,000 \)
    \[ = -4400(15) + 176,000 \]
    \[ = -66,000 + 176,000 \]
    \[ = 110,000 \]

The weight of the corn in the silo is about 110,000 pounds.

45. —CONTINUED—

45. c. Amount of corn herd eats a day = \( \frac{\text{Pounds eaten per cow of cows}}{\text{of days}} \)
    \[ = 10 \times 100 \]
    \[ = 1000 \]

The herd eats 1000 pounds of corn a day.

Number of days \( = \frac{\text{Amount of corn in silo}}{\text{Amount of corn needed each day}} \)
    \[ = \frac{110,000}{1000} \]
    \[ = 110 \]

The corn will last 110 days.

46. \( x(x + 9) = x(x) + x(9) = x^2 + 9x \)

47. \( m(5 - m) = m(5) - m(m) = 5m - m^2 = -m^2 + 5m \)

48. \( (2u - 7u) = 2u(u) - 7(u) = 2u^2 - 7u \)

49. \( -3y(y + 8) = -3y(y) + (-3y)(8) \)
    \[ = -3y^2 + (-24y) \]
    \[ = -3y^2 - 24y \]

50. a. Because the perimeter is 500 feet, \( 2l + 2w = 500. \)
    Using only one length and one width of the rectangle would have a distance of 250 feet. So, \( l + w = 250. \)

45. b. \( A = lw = x(250 - x) = x(250) - x(x) = 250x - x^2 \)

45. c. When \( x = 160; w = 250 - x = 250 - 160 = 90 \)

The width of the pen is 90 feet.

When \( x = 160; A = 250x - x^2 \)
    \[ = 250(160) - (160)^2 \]
    \[ = 40,000 - 25,600 \]
    \[ = 14,400 \]

The area of the pen is 14,400 square feet.

2.2 Mixed Review (p. 75)

51. \( 20 + (-9) = 11 \)

52. \( -34 + 16 = -18 \)

53. \( -81 - 58 = -81 + (-58) = -139 \)

54. \( 65 - (-27) = 65 + 27 = 92 \)

55. Mean: \( \frac{-15 + (-7) + 8 + 3 + (-9)}{5} = \frac{-20}{5} = -4 \)

The mean of the temperatures is \(-4^\circ\text{F}.\)

56. \( (x + 5y) + 2 = x + (5y + 2) \) Associative property of addition

57. \( 3m + 2n = 2n + 3m \) Commutative property of addition

58. \( r^2 \cdot s = sr^2 \) Commutative property of multiplication

59. \( c^1 \cdot 1 = c^1 \) Identity property of multiplication
Chapter 2 continued

2.2 Standardized Test Practice (p. 75)

60. A: \(-3(-7 + 2x) = -3(-7) + (-3)(2x)\)
   \[= 21 + (-6x)\]
   \[= 21 - 6x\]
61. I; \(A = P \times W = (4y + 8)5 = 4y(5) + 8(5) = 20y + 40\)
62. Sample answer:
   Method 1
   Find the cost of one ticket and one popcorn-and-drink combo. Then multiply the result by 2.
   \[2(9.00 + 5.25) = 2(14.25) = 28.50\]
   Method 2
   Find the cost of two tickets and the cost of two popcorn-and-drink combos. Then add the costs.
   \[2(9.00) + 2(5.25) = 18.00 + 10.50 = 28.50\]
   The total amount spent was $28.50.

Student Reference: Rates and Unit Analysis

Checkpoint (p. 77)

1. \(17 \text{ m}
   \frac{1 \text{ sec}}{}\)
2. \(\frac{360}{1 \text{ oz}}\)
3. \(1.5 \text{ in.}
   \frac{1 \text{ h}}{}\)
4. \(0.75 \text{ lb}
   \frac{1 \text{ ft}^2}{1 \text{ lb}}\)
5. Total \(= \frac{\text{Number of days}}{\text{Number of pounds per day}} \times \frac{\text{30 lb}}{1 \text{ day}}\)
   \[= 5 \text{ days} \times 30 \text{ lb} = 150 \text{ lb}\]
   The cow eats 150 pounds in 5 days.
6. \(d = rt = \frac{23}{\text{in.}} \times 4 = 92 \text{ in.}\)
   The snail can travel 92 inches in 4 hours.
7. \(A = 4w = 5 \times 4 = 20\)
   The area is 20 square yards.
   Total cost \(= \frac{\text{Cost per square yard}}{\text{Number of square yards}} \times 20 \text{ yd}^2\)
   \[= \frac{\$11.50}{\text{yd}^2} \times 20 \text{ yd}^2 = \$230\]
   The total cost of the carpet is $230.
8. \(1 \text{ day} = 24 \text{ hours}\)
   \[d = rt = \frac{25,000 \text{ mi}}{1 \text{ h}} \times 24 = 600,000 \text{ mi}\]
   Magellan traveled 600,000 miles in one day.
9. Total \(= \frac{\text{Calories}}{\text{per ounce}} \times \frac{\text{Number of ounces}}{15x}\)
   The number of calories is 15x.
10. \(d = rt = \frac{70 \text{ ft}}{1 \text{ sec}} \times 1 \text{ sec} = 70 \text{ ft}\)
    You travel 70 ft feet.

Lesson 2.3

2.3 Checkpoint (p. 79)

1. \(3x + 2 + 5x\)
   Terms: 3x, 2, 5x
   Like terms: 3x and 5x
   Coefficients: 3, 5
   Constant term: 2
   \(3x + 2 + 5x = 3x + 5x + 2 = (3 + 5)x + 2 = 8x + 2\)
2. \(-7b + 3 + b - 10 = -7b + 3 + b + (-10)\)
   Terms: -7b, 3, b, -10
   Like terms: -7b and b; 3 and -10
   Coefficients: -7, 1
   Constant terms: 3, -10
   \(-7b + 3 + b + (-10) = -7b + b + 3 + (-10)\)
   \[= (-7 + 1)b + 3 + (-10)\]
   \[= -6b + (-7)\]
   \[= -6b - 7\]
3. \(5 + 8w - 6 - w = 5 + 8w + (-6) + (-w)\)
   Terms: 5, 8w, -6, -w
   Like terms: 8w and -w; 5 and -6
   Coefficients: 8, -1
   Constant terms: 5, -6
   \(5 + 8w + (-6) + (-w) = 5 + (-6) + 8w + (-w)\)
   \[= 5 + (-6) + [8 + (-1)]w\]
   \[= -1 + 7w\]
   \[= 7w - 1\]
4. \(4(x + 1) + 2x + 5 = 4x + 4 + 2x + 5\)
   \[= 4x + 4 + 2x + 5\]
   \[= 6x + 9\]
5. \(10y - 3(6 - y) = 10y - 18 + 3y\)
   \[= 10y + 3y - 18\]
   \[= 13y - 18\]
6. \(8c + 2 - (c + 2) = 8c + 2 - c - 2\)
   \[= 8c - c + 2 - 2\]
   \[= 7c\]

2.3 Guided Practice (p. 80)

1. The terms that have a number but no variable are called constant terms.
2. The coefficient of \(y\) in the expression \(8 - 3y + 1\) is -3.
3. \(6x + x + 2 + 4\)
   Terms: 6x, x, 2, 4
   Like terms: 6x and x; 2 and 4
   Coefficients: 6, 1
   Constant terms: 2, 4
   \(6x + x + 2 + 4 = (6 + 1)x + 2 + 4 = 7x + 6\)
Chapter 2 continued

4. \(-4k - 12 + 3k = -4k + (-12) + 3k\)
   Terms: \(-4k, -12, 3k\)
   Like terms: \(-4k\) and \(3k\)
   Coefficients: \(-4, 3\)
   Constant term: \(-12\)
   \(-4k + (-12) + 3k = -4k + 3k + (-12)\)
   \[= (-4 + 3)k + (-12)\]
   \[= -k + (-12)\]
   \[= -k - 12\]

5. \(5n + 1 - n - 8 = 5n + 1 + (-n) + (-8)\)
   Terms: \(5n, 1, -n, -8\)
   Like terms: \(5n\) and \(-n\); \(1\) and \(-8\)
   Coefficients: \(5, -1\)
   Constant terms: \(1, -8\)
   \(5n + 1 + (-n) + (-8) = 5n + (-n) + 1 + (-8)\)
   \[= [5 + (-1)]n + 1 + (-8)\]
   \[= 4n + (-7)\]
   \[= 4n - 7\]

6. \(5x + 2 + 3(x - 1) = 5x + 2 + 3x - 3\)
   \[= 5x + 3x + 2 - 3\]
   \[= 8x + (-1)\]
   \[= 8x - 1\]

7. \(-7(2r + 3) + 11r = -14r - 21 + 11r\)
   \[= -14r + 11r - 21\]
   \[= -3r - 21\]

8. \(p + 6 - 6(p - 2) = p + 6 - 6p + 12\)
   \[= p - 6p + 6 + 12\]
   \[= -5p + 18\]

9. When using the distributive property, distribute the negative sign.
   \(5a - (3a - 7) = 5a - 3a + 7 = 2a + 7\)

2.3 Practice and Problem Solving (pp. 81–82)

10. \(10x + 7 + 3x\)
   Terms: \(10x, 7, 3x\)
   Like terms: \(10x\) and \(3x\)
   Coefficients: \(10, 3\)
   Constant term: \(7\)
   \(10x + 7 + 3x = 10x + 3x + 7\)
   \[= (10 + 3)x + 7\]
   \[= 13x + 7\]

11. \(4y + 23 - y - 6 = 4y + 23 + (-y) + (-6)\)
   Terms: \(4y, 23, -y, -6\)
   Like terms: \(4y\) and \(-y\); \(23\) and \(-6\)
   Coefficients: \(4, -1\)
   Constant terms: \(23, -6\)
   \(4y + 23 + (-y) + (-6) = 4y + (-y) + 23 + (-6)\)
   \[= [4 + (-1)]y + 23 + (-6)\]
   \[= 3y + 17\]

12. \(-19 - 11a + a + 16 = -19 + (-11a) + a + 16\)
   Terms: \(-19, -11a, a, 16\)
   Like terms: \(-11a\) and \(a\); \(-19\) and \(16\)
   Coefficients: \(-11, 1\)
   Constant terms: \(-19, 16\)
   \(-19 + (-11a) + a + 16 = -11a + (-19) + a + 16\)
   \[= -11a + a + (-19) + 16\]
   \[= (-11 + 1)a + (-19) + 16\]
   \[= -10a + (-3)\]
   \[= -10a - 3\]

13. \(2b - 8 + 4b - 6b = 2b + (-8) + 4b + (-6b)\)
   Terms: \(2b, -8, 4b, -6b\)
   Like terms: \(2b, 4b, -6b\)
   Coefficients: \(2, 4, -6\)
   Constant term: \(-8\)
   \(2b + (-8) + 4b + (-6b) = -8 + 2b + 4b + (-6b)\)
   \[= -8 + [2 + 4 + (-6)]b\]
   \[= -8 + 0b\]
   \[= -8\]

14. \(9 + n - 1 - 7n = 9 + n + (-1) + (-7n)\)
   Terms: \(9, n, -1, -7n\)
   Like terms: \(n\) and \(-7n\); \(9\) and \(-1\)
   Coefficients: \(1, -7\)
   Constant terms: \(9, -1\)
   \(9 + n + (-1) + (-7n) = 9 + (-1) + n + (-7n)\)
   \[= 9 + (-1) + [1 + (-7)]n\]
   \[= 8 + (-6a)\]
   \[= -6n + 8\]

15. \(8p - 5p + 5 - p - 2 = 8p + (-5p) + 5 + (-p) + (-2)\)
   Terms: \(8p, -5p, 5, -p, -2\)
   Like terms: \(8p, -5p, \) and \(-p\); \(5\) and \(-2\)
   Coefficients: \(8, -5, -1\)
   Constant term: \(5, -2\)
   \(8p + (-5p) + 5 + (-p) + (-2)\)
   \[= 8p + (-5p) + (-p) + 5 + (-2)\]
   \[= [8 + (-5) + (-1)]p + 5 + (-2)\]
   \[= 2p + 3\]

16. \(4x + 2x = 6x\)

17. \(10a - 3a = 7a\)

18. \(b - 9b = -8b\)

19. \(x + 2x + 3x = 6x\)

20. \(9c^2 - 4c^2 + 2c^2 = 7c^2\)

21. \(3(2y + 5y) = 3(7y) = 21y\)

22. \(4(d + 3) + 7d = 4d + 12 + 7d\)
   \[= 4d + 12 + 17d\]
   \[= 11d + 12\]

23. \(5(k - 7) - k + 7 = 5k - 35 - k + 7\)
   \[= 5k - k - 35 + 7\]
   \[= 4k - 28\]
24. \(-2(2m - 1) + 4m = -4m + 2 + 4m\)
   \[= -4m + 4m + 2\]
   \[= 0 + 2\]
   \[= 2\]

25. \(8n - (n - 3) = 8n - n + 3 = 7n + 3\)

26. \(20u - 6(u + 5) = 20u - 6u - 30 = 14u - 30\)

27. \(-w + 4 - (3w - 13) = -w + 4 - 3w + 13\)
   \[= -w - 3w + 4 + 13\]
   \[= -4w + 17\]

28. \(p - 5(2 - 3p) + 1 = p - 10 + 15p + 1\)
   \[= p + 15p - 10 + 1\]
   \[= 16p - 9\]

29. \(3(q + 4) + 4q + 1 = 3q + 12 + 4q + 1\)
   \[= 3q + 4q + 12 + 1\]
   \[= 7q + 13\]

30. \(-7(r^2 + 2) + 3r^2 = -7r^2 - 14 + 3r^2\)
   \[= -7r^2 + 3r^2 - 14\]
   \[= -4r^2 - 14\]

31. Let \(s\) represent the time you spend swimming.

<table>
<thead>
<tr>
<th>Calories burned</th>
<th>Calories per minute jogging</th>
<th>Calories per minute swimming</th>
</tr>
</thead>
<tbody>
<tr>
<td>(= 14(45 - s) + 8s)</td>
<td>(= 630 - 14s + 8s)</td>
<td>(= 630 - 6s)</td>
</tr>
<tr>
<td>(= -6s + 630)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You burn \(-6s + 630\) calories during your workout.

32. a. Let \(c\) = the number of cars carrying coal.

<table>
<thead>
<tr>
<th>Total weight</th>
<th>Weight per coal car</th>
<th>Weight per iron ore car</th>
</tr>
</thead>
<tbody>
<tr>
<td>(= c \times 100 + (80 - c)90)</td>
<td>(= 100c + 7200 - 90c)</td>
<td>(= 100c - 90c + 7200)</td>
</tr>
<tr>
<td>= (10c + 7200)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The total weight of the freight is \(10c + 7200\) tons.

b. When \(c = 28\);

\(10c + 7200 = 10(28) + 7200 = 280 + 7200 = 7480\)

The total weight of the freight is \(7480\) tons.

33. \(P = a + b + c\)
   \[= x + (x + 5) + (2x + 1)\]
   \[= x + x + 5 + 2x + 1\]
   \[= x + x + 2x + 5 + 1\]
   \[= 4x + 6\]

34. \(P = a + b + c\)
   \[= a + 2a + (10 - 3a)\]
   \[= a + 2a + 10 - 3a\]
   \[= a + 2a - 3a + 10\]
   \[= 0 + 10 = 10\]

35. \(P = 2l + 2w\)
   \[= 2(7y - 5) + 2(2y)\]
   \[= 14y - 10 + 4y\]
   \[= 14y + 4y - 10\]
   \[= 18y - 10\]

36. a. Let \(w\) = the width of the rug.

\(l = 2w\)

\(P = 2l + 2w = 2(2w) + 2w = 4w + 2w = 6w\)

The perimeter of the rug is \(6w\) feet.

b. \(A = lw = 2w \times w = 2w^2\)

The area of the rug is \(2w^2\) square feet.

c. | Width (feet) | 1 | 2 | 4 | 8 | 16 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Perimeter (feet)</td>
<td>6</td>
<td>12</td>
<td>24</td>
<td>48</td>
<td>96</td>
</tr>
<tr>
<td>Area (square feet)</td>
<td>2</td>
<td>8</td>
<td>32</td>
<td>128</td>
<td>512</td>
</tr>
</tbody>
</table>

d. Doubling the width of the rug doubles the perimeter. It increases the area by a factor of 4.

37. a. \(A = lw = 500x\)

The area of the tomato portion is \(500x\) square feet.

\(A = lw = 500(800 - x) = 400,000 - 500x\)

The area of the cucumber portion is \(400,000 - 500x\) square feet.

b. Annual cost = \(\frac{\text{Tomato cost} \times \text{Tomato area}}{\text{Cucumber cost} \times \text{Cucumber area}}\)

\[= 0.27(500x) + 0.10(400,000 - 500x)\]
\[= 135x + 40,000 - 50x\]
\[= 135x - 50x + 40,000\]
\[= 85x + 40,000\]

The annual cost is \(69,750\).

38. a. Let \(a\) = the number of angelfish.

Let \(s\) = the number of swordtails.

Number of tetras = \(20 - a - s\)

—CONTINUED—
38. —CONTINUED—

b. Total cost = Cost of angelfish x Number of angelfish + Cost of swordtails x Number of swordtails
   = 5a + 2s + 3(20 - a - s)
   = 5a + 2s + 60 - 3a - 3s
   = 2a - s + 60

c. When a = 4 and s = 10;
   2a - s + 60 = 2(4) - 10 + 60
   = 8 - 10 + 60
   = -2 + 60
   = 58

The total cost is $58.

2.3 Mixed Review (p. 82)

39. (1) Read and Understand
(2) Make a Plan: Guess, Check, and Revise
(3) Solve the Problem: The cube of a number is that number multiplied by itself three times.

Try 10.
10(10)(10) = 1000, which is too low.
Continue until you arrive at 14.
14(14)(14) = 2744
So, x = 14.

(4) Look Back

40. Expression: 8x + 10
41. Expression: x - 3
42. Expression: \(\frac{x}{6}\)
43. Expression: \(\frac{x}{6}\)

44. \(4(a + 2) = 4(a) + 4(2) = 4a + 8\)
45. \(-2(x + 3) = -2(x) + (-2)(3) = -2x + (-6) = -2x - 6\)
46. \(7(p - 4) = 7(p) - 7(4) = 7p - 28\)
47. \((m - 5)(-6) = m(-6) - 5(-6) = -6m - (-30) = -6m + 30\)
48. \(5(2q + 11) = 5(2q) + 5(11) = 10q + 55\)
49. \(8(3r - 7) = 8(3r) - 8(7) = 24r - 56\)
50. \(-4(1 - 5w) = -4(1) - (-4)(5w) = -4 - (-20w) = -4 + 20w = 20w - 4\)
51. \((8w + 9)(-3) = 8w(-3) + 9(-3) = -24w + (-27) = -24w - 27\)

2.3 Standardized Test Practice (p. 82)

52. C
53. I; \(8t - 6(2t - 1) = 8t - 12t + 6 = -4t + 6\)
54. Sample answer: Use a verbal model to find the total weight.
   Total weight = Weight per canteen \(\times\) Ounces remaining + Weight per fluid ounce \(\times\) Ounces remaining
   = 0.25 + 0.065(32 - x)
   = 0.25 + 0.065(32) - 0.065(x) Distributive property
   = 0.25 + 2.08 - 0.065x Multiply 0.065 and 32.
   = 2.33 - 0.065x Combine like terms.

The weight of the canteen and water is 2.33 - 0.065x pounds.

2.3 Technology Activity (p. 83)

1. \(7(x + 2) = 7x + 14\)
2. \(2x + 4x + 6x = 12x\)
3. \(3x - 9 - 8x + 5 = 3x - 8x - 9 + 5 = -5x - 4\)
4. \(-6(x - 3) + 5x = -6x + 18 + 5x = -6x + 5x + 18 = -x + 18\)
5. \(11x - 3(x + 5) = 11x - 3x - 15 = 8x - 15\)
6. \(2(3x + 4) - 6x = 6x + 8 - 6x = 6x - 6x + 8 + 0 = 8\)
7. When \(x = 0; 2(x - 1) + x = 2(0 - 1) + 0 = 2(-1) = -2\)
   When \(x = 0; 4x - 2 = 4(0) - 2 = 0 - 2 = -2\).
   No. Sample answer: Let \(Y_1 = 2(X - 1) + X\) and \(Y_2 = 4X - 2\). The pairs of values in each row of the table are not always the same, so the two expressions are not equivalent.

Mid-Chapter Quiz (p. 84)

1. \(29 + 18 + 21\)
   = \((29 + 18) + 21\) Use order of operations.
   = \((18 + 29) + 21\) Commutative property of addition
   = \(18 + (29 + 21)\) Associative property of addition
   = \(18 + 50\) Add 29 and 21.
   = \(68\) Add 18 and 50.
2. \[1.3 + 6.8 + 2.7\]
\[= (1.3 + 6.8) + 2.7\]
\[= (6.8 + 1.3) + 2.7\]
Use order of operations.
Commutative property of addition
\[= 6.8 + (1.3 + 2.7)\]
Associative property of addition
\[= 6.8 + 4\]
Add 1.3 and 2.7.
\[= 10.8\]
Add 6.8 and 4.

3. \[4(9)(-25) = [4(9)](-25)\]
\[= [(9)4](-25)\]
Use order of operations.
Commutative property of multiplication
\[= 9[4(-25)]\]
Associative property of multiplication
\[= 9(-100)\]
Multiply 4 and -25.
\[= -900\]
Multiply 9 and -100.

4. \[5(-7)(-12)\]
\[= [5(-7)](-12)\]
Use order of operations.
Commutative property of multiplication
\[= (-7)[5(-12)]\]
Associative property of multiplication
\[= (-7)(-60)\]
Multiply 5 and -12.
\[= 420\]
Multiply -7 and -60.

5. 5280 feet = 1 mile
Factor 1: \(\frac{5280 \text{ feet}}{1 \text{ mile}}\)
Use factor 1.
\[122 \text{ miles} \times \frac{5280 \text{ feet}}{1 \text{ mile}} = 644,160 \text{ feet}\]
She swam 644,160 feet.

6. \[-3(8 + 5) = -3(8) + (-3)(5) = -24 + (-15) = -39\]

7. \[(11 - 4)6 = 11(-6) - 4(6) = 66 - 24 = 42\]

8. \[5(98) = 5(100 - 2) = 5(100) - 5(2) = 500 - 10 = 490\]

9. \[7(4.03) = 7(4 + 0.03)\]
\[= 7(4) + 7(0.03)\]
\[= 28 + 0.21\]
\[= 28.21\]

10. \[2(x - 3) = 2(x) - 2(3) = 2x - 6\]

11. \[-5(y + 4) = -5(y) + (-5)(4)\]
\[= -5y + (-20)\]
\[= -5y - 20\]

12. \[4(9p + 7) = 4(9p) + 4(7) = 36p + 28\]

13. \[(6 - 2m)(-3) = 6(-3) - 2m(-3)\]
\[= -18 - (-6m)\]
\[= -18 + 6m\]
\[= 6m - 18\]

14. \[A = \frac{1}{2}bh\]
\[= \frac{1}{2}(8)(3x + 1)\]
\[= 4(3x + 1)\]
\[= 4(3x) + 4(1)\]
\[= (12x + 4) \text{ square units}\]

15. \[12x + 5 + 3x\]
Terms: \(12x, 5, 3x\)
Like terms: \(12x\) and \(3x\)
Coefficients: \(12, 3\)
Constant term: \(5\)
\[12x + 5 + 3x = 12x + 3x + 5\]
\[= (12 + 3)x + 5\]
\[= 15x + 5\]

16. \[9 + a - 2 - 7a = 9 + a + (2) + (7a)\]
Terms: \(9, a, -2, -7a\)
Like terms: \(a\) and \(-7a\); \(9\) and \(-2\)
Coefficients: \(1, -7\)
Constant terms: \(9, -2\)
\[9 + a + (-2) + (-7a) = 9 + (-2) + a + (-7a)\]
\[= 9 + (-2) + [1 + (-7)]a\]
\[= 7 + (-6a)\]
\[= -6a + 7\]

17. \[-8c + 3 - c + 1 = -8c + 3 + (-c) + 1\]
Terms: \(-8c, 3, -c, 1\)
Like terms: \(-8c\) and \(-c\); \(3\) and \(1\)
Coefficients: \(-8, -1\)
Constant terms: \(3, 1\)
\[-8c + 3 + (-c) + 1 = -8c + (-c) + 3 + 1\]
\[= [-8 + (1)]c + 3 + 1\]
\[= -9c + 4\]

18. \[6n - 4n - 2n = 6n + (-4n) + (-2n)\]
Terms: \(6n, -4n, -2n\)
Like terms: \(6n\), \(-4n\), and \(-2n\)
Coefficients: \(6, -4, -2\)
Constant terms: None
\[6n + (-4n) + (-2n) = [6 + (-4) + (-2)]n = 0n = 0\]

19. \[3(x + 7) + 2x = 3x + 21 + 2x\]
\[= 3x + 2x + 21\]
\[= 5x + 21\]

20. \[y - 2(y - 6) = y - 2y + 12 = -y + 12\]

21. \[4(r - 1) + 5r + 3 = 4r - 4 + 5r + 3\]
\[= 4r + 5r - 4 + 3\]
\[= 9r - 1\]

22. \[8r - 4(2s + 3) = 8s - 8s - 12 = 0 - 12 = -12\]
Chapter 2  continued

Brain Game (p. 84)
E D N S O Z
DOZENS

Lesson 2.4

2.4 Checkpoint (pp. 85–86)

1. \(3 + z = -10\)
2. \(\frac{m}{6} = 4\)
3. \(-8y = 40\)
   \(-8(-5) \div 40\)
   \(40 = 40 \checkmark\)
   \(-5\) is a solution.
4. Equation: \(x - 10 = 7\)
   Question: What number minus 10 equals 7?
   Solution: 17
   Check: 17 - 10 = 7 \(\checkmark\)
5. Equation: \(2 + n = -6\)
   Question: 2 plus what number equals -6?
   Solution: -8
   Check: 2 + (-8) = -6 \(\checkmark\)
6. Equation: \(3w = -15\)
   Question: 3 times what number equals -15?
   Solution: -5
   Check: 3(-5) = -15 \(\checkmark\)
7. Equation: \(4 = \frac{36}{s}\)
   Question: 4 equals 36 divided by what number?
   Solution: 9
   Check: 4 = \(\frac{36}{9}\) \(\checkmark\)
8. Let \(x\) = the number of times people rode the go-carts.
   Cost per ride \(\times\) Number of rides = Total income
   \(5x = 1000\)
   \(5 \times 200 = 1000\)
   People rode the go-carts a total of 200 times.

2.4 Guided Practice (p. 87)

1. A solution of an equation is a number that produces a true statement when it is substituted for the variable.
2. Sample answer:
   Equation: \(-4r = 28\)
   Question: -4 times what number equals 28?
3. \(x + 10 = 15\)
4. \(3 - x = 2\)
   \(5 + 10 \div 15\)
   \(15 = 15 \checkmark\)
   \(15 = 15 \checkmark\)
   5 is a solution.
   5 is not a solution.
5. \(-6x = 54\)
   \(-6(5) \div 54\)
   \(-30 \neq 54\)
   \(\frac{-40}{x} = -8\)
   \(\frac{-40}{5} = -8\)
   5 is not a solution.
6. \(\frac{-40}{x} = -8\)
   \(\frac{-40}{5} = -8\)
   \(5 \) is a solution.
7. (1) Let \(x\) = the number of quesadillas you need.
   Number of wedges = \(4x\)
   \(\frac{40}{x} = 8\)
   \(x = 5\)
   (2) Total number of people \(\times\) Number of wedges per person
   \(= 5 \times 3\)
   \(= 15\)
   You need 36 wedges.
8. \(x - 8 = -4\)
9. \(26 + y = 43\)
10. \(\frac{P}{7} = 16\)
11. \(14m = 56\)
12. \(x + 9 = 12\)
   \(-3 + 9 \div 12\)
   \(6 \neq 12\)
   \(25 = 12\)
   \(25 \) is a solution.
13. \(21 - z = -4\)
   \(21 - 25 \neq -4\)
   \(4 = -4 \checkmark\)
   \(25 \) is a solution.
14. \(91 = 7c\)
   \(91 \div 7(13)\)
   \(13 = 13\)
   13 is a solution.
15. \(\frac{8}{4} = -8\)
   \(\frac{32}{4} \neq -8\)
   32 is not a solution.
16. C; Solution: 9
17. A; Solution: 4
18. D; Solution: -9
19. B; Solution: 36
20. Equation: \(x + 6 = 13\)
   Question: What number plus 6 equals 13?
   Solution: 7
   Check: 7 + 6 = 13 \(\checkmark\)
21. Equation: \(x - 8 = 20\)
   Question: What number minus 8 equals 20?
   Solution: 28
   Check: 28 - 8 = 20 \(\checkmark\)
22. Equation: \(0 = t + 79\)
   Question: 0 equals what number plus 79?
   Solution: -79
   Check: 0 = -79 + 79 \(\checkmark\)

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Chapter 2  Worked-Out Solution Key
23. Equation: \(-4 + y = -9\)
   Question: \(-4\) plus what number equals \(-9\)?
   Solution: \(-5\)
   Check: \(-4 + (-5) = -9\)

24. Equation: \(11 - p = 19\)
   Question: \(11\) minus what number equals \(19\)?
   Solution: \(-8\)
   Check: \(11 - (-8) = 19\)

25. Equation: \(-2 = r - 7\)
   Question: \(-2\) equals what number minus \(7\)?
   Solution: \(5\)
   Check: \(-2 = 5 - 7\)

26. Equation: \(7x = 63\)
   Question: \(7\) times what number equals \(63\)?
   Solution: \(9\)
   Check: \(7(9) = 63\)

27. Equation: \(-10a = 130\)
   Question: \(-10\) times what number equals \(130\)?
   Solution: \(-13\)
   Check: \(-10(-13) = 130\)

28. Equation: \(-54 = -9g\)
   Question: \(-54\) equals \(-9\) times what number?
   Solution: \(6\)
   Check: \(-54 = -9(6)\)

29. Equation: \(\frac{x}{5} = 6\)
   Question: What number divided by \(5\) equals \(6\)?
   Solution: \(30\)
   Check: \(\frac{30}{5} = 6\)

30. Equation: \(\frac{48}{u} = -3\)
   Question: \(48\) divided by what number equals \(-3\)?
   Solution: \(-16\)
   Check: \(\frac{48}{-16} = -3\)

31. Equation: \(1 = \frac{n}{231}\)
   Question: \(1\) equals what number divided by \(231\)?
   Solution: \(231\)
   Check: \(1 = \frac{231}{231}\)

32. \(d = rt\)
   
   \(400 = 50t\)
   \(400 = 50 \times 8\)
   
   It takes a dragonfly about 8 seconds to travel 400 feet.

33. Let \(x = \) the sales in 2000.

   Sales in 2000 in sales in 2001
   \(x - 6 = 128\)
   \(134 - 6 = 128\)

   About 134 million personal computers were sold in 2000.

34. Let \(x = \) the total weight of the trail mix.

   Weight per portion = \(\frac{\text{Total weight}}{\text{Number of portions}}\)
   \[
   \begin{align*}
   3 &= \frac{x}{8} \\
   \frac{3}{8} &= \frac{24}{8}
   \end{align*}
   \]

   The total weight of the trail mix was 24 ounces.

35. a. \(P = x + 9 + 8 + 5 + 9 = 35\)
   \(x + 31 = 35\)
   \(x = 4\) cm

   b. \(K = C + 273\)
   \(0 = C + 273\)
   \(0 = -273 + 273\)
   Absolute zero is \(-273^\circ C\).

   c. Sample answer: To find the Kelvin temperature, add 273 to the temperature in degrees Celsius.

   d. Sample answer: Ask the question: What number minus 273 equals \(C\)?

37. Sample answer: An expression consists of numbers, operations, and sometimes variables but no equal sign or inequality signs. An equation consists of two expressions with an equal sign between them.

   Expression: \(x + 8\)
   Equation: \(x + 8 = 3\)

38. a. Let \(n = \) the number of strips.

   Width of each strip = \(\frac{\text{Width of paper}}{\text{Number of strips}} \times \frac{9}{n}\)

---CONTINUED---
38. —CONTINUED—

b. Let \( n \) be the number of links.

\[
0.75 = \frac{9}{n}
\]

(1) Read and Understand

(2) Make a Plan: Guess, Check, and Revise

(3) Solve the Problem: Guess the number of links the chain will have. Try \( n = 10 \).

\[
\frac{9}{10} = 0.9
\]

Because the width of each link is too long, 10 is too low.

Continue until you arrive at 12.

\[
\frac{9}{12} = 0.75
\]

So, your paper chain will have 12 links.

(4) Look Back

39. a. Let \( x \) be the time in seconds.

\[
\begin{align*}
\text{Beginning altitude} + \text{Rate of climb} \times \text{time} &= \text{Final altitude} \\
200 + 800x &= 13,000
\end{align*}
\]

\[x = 16; \text{it takes the Thunderbirds 16 seconds to complete the climb.}\]

40. 4; Sample answer:

Equation: \(2x + 3 = 11\)

Question: 2 times what number plus 3 equals 11?

Solution: 4

Check: \(2(4) + 3 = 8 + 3 = 11\)

2.4 Mixed Review (p. 89)

41. When \( x = -5 \) and \( y = -3; x + y = -5 + (-3) = -8\)

42. When \( x = -5 \) and \( y = -3; x - y + 6 = -5 - (-3) + 6 = -5 + 3 + 6 = -2 + 6 = 4\)

43. When \( x = -5 \) and \( y = -3; -x + 2 = 3y = -(-5) + 2 + 3(-3) = 5 + 2 + (-9) = 7 + (-9) = -2\)

44. \(8(104) = 8(100 + 4) = 8(100) + 8(4) = 800 + 32 = 832\)

45. \(5(197) = 5(200 - 3) = 5(200) - 5(3) = 1000 - 15 = 985\)

46. \(4(2.8) = 4(3 - 0.2) = 4(3) - 4(0.2) = 12 - 0.8 = 11.2\)

47. \(5c + 2 + 7c = 5c + 7c + 2 = 12c + 2\)

48. \(13k - 8k - k = 4k\)

49. \(6x - 3 + 4x + 1 = 6x + 4x - 3 + 1 = 10x - 2\)

50. \(3y + 7 + 11y = 3y + 21 + 11y = 3y + 11y + 21 = 14y + 21\)

51. \(p - 6 - (4 + p) = p - 6 - 4 - p = p - p - 6 - 4 = 0 - 10 = -10\)

52. \(2n - 7(n - 8) = 2n - 7n + 56 = -5n + 56\)

2.4 Standardized Test Practice (p. 89)

53. B

54. H; \(12p = 60\) \(12(5) = 60\)

Lesson 2.5

2.5 Concept Activity (p. 90)

1. A

2. \(x + 1 = 4\)

The solution is 3.

3. \(x + 2 = 6\)

The solution is 4.

4. \(x + 5 = 7\)

The solution is 2.

5. \(x + 4 = 10\)

The solution is 6.
6. \[3 + x = 8\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]

The solution is 5.

7. \[2 + x = 11\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]

The solution is 9.

8. \[8 = x + 7\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]

The solution is 1.

9. \[16 = 9 + x\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]

The solution is 7.

10. Three 1-tiles must be taken from each side in order to keep both sides of the equation equal.

11. \[2 + x + 4 = 9\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]

Take away 4 1-tiles from each side.

---CONTINUED---

11. —CONTINUED—

Take away 2 1-tiles from each side.
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]

The remaining tiles show that \(x = 3\).
\[
\begin{array}{cccccccc}
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\square & \square & \square & \square & \square & \square & \square & \square \\
\end{array}
\]

2.5 Checkpoint (p. 92)

1. \[x + 8 = 19\]
\[x + 8 - 8 = 19 - 8\]
\[x = 11\]
Check: \(x + 8 = 19\)
\[11 + 8 \nleq 19\]
\[19 = 19\checkmark\]

2. \[-7 = y + 13\]
\[-7 - 13 = y + 13 - 13\]
\[-20 = y\]
Check: \(-7 = y + 13\)
\[-7 \nleq -20 + 13\]
\[-7 = -7\checkmark\]

3. \[n - 4 = -11\]
\[n - 4 + 4 = -11 + 4\]
\[n = -7\]
Check: \(n - 4 = -11\)
\[-7 - 4 \nleq -11\]
\[-11 = -11\checkmark\]

4. \[26 = p - 61\]
\[26 + 61 = p - 61 + 61\]
\[87 = p\]
Check: \(26 = p - 61\)
\[26 \nleq 87 - 61\]
\[26 = 26\checkmark\]

5. Let \(w\) = the weight of the cat.
Weight of cat + Weight of Ben = Combined weight
\[w + 148 = 161\]
\[w + 148 - 148 = 161 - 148\]
\[w = 13\]

The cat weighs 13 pounds.

2.5 Guided Practice (p. 93)

1. Addition and subtraction are inverse operations.
2. You would use the addition property of equality.

Sample answer: To solve \(x - 5 = 7\) for \(x\), you must add 5 to each side of the equation to get \(x\) alone on one side of the equation.
Chapter 2 continued

3. \( x + 4 = 10 \)
   \[ x + 4 - 4 = 10 - 4 \]
   \[ x = 6 \]
   Check: \( x + 4 = 10 \)
   \[ 6 + 4 = 10 \]
   \[ 10 = 10 \checkmark \]

4. \( t + 9 = -5 \)
   \[ t + 9 - 9 = -5 - 9 \]
   \[ t = -14 \]
   Check: \( t + 9 = -5 \)
   \[ -14 + 9 = -5 \]
   \[ -5 = -5 \checkmark \]

5. \( u - 3 = 6 \)
   \[ u - 3 + 3 = 6 + 3 \]
   \[ u = 9 \]
   Check: \( u - 3 = 6 \)
   \[ 9 - 3 = 6 \]
   \[ 6 = 6 \checkmark \]

6. \( y - 7 = -2 \)
   \[ y - 7 + 7 = -2 + 7 \]
   \[ y = 5 \]
   Check: \( y - 7 = -2 \)
   \[ 5 - 7 = -2 \]
   \[ -2 = -2 \checkmark \]

7. \( 16 = a + 25 \)
   \[ 16 - 25 = a + 25 - 25 \]
   \[ -9 = a \]
   Check: \( 16 = a + 25 \)
   \[ 16 - 25 = -9 + 25 \]
   \[ 16 = 16 \checkmark \]

8. \( -70 = b - 30 \)
   \[ -70 + 30 = b - 30 + 30 \]
   \[ -40 = b \]
   Check: \( -70 = b - 30 \)
   \[ -70 + 30 = -40 - 30 \]
   \[ -70 = -70 \checkmark \]

9. The number 8 was subtracted from the left side of the equation, but added to the right side. Subtract 8 from both sides of the equation.
   \( x + 8 = 10 \)
   \[ x + 8 - 8 = 10 - 8 \]
   \[ x = 2 \]

10. Let \( x \) = the population in 1990.
    Population \( + \) Increase in population = Population in 2000
    \[ x + 236 = 3905 \]
    \[ x + 236 - 236 = 3905 - 236 \]
    \[ x = 3669 \]
    The population in 1990 was 3669 people.

2.5 Practice and Problem Solving (pp. 93–95)

11. \( x + 7 = 12 \)
    \[ x + 7 - 7 = 12 - 7 \]
    \[ x = 5 \]
    Check: \( x + 7 = 12 \)
    \[ 5 + 7 = 12 \]
    \[ 12 = 12 \checkmark \]

12. \( y + 9 = 0 \)
    \[ y + 9 - 9 = 0 - 9 \]
    \[ y = -9 \]
    Check: \( y + 9 = 0 \)
    \[ -9 + 9 = 0 \]
    \[ 0 = 0 \checkmark \]

13. \( -2 = z + 6 \)
    \[ -2 - 6 = z + 6 - 6 \]
    \[ -8 = z \]
    Check: \( -2 = z + 6 \)
    \[ -2 + 6 = -8 + 6 \]
    \[ -2 = -2 \checkmark \]

14. \( a - 5 = 8 \)
    \[ a - 5 + 5 = 8 + 5 \]
    \[ a = 13 \]
    Check: \( a - 5 = 8 \)
    \[ 13 - 5 = 8 \]
    \[ 8 = 8 \checkmark \]

15. \( b - 14 = -3 \)
    \[ b - 14 + 14 = -3 + 14 \]
    \[ b = 11 \]
    Check: \( b - 14 = -3 \)
    \[ 11 - 14 = -3 \]
    \[ -3 = -3 \checkmark \]

16. \( 37 = c - 29 \)
    \[ 37 + 29 = c - 29 + 29 \]
    \[ 66 = c \]
    Check: \( 37 = c - 29 \)
    \[ 37 + 29 = 66 - 29 \]
    \[ 37 = 37 \checkmark \]

17. \( 21 + m = 4 \)
    \[ 21 - 21 + m = 4 - 21 \]
    \[ m = -17 \]
    Check: \( 21 + m = 4 \)
    \[ 21 + (-17) = 4 \]
    \[ 4 = 4 \checkmark \]
18. \[ n - 72 = 72 \]
   \[ n - 72 + 72 = 72 + 72 \]
   \[ n = 144 \]
   Check: \( n - 72 = 72 \)
   \[ 144 - 72 = 72 \]
   \[ 72 = 72 \checkmark \]

19. \[ p - 24 = -53 \]
   \[ p - 24 + 24 = -53 + 24 \]
   \[ p = -29 \]
   Check: \( p - 24 = -53 \)
   \[ -29 - 24 = -53 \]
   \[ -53 = -53 \checkmark \]

20. \[ q + 8 = 57 \]
   \[ q + 8 - 8 = 57 - 8 \]
   \[ q = 49 \]
   Check: \( q + 8 = 57 \)
   \[ 49 + 8 = 57 \]
   \[ 57 = 57 \checkmark \]

21. \[ r - 23 = -6 \]
   \[ r - 23 + 23 = -6 + 23 \]
   \[ r = 17 \]
   Check: \( r - 23 = -6 \)
   \[ 17 - 23 = -6 \]
   \[ -6 = -6 \checkmark \]

22. \[ 28 = g + 28 \]
   \[ 28 - 28 = g + 28 - 28 \]
   \[ 0 = g \]
   Check: \( 28 = g + 28 \)
   \[ 28 \neq 0 + 28 \]
   \[ 28 = 28 \checkmark \]

23. \[ -13 + t = 10 \]
   \[ -13 + 13 + t = 10 + 13 \]
   \[ t = 23 \]
   Check: \( -13 + t = 10 \)
   \[ -13 + 23 = 10 \]
   \[ 10 = 10 \checkmark \]

24. \[ 216 = u - 129 \]
   \[ 216 + 129 = u - 129 + 129 \]
   \[ 345 = u \]
   Check: \( 216 = u - 129 \)
   \[ 216 \neq 345 - 129 \]
   \[ 216 = 216 \checkmark \]

25. \[ 177 - 403 = 403 - 403 + w \]
   \[ -226 = w \]
   Check: \( 177 = 403 + w \)
   \[ 177 \neq 403 + (-226) \]
   \[ 177 = 177 \checkmark \]

26. Let \( x \) = the price before the rebate.
   Price before rebate = Price after rebate + rebate amount
   \[ x - 30 = 185 \]
   \[ x - 30 + 30 = 185 + 30 \]
   \[ x = 215 \]
   The price of the DVD player before the rebate is applied is $215.

27. Let \( x \) = the maximum temperature tolerated by a Japanese giant hornet.
   Maximum temperature of hornet = Maximum temperature of honeybees + Difference in temperature
   \[ x + 3 = 48 \]
   \[ x + 3 - 3 = 48 - 3 \]
   \[ x = 45 \]
   The maximum temperature tolerated by a Japanese giant hornet is 45°C.

28. Let \( x \) = the original height of the Great Pyramid.
   Original height - Feet lost = Current height
   \[ x - 30 = 451 \]
   \[ x - 30 + 30 = 451 + 30 \]
   \[ x = 481 \]
   The original height of the Great Pyramid was 481 feet.

29. Let \( x \) = the distance from the summit.
   Height climbed + Distance from the summit = Height of summit
   \[ 26,000 + x = 29,035 \]
   \[ 26,000 - 26,000 + x = 29,035 - 26,000 \]
   \[ x = 3035 \]
   Stacy Allison got 3035 feet from the summit.

30. Let \( x \) = the distance in the expanded phase.
   Distance in expanded phase - Difference in phases = Distance in contracted phase
   \[ x - 5 = 51 \]
   \[ x - 5 + 5 = 51 + 5 \]
   \[ x = 56 \]
   Zeta Geminorum is 56 million miles across in its expanded phase.

31. Instead of subtracting 9 from both sides, you could add -9 to both sides.
   \[ x + 9 = -3 \]
   \[ x + 9 + (-9) = -3 + (-9) \]
   \[ x = -12 \]
Chapter 2 continued

32. \[ a + 5 + 8 = 20 \]
    \[ a + 13 = 20 \]
    \[ a + 13 - 13 = 20 - 13 \]
    \[ a = 7 \]
Check: \[ a + 5 + 8 = 20 \]
    \[ 7 + 5 + 8 \neq 20 \]
    \[ 20 = 20 \checkmark \]

33. \[ 3 + c + 6 = -9 \]
    \[ c + 3 + 6 = -9 \]
    \[ c + 9 = -9 \]
    \[ c + 9 - 9 = -9 - 9 \]
    \[ c = -18 \]
Check: \[ 3 + c + 6 = -9 \]
    \[ 3 + (-18) + 6 \neq -9 \]
    \[ -9 = -9 \checkmark \]

34. \[ 9 + x - 4 = 2 \]
    \[ x + 9 - 4 = 2 \]
    \[ x + 5 = 2 \]
    \[ x + 5 - 5 = 2 - 5 \]
    \[ x = -3 \]
Check: \[ 9 + x - 4 = 2 \]
    \[ 9 + (-3) - 4 \neq 2 \]
    \[ 2 = 2 \checkmark \]

35. \[ n - 6 - 1 = 5 \]
    \[ n - 7 = 5 \]
    \[ n - 7 + 7 = 5 + 7 \]
    \[ n = 12 \]
Check: \[ n - 6 - 1 = 5 \]
    \[ 12 - 6 - 1 \neq 5 \]
    \[ 5 = 5 \checkmark \]

36. \[ 0 = r + 7 - 32 \]
    \[ 0 = r - 25 \]
    \[ 0 + 25 = r - 25 + 25 \]
    \[ 25 = r \]
Check: \[ 0 = r + 7 - 32 \]
    \[ 0 \neq 25 + 7 - 32 \]
    \[ 0 = 0 \checkmark \]

37. \[ -5 = -17 + y + 8 \]
    \[ -5 = y - 17 + 8 \]
    \[ -5 = y - 9 \]
    \[ -5 + 9 = y - 9 + 9 \]
    \[ 4 = y \]
Check: \[ -5 = -17 + y + 8 \]
    \[ -5 \neq -17 + 4 + 8 \]
    \[ -5 = -5 \checkmark \]

38. \[ P = a + b + c \]
    \[ 34 = x + 11 + 14 \]
    \[ 34 = x + 25 \]
    \[ 34 - 25 = x + 25 - 25 \]
    \[ 9 = x \]
So, \( x = 9 \) inches.

39. \[ P = a + b + c \]
    \[ 59 = 22 + 13 + x \]
    \[ 59 = 35 + x \]
    \[ 59 - 35 = 35 - 35 + x \]
    \[ 24 = x \]
So, \( x = 24 \) centimeters.

40. \[ P = 2l + 2w \]
    \[ 352 = 2(110) + 2(x) \]
    \[ 352 = 220 + 2x \]
    \[ 352 - 220 = 220 - 220 + 2x \]
    \[ 132 = 2x \]
Because \( 2x = 132 \), \( x = 66 \).
So, \( x = 66 \) feet.

41. a. Let \( x \) be the LDL level.
    Total cholesterol = LDL + HDL + \[ \frac{Triglycerides}{5} \]
    \[ 190 = x + 45 + \frac{125}{5} \]
    \[ b. \]
    \[ 190 = x + 45 + \frac{125}{5} \]
    \[ 190 = x + 45 + 25 \]
    \[ 190 = x + 70 \]
    \[ 190 - 70 = x + 70 - 70 \]
    \[ 120 = x \]
    The LDL level is 120 mg/dL.
    c. The LDL level of the given patient is borderline.

42. a. Let \( x \) be the change in the Vasa's position.
    Original depth + Change in Shallow + Vasa's position depth
    \[ -105 + x = -50 \]
    \[ -105 + 105 + x = -50 + 105 \]
    \[ x = 55 \]
    The change in Vasa's position was an increase of 55 feet due to the salvage work in 1959.
    b. Let \( x \) be the number of years underwater.
    Year ship sank + Number of years = was lifted to underwater surface
    \[ 1628 + x = 1961 \]
    \[ 1628 - 1628 + x = 1961 - 1628 \]
    \[ x = 333 \]
    The Vasa remained underwater for 333 years.
43. Because $34 = y$, $y + 5 = 34 + 5 = 39$.
   So, $39 = y + 5$.

44. Let $x$ be the amount spent on fabric for a decorative border.

   Yards of Solid Yards Printed solid color × cost of per yard printed yard
   + Yards of Batting × Batting cost per yard + Decorative border = Total cost
   5 × 4 + 12 × 8 + 2 × 11 + x = 150
   20 + 96 + 22 + x = 150
   116 + 22 + x = 150
   138 + x = 150
   138 + x = 150 – 138
   x = 12

You can spend $12 on fabric for a decorative border.

45. Let $x$ be the sales of tennis shoes in 1996.

   $x + 4 + (-30) + (-10) + 15 = 520$
   $x + (-21) = 520$
   $x - 21 = 520$
   $x - 21 + 21 = 520 + 21$
   $x = 541$

In 1996, the sales of tennis shoes were $541 million.

2.5 Mixed Review (p. 95)

46. $6 \cdot 6 \cdot 6 = 6^3$

47. $(0.3)(0.3) = (0.3)^2$

48. $x \cdot x \cdot x = x^3$

49. $t \cdot t \cdot t \cdot t \cdot t = t^5$

50. $2^3 = 2 \cdot 2 \cdot 2 \cdot 2 = 64$

51. $7^4 = 7 \cdot 7 \cdot 7 \cdot 7 = 2401$

52. $(0.8)^2 = (0.8)(0.8) = 0.64$

53. $(2.5)^3 = (2.5)(2.5)(2.5) = 15.625$

54. The opposite of 8 is –8.

55. The opposite of –27 is 27.

56. The opposite of 0 is 0.

57. The opposite of 144 is –144.

58. When $x = 4$; $|x| = |4| = 4$

59. When $y = -7$; $|y| = |-7| = 7$

60. When $y = -7$; $|y| + |-y| = |-7| + |-(−7)|$
   $= |-7| + 7$
   $= 7 + 7$
   $= 14$

61. When $x = 4$ and $y = -7$;
   $|y| - |-x| = |-7| - |-4| = 7 - 4 = 3$

62. $d = rt$
   $60 = 20t$
   $60 = 20 \cdot 3$
   So, it takes a dolphin 3 hours to swim $60$ miles.

2.5 Standardized Test Practice (p. 95)

63. A; $x + 18 = -13$
   $x + 18 - 18 = -13 - 18$
   $x = -31$

64. H; $-21 = a - 47$
   $-21 + 47 = a - 47 + 47$
   $26 = a$

65. Let $x$ be the number of employees at the beginning of the year.

Write a verbal model.

Employees at the beginning + Employees hired - Employees that left = Employees at the end of the year

$x + 140 - 93 = 816$

Combine like terms.

$x + 47 = 816$

Subtract 47 from each side.

$x + 47 - 47 = 816 - 47$

$x = 769$

There were 769 employees at the beginning of the year.

Lesson 2.6

2.6 Concept Activity (p. 96)

1. $2x = 4$

The solution is 2.

2. $2x = 10$

The solution is 5.
3. $3x = 18$

The solution is 6.

4. $4x = 12$

The solution is 3.

5. $6x = 6$

The solution is 1.

6. $5x = 20$

The solution is 4.

7. $21 = 7x$

The solution is 3.

8. $21 = 3x$

The solution is 7.

9. $3x = 12$

Sample answer: Model $8x = 56$ with algebra tiles. There are eight $x$-tiles, so divide the $x$-tiles and 1-tiles into eight equal groups. One $x$-tile is equal to seven 1-tiles. The solution is 7.

10. $2x + 3x = 15$

Model the equation with algebra tiles. Group like terms.

---CONTINUED---
Chapter 2 continued

10. —CONTINUED—

There are 5 x-tiles, so divide the x-tiles and 1-tiles into 5 equal groups.

One x-tile is equal to three 1-tiles.

So, the solution is 3.

2.6 Checkpoint (p. 98)

1. \[ 2x = 18 \]
   \[ \frac{2x}{2} = \frac{18}{2} \]
   \[ x = 9 \]
   Check: \[ 2x = 18 \]
   \[ 2(9) = 18 \]

2. \[ -60 = -5a \]
   \[ \frac{-60}{-5} = \frac{-5a}{-5} \]
   \[ a = 12 \]
   Check: \[ -60 = -5a \]
   \[ -60 = -5(12) \]
   \[ 18 = 18 \]

3. \[ \frac{y}{2} = 13 \]
   \[ \frac{2 \cdot \frac{y}{2}}{2} = \frac{2 \cdot 13}{2} \]
   \[ y = 26 \]
   Check: \[ \frac{y}{2} = 13 \]
   \[ \frac{26}{2} = \frac{13}{2} \]
   \[ 13 = 13 \]

4. \[ -8 = \frac{b}{8} \]
   \[ \frac{-8}{\frac{b}{8}} = \frac{-8}{\frac{b}{8}} \]
   \[ -64 = b \]
   Check: \[ -8 = \frac{b}{8} \]
   \[ -8 = \frac{b}{8} \]

2.6 Guided Practice (p. 99)

1. Multiplication and division are inverse operations.

2. You would use the multiplication property of equality.
   Sample answer: You would use the multiplication property to solve \( \frac{x}{5} = 12 \) because both sides need to be multiplied by 5 to get \( x \) alone on one side of the equation.

3. \[ 5c = -15 \]
   \[ \frac{5c}{5} = \frac{-15}{5} \]
   \[ c = -3 \]
   Check: \[ 5c = -15 \]
   \[ 5(-3) = -15 \]
   \[ -15 = -15 \]

4. \[ 54 = 9x \]
   \[ \frac{54}{9} = \frac{9x}{9} \]
   \[ 6 = x \]
   Check: \[ 54 = 9x \]
   \[ 54 \div 9 = 9(6) \]
   \[ 54 = 54 \]

5. \[ 6 = \frac{u}{4} \]
   \[ 4 \cdot 6 = 4 \cdot \frac{u}{4} \]
   \[ 24 = u \]
   Check: \[ 6 = \frac{u}{4} \]
   \[ 6 \div 24 = \frac{4}{4} \]
   \[ 4 = 4 \]

6. \[ \frac{y}{-10} = 7 \]
   \[ (-10) \cdot \frac{y}{-10} = (-10)7 \]
   \[ y = -70 \]
   Check: \[ \frac{y}{-10} = 7 \]
   \[ \frac{-70}{-10} = 7 \]
   \[ 7 = 7 \]

7. (1) Let \( b \) be the time in minutes.
   Pages per minute \( \times \) Number of minutes = Number of pages
   \[ 8b = 40 \]
   \[ b = 5 \]
   It takes 5 minutes to print the black and white document.

(2) Let \( c \) be the time in minutes.
   Pages per minute \( \times \) Number of minutes = Number of pages
   \[ 5c = 20 \]
   \[ c = 4 \]
   It takes 4 minutes to print the color document.

(3) It takes \( 5 + 4 = 9 \) minutes to print both documents.

2.6 Practice and Problem Solving (pp. 99–101)

8. \[ 3x = 27 \]
   \[ \frac{3x}{3} = \frac{27}{3} \]
   \[ x = 9 \]
   Check: \[ 3x = 27 \]
   \[ 3(9) = 27 \]
   \[ 27 = 27 \]

9. \[ 4y = 52 \]
   \[ \frac{4y}{4} = \frac{52}{4} \]
   \[ y = 13 \]
   Check: \[ 4y = 52 \]
   \[ 4(13) = 52 \]
   \[ 52 = 52 \]

10. \[ -65 = 13u \]
    \[ \frac{-65}{13} = \frac{13u}{13} \]
    \[ -5 = u \]
    Check: \[ -65 = 13u \]
    \[ -65 \div 13 = -5 \]
    \[ -5 = -5 \]

11. \[ 84 = -21v \]
    \[ \frac{84}{-21} = \frac{-21v}{-21} \]
    \[ -4 = v \]
    Check: \[ 84 = -21v \]
    \[ 84 \div -21 = -4 \]
    \[ -4 = -4 \]
12. \( \frac{x}{7} = 5 \)  
\[ 7 \cdot \frac{x}{7} = 7 \cdot 5 \]  
\[ x = 35 \]

Check: \( \frac{x}{7} = 5 \)  
\[ \frac{35}{7} = 5 \]
\[ 5 = 5 \checkmark \]

13. \( \frac{y}{3} = 8 \)  
\[ (-3) \left( \frac{y}{3} \right) = (-3)8 \]  
\[ y = -24 \]

Check: \( \frac{y}{3} = 8 \)  
\[ \frac{-24}{-3} = 8 \]  
\[ 8 = 8 \checkmark \]

14. \( 16 = \frac{p}{6} \)  
\[ 6 \cdot 16 = 6 \cdot \frac{p}{6} \]  
\[ 96 = p \]

Check: \( 16 = \frac{p}{6} \)  
\[ \frac{96}{6} = 16 \]  
\[ 16 = 16 \checkmark \]

15. \( -7 = \frac{q}{11} \)  
\[ 11(-7) = 11 \left( \frac{q}{11} \right) \]  
\[ -77 = q \]

Check: \( -7 = \frac{q}{11} \)  
\[ -7 = \frac{-77}{11} \]  
\[ -7 = -7 \checkmark \]

16. \( -23a = 0 \)  
\[ \frac{-23a}{-23} = \frac{0}{-23} \]  
\[ a = 0 \]

Check: \( -23a = 0 \)  
\[ -23(0) = 0 \]  
\[ 0 = 0 \checkmark \]

17. \( -95 = -5b \)  
\[ -95 = -5b \]

Check: \( -95 = -5b \)  
\[ -95 \neq -5(19) \]  
\[ -95 = -95 \checkmark \]

18. \( -r = 38 \)  
\[ \frac{-r}{-1} = \frac{38}{-1} \]  
\[ r = -38 \]

Check: \( -r = 38 \)  
\[ -(38) \neq 38 \]  
\[ 38 = 38 \checkmark \]

19. \( 301 = 43s \)  
\[ \frac{301}{43} = \frac{43s}{43} \]  
\[ s = 7 \]

Check: \( -r = 38 \)  
\[ 301 = 43s \]  
\[ 301 \neq 43(7) \]  
\[ 301 = 301 \checkmark \]

20. \( \frac{c}{-2} = -91 \)  
\[ (-2) \left( \frac{c}{-2} \right) = (-2)(-91) \]  
\[ c = 182 \]

Check: \( \frac{c}{-2} = -91 \)  
\[ \frac{182}{-2} = -91 \]  
\[ -91 = -91 \checkmark \]

21. \( 17 = \frac{d}{17} \)  
\[ 17 \cdot 17 = 17 \cdot \frac{d}{17} \]  
\[ c = 182 \]

Check: \( 17 = \frac{d}{17} \)  
\[ 17 \neq \frac{289}{17} \]  
\[ 17 = 17 \checkmark \]

22. \( 9 = \frac{m}{-36} \)  
\( (-36)9 = (-36) \left( \frac{m}{-36} \right) \)  
\( 62 \cdot \frac{n}{62} = 62(-54) \]

Check: \( 9 = \frac{m}{-36} \)  
\( 9 = -3348 \]  
\[ 62 \neq -54 \]

23. \( \frac{n}{62} = -54 \)  
\( 9 = \frac{-324}{-36} \)  
\( -324 = m \)

Check: \( \frac{n}{62} = -54 \)  
\( -324 = m \)  
\[ -54 = -54 \]

24. Let \( x \) = the total rushing yards.

Average rushing yards per game = \( \frac{Total \ rushing \ yards}{Number \ of \ games \ played} \)

\( 81 = \frac{x}{16} \)
\[ 16 \cdot 81 = 16 \cdot \frac{x}{16} \]
\[ 1296 = x \]

Michael Bennett rushed 1296 yards.

25. Let \( t \) = the time drilling.

Thickness of ice \( \times \) Rate of drilling = Time it takes to drill through the sheet of ice.

\[ \frac{75}{15} = \frac{15}{15} \]
\[ 5 = t \]

It takes 5 minutes to drill through the sheet of ice.

26. Let \( x \) = the number of seedlings planted.

Number of seedlings per acre \( \times \) Number of acres = Number of seedlings

\[ \frac{300}{100} = \frac{x}{100} \]
\[ 100 \cdot 300 = 100 \cdot \frac{x}{100} \]
\[ 30,000 = x \]

So, 30,000 seedlings were planted.

27. Let \( t \) = the download time.

Download size \( \times \) Download speed = Size of file

\[ 7 \times 5384 = \frac{7384}{7} \]
\[ 7 \times 5384 = \frac{384}{7} \]
\[ t = 512 \]

It takes 512 seconds, or 8 minutes 32 seconds, to download using dial-up service.

---CONTINUED---
27. —CONTINUED—

DSL: $96t = 3584$
\[
\frac{96t}{96} = \frac{3584}{96}
\]
\[t = 37\]

It takes about 37 seconds to download using DSL service.

Cable: $188t = 3584$
\[
\frac{188t}{188} = \frac{3584}{188}
\]
\[t = 19\]

It takes about 19 seconds to download using cable service.

28. $7x - 3x = 24$
\[4x = 24\]
\[\frac{4x}{4} = \frac{24}{4}
\]
\[x = 6\]

Check: $7x - 3x = 24$
\[7(6) - 3(6) = 24\]
\[42 - 18 = 24\]
\[24 = 24 \checkmark\]

29. $-110 = 12y + 10y$
\[-110 = 22y\]
\[\frac{-110}{22} = \frac{22y}{22}\]
\[-y = 5\]

Check: $-110 = 12y + 10y$
\[-110 = 12(-5) + 10(-5)\]
\[-110 = -60 + (-50)\]
\[-110 = -110 \checkmark\]

30. $-4(9g) = 252$
\[-36g = 252\]
\[\frac{-36g}{-36} = \frac{252}{-36}\]
\[g = -7\]

Check: $-4(9g) = 252$
\[-4[(-7)] = 252\]
\[-4(-63) = 252\]
\[252 = 252 \checkmark\]

31. $150 = 6(5h)$
\[150 = 30h\]
\[\frac{150}{30} = \frac{30h}{30}\]
\[5 = h\]

Check: $150 = 6(5h)$
\[150 = 6[5(5)]\]
\[150 = 6(25)\]
\[150 = 150 \checkmark\]

32. $-3 = \frac{z}{6 + 11}$
\[-3 = \frac{z}{17}\]
\[17(-3) = 17 \cdot \frac{z}{17}\]
\[-51 = z\]

Check: $-3 = \frac{z}{6 + 11}$
\[-3 = \frac{z}{6 + 11}\]
\[-3 \cdot \frac{6 + 11}{z} = \frac{-51}{17}\]
\[-3 = -3 \checkmark\]

33. \[
\frac{w}{8} = 9 - (-4)
\]
\[
\frac{w}{8} = 9 + 4
\]
\[
\frac{w}{8} = 13
\]
\[8 \cdot \frac{w}{8} = 8 \cdot 13\]
\[w = 104
\]

Check: \[
\frac{w}{8} = 9 - (-4)
\]
\[
\frac{104}{8} = 9 - (-4)
\]
\[13 = 9 + 4
\]
\[13 = 13 \checkmark\]

34. a. $A = \text{Area of rectangle} + \text{Area of triangle}$
\[= lw + \frac{1}{2}bh\]
\[= x \cdot 8 + \frac{1}{2} \cdot 6 \cdot x\]
\[= 8x + 3x\]
\[= 11x\]

b. Let $A = 154$ square feet.
\[A = 11x\]
\[154 = 11x\]
\[154 = 11x\]
\[\frac{154}{11} = \frac{11x}{11}\]
\[14 = x\]

When $A = 154$, $x = 14$ feet.

35. a. Let $x = \text{the number of days}$. 
\[d = rt\]
\[d = 100x\]

—CONTINUED—
35. **CONTINUED**

b.

<table>
<thead>
<tr>
<th>Travel time (days)</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
</tr>
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<tbody>
<tr>
<td>Distance traveled (miles)</td>
<td>0</td>
<td>500</td>
<td>1000</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
</tr>
</tbody>
</table>

c-d.

**Gray Whale Migration**

The points all lie on a straight line that passes through the origin.

d. It takes 50 days for the whales to migrate from the Baja Peninsula to Alaska.

e. \[100x = 5000\]
\[
\frac{100x}{100} = \frac{5000}{100}
\]
\[x = 50\]

The answers are the same.

36. Let \(x\) be the number of columns.

\[
\text{Number of rows} \times \text{Number of columns} = \text{Number of pixels}
\]

\[
80x = 6240
\]
\[
80x = \frac{6240}{80}
\]
\[x = 78
\]

The viewfinder has 78 columns.

37. **Sample answer:** You are going on a vacation to the beach with your family. The beach is 400 miles from your home. If you drive at an average speed of 50 miles per hour, how long will it take to arrive at the beach?

Let \(x\) be the time in hours.

\[rt = d\]

\[50x = 400\]
\[
\frac{50x}{50} = \frac{400}{50}
\]
\[x = 8\]

It will take 8 hours to arrive at the beach.

38. Let \(x\) be the number of lightening strikes detected.

\[24 \text{ hours} = 24 \text{ hours} \times \frac{60 \text{ minutes}}{1 \text{ hour}} = 1440 \text{ minutes}\]

\[
\text{Lightening strikes per minute} = \frac{\text{Number of lightening strikes}}{\text{Number of minutes}}
\]

\[80 = \frac{x}{1440}\]
\[1440 \times 80 = 1440 \times \frac{x}{1440}\]
\[115,200 = x\]

There were 115,200 lightening strikes.

39. a. Let \(x\) be the amount of wheat (in tou) replaced by the goat’s owner.

The amount replaced by the horse’s owner is \(2x\).

The amount replaced by the cow’s owner is \(2(2x) = 4x\).

b. \[x + 2x + 4x = 5\]
\[7x = 5\]
\[x = \frac{5}{7}\]

The goat’s owner should replace 0.7 tou. The horse’s owner should replace 1.4 tou. The cow’s owner should replace 2.9 tou.

### 2.6 Mixed Review (p. 101)

<table>
<thead>
<tr>
<th>40.</th>
<th>2.9</th>
<th>41.</th>
<th>7.63</th>
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<tr>
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<td>(\pm)</td>
<td>5.18</td>
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<td>(-)</td>
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<td>44.</td>
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<td>6.51</td>
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<td>(\times)</td>
<td>2.3</td>
<td>(\times)</td>
<td>9.22</td>
</tr>
<tr>
<td>1.38</td>
<td>1302</td>
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<td>9.2</td>
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<td>10.58</td>
<td>58.59</td>
<td>60.0222</td>
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<tr>
<td>46.</td>
<td>6.7</td>
<td>47.</td>
<td>3.4</td>
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<td>(\sqrt[3]{133.6})</td>
<td>(\sqrt[3]{8})</td>
<td>(\sqrt[3]{\sqrt[3]{13.6}})</td>
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<td>67536</td>
<td>24</td>
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<td>536</td>
<td>3481.6</td>
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<td>0</td>
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<tr>
<td>53.6 (\div) 6.7 = 8</td>
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<tr>
<td>8.16 (\div) 3.4 = 2.4</td>
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</tbody>
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| 48. | \(-19 + 40\) = 21 |
| 49. | \(-26 + \(-7\) = \(-33\) |
| 50. | \(3 - 18 = 3 + \(-18\) = \(-15\) |
| 51. | \(-12 - \(-10\) = \(-12 + 10\) = \(-2\) |
| 52. | \(5(-14) = -70\) | 53. | \(-23(-8) = 184\) |
54. \(-90 + 15 = -6\)  
55. \(-36 \div (-4) = 9\)
56. Let \(x\) = the number of endangered plant species in 1994.
Number in 1994 + Increase = Number in 2001
\[x + 177 = 593\]
\[x + 177 - 177 = 593 - 177\]
\[x = 416\]
There were 416 endangered plant species in 1994.

2.6 Standardized Test Practice (p. 101)

57. D; \[\frac{x}{-2} = -8\]
\[(-2)\left(\frac{x}{-2}\right) = (-2)(-8)\]
\[x = 16\]

58. H; Let \(x\) = the number of miles per gallon.
Number of gallons \(\times\) miles per gallon = Number of miles
\[12x = 420\]
\[\frac{12x}{12} = \frac{420}{12}\]
\[x = 35\]
The car got 35 miles per gallon.

Lesson 2.7

2.7 Checkpoint (pp. 103–104)

1. \(-1.3 + (-4.2) = -5.5\)
2. \(10.57 + (-6.89) = 3.68\)
3. \(9.817 + (-1.49) = 9.817 + 1.49 = 11.307\)
4. \(3.1(-6.8) = -21.08\)
5. \(-11.41 + (-0.7) = 16.3\)
6. \(-15.841 + 2.17 = -7.3\)

7. Sample answer: To check whether your answer is reasonable, round the factors to their nearest whole numbers.
\[3.1 = 3\]
\[-6.8 \approx -7\]
\[3(-7) = -21\]
Because \(-21\) is close to \(-21.08\), the answer is reasonable.

8. \[x + 3.8 = 5.2\]
\[x + 3.8 - 3.8 = 5.2 - 3.8\]
\[x = 1.4\]
Check: \[x + 3.8 = 5.2\]
\[1.4 + 3.8 \approx 5.2\]
\[5.2 = 5.2\checkmark\]

9. \[a + 10.4 = -1.17\]
\[a + 10.4 - 10.4 = -1.17 - 10.4\]
\[a = -11.57\]
Check: \[a + 10.4 = -1.17\]
\[-11.57 + 10.4 \approx -1.17\]
\[-1.17 = -1.17\checkmark\]

10. \[6.29 + c = 4.01\]
\[6.29 - 6.29 + c = 4.01 - 6.29\]
\[c = -2.28\]
Check: \[6.29 + c = 4.01\]
\[6.29 + (-2.28) \approx 4.01\]
\[4.01 = 4.01\checkmark\]

11. \[y - 7.8 = 22.3\]
\[y - 7.8 + 7.8 = 22.3 + 7.8\]
\[y = 30.1\]
Check: \[y - 7.8 = 22.3\]
\[30.1 - 7.8 \approx 22.3\]
\[22.3 = 22.3\checkmark\]

12. \[r - 0.88 = -0.56\]
\[r - 0.88 + 0.88 = -0.56 + 0.88\]
\[r = 0.32\]
Check: \[r - 0.88 = -0.56\]
\[0.32 - 0.88 \approx -0.56\]
\[-0.56 = -0.56\checkmark\]

13. \[-9.34 = t - 2.75\]
\[-9.34 + 2.75 = t - 2.75 + 2.75\]
\[-6.59 = t\]
Check: \[-9.34 = t - 2.75\]
\[-9.34 \approx -6.59 + 2.75\]
\[-9.34 = -9.34\checkmark\]

14. \[7x = 40.6\]
\[\frac{7x}{7} = \frac{40.6}{7}\]
\[x = 5.8\]
Check: \[7x = 40.6\]
\[7(5.8) \approx 40.6\]
\[40.6 = 40.6\checkmark\]

15. \[-1.8u = 6.3\]
\[\frac{-1.8u}{-1.8} = \frac{6.3}{-1.8}\]
\[u = -3.5\]
Check: \[-1.8u = 6.3\]
\[-1.8(-3.5) \approx 6.3\]
\[6.3 = 6.3\checkmark\]
Chapter 2 continued

16. \( \frac{y}{11.5} = 0.4 \)
   
   \[ 11.5 \cdot \frac{y}{11.5} = 11.5 \cdot 0.4 \]
   
   \[ y = 4.6 \]
   
   Check: \( \frac{y}{11.5} = 0.4 \)
   
   \[ \frac{4.6}{11.5} \approx 0.4 \]
   
   \[ 0.4 = 0.4 \checkmark \]

17. \(-9.1 = \frac{v}{-5.9}\)

\[ (-5.9)(-9.1) = (-5.9) \left( \frac{v}{-5.9} \right) \]

\[ 53.69 = v \]

Check: \(-9.1 = \frac{v}{-5.9}\)

\[ -9.1 = 53.69 \frac{-9.1}{-5.9} \]

\[ -9.1 = -9.1 \checkmark \]

18. Let \( x \) be the balance before the deposit.

Balance before deposit + Deposit = Balance after deposit

\[ x + 122.94 = 286.59 \]

\[ x + 122.94 - 122.94 = 286.59 - 122.94 \]

\[ x = 163.65 \]

Before the deposit you had a balance of $163.65.

2.7 Guided Practice (p. 105)

1. The sum of a positive decimal and a negative decimal has the same sign as the decimal with the greater absolute value.

2. To solve the equation \(-7.9x = 86.9\), divide both sides by \(-7.9\) to get \(x\) alone on one side of the equation.

\[ \frac{-7.9x}{-7.9} = \frac{86.9}{-7.9} \]

\[ x = 11 \]

3. \(-6.2 + 4.5 = -1.7 \)

4. \(1.9 - (-9.1) = 1.9 + 9.1 = 11 \)

5. \(-0.4(-8.3) = 3.32 \)

6. \(7.35 + (-2.1) = 5.25 \)

7. \(x - 2.2 = 3.2\)

\[ x - 2.2 + 2.2 = 3.2 + 2.2 \]

\[ x = 5.4 \]

Check: \(x - 2.2 = 3.2\)

\[ 5.4 - 2.2 \neq 3.2 \]

\[ 3.2 = 3.2 \checkmark \]

8. \(y + 0.6 = -1\)

\[ y + 0.6 - 0.6 = -1 - 0.6 \]

\[ y = -1.6 \]

Check: \(y + 0.6 = -1\)

\[ -1.6 + 0.6 \neq -1 \]

\[ -1 = -1 \checkmark \]

9. \(\frac{n}{-7.1} = 5.8\)

\[ (-7.1) \left( \frac{n}{-7.1} \right) = (-7.1)(5.8) \]

\[ n = -41.18 \]

Check: \(\frac{n}{-7.1} = 5.8\)

\[ \frac{-41.18}{-7.1} \approx 5.8 \]

\[ 5.8 = 5.8 \checkmark \]

10. \(-5.2a = -1.3\)

\[ -5.2a = -1.3 \]

\[ -5.2 = -5.2 \]

\[ a = 0.25 \]

Check: \(-5.2a = -1.3\)

\[ -5.2(0.25) \neq -1.3 \]

\[ -1.3 = -1.3 \checkmark \]

11. \(1) \frac{-0.19}{(-0.28)} + 0.04 + (-0.18) = -0.61 \)

The overall change is -0.61 meter.

(2) Let \( x \) be the water level in 1997.

Water level in 1997 + Decrease in Water level in water level water level = in 2001

\[ x + (-0.61) = 182.98 \]

\[ x - 0.61 = 182.98 \]

(3)

\[ x - 0.61 = 182.98 \]

\[ x = 183.59 \]

Lake Superior's water level in 1997 was 183.59 meters.

2.7 Practice and Problem Solving (pp. 105-107)

12. \(7.8 + (-9.3) = -1.5 \)

13. \(-1.25 + 14.4 = 13.15 \)

14. \(-2.583 + (-5.399) = -7.982 \)

15. \(6.1 - 18.7 = 6.1 + (-18.7) = -12.6 \)

16. \(-3.72 - 4.58 = -3.72 + (-4.58) = -8.3 \)

17. \(-0.62 - (-0.741) = -0.62 + 0.741 = 0.121 \)

18. \(-4.8(0.1) = -0.48 \)

19. \(-11.7(-6.82) = 79.794 \)

20. \(2.03(-1.66) = -3.3698 \)

21. \(34.1 + (-5.5) = -6.2 \)

22. \(-0.63 + 0.7 = -0.9 \)
23. \(-7.532 \div (-2.69) = 2.8\)
24. \(x + 8.5 = 13.7\)
   \(x + 8.5 \div 8.5 = 13.7 - 8.5\)
   \(x = 5.2\)
   Check: \(x + 8.5 = 13.7\)
   \(5.2 + 8.5 \div 8.5 = 13.7\)
   \(13.7 = 13.7 \checkmark\)
25. \(a + 4.8 = 2.29\)
   \(a + 4.8 - 4.8 = 2.29 - 4.8\)
   \(a = -2.51\)
   Check: \(a + 4.8 = 2.29\)
   \(-2.51 + 4.8 \div 2.29 = 2.29\)
   \(2.29 = 2.29 \checkmark\)
26. \(-3.36 = b + 5.12\)
   \(-3.36 - 5.12 = b + 5.12 - 5.12\)
   \(-8.48 = b\)
   Check: \(-3.36 = b + 5.12\)
   \(-3.36 \div -8.48 + 5.12 = -3.36\)
   \(-3.36 = -3.36 \checkmark\)
27. \(y - 1.3 = -7.4\)
   \(y - 1.3 + 1.3 = -7.4 + 1.3\)
   \(y = -6.1\)
   Check: \(y - 1.3 = -7.4\)
   \(-6.1 - 1.3 \div -7.4 = -7.4\)
   \(-7.4 = -7.4 \checkmark\)
28. \(g - 6.27 = 10.63\)
   \(g - 6.27 + 6.27 = 10.63 + 6.27\)
   \(g = 16.9\)
   Check: \(g - 6.27 = 10.63\)
   \(16.9 - 6.27 \div 10.63 = 10.63\)
   \(10.63 = 10.63 \checkmark\)
29. \(-0.504 + h = -0.18\)
   \(-0.504 + 0.504 + h = -0.18 + 0.504\)
   \(h = 0.324\)
   Check: \(-0.504 + h = -0.18\)
   \(-0.504 + 0.324 \div -0.18 = -0.18\)
   \(-0.18 = -0.18 \checkmark\)
30. \(8w = 75.2\)
   \(8w = 75.2\)
   \(8 \div 8 = 75.2\)
   \(w = 9.4\)
   Check: \(8w = 75.2\)
   \(8(9.4) \div 75.2 = 75.2\)
   \(75.2 = 75.2 \checkmark\)
31. \(-0.96j = -0.72\)
   \(-0.96j = -0.72\)
   \(-0.96 = -0.96\)
   \(j = 0.75\)
   Check: \(-0.96j = -0.72\)
   \(-0.96(0.75) \div 0.72 = -0.72\)
   \(-0.72 = -0.72 \checkmark\)
32. \(3.498 = 0.53k\)
   \(3.498 = 0.53k\)
   \(0.53 = 0.53\)
   \(6.6 = k\)
   Check: \(3.498 = 0.53k\)
   \(3.498 \div 0.53(-6.6) = 3.498\)
   \(3.498 = 3.498 \checkmark\)
33. \(\frac{x}{6.9} = -3\)
   \(6.9 \cdot \frac{x}{6.9} = 6.9(-3)\)
   \(x = -20.7\)
   Check: \(\frac{x}{6.9} = -3\)
   \(-20.7 \div 6.9 = -3\)
   \(-3 = -3 \checkmark\)
34. \(\frac{r}{0.4} = 0.8\)
   \(0.4 \cdot \frac{r}{0.4} = 0.4 \cdot 0.8\)
   \(r = 0.32\)
   Check: \(\frac{r}{0.4} = 0.8\)
   \(0.32 \div 0.4 = 0.8\)
   \(0.8 = 0.8 \checkmark\)
35. \(-9.1 = \frac{s}{-7.12}\)
   \(-7.12(-9.1) = -7.12\left(\frac{s}{-7.12}\right)\)
   \(64.792 = s\)
   Check: \(-9.1 = \frac{s}{-7.12}\)
   \(-9.1 \div 64.792 \div -7.12 = -9.1\)
   \(-9.1 = -9.1 \checkmark\)
36. 

4.81 corresponds to an x-value of 1.3. So, the solution of 3.7x = 4.81 is 1.3.
Chapter 2 continued

37. Let \( x \) = the area of each section of the mirror,
   Number of sections \( \times \) Area of each section = Area of mirror
   \[ 36x = 75.8 \]
   \[ \frac{36x}{36} = \frac{75.8}{36} \]
   \[ x \approx 2.1 \]
   Each section of the mirror has an area of about 2.1 square meters.

38. Let \( x \) = the number of hits.
   Batting average = \( \frac{\text{Number of hits}}{\text{Number of times at bat}} \)
   \[ 0.350 = \frac{x}{692} \]
   \[ 692 \cdot 0.350 = 692 \cdot \frac{x}{692} \]
   \[ 242.2 = x \]
   Suzuki had 242 hits.

39. \( 2.6x - 7.1x = -4.5x \)
40. \( -3.5(4a + 1.9) = -3.5(4a) + (-3.5)(1.9) \)
    \[ = -14a + (-6.65) \]
    \[ = -14a - 6.65 \]
41. \( 0.8(3 - 11n) + 1.4n = 0.8(3) - 0.8(11n) + 1.4n \)
    \[ = 2.4 - 8.8n + 1.4n \]
    \[ = -7.4n + 2.4 \]

42. \[ P = a + b + c \]
    \[ 10 = x + 3.2 + 4.1 \]
    \[ 10 = x + 7.3 \]
    \[ 10 - 7.3 = x + 7.3 - 7.3 \]
    \[ 2.7 = x \]
   So, \( x = 2.7 \) meters.

43. \[ A = lw \]
    \[ 75.52 = 11.8x \]
    \[ \frac{75.52}{11.8} = \frac{11.8}{11.8} \]
    \[ 6.4 = x \]
   So, \( x = 6.4 \) feet.

44. \[ A = \frac{1}{2}bh \]
    \[ 15.75 = \frac{1}{2} \cdot 7.5 \cdot x \]
    \[ 15.75 = 3.75x \]
    \[ \frac{15.75}{3.75} = \frac{3.75}{3.75} \]
    \[ 4.2 = x \]
   So, \( x = 4.2 \) centimeters.

45. a. The U.S. government received more money than it spent over the entire period 1995–2000.
   For each of these pairs, the absolute value of the positive number is greater than the absolute value of the negative number. So, the final answer will be positive.
   \[ -104.4 + (104.4) + (124.4) + (136.7) \]
   \[ + 69.2 + 124.6 + 236.4 = 136.7 \]
   The overall surplus is \$136.7 billion.

   b. \[ \frac{136.7}{6} = 22.8 \]
   The mean annual surplus was \$22.8 billion.

   d. Median: \[ \frac{47.2 + 23.6}{2} = 30.4 \]
   Sample answer: The median annual surplus was \$23.6 billion. The median is only slightly higher than the mean.

46. \[ 0.1x = 1 \]
    \[ 0.1x = 1 \]
    \[ 0.01x = \frac{1}{10} \]
   \[ x = 10 \]
   \[ x = 100 \]
    \[ 0.01x = \frac{1}{100} \]
   \[ x = 1000 \]
   \[ x = 10,000 \]
   Sample answer: As the coefficients of \( x \) get closer to 0, the solutions rapidly increase.

47. a. Let \( x \) = the airplane's speed.
   Mach number = \( \frac{\text{Speed of airplane}}{\text{Speed of sound}} \)
   Cessna Skyhawk: \[ \frac{0.19}{740} \]
   \[ 0.19 = \frac{740}{740} \]
   \[ 141 = x \]
   The Cessna Skyhawk's speed is about 141 miles per hour.
   Boeing 747: \[ \frac{0.86}{663} \]
   \[ 0.86 = \frac{663}{663} \]
   \[ 570 = x \]
   The Boeing 747's speed is about 570 miles per hour.
   Concorde: \[ \frac{2.04}{660} \]
   \[ 2.04 = \frac{660}{660} \]
   \[ 1346 = x \]
   The Concorde's speed is about 1346 miles per hour.

—CONTINUED—
47. —CONTINUED—
   b. Let \( t \) = the time in hours.
   \[ d = rt \]
   \[ 550 = rt \]
   Cessna Skyhawk: \( 550 = 141t \)
   \[
   \frac{550}{141} = \frac{141t}{141} \]
   \[ 3.9 \, t \]
   The Cessna Skyhawk will take about 3.9 hours.
   Boeing 747: \( 550 = 570t \)
   \[
   \frac{550}{570} = \frac{570t}{570} \]
   \[ 1.0 \, t \]
   The Boeing 747 will take about 1.0 hour.
   Concorde: \( 550 = 1346t \)
   \[
   \frac{550}{1346} = \frac{1346t}{1346} \]
   \[ 0.4 \, t \]
   The Concorde will take about 0.4 hour.

2.7 Mixed Review (p. 107)

48. \[ 5x + 11 + 8x \]
   Terms: \( 5x, 11, 8x \)
   Like terms: \( 5x \) and \( 8x \)
   Coefficients: \( 5, 8 \)
   Constant term: \( 11 \)
   \[ 5x + 11 + 8x = 5x + 8x + 11 \]
   \[ = (5 + 8)x + 11 \]
   \[ = 13x + 11 \]

49. \[ -3p + 2 + p - 4 = -3p + 2 + p + (-4) \]
   Terms: \( -3p, 2, p, -4 \)
   Like terms: \( -3p \) and \( p \); \( 2 \) and \( -4 \)
   Coefficients: \( -3, 1 \)
   Constant terms: \( 2, -4 \)
   \[ -3p + 2 + p + (-4) = -3p + p + 2 + (-4) \]
   \[ = (-3 + 1)p + 2 + (-4) \]
   \[ = -2p + (-2) \]
   \[ = -2p - 2 \]

50. \[ 7w - w + 9 - 6w = 7w + (-w) + 9 + (-6w) \]
   Terms: \( 7w, -w, 9, -6w \)
   Like terms: \( 7w, -w, \) and \( -6w \)
   Coefficients: \( 7, -1, -6 \)
   Constant term: \( 9 \)
   \[ 7w + (-w) + 9 + (-6w) \]
   \[ = 7w + (-w) + (-6w) + 9 \]
   \[ = [7 + (-1) + (-6)]w + 9 \]
   \[ = 0w + 9 \]
   \[ = 9 \]

51. \[ 8 + 2y - 1 - 9y + 3 = 8 + 2y + (-1) + (-9y) + 3 \]
   Terms: \( 8, 2y, -1, -9y, 3 \)
   Like terms: \( 2y \) and \( -9y; \) \( 8, -1, \) and \( 3 \)
   Coefficients: \( 2, -9 \)
   Constant terms: \( 8, -1, 3 \)
   \[ 8 + 2y + (-1) + (-9y) + 3 \]
   \[ = 2y + 8 + (-9y) + (-1) + 3 \]
   \[ = 2y + (-9y) + 8 + (-1) + 3 \]
   \[ = [2 + (-9)]y + 8 + (-1) + 3 \]
   \[ = -7y + 10 \]

52. \[ x + 12 = 5 \]
   \[ x + 12 - 12 = 5 - 12 \]
   \[ x = -7 \]
   Check: \( x + 12 = 5 \)
   \[ -7 + 12 = 5 \]
   \[ 5 = 5 \checkmark \]

53. \[ y - 9 = -4 \]
   \[ y - 9 + 9 = -4 + 9 \]
   \[ y = 5 \]
   Check: \( y - 9 = -4 \)
   \[ 5 - 9 = -4 \]
   \[ -4 = -4 \checkmark \]

54. \[ 32c = 192 \]
   \[ c = \frac{192}{32} \]
   \[ c = 6 \]
   Check: \[ 32c = 192 \]
   \[ 32(6) = 192 \]
   \[ 192 = 192 \checkmark \]

55. \[ \frac{d}{19} = -8 \]
   \[ 19 \cdot \frac{d}{19} = 19(-8) \]
   \[ d = -152 \]
   Check: \[ \frac{d}{19} = -8 \]
   \[ \frac{-152}{19} \]
   \[ -8 = -8 \checkmark \]

2.7 Standardized Test Practice (p. 107)

56. a. \( s = 3.49T \)
   \[ s = 3.49(11) = 38.39 \]
   The speed of the waves is 38.39 miles per hour.

—CONTINUED—
Chapter 2 continued

56. —CONTINUED—
   b. Let \( t \) = the time in hours.
   \[ d = rt \]
   \[ 8000 = 38.39t \]
   \[ \frac{8000}{38.39} = t \]
   \[ 208.4 = t \]
   It takes about 208.4 hours to reach the Alaskan coast.
   \[ 208.4 \text{ hours} = 208.4 \text{ hours} \times \frac{1 \text{ day}}{24 \text{ hours}} = 8.7 \text{ days} \]
   It takes about 8.7 days to reach the Alaskan coast.

**Brain Game (p. 107)**

- \[ 12.7 + a = 65.6 \]
- \[ 12.7 - 12.7 + a = 65.6 - 12.7 \]
  \[ a = 52.9 \]
- \[ b - a = 38.8 \]
  \[ b - 52.9 = 38.8 \]
  \[ b - 52.9 + 52.9 = 38.8 + 52.9 \]
  \[ b = 91.7 \]
- \[ 3.5x = b \]
  \[ 3.5x = 91.7 \]
  \[ \frac{3.5x}{3.5} = \frac{91.7}{3.5} \]
  \[ x = 26.2 \]

A marathon is 26.2 miles.

**Chapter 2 Review (pp. 108–111)**

1. The additive identity is 0 and the multiplicative identity is 1.
2. To solve \( ax = b \), divide both sides of the equation by \( a \).
3. The expressions \( 2(8 + 3) \) and \( 2(8) + 2(3) \) are equivalent numerical expressions.
4. \[ 5 - 9n = 5 + (-9n) \]
   The coefficient of \( n \) is \(-9\) and the constant term is \(5\).
5. \[ 16 + 18 + 14 \]
   \[ = (16 + 18) + 14 \]
   \[ = (16 + 18) + 14 \]
   \[ = 38 + 14 \]
   \[ = 52 \]
   Use order of operations.
   Commutative property of addition
   Associative property of addition
   Add 16 and 14.
   Add 18 and 30.

6. \[ 38 + 23 + (-8) \]
   \[ = (38 + 23) + (-8) \]
   \[ = (23 + 38) + (-8) \]
   \[ = 23 + 38 + (-8) \]
   \[ = 23 + [38 + (-8)] \]
   \[ = 23 + 30 \]
   \[ = 53 \]
   Use order of operations.
   Commutative property of addition
   Associative property of addition
   Add 38 and \(-8\).
   Add 23 and 30.

7. \[ 4.7 + 2.5 + 2.3 \]
   \[ = (4.7 + 2.5) + 2.3 \]
   \[ = (2.5 + 4.7) + 2.3 \]
   Use order of operations.
   Commutative property of addition
   Associative property of addition
   \[ = 2.5 + (4.7 + 2.3) \]
   \[ = 2.5 + 7 \]
   \[ = 9.5 \]
   Add 4.7 and 2.3.
   Add 2.5 and 7.

8. \[ 4(11)(25) = [4(11)](25) \]
   \[ = [11(4)](25) \]
   \[ = [11(4)(25)] \]
   \[ = 11(100) \]
   \[ = 1100 \]
   Use order of operations.
   Commutative property of multiplication
   Associative property of multiplication
   Multiply 4 and 25.
   Multiply 11 and 100.

9. \[ 5(-3)(12) = [5(-3)](12) \]
   \[ = [-3(5)](12) \]
   \[ = [-3(5)(12)] \]
   \[ = -3(60) \]
   \[ = -180 \]
   Use order of operations.
   Commutative property of multiplication
   Associative property of multiplication
   Multiply 5 and 12.
   Multiply \(-3\) and 60.

10. \[ 6(13)(0.5) = [6(13)](0.5) \]
    \[ = [13(6)](0.5) \]
    \[ = [13(6)(0.5)] \]
    \[ = 13(6)(0.5) \]
    \[ = 13(3) \]
    \[ = 39 \]
    Use order of operations.
    Commutative property of multiplication
    Associative property of multiplication
    Multiply 6 and 0.5.
    Multiply 13 and 3.

11. \[ 3(106) = 3(100 + 6) = 3(100) + 3(6) = 300 + 18 = 318 \]
12. \[ 6(99) = 6(100 - 1) = 6(100) - 6(1) = 600 - 6 = 594 \]
13. \[ 8(5.2) = 8(5 + 0.2) = 8(5) + 8(0.2) = 40 + 1.6 = 41.6 \]
14. \[ (7.95)(4) = (8 - 0.05)(4) \]
    \[ = 8(4) - 0.05(4) \]
    \[ = 32 - 0.2 \]
    \[ = 31.8 \]
15. \[ -2(x + 4) = -2(x + (-2)(4)) \]
    \[ = -2(x + (-8)) \]
    \[ = -2x - 8 \]
16. \[ 5(y - 8) = 5(y) - 5(8) = 5y - 40 \]
17. \[ 4(7a + 2) = 4(7a) + 4(2) = 28a + 8 \]
18. \[ (6 - 11c)(-3) = (6 - 3) - 11c(-3) \]
    \[ = -18 - (-33c) \]
    \[ = -18 + 33c \]
    \[ = 33c - 18 \]
19. \[ 4t + 13t + 2 \]
   Terms: \(4t\), \(13t\), 2
   Like terms: \(4t\) and \(13t\)
   Coefficients: 4, 13
   Constant term: 2

Pre-Algebra
Chapter 2 Worked-Out Solution Key
20. \( x + 5 - 3x - 1 = x + 5 + (-3x) + (-1) \)
   Terms: \( x, 5, -3x, -1 \)
   Like terms: \( x \) and \(-3x\); 5 and \(-1\)
   Coefficients: \( 1, -3 \)
   Constant terms: \( 5, -1 \)

21. \( 12 - 7k + 9 - k = 12 + (-7k) + 9 + (-k) \)
   Terms: \( 12, -7k, 9, -k \)
   Like terms: \(-7k\) and \(-k\); 12 and 9
   Coefficients: \(-7, -1 \)
   Constant terms: \( 12, 9 \)

22. \( 5x - 9 - x + 2 = 5x - x - 9 + 2 = 4x - 7 \)

23. \( 3(u + 1) + 4u + 1 = 3u + 3 + 4u + 1 \)
   \[ = 3u + 4u + 3 + 1 \]
   \[ = 7u + 4 \]

24. \( 8a - 2(7a - 3) = 8a - 14a + 6 = -6a + 6 \)

25. Equation: \( x + 10 = 23 \)
   Question: What number plus 10 equals 23?
   Solution: 13
   Check: \( 13 + 10 = 23 \) ✓

26. Equation: \( 7 - y = -1 \)
   Question: 7 minus what number equals -1?
   Solution: 8
   Check: \( 7 - 8 = -1 \) ✓

27. Equation: \( 36 = -4a \)
   Question: 36 equals \(-4\) times what number?
   Solution: \(-9 \)
   Check: \( 36 = -4(-9) \) ✓

28. Equation: \( \frac{b}{5} = 8 \)
   Question: What number divided by 5 equals 8?
   Solution: \( 40 \)
   Check: \( \frac{40}{5} = 8 \) ✓

29. \( d = rt \)
   \( 150 = 50 \cdot t \)
   \( 150 = 50 \times 3 \)
   The trip takes 3 hours.

30. \( x + 8 = 21 \)
   \( x + 8 - 8 = 21 - 8 \)
   \( x = 13 \)
   Check: \( x + 8 = 21 \)
   \( 13 + 8 = 21 \)
   \( 21 = 21 \) ✓

31. \( -9 = t + 16 \)
   \( -9 - 16 = t + 16 - 16 \)
   \( -25 = t \)
   Check: \(-9 = t + 16 \)
   \( -9 \neq -25 + 16 \)
   \(-9 = -9 \) ✓

32. \( p - 7 = -8 \)
   \( p - 7 + 7 = -8 + 7 \)
   \( p = -1 \)
   Check: \( p - 7 = -8 \)
   \( -1 - 7 \neq -8 \)
   \(-8 = -8 \) ✓

33. \( 29 = r - 64 \)
   \( 29 + 64 = r - 64 + 64 \)
   \( 93 = r \)
   Check: \( 29 = r - 64 \)
   \( 29 \neq 93 - 64 \)
   \( 29 = 29 \) ✓

34. Let \( x \) be the salary before the promotion.
   Previous salary + Raise = New salary
   \( x + 4500 = 50,750 \)
   \( x + 4500 - 4500 = 50,750 - 4500 \)
   \( x = 46,250 \)
   Her salary before the promotion was $46,250.

35. \(-5x = 45 \)
   \( \frac{-5x}{-5} = \frac{45}{-5} \)
   \( x = -9 \)
   Check: \(-5x = 45 \)
   \( -5(-9) \neq 45 \)
   \( 45 = 45 \) ✓

36. \(-54 = -3y \)
   \( -54 = -3y \)
   \( -3 = -3 \)
   \( 18 = y \)
   Check: \(-54 = -3y \)
   \( -54 \neq -3(18) \)
   \(-54 = -54 \) ✓

37. \( \frac{a}{8} = 4 \)
   \( 8 \cdot \frac{a}{8} = 8 \cdot 4 \)
   \( a = 32 \)
   Check: \( \frac{a}{8} = 4 \)
   \( \frac{32}{8} \neq 4 \)
   \( 4 = 4 \) ✓
Chapter 2 continued

38. \[ 9 = \frac{c}{-9} \]
\[ (-9)9 = (-9)\left(\frac{c}{-9}\right) \]
\[ -81 = c \]
Check: \[ 9 = \frac{c}{-9} \]
\[ 9 \not\equiv \frac{-81}{-9} \]
9 = 9 ✓

39. Let \( x \) = the total number of fliers.

Fliers per stack = \( \frac{\text{Number of fliers}}{\text{Number of stacks}} \)

\[ 15 = \frac{x}{6} \]
\[ 6 \times 15 = 6 \times \frac{x}{6} \]

90 = \( x \)

There are 90 fliers.

40. \(-6.6 + 1.4 = -5.2\)
41. \(2.8 - (-4.7) = 2.8 + 4.7 = 7.5\)
42. \(-9.4(-5.31) = 49.914\)
43. \(7 + (-2.5) = -2.8\)
44. \(x + 6 = 1.8\)
\[ x + 6 - 6 = 1.8 - 6 \]
\[ x = -4.2 \]
Check: \[ x + 6 = 1.8 \]
\[ -4.2 + 6 \equiv 1.8 \]
\[ 1.8 = 1.8 ✓ \]

45. \(2.4h = -8.4\)
\[ \frac{2.4h}{2.4} = -8.4 \]
\[ h = -3.5 \]
Check: \[ 2.4h = -8.4 \]
\[ 2.4(-3.5) \equiv -8.4 \]
\[ -8.4 = -8.4 ✓ \]

46. \(\frac{n}{-5} = -7.3\)
\[ (-5)\left(\frac{n}{-5}\right) = (-5)(-7.3) \]
\[ n = 36.5 \]
Check: \[ \frac{n}{-5} = -7.3 \]
\[ \frac{36.5}{-5} \equiv -7.3 \]
\[ -7.3 = -7.3 ✓ \]

47. \(u - 4.6 = 3.7\)
\(u - 4.6 + 4.6 = 3.7 + 4.6\)
\(u = 8.3\)
Check: \(u - 4.6 = 3.7\)
\[ 8.3 - 4.6 \equiv 3.7 \]
\[ 3.7 = 3.7 ✓ \]

Chapter 2 Test (p. 112)

1. \(48 + 25 + 22\)
\(= (48 + 25) + 22\) Use order of operations.
\(= (25 + 48) + 22\) Commutative property of addition
\(= 25 + (48 + 22)\) Associative property of addition
\(= 25 + 70\)
\(= 95\)
2. \(15(-7)(4) = [15(-7)](4)\) Use order of operations.
\(= [-7(15)](4)\) Commutative property of multiplication
\(= -7(15)(4)\) Associative property of multiplication
\(= -7(60)\)
\(= -420\) Multiply 15 and 4.
3. \(5.9 + 10.4 + 2.1\)
\(= (5.9 + 10.4) + 2.1\) Use order of operations.
\(= (10.4 + 5.9) + 2.1\) Commutative property of addition
\(= 10.4 + (5.9 + 2.1)\) Associative property of addition
\(= 10.4 + 8\)
\(= 18.4\)
4. \(36 + 1 + 0\)
\(= 36 + 0\) Identity property of multiplication
\(= 36\) Identity property of addition
5. \(-8(5) = 5(-8)\) Commutative property of multiplication
6. \(4 + 0 = 4\) Identity property of addition
7. \(x^2 + y = y + x^2\) Commutative property of addition
8. \(7(xy)^2 = (7x)y^2\) Associative property of multiplication
9. 1 yard = 3 feet
Factor 1: \(\frac{1 \text{ yard}}{3 \text{ feet}}\)
Factor 2: \(\frac{3 \text{ feet}}{1 \text{ yard}}\)
Use factor 2.

37 yards = 37 \(\frac{\text{yards}}{1 \text{ yard}} \times \frac{3 \text{ feet}}{1 \text{ yard}} = 111 \text{ feet}\)
10. \(7(8 - 3) = 7(8) - 7(3) = 56 - 21 = 35\)
11. \((4 + 6)(-6) = 4(-6) + 6(-6) = -24 + (-36) = -60\)
12. \(5(309) = 5(300 + 9) = 5(300) + 5(9) = 1500 + 45 = 1545\)

13. \(8(4.95) = 8(5 - 0.05) = 8(5) - 8(0.05) = 40 - 0.4 = 39.6\)

14. \(A = lw\)
\[= (x + 3)s\]
\[= x(5) + 3(5) = (5x + 15) \text{square units}\]

15. \(A = lw\)
\[= (4a - 5)s\]
\[= 4a(6) + 5(6) = (24a - 30) \text{square units}\]

16. \(A = \frac{1}{2}bh\)
\[= \frac{1}{2}(8)(7 - c) = 4(7 - c) = 4(7) - 4(c) = 28 - 4c = (-4c + 28) \text{square units}\]

17. \(A = \frac{1}{2}bh\)
\[= \frac{1}{2}(2a + 10)(12) = \frac{1}{2}(12)(2a + 10) = 6(2a + 10) = 6(2a) + 6(10) = (12a + 60) \text{square units}\]

18. \(4x + 2 + 5x\)
Terms: 4x, 2, 5x
Like terms: 4x and 5x
Coefficients: 4, 5
Constant term: 2
\(4x + 2 + 5x = 4x + 5x + 2 = (4 + 5)x + 2 = 9x + 2\)

19. \(-a + 3a + 7 - 4 = -a + 3a + 7 + (-4)\)
Terms: \(-a\), 3a, 7, \(-4\)
Like terms: \(-a\) and 3a; 7 and \(-4\)
Coefficients: \(-1\), 3
Constant terms: 7, \(-4\)
\(-a + 3a + 7 + (-4) = (-1 + 3)a + 7 + (-4) = 2a + 3\)

20. \(8k - 5 - 2k + 1 = 8k + (-5) + (-2k) + 1\)
Terms: 8k, \(-5\), \(-2k\), 1
Like terms: 8k and \(-2k\); \(-5\) and 1
Coefficients: 8, \(-2\)
Constant terms: \(-5\), 1
\(8k + (-5) + (-2k) + 1 = 8k + (-2k) + (-5) + 1 = [8 + (-2)]k + (-5) + 1 = 6k + (-4) = 6k - 4\)

21. \(y + 7y - 9 - 3y = y + 7y + (-9) + (-3y)\)
Terms: \(y\), 7y, \(-9\), \(-3y\)
Like terms: \(y\), 7y, and \(-3y\)
Coefficients: 1, 7, \(-3\)
Constant term: \(-9\)
\(y + 7y + (-9) + (-3y) = y + 7y + (-3y) + (-9) = [1 + 7 + (-3)]y + (-9) = 5y + (-9) = 5y - 9\)

22. \(2(x - 7) - 3x = 2x - 14 - 3x = 2x - 3x - 14 = -x - 14\)

23. \(-4(n + 1) + 15n = -4n - 4 + 15n = -4n + 15n - 4 = 11n - 4\)

24. \(8p + 4 - (p + 4) = 8p + 4 - p - 4 = 8p - p + 4 - 4 = 7p + 0 = 7p\)

25. \(9r - 3(3r - 2) = 9r - 9r + 6 = 6\)

26. \(17 - x = 4\)
\(17 - 12 \neq 4\)
\(5 \neq 4\)
12 is not a solution.

27. \(\frac{a}{4} = 3\)
\(\frac{12}{4} \neq 3\)
\(3 = 3 \checkmark\)
12 is a solution.

28. \(x + 12 = 9\)
\(x + 12 - 12 = 9 - 12\)
\(x = -3\)

29. \(-4 = h - 20\)
\(-4 + 20 = h - 20 + 20 = 16 = h\)
Chapter 2 continued

30. \(-3r = 87\)
\[
\begin{align*}
-3r &= 87 \\
\frac{-3r}{-3} &= \frac{87}{-3} \\
r &= -29
\end{align*}
\]

31. \(\frac{s}{7} = 13\)
\[
\begin{align*}
7 \cdot \frac{s}{7} &= 7 \cdot 13 \\
s &= 91
\end{align*}
\]

32. Let \(x\) = the time in hours.

\[
\text{Pages per hour} \times \text{Time in hours} = \text{Number of pages}
\]
\[
\begin{align*}
30x &= 540 \\
\frac{30x}{30} &= \frac{540}{30} \\
x &= 18
\end{align*}
\]

It takes you 18 hours to read the book.

33. \(-3.1 + (-7.3) = -10.4\)

34. \(5.85 - 9.47 = 5.85 + (-9.47) = -3.62\)

35. \(-6.2(-0.9) = 5.58\)

36. \(7.15 + (-1.3) = -5.5\)

37. \(x + 6.5 = -4.5\)
\[
\begin{align*}
x + 6.5 - 6.5 &= -4.5 - 6.5 \\
x &= -11
\end{align*}
\]

38. \(c - 2.59 = 1.48\)
\[
\begin{align*}
c - 2.59 + 2.59 &= 1.48 + 2.59 \\
c &= 4.07
\end{align*}
\]

39. \(-9.12 = -2.4y\)
\[
\begin{align*}
-9.12 &= -2.4y \\
\frac{-9.12}{-2.4} &= y \\
y &= 3.8
\end{align*}
\]

40. \(\frac{m}{-3.4} = 8.3\)
\[
\begin{align*}
(-3.4) \left(\frac{m}{-3.4}\right) &= (-3.4)(8.3) \\
m &= -28.22
\end{align*}
\]

Chapter 2 Standardized Test (p. 113)

1. C

2. I; 12 inches = 1 foot

Factor 1: \(\frac{12 \text{ inches}}{1 \text{ foot}}\)

Factor 2: \(\frac{1 \text{ foot}}{12 \text{ inches}}\)

Use factor 1.

17 feet = 17 feet \(\times\) \(\frac{12 \text{ inches}}{1 \text{ foot}}\) = 204 inches

3. B; \(A = \frac{1}{2}bh\)
\[
\begin{align*}
A &= \frac{1}{2}(4x + 6)(8) \\
&= \frac{1}{2}(32x + 24) \\
&= 16x + 24
\end{align*}
\]

4. G

5. A; \(5a + 8 - 2(a + 4) = 5a + 8 - 2a - 8\)
\[
\begin{align*}
5a - 2a + 8 - 8 &= 3a + 0 \\
3a &= 3a
\end{align*}
\]

6. H

7. D; \(\frac{24}{t} = 3\)
\[
\begin{align*}
24 &= 3t \\
\frac{24}{3} &= t \\
t &= 8
\end{align*}
\]

8. G; \(y + 31 = 19\)
\[
\begin{align*}
y + 31 - 31 &= 19 - 31 \\
y &= -12
\end{align*}
\]

9. B; \(-20 = g - 4\)
\[
\begin{align*}
-20 + 4 &= g - 4 + 4 \\
-16 &= g
\end{align*}
\]

10. I; \(\frac{x}{-3} = -18\)
\[
\begin{align*}
-3 \left(\frac{x}{-3}\right) &= -3(-18) \\
x &= 54
\end{align*}
\]

11. C; \(-4.85 = -6.32\)
\[
\begin{align*}
-4.85 + 6.32 &= -6.32 + 4.85 \\
1.47 &= 1.47
\end{align*}
\]

12. G; \(5.2w = -2.08\)
\[
\begin{align*}
5.2w &= -2.08 \\
\frac{5.2w}{5.2} &= \frac{-2.08}{5.2} \\
w &= -0.4
\end{align*}
\]

13. Let \(r\) = the number of movies you rent in a year. So, you see \(52 - r\) movies in the theater.

\[
\text{Cost of rental} \times \text{Number of rentals} + \text{Cost of ticket} \times \text{Number of tickets} = \text{Total amount}
\]
\[
\begin{align*}
4r + 9(52 - r) &= 4r + 468 - 9r \\
4r - 9r + 468 &= -5r + 468
\end{align*}
\]
14. \( A = lw = 300 \cdot 150 = 45,000 \)
   The lawn has an area of 45,000 square feet.

b. Let \( t \) = the time in hours.
   \[
   \text{Rate of mowing} \times \text{Time mowing} = \text{Area of lawn} \\
   20,000t = 45,000 \\
   \frac{20,000t}{20,000} = \frac{45,000}{20,000} \\
   t = 2.25 
   \]
   It will take you 2 hours and 15 minutes to mow the lawn.

c. Amount charged = Cost per hour \( \times \) Number of hours
   \[
   = \$12 \times 2.25 \\
   = \$27 
   \]
   You should charge $27 to mow the lawn.

**Chapter 2 Project: Measuring Indirectly**

**Investigate (p. 114)**

1. **Sample answer**: For 10 pennies, the height is about 14 millimeters.

2. \( 14 = 10h \)

3. \( 14 = 10h \)

   \[
   \frac{14}{10} = h \\
   1.4 = h 
   \]
   The height of a penny is about 1.4 millimeters.

4. \( 1.4 \text{ mm} \times 1,000,000 = 1,400,000 \text{ mm} \)
   The height of a stack of one million pennies is about 1,400,000 millimeters, or 1400 meters.

**Project Extensions (p. 115)**

**Research**

2002 production:
Pennies: 7,288,855,000
Nickels: 1,230,480,000
Dimes: 2,567,000,000
Quarters: 3,313,704,000

Value:
Pennies: \( 7,288,855,000 \times \$0.01 = \$72,888,550 \)
Nickels: \( 1,230,480,000 \times \$0.05 = \$61,524,000 \)
Dimes: \( 2,567,000,000 \times \$0.10 = \$256,700,000 \)
Quarters: \( 3,313,704,000 \times \$0.25 = \$828,426,000 \)

The combined value is \$1,219,538,550.

To find the values of each coin, I multiplied the number of pennies by $0.01, the number of nickels by $0.05, the number of dimes by $0.10, and the number of quarters by $0.25. To find the combined value, I added the values of each coin type.

**Experiment**

The official thickness of a $1 bill is 0.0043 inches or 0.11 millimeters. About 17 million $1 bills are printed each day.

To find the height of a stack of 17 million $1 bills, multiply 17,000,000 by the thickness of a $1 bill.

\[
17,000,000 \times 0.0043 \text{ in.} = 73,100 \text{ in.} \\
73,100 \text{ in.} = 73,100 \text{ in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} = 6100 \text{ ft} \\
17,000,000 \times 0.11 \text{ mm} = 1,870,000 \text{ mm} \\
1,870,000 \text{ mm} = 1,870,000 \text{ mm} \times \frac{1 \text{ m}}{1000 \text{ mm}} = 1900 \text{ m} 
\]

The height of a stack of 17 million $1 bills is about 6100 feet or about 1900 meters.

Students’ answers will likely be higher because of wrinkled bills.