Chapter 2
Linear Equations and Inequalities in One Variable

2.1 Check Points

1. \[ x = 5, 12 \]
\[ x = 5, 12, 5 \]
\[ x = 0, 17 \]
\[ x = 17 \]

Check:
\[ x = 5, 12 \]
\[ 17, 5, 12 \]
\[ 12, 12 \]
The solution set is 17.

2. \[ z = 2.8, 5.09 \]
\[ z = 2.8, 5.09, 2.8 \]
\[ z = 0, 2.29 \]
\[ z = 2.29 \]

Check:
\[ z = 2.8, 5.09 \]
\[ 2.29, 2.8, 5.09 \]
\[ 5.09, 5.09 \]
The solution set is 2.29.

3. \[ \frac{1}{2} \]
\[ \frac{3}{4} \]
\[ \frac{1}{3} \]
\[ \frac{2}{3} \]

4. \[ 8y = 7, 7y = 10, 6, 4 \]
\[ y = 3, 10 \]
\[ y = 3, 3, 10, 3 \]
\[ y = 13 \]

Check:
\[ x = 2, 4 \]
\[ 4, 4 \]
\[ \frac{2}{3}, \frac{3}{4}, x \]
\[ \frac{1}{4}, x \]

Check:
\[ x = \frac{1}{2}, \frac{3}{4} \]
\[ \frac{1}{2}, \frac{1}{4}, \frac{3}{4} \]
\[ 1, 2 \]
\[ 2, 4 \]
\[ \frac{1}{2}, \frac{1}{2} \]

The solution set is 1.
The solution set is 12.

6. 3x 6 2x 5
3x 2x 6 2x 2x 5
    x 6 5
    x 6 6 5 6
    x 11
Check:
    3x 6 2x 5
3(11) 6 2(11) 5
    33 6 22 5
    27 27
The solution set is 11.

7. V 900 60A
   V 900 60(50)
   V 900 3000
V 900 900 3000 900
   V 2100
At 50 months, a child will have a vocabulary of 2100 words.
2.1 Concept and Vocabulary Check

1. solving
2. linear
3. equivalent
4. \( b + c \)
5. subtract; solution
6. adding 7
7. subtracting \( 6x \)

2.1 Exercise Set

1. linear
2. linear
3. not linear
4. not linear
5. not linear
6. not linear
7. linear
8. linear
9. not linear
10. not linear

11. \( x \ 4 \ 19 \)
    \( x \ 4 \ 4 \ 19 \ 4 \)
    \( x \ 0 \ 23 \)
    \( x \ 23 \)
    Check:
    \( x \ 4 \ 19 \)
    \( 23 \ 4 \ 19 \)
    \( 19 \ 19 \)
    The solution set is 23.

12. \( y \ 5 \ 5 \ 18 \ 5 \)
    \( y \ 13 \)
    Check:
    \( 13 \ 5 \ 18 \)
    \( 18 \ 18 \)
    The solution set is 13.

13. \( z \ 8 \ 12 \)
    \( z \ 8 \ 8 \ 12 \ 8 \)
    \( z \ 0 \ 20 \)
    \( z \ 20 \)
    Check:
    \( z \ 8 \ 12 \)
    \( 20 \ 8 \ 12 \)
    \( 12 \ 12 \)
    The solution set is 20.

14. \( z \ 15 \ 13 \)
    \( z \ 28 \)
    Check:
    \( 28 \ 13 \ 15 \)
    \( 15 \ 15 \)
    The solution set is 28.

15. \( 16 \ x \)
    Check:
    \( 2 \ 16 \ 14 \)
    \( 2 \ 2 \)
    The solution set is 16.

16. \( 24 \ x \)
    Check:
    \( 13 \ 24 \ 11 \)
    \( 13 \ 13 \)
    The solution set is 24.

17. \( 17 \ y \ 5 \)
    \( 17 \ 5 \ y \ 5 \ 5 \)
    \( 12 \ y \)
    Check:
    \( 17 \ 12 \ 5 \)
    \( 17 \ 17 \)
    The solution set is 12.
23. \[ \frac{1}{3} + \frac{7}{3} = \frac{7}{3} + \frac{1}{3} \]
   \[ x = 2 \]
   Check:
   \[ 2 \cdot \frac{1}{3} = \frac{2}{3} \cdot \frac{1}{3} \]
   \[ 3 \cdot \frac{1}{3} = \frac{3}{3} \cdot \frac{1}{3} \]
   The solution set is 2.

24. \[ \frac{7}{8} + \frac{9}{8} = \frac{9}{8} + \frac{7}{8} \]
   \[ x = \frac{1}{4} \]
   Check:
   \[ \frac{1}{8} + \frac{9}{8} = \frac{2}{8} + \frac{1}{4} \]
   \[ \frac{8}{8} + \frac{8}{8} = \frac{8}{8} + \frac{8}{8} \]
   The solution set is 4.

25. \[ \frac{5}{6} + \frac{7}{12} = \frac{7}{12} + \frac{5}{6} \]
   \[ t = \frac{1}{12} \]
   Check:
   \[ \frac{1}{6} + \frac{7}{12} = \frac{17}{12} + \frac{1}{12} \]
   \[ \frac{12}{12} + \frac{12}{12} = \frac{12}{12} + \frac{12}{12} \]
   The solution set is 17.
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.1  The Addition Property of Equality

26.  \( \frac{2}{3} + \frac{7}{6} \)

\[
\begin{align*}
    t & \quad \frac{7}{6} \quad \frac{2}{3} \\
    & \quad \frac{11}{6} \\
\end{align*}
\]

Check:
\[
\begin{align*}
    11 & \quad 2 \quad 7 \\
    6 & \quad 3 \quad 6 \\
    11 & \quad 4 \quad 7 \\
\end{align*}
\]

The solution set is \( \frac{11}{6} \).

27.  \( x + \frac{3}{4} \cdot \frac{9}{2} \)

\[
\begin{align*}
    x & \quad \frac{3}{4} \quad \frac{9}{2} \\
    & \quad \frac{21}{4} \\
\end{align*}
\]

Check:
\[
\begin{align*}
    21 & \quad 3 \quad 9 \\
    4 & \quad 4 \quad 2 \\
    18 & \quad 9 \\
\end{align*}
\]

The solution set is \( \frac{21}{4} \).

28.  \( x + \frac{3}{5} \cdot \frac{7}{10} \)

\[
\begin{align*}
    x & \quad \frac{3}{5} \quad \frac{7}{10} \\
    & \quad \frac{13}{10} \\
\end{align*}
\]

Check:
\[
\begin{align*}
    13 & \quad 3 \quad 7 \\
    10 & \quad 5 \quad 10 \\
    13 & \quad 6 \quad 7 \\
    10 & \quad 10 \quad 10 \\
    7 & \quad 7 \\
    10 & \quad 10 \\
\end{align*}
\]

29.  \( \frac{1}{5} y + \frac{3}{4} \)

\[
\begin{align*}
    y & \quad \frac{3}{4} \quad 5 \\
    & \quad \frac{11}{20} \quad \frac{3}{20} \\
\end{align*}
\]

Check:
\[
\begin{align*}
    1 & \quad 11 \quad 3 \\
    5 & \quad 20 \quad 4 \\
\end{align*}
\]

The solution set is \( \frac{11}{20} \).

30.  \( \frac{1}{8} y + \frac{1}{4} \)

\[
\begin{align*}
    y & \quad \frac{1}{4} \quad \frac{1}{8} \\
    & \quad \frac{1}{2} \quad \frac{1}{2} \\
\end{align*}
\]

Check:
\[
\begin{align*}
    1 & \quad 1 \quad 1 \\
    8 & \quad 8 \quad 4 \\
    2 & \quad 8 \quad 4 \\
    1 & \quad 1 \quad 1 \\
    4 & \quad 4 \\
\end{align*}
\]

The solution set is \( \frac{13}{8} \).
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.1  The Addition Property of Equality

Check:

\[
\begin{array}{ccc}
3.2 & 4.3 & 7.5 \\
7.5 & 7.5 & \\
\end{array}
\]

The solution set is 4.3.

3
1
.

3
2
.
x

7
5
3
.
2
x

x
4
.
3
32. \[2.7 w = 5.3\]
   \[w = \frac{5.3}{2.7}\]
   \[w = 2.6\]

   Check:
   \[2.7 \times 2.6 = 5.3\]
   \[5.5 = 5.3\]

   The solution set is 2.6.

33. \[
\begin{align*}
\frac{x}{4} & = \frac{3}{9} \\
\frac{x}{4} & = \frac{2}{9} \\
\frac{x}{4} & = \frac{21}{4}
\end{align*}
\]

   Check:
   \[
\begin{align*}
\frac{21}{4} & = \frac{3}{9} \\
\frac{21}{4} & = \frac{2}{9} \\
\frac{21}{4} & = \frac{2}{9}
\end{align*}
\]

   The solution set is \(\frac{21}{4}\).

34. \[
\begin{align*}
r & = \frac{3}{5} \\
r & = \frac{7}{10} \\
r & = \frac{6}{10}
\end{align*}
\]

   Check:
   \[
\begin{align*}
\frac{13}{10} & = \frac{3}{5} \\
\frac{13}{10} & = \frac{7}{10} \\
\frac{13}{10} & = \frac{6}{10}
\end{align*}
\]

   The solution set is \(\frac{13}{10}\).

35. \[
\begin{align*}
y & = \frac{5}{13} \\
y & = \frac{18}{y}
\end{align*}
\]

   Check:
   \[
\begin{align*}
5 & = 13y \\
5 & = 18y
\end{align*}
\]

   The solution set is 18.

36. \[
\begin{align*}
x & = \frac{11}{8} \\
x & = \frac{11}{19}
\end{align*}
\]

   Check:
   \[
\begin{align*}
11 & = 8x \\
11 & = 19x
\end{align*}
\]

   The solution set is 19.

37. \[
\begin{align*}
s & = \frac{3}{5} \\
s & = \frac{3}{2}
\end{align*}
\]

   Check:
   \[
\begin{align*}
\frac{6}{10} & = \frac{15}{10} \\
\frac{9}{10} & = s
\end{align*}
\]

   The solution set is \(\frac{9}{10}\).

38. \[
\begin{align*}
z & = \frac{7}{3} \\
z & = \frac{5}{2}
\end{align*}
\]

   Check:
   \[
\begin{align*}
\frac{7}{3} & = \frac{29}{6} \\
14 & = 15z
\end{align*}
\]

   The solution set is \(\frac{29}{6}\).
Chapter 2 Linear Equations and Inequalities in One Variable

Section 2.1 The Addition Property of Equality

39. \[ 830 \cdot y - 520 \]
    \[ y \cdot 520 = 830 \]
    \[ y \cdot 310 \]
    Check:
    \[ 830 \cdot 310 = 520 \]
    \[ 520 \cdot 520 \]
    The solution set is 310.

40. \[ 90 \cdot t - 35 \]
    \[ t \cdot 35 = 90 \]
    \[ t \cdot 55 \]
    Check:
    \[ 90 \cdot 55 = 35 \]
    \[ 35 \cdot 35 \]
    The solution set is 55.

41. \[ r - 3.7 = 8 \]
    \[ r \cdot 8 = 3.7 \]
    \[ r \cdot 4.3 \]
    Check:
    \[ 4.3 \cdot 3.7 = 8 \]
    \[ 8 \cdot 8 \]
    The solution set is 4.3.

42. \[ x - 10.6 = 9 \]
    \[ x \cdot 9 = 10.6 \]
    \[ x \cdot 19.6 \]
    Check:
    \[ 19.6 \cdot 10.6 = 9 \]
    \[ 9 \cdot 9 \]
    The solution set is 19.6.

43. \[ 3.7 \cdot m = 3.7 \]
    \[ m \cdot 3.7 = 3.7 \]
    \[ m \cdot 0 \]
    Check:
    \[ 3.7 \cdot 0 = 3.7 \]
    \[ 3.7 \cdot 3.7 \]
    The solution set is 0.

44. \[ y \cdot \frac{7}{11} = 7 \]
    \[ y \cdot \frac{7}{11} = 7 \]
    \[ y \cdot 0 \]
    Check:
    \[ 0 \cdot \frac{7}{11} = \frac{7}{11} \]
    \[ \frac{7}{11} \cdot \frac{7}{11} \]
    The solution set is 0.

45. \[ 6y - 35y = 14 \]
    \[ y \cdot 3 = 14 \]
    \[ y \cdot 14 = 3 \]
    \[ y \cdot 11 \]
    Check:
    \[ 611 \cdot 3 = 511 \]
    \[ 14 = 66 \]
    \[ 35 \cdot 14 \]
    The solution set is 11.

46. \[ 3x - 5x = 9 \]
    \[ x \cdot 5 = 9 \]
    \[ x \cdot 14 \]
    Check:
    \[ 314 \cdot 5 = 14 \]
    \[ 9 \cdot 42 \]
    \[ 56 \cdot 9 \]
    \[ 9 \cdot 9 \]
    The solution set is 14.

47. \[ 7 - 5x + 8 + 2x + 4x - 3 = 2 + 3 \cdot 5 \]
    \[ x + 12 = 17 \]
    \[ x = 5 \]
    Check:
    \[ 7 - 5(5) + 8 + 2(5) + 4(5) - 3 = 2 + 3 \cdot 5 \]
    \[ 17 = 17 \]
    The solution set is \{5\}. 
48. \[13 \times r + 2 \times 6r + 2r + 1 + 3 + 2 + 9 \\
3r + 6r + 2r + 1 + 3 + 18 \]
\[r + 14 + 21 \\
r + 14 + 14 + 21 + 14 \]
Check:
\[13 \times 37 + 2 \times 67 + 27 + 1 + 3 + 2 + 9 \\
13 \times 21 + 2 \times 42 + 14 + 1 + 3 + 18 \]
\[21 + 21 \]
The solution set is 7.

49. \[7y + 4 + 6y + 9 \\
7y + 6y + 4 + 9 \]
\[y + 9 + 4 \\
y + 13 \]
Check:
\[713 + 4 + 613 + 9 \\
91 + 4 + 78 + 9 \]
\[87 + 87 \]
The solution set is 13.

50. \[4r + 3 + 5 + 3r \\
4r + 3 + 3r + 5 + 3r + 3r + 3 \]
\[r + 3 + 3 + 5 + 3 \]
\[r + 8 \]
Check:
\[48 + 3 + 5 + 38 \\
32 + 3 + 5 + 24 \]
\[29 + 29 \]
The solution set is 8.

51. \[12 \times 6x + 18 + 7x \\
12 \times x + 18 \]
\[x + 6 \]
Check:
\[12 \times 66 + 18 + 76 \]
\[12 + 36 + 18 + 42 \]
\[24 + 24 \]
The solution set is 6.

52. \[20 \times 7s + 26 + 8s \\
20 \times 7s + 8s + 26 + 8s + 8s \\
20 + s + 26 \\
20 + 20 + s + 26 + 20 \\
s + 6 \]
Check:
\[20 \times 7 + 6 + 26 + 86 \\
20 \times 42 + 26 + 48 \]
\[22 + 22 \]
The solution set is 6.

53. \[4x + 2 + 3x + 6 + 8 \\
4x + 2 + 3 + 18 + 8 \]
\[4x + 2 + 3x + 10 \]
\[4x + 3 + x + 2 + 10 \\
x + 2 + 10 \]
\[x + 10 + 2 \\
x + 12 \]
Check:
\[412 + 2 + 312 + 6 + 8 \\
48 + 2 + 318 + 8 \]
\[46 + 54 + 8 \\
46 + 46 \]
The solution set is 12.

54. \[7x + 3 + 6x + 1 + 9 \\
7x + 3 + 6x + 6 + 9 \]
Check:
\[70 + 3 + 60 + 1 + 9 \\
0 + 3 + 61 + 9 \]
\[3 + 6 + 9 \\
3 + 3 \]
The solution set is 0.

55. \[x + \quad \]
\[x + \quad \]
\[x + \quad \]
\[x + \quad \]
The solution set is 6.

56. \[x + \quad \]
\[x + \quad \]
\[x + \quad \]
\[x + \quad \]
The solution set is 6.
57. \[ 2x + 3x = 3x + 2x \]
\[ x = x \]
\[ 0 = x \]

58. \[ 6x + 7x = 6x + 2x \]
\[ 6x = 6x \]
\[ 7x = 2x \]
\[ 6x = x \]

59. \[ x = 12 \]
\[ 2 = 2 \]
\[ 12 = 10 \]
The number is 10.

60. \[ x = 23 \]
\[ 8 = 23 \]
\[ 8 = 23 \]
\[ 15 = 8 \]
The number is 15.

61. \[ \frac{\frac{2}{5} \cdot 8}{x} = \frac{2 \cdot \frac{7}{8}}{x} \]
\[ \frac{7}{5} = \frac{2}{x} \]
\[ 8 = \frac{5}{x} \]
\[ 8 \cdot x = \frac{5}{x} \]
The number is 8.

62. \[ \frac{3 \cdot \frac{2}{x} \cdot \frac{5}{x}}{x} = \frac{5}{x} \cdot \frac{5}{x} \]
\[ \frac{3 \cdot \frac{2}{x} \cdot \frac{5}{x}}{x} = \frac{2}{x} \cdot \frac{5}{x} \]
\[ \frac{3 \cdot \frac{2}{x} \cdot \frac{5}{x}}{x} = \frac{7}{x} \]
\[ 3 \cdot \frac{2}{x} \cdot \frac{5}{x} = 3 \cdot x \]
The number is 3.

63. \[ S = 1850, M = 150 \]
\[ C = M - S \]
\[ C = 150 - 1850 \]
\[ C = 150 - 150 \]
\[ C = 1700 \]
The cost of the computer is $1700.

64. \[ C = 520, S = 650 \]
\[ C = M - S \]
\[ 520 - M = 650 \]
\[ M = 520 - 650 \]
\[ M = 130 \]
The markup is $130.

65. a. \[ p \cdot 0.8 \cdot 25 \]
\[ 0.8(30) \cdot 25 \cdot 24 \]
\[ 0.8 \cdot 25 \cdot 24 \]
\[ p \cdot 25 \]
According to the formula, 49% of U.S. college freshman had an average grade of A in high school in 2010. This overestimates the value given in the bar graph by 1%.

b. \[ p \cdot 0.8 \cdot 25 \]
\[ 0.8(40) \cdot 25 \cdot 32 \]
\[ 0.8 \cdot 25 \cdot 32 \]
\[ p \cdot 57 \]
According to the formula, 57% of U.S. college freshman had an average grade of A in high school in 2020.

66. a. \[ p \cdot 0.8 \cdot 25 \]
\[ 0.8(20) \cdot 25 \cdot 16 \]
\[ 0.8 \cdot 25 \cdot 16 \]
\[ p \cdot 41 \]
According to the formula, 41% of U.S. college freshman had an average grade of A in high school in 2000. This underestimates the value given in the bar graph by 2%.

b. \[ p \cdot 0.8 \cdot 25 \]
\[ 0.8(50) \cdot 25 \cdot 40 \]
\[ 0.8 \cdot 25 \cdot 40 \]
\[ p \cdot 65 \]
According to the formula, 65% of U.S. college freshman had an average grade of A in high school in 2030.
67. a. According to the line graph, the U.S. diversity index was about 55 in 2010.
   b. 2010 is 30 years after 1980.
      \[ I \ 0.7x \ 34 \]
      \[ I \ 0.7(30) \ 34 \]
      \[ I \ 21 \ 34 \]
      \[ I \ 55 \]
      According to the formula, the U.S. diversity index was 55 in 2010.
      This matches the line graph very well.

68. a. According to the line graph, the U.S. diversity index was about 47 in 2000.
   b. 2000 is 20 years after 1980.
      \[ I \ 0.7x \ 34 \]
      \[ I \ 0.7(20) \ 34 \]
      \[ I \ 14 \ 34 \]
      \[ I \ 48 \]
      According to the formula, the U.S. diversity index was 48 in 2000.
      This matches the line graph very well.

69. – 71. Answers will vary.

72. The adjective linear means that the points lie on a line.

73. does not make sense; Explanations will vary.
    Sample explanation: It does not matter whether the number is added beside or below, as long as it is added to both sides of the equation.

74. makes sense

75. makes sense

76. makes sense

77. false; Changes to make the statement true will vary.
    A sample change is: If \( y \ a \ b \), then \( y \ a \ b \).

78. false; Changes to make the statement true will vary.
    A sample change is: If \( y \ 7 \ 0 \), then \( y \ 7 \).

79. true

80. false; Changes to make the statement true will vary.
    A sample change is: If \( 3x \ 18 \), then \( x \ \frac{18}{3} \).

81. Answers will vary. An example is: \( x \ 100 \ 101 \)

82. \( x \ 7.0463 \ 9.2714 \)
    \( x \ 9.2714 \ 7.0463 \)
    \( x \ 2.2251 \)
    The solution set is \( 2.2251 \).

83. \( 6.9825 \ 4.2296 \ y \)
    \( 6.9825 \ 4.2296 \ y \)
    \( 2.7529 \ y \)
    The solution set is \( 2.7529 \).

84. \( \frac{9}{4x} \ x \)

85. \( 16 \ 8 \ 4 \ 2 \ 16 \ 2 \ 2 \)
    \( 16 \ 22 \)
    \( 16 \ 4 \)
    \( 12 \)

86. \( 37x \ 25x \ 1 \)
    \( 37x \ 10x \ 2 \)
    \( 33x \ 2 \)
    \( 9x \ 6 \ or \ 6ix \)

87. \( \frac{5}{x} \)
    \( 5 \)
    \( \frac{1}{5} \)
    \( \frac{7}{y} \)

88. \( \frac{7}{y} \)

89. \( 3x \ 14 \ 2x \ 6 \)
    \( 3(4) \ 14 \ 2(4) \ 6 \)
    \( 12 \ 14 \ 8 \ 6 \)
    \( 2 \ 2 \), true
    Yes, \( 4 \) is a solution of the equation.
2.2 Check Points

1. \( \frac{x}{12} \)
   \[
   \begin{align*}
   3 & \quad 3 \\
   3 \cdot \frac{x}{3} & \quad 12 \cdot 3 \\
   1 \cdot x & \quad 36 \\
   
   x & \quad 36 \\
   \end{align*}
   \]
Check:
   \[
   \begin{align*}
   \frac{x}{3} & \quad 12 \\
   \frac{36}{3} & \quad 12 \\
   12 & \quad 12 \\
   
   \end{align*}
   \]
   The solution set is 36.

2. a. \( 4x \ 84 \)
   \[
   \begin{align*}
   4x & \quad 84 \\
   4 & \quad 4 \\
   1 \cdot x & \quad 21 \\
   x & \quad 21 \\
   
   \end{align*}
   \]
   The solution set is 21.

b. \( 11y \ 44 \)
   \[
   \begin{align*}
   11y & \quad 44 \\
   11 & \quad 11 \\
   1 \cdot x & \quad 4 \\
   x & \quad 4 \\
   
   \end{align*}
   \]
   The solution set is 4.

c. \( 15.5 \ 5z \)
   \[
   \begin{align*}
   15.5 & \quad 5z \\
   5 & \quad 5 \\
   3.1 & \quad 1z \\
   3.1 & \quad z \\
   
   \end{align*}
   \]
   The solution set is 3.1.

3. a. \( \frac{2}{3}y \ 16 \)
   \[
   \begin{align*}
   \frac{2}{3} & \quad y \quad \frac{3}{16} \\
   2 & \quad 3 \\
   1 \cdot y & \quad 24 \\
   y & \quad 24 \\
   
   \end{align*}
   \]
   The solution set is 24.

b. \( 28 \quad \frac{7}{4} \)
   \[
   \begin{align*}
   4 & \quad 4 \\
   \frac{28}{4} & \quad \frac{7}{4} \\
   16 & \quad 1x \\
   16 & \quad x \\
   
   \end{align*}
   \]
   The solution set is 16.

4. a. \( x \ 5 \)
   \[
   \begin{align*}
   1 \cdot x & \quad 5 \\
   (1) \cdot (1x) & \quad (1)5 \\
   1 \cdot x & \quad 5 \\
   x & \quad 5 \\
   
   \end{align*}
   \]
   The solution set is 5.

b. \( x \ 3 \)
   \[
   \begin{align*}
   1 \cdot x & \quad 3 \\
   (1) \cdot (1x) & \quad (1)3 \\
   1 \cdot x & \quad 3 \\
   x & \quad 3 \\
   
   \end{align*}
   \]
   The solution set is 3.

5. \( 4x \ 3 \ 27 \)
   \[
   \begin{align*}
   4x & \quad 3 \ 27 \\
   4 \cdot x & \quad 24 \\
   4 \cdot 4 & \quad 24 \\
   x & \quad 6 \\
   
   \end{align*}
   \]
   The solution set is 6.

6. \( 4y \ 15 \ 25 \)
   \[
   \begin{align*}
   4 \cdot y & \quad 15 \ 25 \\
   4 \cdot 40 & \quad 40 \\
   4 \cdot 4 & \quad 40 \\
   y & \quad 10 \\
   
   \end{align*}
   \]
   The solution set is 10.
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.2  The Multiplication Property of Equality

7. 2x 15 4x 21
   2x 4x 15 4x 4x 21
   6x 15 21
   6x 15 21 15
   6x 36

   \[
   \begin{align*}
   \frac{6x}{6} &= \frac{36}{6} \\
   x &= 6
   \end{align*}
   \]
   The solution set is 6.

8. a. The bar graph indicates that the median weekly earnings for men with a bachelor’s degree and higher in 2013 was $1395. Since 2013 is 33 years after 1980, substitute 33 into the formula for \( n \).

   \[ M = 29n + 427 \]
   \[ M = 29(33) + 427 \]
   \[ M = 957 + 427 \]
   \[ M = 1384 \]
   The formula indicates that the median weekly earnings for men with a bachelor’s degree and higher in 2013 was $1384. The formula underestimates by $11.

b. \( M = 29n + 427 \)
   1442 29n 427
   1442 427 29n 427 427
   1015 29n
   1015 29n
   29 29
   35 n
   The formula estimates that 35 years after 1980, or in 2015, the median weekly earnings for men with a bachelor’s degree and higher will be $1442.

2.2 Exercise Set

1. \( \frac{x}{6} = 5 \)
   \[ x = 6 \cdot 5 \]
   \[ x = 30 \]
   Check:
   \[ \frac{30}{6} = 5 \]
   \[ 5 = 5 \]
   The solution set is 30.

2. \( \frac{x}{7} = 4 \)
   \[ x = 7 \cdot 4 \]
   \[ x = 28 \]
   Check:
   \[ \frac{28}{7} = 4 \]
   \[ 4 = 4 \]
   The solution set is 28.

3. \( \frac{x}{3} = 11 \)
   \[ x = 3 \cdot 11 \]
   \[ x = 33 \]
   Check:
   \[ \frac{33}{3} = 11 \]
   \[ 11 = 11 \]
   The solution set is 33.

2.2 Concept and Vocabulary Check

1. \( bc \)
2. divide
3. multiplying; 7
4. dividing; 8
   Alternatively, multiplying: \( \frac{1}{8} \)
4. \[ \frac{x}{5} = 8 \]
   \[ 5 \cdot \frac{x}{5} = 8 \cdot 5 \]
   \[ x = 40 \]
   Check: \[ \frac{40}{8} \]
   \[ 5 \cdot 8 = 8 \]
   The solution set is 40.

5. \[ 5y = 35 \]
   \[ \frac{5y}{5} = \frac{35}{5} \]
   \[ y = 7 \]
   Check: \[ \frac{57}{35} \]
   \[ 35 \cdot 7 = 245 \]
   The solution set is 7.

6. \[ 6y = 42 \]
   \[ \frac{6y}{6} = \frac{42}{6} \]
   \[ y = 7 \]
   Check: \[ \frac{67}{42} \]
   \[ 42 \cdot 7 = 294 \]
   The solution set is 7.

7. \[ 7y = 63 \]
   \[ \frac{7y}{7} = \frac{63}{7} \]
   \[ y = 9 \]
   Check: \[ \frac{79}{63} \]
   \[ 63 \cdot 9 = 567 \]
   The solution set is 9.

8. \[ 4y = 32 \]
   \[ \frac{4y}{4} = \frac{32}{4} \]
   \[ y = 8 \]

9. \[ \frac{28}{8}z = \frac{8}{8} \]
   \[ z = \frac{7}{7} \]
   Check: \[ \frac{28}{8} \]
   \[ 28 \cdot \frac{7}{2} = 2 \]

10. \[ \frac{36}{8}z = \frac{8}{8} \]
    \[ z = \frac{9}{9} \]
    Check: \[ \frac{36}{8} \]
    \[ 36 \cdot \frac{9}{2} = 2 \]
    The solution set is \[ \frac{9}{2} \text{ or } 3 \frac{3}{2} \text{.} \]

11. \[ \frac{18}{3}z = \frac{3}{3} \]
    \[ z = \frac{6}{6} \]
    Check: \[ \frac{18}{3} \]
    \[ 18 \cdot \frac{6}{1} = 18 \]
    The solution set is 6.

12. \[ \frac{54}{9}z = \frac{9}{9} \]
    \[ z = \frac{6}{6} \]
    Check: \[ \frac{54}{9} \]
    \[ 54 \cdot \frac{6}{1} = 96 \]
    Check:
48 32
32 32
The solution set is 8.

54 54
The solution set is 6.
Section 2.2 The Multiplication Property of Equality

13. \[ 8x \cdot 6 \]
    \[
    \begin{array}{c}
    8x \\
    8x \\
    \hline
    6 \\
    8
    \end{array}
    \]
    \[
    \begin{array}{c}
    8 \\
    \hline
    3
    \end{array}
    \]
    \[
    \begin{array}{c}
    6 \\
    8
    \end{array}
    \]

    Check:
    
    \[
    \begin{array}{c}
    24 \\
    \hline
    6
    \end{array}
    \]
    \[
    \begin{array}{c}
    4 \\
    \hline
    6
    \end{array}
    \]

    The solution set is \( \frac{3}{4} \).

14. \[ 8x \cdot 4 \]
    \[
    \begin{array}{c}
    8x \\
    8x \\
    \hline
    4 \\
    8
    \end{array}
    \]
    \[
    \begin{array}{c}
    4 \\
    \hline
    1
    \end{array}
    \]

    Check:
    
    \[
    \begin{array}{c}
    2 \\
    \hline
    4
    \end{array}
    \]
    \[
    \begin{array}{c}
    4 \\
    \hline
    4
    \end{array}
    \]

    The solution set is \( \frac{1}{2} \).

15. \[ 17y \cdot 0 \]
    \[
    \begin{array}{c}
    17y \\
    \hline
    0
    \end{array}
    \]
    \[
    \begin{array}{c}
    17 \\
    \hline
    0
    \end{array}
    \]

    Check:
    
    \[
    170 \\
    0
    \]

    The solution set is 0.

16. \[ 16y \cdot 0 \]
    \[
    \begin{array}{c}
    16y \\
    \hline
    0
    \end{array}
    \]
    \[
    \begin{array}{c}
    16 \\
    \hline
    0
    \end{array}
    \]

    Check:
    
    \[
    160 \\
    0
    \]

17. \[ \frac{2}{3}y \cdot 12 \]
    \[
    \begin{array}{c}
    \frac{2}{3} \\
    \hline
    \frac{2}{3}
    \end{array}
    \]
    \[
    \begin{array}{c}
    2 \\
    \hline
    2
    \end{array}
    \]
    \[
    \begin{array}{c}
    \frac{12}{3} \\
    \hline
    \frac{12}{3}
    \end{array}
    \]
    \[
    \begin{array}{c}
    36 \\
    \hline
    3
    \end{array}
    \]

    Check:
    
    \[
    \begin{array}{c}
    2 \\
    \hline
    18
    \end{array}
    \]
    \[
    \begin{array}{c}
    2 \\
    \hline
    12
    \end{array}
    \]

    The solution set is 18.

18. \[ \frac{3}{4}y \cdot 15 \]
    \[
    \begin{array}{c}
    \frac{3}{4} \\
    \hline
    \frac{3}{4}
    \end{array}
    \]
    \[
    \begin{array}{c}
    \frac{4}{3} \\
    \hline
    \frac{4}{3}
    \end{array}
    \]
    \[
    \begin{array}{c}
    \frac{15}{3} \\
    \hline
    \frac{15}{3}
    \end{array}
    \]

    Check:
    
    \[
    \begin{array}{c}
    \frac{3}{4} \\
    \hline
    \frac{20}{15}
    \end{array}
    \]
    \[
    \begin{array}{c}
    \frac{60}{15} \\
    \hline
    \frac{60}{15}
    \end{array}
    \]

    The solution set is 20.

19. \[ \frac{28}{7}x \cdot 2 \]
    \[
    \begin{array}{c}
    \frac{28}{7} \\
    \hline
    \frac{2}{7}
    \end{array}
    \]
    \[
    \begin{array}{c}
    \frac{7}{7} \\
    \hline
    1x
    \end{array}
    \]
    \[
    \begin{array}{c}
    \frac{56}{7} \\
    \hline
    8x
    \end{array}
    \]

    Check:
    
    \[
    \begin{array}{c}
    160 \\
    \hline
    0
    \end{array}
    \]
    \[
    \begin{array}{c}
    0 \\
    \hline
    0
    \end{array}
    \]
2
8

The solution set is 0.
20. \[ \frac{5}{8} \cdot \frac{20}{x} \]
\[ \frac{8}{20} \cdot \frac{8}{5} \cdot \frac{5}{x} \cdot \frac{8}{5} \]
\[ \frac{160}{5} \cdot \frac{1}{x} \]
\[ \frac{32}{x} \]
Check:
\[ \frac{20}{5} \cdot \frac{5}{8} \cdot \frac{32}{x} \]
\[ \frac{160}{8} \]
\[ \frac{20}{20} \]
The solution set is 32.

21. \[ x \cdot 17 \]
\[ 1x \cdot 17 \]
\[ 11x \cdot 117 \]
\[ x \cdot 17 \]
Check:
\[ 17 \times 17 \]
\[ 17 \times 17 \]
The solution set is 17.

22. \[ x \cdot 23 \]
\[ 1x \cdot 23 \]
\[ 11x \cdot 123 \]
\[ x \cdot 23 \]
Check:
\[ 23 \times 23 \]
\[ 23 \times 23 \]
The solution set is 23.

23. \[ 47 \cdot y \]
\[ 47 \cdot 1(y) \]
\[ 1(47) \cdot 1(1)(y) \]
\[ 47 \cdot y \]
Check:
\[ 47 \cdot y \]
\[ 47 \cdot (47) \]
\[ 47 \cdot 47 \]
The solution set is 47.

24. \[ 51 \cdot y \]
\[ \frac{51}{y} \]
\[ 1 \cdot 1 \]
\[ \frac{51}{y} \]
Check:
\[ 51 \cdot 51 \]
The solution set is 51.

25. \[ \frac{x}{9} \cdot \frac{5}{5} \]
\[ \frac{5 \cdot x}{5} \]
\[ \frac{5}{5} \cdot 59 \]
\[ \frac{5}{5} \cdot 45 \]
Check:
\[ \frac{45}{9} \cdot \frac{5}{5} \]
\[ \frac{9}{9} \cdot 45 \]
The solution set is 45.

26. \[ \frac{x}{5} \cdot \frac{1}{1} \]
\[ \frac{5}{5} \cdot \frac{x}{5} \]
\[ 5 \cdot \frac{x}{5} \]
Check:
\[ \frac{5}{5} \cdot \frac{1}{1} \]
\[ \frac{1}{1} \cdot 1 \]
The solution set is 5.

27. \[ 2x \cdot 12 \cdot 50 \]
\[ 2 \cdot 12 \cdot 50 \]
\[ 10x \cdot 50 \]
\[ \frac{10}{50} \cdot 50 \]
\[ 10 \cdot 10 \]
Check:
\[ 25 \cdot 125 \cdot 50 \]
\[ 10 \cdot 60 \cdot 50 \]
\[ \frac{50}{50} \cdot 50 \]
The solution set is 5.
28. \[ \begin{align*} 8x & \quad 3x \quad 45 \\ 8x & \quad 3x \quad 45 \\ & \quad 5x \quad 45 \\ & \quad \frac{5x}{5} \quad \frac{45}{5} \\ & \quad x \quad 9 \\ \end{align*} \]

Check:
\[ \begin{align*} 89 & \quad 39 \quad 45 \\ 72 & \quad 27 \quad 45 \\ & \quad 45 \quad 45 \\ \end{align*} \]

The solution set is 9.

29. \[ \begin{align*} 2x & \quad 1 \quad 11 \\ 2x & \quad 11 \quad 11 \quad 1 \\ & \quad 2x \quad 10 \\ & \quad \frac{2x}{2} \quad \frac{10}{2} \\ & \quad 2 \quad \frac{11}{5} \quad \frac{1}{5} \\ \end{align*} \]

Check:
\[ \begin{align*} 25 & \quad 1 \quad 11 \\ 10 & \quad 1 \quad 11 \\ & \quad 11 \quad 11 \\ \end{align*} \]

The solution set is 5.

30. \[ \begin{align*} 2x & \quad 5 \quad 13 \\ 2x & \quad 5 \quad 5 \quad 13 \quad 5 \\ & \quad 2x \quad 8 \\ & \quad \frac{2x}{2} \quad \frac{8}{2} \\ & \quad 2 \quad \frac{11}{4} \quad \frac{1}{4} \\ \end{align*} \]

Check:
\[ \begin{align*} 24 & \quad 5 \quad 13 \\ 8 & \quad 5 \quad 13 \\ & \quad 13 \quad 13 \\ \end{align*} \]

The solution set is 4.

31. \[ \begin{align*} 2x & \quad 3 \quad 9 \\ 2x & \quad 3 \quad 3 \quad 9 \quad 3 \\ & \quad 2x \quad 12 \\ & \quad \frac{2x}{2} \quad \frac{12}{2} \\ & \quad \frac{x}{6} \\ \end{align*} \]

Check:
\[ \begin{align*} 26 & \quad 3 \quad 9 \\ 12 & \quad 3 \quad 9 \\ & \quad 9 \quad 9 \\ \end{align*} \]

The solution set is 6.

32. \[ \begin{align*} 3x & \quad 2 \quad 9 \\ 3x & \quad 2 \quad 2 \quad 9 \quad 2 \\ & \quad 3x \quad 11 \\ & \quad \frac{3x}{3} \quad \frac{11}{3} \\ & \quad \frac{x}{3} \quad \frac{11}{3} \\ \end{align*} \]

Check:
\[ \begin{align*} 3 \quad 11 & \quad 9 \\ 3 & \quad 11 \quad 2 \quad 9 \\ & \quad 9 \quad 9 \\ \end{align*} \]

The solution set is \( \frac{11}{3} \).

33. \[ \begin{align*} 2y & \quad 5 \quad 7 \\ 2y & \quad 5 \quad 5 \quad 7 \quad 5 \\ & \quad 2y \quad 2 \\ & \quad \frac{2y}{2} \quad \frac{2}{2} \\ & \quad \frac{y}{1} \quad \frac{1}{1} \\ \end{align*} \]

Check:
\[ \begin{align*} 21 & \quad 5 \quad 7 \\ 2 & \quad 5 \quad 7 \\ & \quad 7 \quad 7 \\ \end{align*} \]

The solution set is 1.
34. \(3y 4 13\)
\(3y 4 4 13 4\)
\(3y 9\)
\(3y 9\)
\(3 3\)
\(y 3\)
Check:
\(33 4 13\)
\(9 4 13\)
\(13 13\)
The solution set is 3.

35. \(3y 7 1\)
\(3y 7 7 1 7\)
\(3y 6\)
\(3y 6\)
\(3 3\)
\(y 2\)
Check:
\(32 7 1\)
\(6 7 1\)
\(1 1\)
The solution set is 2.

36. \(2y 5 7\)
\(2y 5 5 7 5\)
\(2y 12\)
\(2y 12\)
\(2 2\)
\(y 6\)
Check:
\(26 5 7\)
\(12 5 7\)
\(7 7\)
The solution set is 6.

37. \(12 4z 3\)
\(12 3 4z 3 3\)
\(9 4z\)
\(9 4z\)
\(4 4\)
\(9\)
\(4 z\)
Check:
\(12 4\)
\(9 3\)
\(12 12\)
The solution set is \(\frac{9}{4}\).

38. \(14 5z 21\)
\(14 21 5z 21 21\)
\(35 5z\)
\(35 5z\)
\(5 5\)
\(7 z\)
Check:
\(14 57 21\)
\(14 35 21\)
\(14 14\)
The solution set is 7.

39. \(x 3 3\)
\(x 3 3 3 3\)
\(x 6\)
\(x 6\)
Check:
\(6 3 3\)
\(6 3 3\)
\(3 3\)
The solution set is 6.
40. \[ x \cdot 5 = 5 \]
\[ x \cdot 5 = 5 \]
\[ x = 10 \]
\[ x = 10 \]
Check:
\[ 10 \cdot 5 = 5 \]
\[ 10 \cdot 5 = 5 \]
\[ 5 \cdot 5 \]
The solution set is 10.

41. \[ 6y \cdot 2 = 12 \]
\[ 6y = 12 \]
\[ 2y = 12 \]
\[ 6y = 12 \]
\[ 6y = 2 \cdot 6y \]
\[ 6y = 12 \]
\[ 4y = 12 \]
\[ 4y = 4 \]
\[ 3y = 4 \]
Check:
\[ 63 = 23 \]
\[ 12 = 18 \]
\[ 18 = 18 \]
The solution set is 3.

42. \[ 8y \cdot 3 = 10 \]
\[ 8y = 3 \cdot 8y \]
\[ 3y = 10 \]
\[ 5y = 10 \]
\[ 5y = 10 \]
\[ 5 = 5 \]
\[ y = 2 \]
Check:
\[ 82 = 32 \]
\[ 10 = 16 \]
\[ 16 = 16 \]
The solution set is 2.

43. \[ 3z \cdot 2z = 15 \]
\[ 3z = 2z \]
\[ 2z = 5z \]
\[ 5z = 15 \]
\[ 5z = 15 \]
\[ z = 3 \]
Check:
\[ 33 = 23 \]
\[ 12 = 15 \]
\[ 12 = 9 \]
The solution set is 3.

44. \[ 2z \cdot 4z = 18 \]
\[ 2z = 4z \]
\[ 4z = 6z \]
\[ 6z = 18 \]
\[ 6z = 18 \]
\[ 6 = 6 \]
\[ z = 3 \]
Check:
\[ 23 = 43 \]
\[ 18 = 12 \]
\[ 18 = 18 \]
The solution set is 3.

45. \[ 5x \cdot 2x = 12 \]
\[ 5x = 2x \]
\[ 2x = 3x \]
\[ 3x = 12 \]
\[ 3x = 12 \]
\[ 3 = 3 \]
\[ x = 4 \]
Check:
\[ 54 = 24 \]
\[ 12 = 8 \]
\[ 12 = 12 \]
The solution set is 4.
46. \[ 7x \ 3x \ 8 \]
\[ 7x \ 3x \ 3x \ 8 \ 3x \]
\[ 4x \ 8 \]
\[ 4x \ 8 \]
\[ 4 \ 4 \]
\[ x \ 2 \]
Check:
\[ 72 \ 32 \ 8 \]
\[ 14 \ 6 \ 8 \]

14 14
The solution set is 2.

47. \[ 8y \ 4 \ 2y \ 5 \]
\[ 8y \ 4 \ 2y \ 2y \ 5 \ 2y \]
\[ 6y \ 4 \ 5 \]
\[ 6y \ 4 \ 4 \ 5 \ 4 \]
\[ 6y \ 9 \]
\[ 6y \ 9 \]
\[ 6 \ 6 \]
\[ y \ 3 \ 2 \]
Check:
\[ 8 \ 3 \ 4 \ 2 \ 3 \ 5 \]
\[ 2 \ 2 \]
\[ 12 \ 4 \ 3 \ 5 \]
\[ 8 \ 8 \]
The solution set is \( \frac{3}{2} \).

48. \[ 5y \ 6 \ 3y \ 6 \]
\[ 5y \ 6 \ 3y \ 3y \ 6 \ 3y \]
\[ 2y \ 6 \ 6 \]
\[ 2y \ 6 \ 6 \ 6 \ 6 \]
\[ 2y \ 12 \]
\[ 2y \ 12 \]
\[ 2 \ 2 \]
\[ y \ 6 \]
Check:
\[ 56 \ 6 \ 36 \ 6 \]
\[ 30 \ 6 \ 18 \ 6 \]
\[ 24 \ 24 \]
The solution set is 6.

49. \[ 6z \ 5 \ z \ 5 \]
\[ 6z \ 5 \ z \ 5 \ z \]
\[ 5z \ 5 \ 5 \]
\[ 5z \ 5 \ 5 \ 5 \ 5 \]
\[ 5z \ 10 \]
\[ \frac{5z}{5} \ 10 \]
\[ \frac{5z}{5} \]
\[ z \ 2 \]
Check:
\[ 62 \ 5 \ 2 \ 5 \]
\[ 12 \ 5 \ 2 \ 5 \]
\[ 7 \ 7 \]
The solution set is 2.

50. \[ 6z \ 3 \ z \ 2 \]
\[ 6z \ 3 \ z \ 2 \ z \]
\[ 5z \ 3 \ 2 \]
\[ 5z \ 3 \ 3 \ 2 \ 3 \]
\[ 5z \ 5 \]
\[ \frac{5z}{5} \ 5 \]
\[ 5 \ 5 \]
\[ z \ 1 \]
Check:
\[ 61 \ 3 \ 1 \ 2 \]
\[ 6 \ 3 \ 3 \]
\[ 3 \ 3 \]
The solution set is 1.

51. \[ 6x \ 14 \ 2x \ 2 \]
\[ 6x \ 2x \ 14 \ 2 \]
\[ 4x \ 2 \ 14 \]
\[ 4x \ 16 \]
\[ x \ 4 \]
Check:
\[ 64 \ 14 \ 24 \ 2 \]
\[ 24 \ 14 \ 8 \ 2 \]
\[ 10 \ 10 \]
The solution set is 4.
52. \[9x \ 2 \ 6x \ 4\]
\[9x \ 2 \ 6x \ 6x \ 4 \ 6x\]
\[3x \ 2 \ 4\]
\[3x \ 2 \ 2 \ 4 \ 2\]
\[3x \ 6\]
\[3x \ 6\]
\[3 \ 3\]
\[x \ 2\]

Check:
\[92 \ 2 \ 62 \ 4\]
\[18 \ 2 \ 12 \ 4\]
\[16 \ 16\]
The solution set is \(2\).

53. \[3y \ 1 \ 5 \ 2y\]
\[3y \ 2y \ 1 \ 5\]
\[y \ 5 \ 1\]
\[y \ 6\]
\[y \ 6\]

Check:
\[36 \ 1 \ 5 \ 26\]
\[18 \ 1 \ 5 \ 12\]
\[17 \ 17\]
The solution set is \(6\).

54. \[3y \ 2 \ 5 \ 4y\]
\[3y \ 2y \ 5 \ 4y \ 4y\]
\[y \ 2 \ 5\]
\[y \ 2 \ 2 \ 5 \ 2\]
\[y \ 3\]

Check:
\[33 \ 2 \ 5 \ 43\]
\[9 \ 2 \ 5 \ 12\]
\[7 \ 7\]
The solution set is \(3\).

55. \[x\]
\[\frac{x}{2}\]
\[\frac{x}{3}\]
\[\frac{x}{5}\]
\[x \ \triangle\]

56. \[\Delta x \ \triangle x\]
\[\Delta x\]

57. \[\frac{x}{1} \ \frac{x}{1}\]
\[\frac{x}{x}\]

58. \[\frac{x}{\triangle}\]
\[\frac{x}{\triangle}\]
\[\frac{x}{\triangle}\]
\[\frac{x}{\triangle}\]

59. \[6x \ 10\]
\[\frac{6x}{10}\]
\[\frac{6}{6}\]
\[\frac{10}{5}\]
\[x \ 6 \ 3\]
\[\frac{5}{3}\]
The number is \(\frac{5}{3}\).

60. \[6 \ x \ 20\]
\[6 \ x \ 20\]
\[\frac{6}{6}\]
\[\frac{10}{3}\]

The number is \(\frac{10}{3}\).

61. \[\frac{x}{9} \ 5\]
\[\frac{x}{9} \ 59\]
\[\frac{x}{9} \ 59\]
\[\frac{x}{9} \ 59\]
\[x \ 45\]
The number is \(45\).

62. \[\frac{x}{7} \ 8\]
\[\frac{x}{7} \ 8\]
\[\frac{x}{7} \ 8\]
\[\frac{x}{7} \ 8\]
\[x \ 56\]
The number is \(56\).
63. \[ 4x \times 8 \times 56 \]
\[ 4x \times 8 \times 8 \times 56 \times 8 \]
\[ 4x \times 64 \]
\[ \frac{4x \times 64}{4 \times 4} \times 16 \]
The number is 16.

64. \[ 3x \times 10 \times 23 \]
\[ 3x \times 10 \times 10 \times 23 \times 10 \]
\[ 3x \times 33 \]
\[ \frac{3x \times 33}{3 \times 3} \times 11 \]
The number is 11.

65. \[ 3x \times 15 \times 6 \]
\[ 3x \times 15 \times 15 \times 6 \times 15 \]
\[ 3x \times 21 \]
\[ \frac{3x \times 21}{3 \times 3} \times 7 \]
The number is 7.

66. \[ 5x \times 11 \times 29 \]
\[ 5x \times 11 \times 11 \times 29 \times 11 \]
\[ 5x \times 40 \]
\[ \frac{5x \times 40}{5 \times 5} \times 8 \]
The number is 8.

67. \[ M \times \frac{n}{5} \]
\[ 2 \times \frac{n}{5} \]
\[ 52 \times \frac{n}{11} \]
\[ 5 \times \frac{n}{10} \]
If you are 2 miles away from the lightning flash, it will take 10 seconds for the sound of thunder to reach you.

68. \[ M \times \frac{n}{5} \]
\[ 3 \times \frac{n}{5} \]
\[ 53 \times \frac{5}{5} \times \frac{n}{15} \]
If you are 3 miles away from the lightning flash, it will take 15 seconds for the sound of thunder to reach you.

69. \[ M \times \frac{A}{740} \]
\[ 2.03 \times \frac{A}{740} \]
\[ 740 \times 0.03 \times \frac{A}{740} \times \frac{A}{740} \times 1502.2 \]
The speed of the Concorde is 1502.2 miles per hour.

70. \[ M \times \frac{A}{240} \]
\[ 3.3 \times \frac{A}{740} \]
\[ 740 \times 3.3 \times \frac{A}{740} \times \frac{A}{740} \times 2442 \]
The speed of the SR-71 Blackbird is 2442 miles per hour.

71. a. The bar graph indicates the median weekly earnings, in 2013, for men with some college or an associate’s degree is $858. Since 2013 is 33 years after 1980, substitute 33 into the formula for \( n \).
\[ M \times 15n \times 358 \]
\[ M \times 15(33) \times 358 \]
\[ M \times 853 \]
The formula indicates the median weekly earnings, in 2013, for men with some college or an associate’s degree is $853. The formula underestimates by $5.

b. \[ M \times 15n \times 358 \]
\[ 1033 \times 15n \times 358 \]
\[ 675 \times 15n \]
45 $n$
The formula indicates the median weekly earnings for men with some college or an associate’s degree will reach $1033.45$ years after 1980, or in 2025.
72. a. The bar graph indicates the median weekly earnings, in 2013, for women with some college or an associate’s degree is $657. Since 2013 is 33 years after 1980, substitute 33 into the formula for \( n \).
\[
W = 13n + 231
\]
\[
W = 13(33) + 231
\]
\[
W = 660
\]
The formula indicates the median weekly earnings, in 2013, for women with some college or an associate’s degree is $660. The formula overestimates by $3.

b. \[
W = 13n + 231
\]
\[
777 = 13n + 231
\]
\[
546 = 13n
\]
\[
42 = n
\]
The formula indicates the median weekly earnings for women with some college or an associate’s degree will reach $777 in 42 years after 1980, or in 2022.

73. – 75. Answers will vary.

76. does not make sense; Explanations will vary.
Sample explanation: The addition property of equality is not necessary for this equation.

77. does not make sense; Explanations will vary.
Sample explanation: When you subtract 12 from 12, 3x, you should obtain 3x, not positive 3x.

78. makes sense

79. does not make sense; Explanations will vary.
Sample explanation: To determine the price in 2009, substitute 69 in for \( n \) and simplify.

80. false; Changes to make the statement true will vary.
A sample change is: If 7x 21, then \[
\frac{7x}{7} = \frac{21}{7}
\]

81. false; Changes to make the statement true will vary.
A sample change is: If 3x 16, then 3x 20.

82. false; Changes to make the statement true will vary.
A sample change is: If 3x 7, then 3x 7 and

83. true

both sides of this equation by 60 (since we will divide both sides of the equation by 60 to solve).
For example, suppose we want the solution to be 3. We set \( x \) equal to this value and write \( x = 3 \).
Now multiply both sides of the equation by 60.
\[
x = 3
\]
\[
60x = 60 \cdot 3
\]
\[
60x = 180
\]
So, our equation is \( 60x = 180 \) and the solution is \( x = 3 \) (an integer).

85. Answers will vary. As an example, start with an integer solution, such as 10, and set it equal to \( x \).
That is, we have \( x = 10 \). The solution was obtained by multiplying both sides by \[
\frac{4}{5}
\]
To undo this, we multiply both sides of our equation by the reciprocal, \[
\frac{5}{4}
\]
This gives, \[
\frac{5}{4} \cdot \frac{5}{4} = \frac{25}{16}
\]
Therefore, an example equation would be \[
\frac{5}{4} \cdot \frac{25}{2}
\]

86. \[
3.7x = 19.46 \quad 9.988
\]
\[
3.7x = 9.988 \quad 19.46
\]
\[
3.7x = 9.472
\]
\[
\frac{3.7x}{3.7} = \frac{9.472}{3.7}
\]
\[
x = 2.56
\]
The solution set is \( x = 2.56 \).

87. \[
72.8y = 14.6 \quad 455.43 \quad 4.98y
\]
\[
72.8y = 14.6 \quad 4.98y
\]
\[
455.43 \quad 4.98y
\]
\[
67.82y = 14.6 \quad 455.43
\]
\[
67.82y = 14.6 \quad 4.5543 \quad 14.6
\]
\[
67.82y = 440.83
\]
\[
67.82y = 440.83
\]
\[
72.825 \quad 67.82
\]
\[
y = 6.5
\]
The solution set is \( y = 6.5 \).
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.2  The Multiplication Property of Equality

\[
\frac{7}{3} \quad \text{(Equation)}
\]

**88.**
\[
\begin{align*}
10^2 \\
1010 \\
100
\end{align*}
\]

**84.** Answers will vary. Start by selecting the integer answer and set \( x \) equal to this value. Then, multiply.

**89.**  \( 10 \quad 110 \quad 11010 \quad 100 \)
Section 2.2 The Multiplication Property of Equality

3. Simplify the algebraic expression on each side.
   \[
   4(2x \ 1) \ 29 \ 3(2x \ 5) \\
   8x \ 4 \ 29 \ 6x \ 15 \\
   8x \ 25 \ 6x \ 15
   \]
   Collect variable terms on one side and constant terms on the other side.
   \[
   8x \ 6x \ 25 \ 6x \ 6x \ 15 \\
   2x \ 25 \ 15 \\
   2x \ 25 \ 25 \ 15 \ 25 \\
   2x \ 10
   \]
   Isolate the variable and solve.
   \[
   \frac{2x}{2} \ 10 \\
   \frac{x}{2} \ 5
   \]
   The solution set is 5.

4. Begin by multiplying both sides of the equation by 12, the least common denominator.
   \[
   \frac{x}{4} \ 2x \ 5 \\
   \frac{3}{6}
   \]
   \[
   12 \ x \ 12 \ 2x \ 5 \\
   4 \ 3 \ 6
   \]
   \[
   12 \ x \ 12 \ \frac{2x}{3} \ 12 \ 5 \\
   4 \ 3 \ 6
   \]
   \[
   3x \ 8x \ 10 \\
   3x \ 8x \ 8x \ 10 \\
   5x \ 10 \\
   5x \ 10
   \]
   \[
   5 \ 5 \\
   x \ 2
   \]
   The solution set is 2.

5. First apply the distributive property to remove the parentheses, and then multiply both sides by 100 to clear the decimals.
   \[
   0.48x \ 3 \ 0.2(x \ 6) \\
   0.48x \ 3 \ 0.2x \ 1.2
   \]
   \[
   100(0.48x \ 3) \ 100(0.2x \ 1.2) \\
   48x \ 300 \ 20x \ 120
   \]
   \[
   48x \ 300 \ 300 \ 20x \ 120 \ 300 \\
   48x \ 20x \ 420
   \]
   \[
   48x \ 20x \ 20x \ 420 \\
   28x \ 420
   \]
   \[
   6x \ 12
   \]
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.2  The Multiplication Property of Equality

\[
\begin{align*}
\frac{28x}{28} & \\
\quad & \\
& \\
\end{align*}
\]

\[
\begin{align*}
6 & 6 \\
x & 2 \\
\end{align*}
\]

The solution set is 2.

\[
\begin{align*}
\frac{4}{2} & \\
\quad & \\
\frac{0}{2} & \\
x & 15 \\
\end{align*}
\]

The solution set is 15.
6. $$3x \neq 3(x - 1)$$
   $$3x \neq 3x$$
   $$3x \neq 3x - 3$$
   $$7 \neq 3$$
   The original equation is equivalent to the false statement $7 \neq 3$.
   The equation has no solution. The solution set is $\emptyset$.

7. $$3(x - 1) = 9, 8x = 6, 5x$$
   $$3x = 3, 9, 3x = 6$$
   $$3x = 6, 3x = 6$$
   $$3x = 6, 3x = 6$$
   $$6 \neq 6$$
   The original equation is equivalent to $6 \neq 6$, which is true for every value of $x$.
   The equation’s solution is all real numbers or $x \in \mathbb{R}$.

8. $$D = \frac{10x}{9} \geq \frac{53}{9}$$
   $$10 = \frac{10x}{9} \geq \frac{53}{9}$$
   $$9 \geq \frac{9}{10} \geq \frac{53}{9}$$
   $$9 \geq \frac{9}{10} \geq \frac{53}{9}$$
   $$90 \geq 10x \geq 53$$
   $$90 \geq 10x \geq 53$$
   $$37 \leq 10x \leq 53$$
   $$37 \leq 10x \leq 53$$
   $$3.7 \leq x \leq 3.7$$
   The formula indicates that if the low-humor group averages a level of depression of 10 in response to a negative life event, the intensity of that event is 3.7. This is shown as the point whose corresponding value on the vertical axis is 10 and whose value on the horizontal axis is 3.7.

2.3 Exercise Set

1. $$5x = 3x + 4x \leq 10 \geq 2$$
   $$8x = 4x \leq 12 \geq 4$$
   $$4x \leq 12 \geq 4$$
   $$x \geq 3$$
   The solution set is $[3, \infty)$.

2. $$4x = 8x - 2x \leq 20 \geq 15$$
   $$10x \geq 5$$
   $$x \leq \frac{5}{10} \leq \frac{1}{2}$$
   The solution set is $(-\infty, \frac{1}{2}]$.

3. $$4x = 9x - 22 \leq 3x \geq 30$$
   $$5x \leq 22 \leq 3x \geq 30$$
   $$5x \leq 22 \leq 3x \geq 30$$
   $$8x \geq 22 \geq 30$$
   $$8x \geq 22 \geq 30$$
   $$8x \geq 22 \geq 30$$
   $$8x \geq 22 \geq 30$$
   $$x \geq \frac{1}{2}$$
   The solution set is $(\frac{1}{2}, \infty)$.

4. $$3x = 2x + 64 \leq 40 \geq 7x$$
   $$5x \leq 64 \leq 40 \geq 7x$$
   $$12x \leq 64 \leq 40 \geq 7x$$
   $$12x \leq 64 \leq 40 \geq 7x$$
   $$12x \leq 64 \leq 40 \geq 7x$$
   $$x \leq \frac{1}{2}$$
   The solution set is $(-\infty, \frac{1}{2}]$.

2.3 Concept and Vocabulary Check

1. simplify each side; combine like terms
2. 30
3. 100
4. inconsistent
5. \[3x \cdot 6 \cdot 6 \cdot 3x \cdot 6 \]
   \[2x \cdot 6 \cdot 2 \cdot 3x \]
   \[2x \cdot 6 \cdot 2 \cdot 2 \cdot 3x \cdot 2 \]
   \[2x \cdot 4 \cdot 3x \]
   \[2x \cdot 4 \cdot 2x \cdot 3x \cdot 2x \cdot 4 \cdot x \]
   The solution set is 4.

6. \[3x \cdot 2 \cdot x \cdot 6 \cdot 3x \cdot 8 \]
   \[2x \cdot 2 \cdot 3x \cdot 2 \]
   \[2x \cdot 2 \cdot 3x \cdot 3x \cdot 2 \cdot 3x \cdot x \cdot 2 \cdot 2 \]
   \[x \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot 4 \]
   \[x \cdot 4 \]
   The solution set is 4.

7. \[4x \cdot 1 \cdot 20 \]
   \[4x \cdot 4 \cdot 20 \]
   \[4x \cdot 20 \cdot 4 \]
   \[4x \cdot 16 \]
   \[\frac{4x}{16} \]
   \[\frac{4}{4} \]
   \[\frac{x}{4} \]
   The solution set is 4.

8. \[3x \cdot 2 \cdot 6 \]
   \[3x \cdot 6 \cdot 6 \]
   \[3x \cdot 0 \]
   \[x \cdot 0 \]
   The solution set is 0.

9. \[7(2x - 1) = 42 \]
   \[14x - 7 = 42 \]
   \[14x = 49 \]
   \[x = \frac{49}{14} = \frac{7}{2} \]
   The solution set is \(\frac{7}{2}\).

10. \[42x \cdot 3 \cdot 32 \]
    \[8x \cdot 12 \cdot 32 \]
    \[8x \cdot 44 \]
    \[x = \frac{44}{8} - \frac{11}{2} \]
    The solution set is \(\frac{11}{2}\).

11. \[38 \cdot 30 \cdot 2 \cdot x \cdot 1 \]
    \[38 \cdot 30 \cdot 2x \cdot 2 \]
    \[38 \cdot 32 \cdot 2x \]
    \[38 \cdot 32 \cdot 2x \]
    \[6 \cdot 2x \]
    \[6 \cdot 2x \]
    \[2 \cdot 2 \]
    \[3 \cdot x \]
    The solution set is 3.

12. \[20 \cdot 44 \cdot 8 \cdot 2x \]
    \[20 \cdot 44 \cdot 16 \cdot 8x \]
    \[20 \cdot 28 \cdot 8x \]
    \[8 \cdot 8x \]
    \[1 \cdot x \]
    The solution set is 1.

13. \[24z \cdot 3 \cdot 8 \cdot 46 \]
    \[8z \cdot 6 \cdot 8 \cdot 46 \]
    \[8z \cdot 2 \cdot 46 \]
    \[8z \cdot 2 \cdot 46 \cdot 2 \]
    \[8z \cdot 48 \]
    \[8z \cdot 48 \]
    \[\frac{8z}{3} \cdot \frac{48}{8} \]
    \[z \cdot 6 \]
    The solution set is 6.

14. \[9z \cdot 8 \cdot 89 \]
    \[9z \cdot 81 \]
    \[9z \cdot 89 \]
    \[z \cdot 9 \]
    The solution set is 9.
15. \[6x \ 3x \ 10 \ 14\]
\[6x \ 3x \ 10 \ 14\]
\[3x \ 10 \ 14\]
\[3x \ 10 \ 10 \ 14 \ 10\]
\[3x \ 24\]
\[\frac{3x}{3} \ \frac{24}{3}\]
\[x \ 8\]

The solution set is 8.

16. \[5x \ 2x \ 14 \ 10\]
\[5x \ 2x \ 14 \ 10\]
\[3x \ 14 \ 10\]
\[3x \ 24\]
\[x \ 8\]

The solution set is 8.

\[52x \ 1 \ 12x \ 3\]
\[10x \ 5 \ 12x \ 3\]
\[10x \ 10x \ 5 \ 12x \ 10x \ 3\]
\[5 \ 2x \ 3\]
\[5 \ 3 \ 2x \ 3 \ 3\]
\[8 \ 2x\]
\[\frac{8}{2} \ \frac{2x}{2}\]
\[x \ 4\]

The solution set is 4.

17. \[3x \ 2 \ x \ 30\]
\[3x \ 6 \ x \ 30\]
\[2x \ 6 \ 30\]
\[2x \ 24\]
\[x \ 12\]

The solution set is 12.

19. \[35 \ x \ 42x \ 1\]
\[15 \ 3x \ 8x \ 4\]
\[15 \ 3 \ x \ 8x \ 8x \ 4 \ 8x\]
\[15 \ 11x \ 4\]
\[15 \ 11x \ 15 \ 4 \ 15\]
\[11x \ 11\]
\[11 \ 11\]
\[x \ 1\]

The solution set is 1.

20. \[33x \ 1 \ 43 \ 3x\]
\[9x \ 3 \ 12 \ 12x\]
\[3 \ 3 \ 12\]
\[3x \ 15\]
\[x \ 5\]

The solution set is 5.

\[8 \ y \ 2 \ 23y \ 4\]
\[8y \ 16 \ 6y \ 8\]

21. \[8y \ 16 \ 16 \ 6y \ 8 \ 16\]
\[8y \ 6y \ 8\]
\[8y \ 6y \ 6y \ 8 \ 6y\]
\[2y \ 8\]
\[y \ 4\]

The solution set is 4.

\[8y \ 3 \ 32y \ 12\]
\[8y \ 24 \ 6y \ 36\]
\[2y \ 24 \ 36\]

22. \[2y \ 12\]
\[y \ 6\]

The solution set is 6.

23. \[3x \ 3 \ 7x \ 14 \ 3\]
\[3x \ 3 \ 7x \ 17\]
\[3x \ 3 \ 3 \ 7x \ 17 \ 3\]
\[3x \ 7x \ 20\]
\[3x \ 7x \ 7x \ 20 \ 7x\]
\[4x \ 20\]
\[4x \ 20\]
\[4 \ 4\]
\[x \ 5\]

The solution set is 5.
24. \[5x \cdot 4 \cdot x \cdot 9 \cdot 2 \cdot x \cdot 3 \]
\[5x \cdot 4 \cdot 3 \cdot 6 \cdot 2 \cdot x \cdot 3 \]
\[x \cdot 3 \cdot 6 \cdot 2 \cdot x \cdot 3 \]
\[x \cdot 2 \cdot x \cdot 3 \]
\[x \cdot 3 \cdot 3 \]
\[x \cdot 3 \cdot 3 \]

The solution set is \(33\).

25. \[52x \cdot 8 \cdot 2 \cdot 5 \cdot x \cdot 3 \cdot 3 \]
\[10x \cdot 4 \cdot 0 \cdot 2 \cdot 5 \cdot x \cdot 15 \cdot 3 \]
\[10x \cdot 4 \cdot 2 \cdot 5 \cdot x \cdot 12 \]
\[10x \cdot 4 \cdot 2 \cdot 5 \cdot x \cdot 12 \cdot 42 \]
\[10x \cdot 5 \cdot x \cdot 30 \]
\[10x \cdot 5 \cdot x \cdot 30 \cdot 5 \cdot x \]
\[5 \cdot x \cdot 30 \]
\[\frac{5 \cdot x}{5} = \frac{30}{5} \]
\[x \cdot 6 \]

The solution set is \(6\).

26. \[73x \cdot 2 \cdot 5 \cdot 6 \cdot 2 \cdot x \cdot 1 \cdot 24 \]
\[21x \cdot 14 \cdot 5 \cdot 12 \cdot x \cdot 6 \cdot 24 \]
\[21x \cdot 9 \cdot 12 \cdot x \cdot 18 \]
\[21x \cdot 12 \cdot x \cdot 27 \]
\[9x \cdot 27 \]
\[x \cdot 3 \]

The solution set is \(3\).

27. \[6 \cdot 4 \cdot 1 \cdot x \cdot 3 \cdot x \cdot 1 \]
\[6 \cdot 4 \cdot 4 \cdot x \cdot 3 \cdot x \cdot 3 \]
\[6 \cdot 1 \cdot 7 \cdot x \]
\[6 \cdot 1 \cdot 1 \cdot 7 \cdot x \cdot 1 \]
\[7 \cdot 7 \cdot x \]
\[7 \cdot 7 \cdot x \]
\[7 \cdot 7 \]
\[1 \cdot x \]

The solution set is \(1\).

28. \[100 \cdot x \cdot 1 \cdot 4 \cdot x \cdot 6 \]
\[100 \cdot x \cdot 1 \cdot 4 \cdot x \cdot 24 \]
\[100 \cdot 3 \cdot x \cdot 23 \]
\[123 \cdot 3 \cdot x \]
\[41 \cdot x \]

The solution set is \(41\).

29. \[10 \cdot z \cdot 4 \cdot 4 \cdot z \cdot 2 \cdot 3 \cdot z \cdot 1 \cdot 2 \cdot z \cdot 3 \]
\[10 \cdot z \cdot 4 \cdot 0 \cdot 4 \cdot z \cdot 8 \cdot 3 \cdot z \cdot 3 \cdot 2 \cdot z \cdot 6 \]
\[6 \cdot z \cdot 48 \cdot 5 \cdot z \cdot 9 \]
\[6 \cdot z \cdot 48 \cdot 48 \cdot 5 \cdot z \cdot 9 \cdot 48 \]
\[6 \cdot z \cdot 5 \cdot z \cdot 57 \cdot 5 \cdot z \cdot 5 \cdot 7 \]

The solution set is \(57\).

30. \[2 \cdot z \cdot 4 \cdot 3 \cdot z \cdot 2 \cdot 2 \cdot 6 \cdot z \cdot 2 \]
\[2 \cdot z \cdot 8 \cdot 3 \cdot z \cdot 2 \cdot 2 \cdot 6 \cdot z \cdot 2 \]
\[5 \cdot z \cdot 10 \cdot 6 \cdot z \cdot 10 \]
\[0 \]

The solution set is \(10\).

31. \[\frac{x}{5} = 4 \cdot 6 \]

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is \(5\).

\[5 \cdot \frac{x}{5} = 4 \cdot 56 \]
\[5 \cdot 1 \cdot x \]

\[\frac{x}{5} = 5 \cdot 4 \cdot 30 \]
\[x \cdot 20 \cdot 30 \]
\[x \cdot 20 \cdot 20 \cdot 30 \cdot 20 \]
\[x \cdot 10 \]

The solution set is \(10\).

32. \[\frac{x}{2} = 13 \cdot 22 \]

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is \(2\).

\[\frac{x}{2} = 13 \cdot 22 \]
\[x \cdot 2 \cdot \frac{13}{2} \cdot 222 \]

\[x \cdot 2 \cdot \frac{213}{44} \cdot 44 \]
\[x \cdot 26 \cdot 44 \]
\[x \cdot 26 \cdot 26 \cdot 44 \cdot 26 \]
\[x \cdot 70 \]

The solution set is \(70\).
33. \( \frac{2x}{3} = 5 \)
   To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 3.
   \[
   \begin{align*}
   3 \cdot \frac{2x}{3} & = 5 \cdot 3 \\
   2x & = 15 \\
   \frac{2x}{2} & = \frac{15}{2} \\
   x & = \frac{15}{2} \\
   \end{align*}
   \]
   The solution set is 18.

34. \( \frac{3x}{4} = \frac{9}{6} \)
   To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 4.
   \[
   \begin{align*}
   4 \cdot \frac{3x}{4} & = \frac{9}{6} \cdot 4 \\
   3x & = 6 \\
   \frac{3x}{3} & = \frac{6}{3} \\
   x & = 2 \\
   \end{align*}
   \]
   The solution set is 4.

35. \( \frac{2y}{3} = \frac{5}{4} \)
   To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 12.
   \[
   \begin{align*}
   12 \cdot \frac{2y}{3} & = \frac{5}{4} \cdot 12 \\
   2y & = 15 \\
   \frac{2y}{2} & = \frac{15}{2} \\
   y & = \frac{15}{2} \\
   \end{align*}
   \]
   The solution set is \( \frac{5}{2} \).

36. \( \frac{3y}{4} = \frac{2}{3} \)
   To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 12.
   \[
   \begin{align*}
   12 \cdot \frac{3y}{4} & = \frac{2}{3} \cdot 12 \\
   3y & = 8 \\
   \frac{3y}{3} & = \frac{8}{3} \\
   y & = \frac{8}{3} \\
   \end{align*}
   \]
   The solution set is \( \frac{5}{3} \).

37. \( \frac{x}{3} = \frac{2}{6} \)
   To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 6.
   \[
   \begin{align*}
   6 \cdot \frac{x}{3} & = \frac{2}{6} \cdot 6 \\
   2x & = 2 \\
   \frac{2x}{2} & = \frac{2}{2} \\
   x & = 1 \\
   \end{align*}
   \]
   The solution set is 1.

38. \( \frac{x}{4} = \frac{x}{5} \)
   To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 20.
   \[
   \begin{align*}
   20 \cdot \frac{x}{4} & = \frac{x}{5} \cdot 20 \\
   5x & = 4x \\
   \frac{5x}{5} & = \frac{4x}{4} \\
   x & = 4 \\
   \end{align*}
   \]
   The solution set is 4.
39. \( \frac{20 \ z \ z}{3 \ 2} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 6.

\[
6 \times 20 \ z \ 6 \ z \\
3 \ 2 \\
120 \ 2z \ 3z \\
120 \ 2z \ 2z \ 3z \ 2z \\
120 \ 5z \\
120 \ 5z \\
5 \ 5 \\
24 \ z
\]

The solution set is 24.

40. \( \frac{z}{5 \ 2} = \frac{z}{6} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 30.

\[
30 \ z \ 1 \ 30 \ z \\
5 \ 2 \ 6 \\
6z \ 15 \ 5z \\
z \ 15 \ 0 \\
z \ 15
\]

The solution set is 15.

41. \( \frac{x}{3} \frac{2}{5} \frac{3}{5} \frac{2}{5} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 15.

\[
15 \ x \ 2 \ 15 \ x \ 2 \\
3 \ 5 \ 5 \ 5 \\
15 \ x \ 15 \ x \ 15 \ x \\
3 \ 5 \ 5 \ 5 \\
5y \ 6 \ 3y \ 6 \\
5y \ 6 \ 3y \ 6 \ 3y \\
2y \ 6 \ 6 \\
2y \ 6 \ 6 \ 6 \\
2y \ 12 \\
\frac{2y}{2} \frac{12}{2} \\
y \ 6
\]

42. \( \frac{y}{12} \frac{1}{6} \frac{1}{2} \frac{1}{4} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 12.

\[
12 \ y \ 1 \\
12 \ y \ 1 \\
12 \ 6 \ 2 \ 4 \\
y \ 2 \ 6y \ 3 \\
5y \ 2 \ 3 \\
5y \ 5 \\
y \ 1
\]

The solution set is 1.

43. \( \frac{3x}{4} \frac{3}{4} \frac{y}{2} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 8.

\[
8 \ 3x \ 3 \ 8 \ y \ 2 \\
4 \ 2 \\
3x \ 8 \\
8 \ 4 \ 8 \ 3 \ 8 \ 2 \\
6x \ 24 \ 4x \ 16 \\
6x \ 24 \ 4x \ 16 \ 4x \\
2x \ 24 \ 16 \\
2x \ 24 \ 24 \ 16 \ 24 \\
2x \ 40 \\
2x \ 40 \\
2 \ 2 \\
2x \ 20
\]

The solution set is 20.

44. \( \frac{3x}{5} \frac{2}{5} \frac{x}{2} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 15.

\[
\frac{3x}{2} \frac{x}{2} \\
15 \ 5 \ 5 \ 15 \ 3 \ 5
\]

The solution set is 6.
The solution set is 3.
45. \( \frac{x^3}{5} \cdot \frac{x^5}{1} \cdot \frac{x}{4} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 20.

\[ 20 \cdot \frac{x^3}{1} \cdot 20 \cdot \frac{x^5}{4} \]

\[ 4 \cdot 12 \cdot 20 \cdot 5 \cdot 5 \]

\[ 4 \cdot 5 \cdot 5 \cdot 25 \]

\[ x \cdot 32 \cdot 25 \]

\[ x \cdot 32 \cdot 25 \cdot 32 \]

\[ 1 \cdot 17 \]

\[ x \cdot 7 \]

The solution set is 7.

46. \( \frac{x^2}{3} \cdot \frac{x}{4} \cdot \frac{1}{4} \)

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 12.

\[ 12 \cdot \frac{x^2}{3} \cdot \frac{x}{4} \cdot \frac{1}{4} \]

\[ 4 \cdot 2 \cdot 48 \cdot 3 \cdot 1 \]

\[ 4 \cdot 8 \cdot 48 \cdot 3 \cdot 3 \]

\[ 4 \cdot 56 \cdot 3 \cdot 3 \]

\[ x \cdot 56 \cdot 3 \]

\[ x \cdot 59 \]

The solution set is 59.

47. \( 3.6x \cdot 2.9x \cdot 6.3 \)

To clear the equation of decimals, multiply both sides by 10.

\[ 10(3.6x) \cdot 10(2.9x) \cdot 6.3 \]

\[ 36x \cdot 29x \cdot 63 \]

\[ 7x \cdot 63 \]

\[ x \cdot 9 \]

The solution set is 9.

48. \( 1.2x \cdot 3.6 \cdot 2.4 \cdot 0.3x \)

To clear the equation of decimals, multiply both sides by 10.

\[ 10(1.2x) \cdot 10(2.4) \cdot 0.3x \]

\[ 12x \cdot 60 \cdot 3x \]

\[ 15x \cdot 60 \]

\[ x \cdot 4 \]

The solution set is 4.

49. \( 0.92y \cdot 2 \cdot y \cdot 0.4 \)

To clear the equation of decimals, multiply both sides by 100.

\[ 100(0.92y) \cdot 100(y) \cdot 0.4 \]

\[ 92y \cdot 200 \cdot 100 \cdot y \cdot 40 \]

\[ 92y \cdot 100 \cdot y \cdot 240 \]

\[ 8y \cdot 240 \]

\[ y \cdot 30 \]

The solution set is 30.

50. \( 0.15y \cdot 0.1 \cdot 2.5y \cdot 1.04 \)

To clear the equation of decimals, multiply both sides by 100.

\[ 100(0.15y) \cdot 100(0.1) \cdot 100(2.5y) \cdot 1.04 \]

\[ 15y \cdot 10 \cdot 250 \cdot y \cdot 104 \]

\[ 15y \cdot 250 \cdot y \cdot 94 \]

\[ 235y \cdot 94 \]

\[ y \cdot 0.4 \]

The solution set is 0.4.

51. \( 0.3x \cdot 4 \cdot 0.1(x) \cdot 10 \)

\[ 0.3x \cdot 4 \cdot 0.1x \cdot 1 \]

To clear the equation of decimals, multiply both sides by 10.

\[ 10(0.3x) \cdot 10(0.1x) \cdot 1 \]

\[ 3x \cdot 40 \cdot x \cdot 10 \]

\[ 3x \cdot x \cdot 50 \]

\[ 2x \cdot 50 \]

\[ x \cdot 25 \]

The solution set is 25.
52. \[0.1(x + 80) = 14 + 0.2x\]
\[0.1x + 8 = 14 + 0.2x\]
To clear the equation of decimals, multiply both sides by 10.
\[10(0.1x + 8) = 10(14 + 0.2x)\]
\[x + 80 = 140 + 2x\]
\[60 = 2x\]
\[3x = 60\]
\[x = 20\]
The solution set is 20.

53. \[0.4(2z + 6) = 0.1 + 0.5(2z + 3)\]
\[0.8z + 2.4 = 0.1 + 1.5\]
\[0.8z + 2.5 = 1.5\]
To clear the equation of decimals, multiply both sides by 10.
\[10(0.8z + 2.5) = 10(z + 1.5)\]
\[8z + 25 = 10z + 15\]
\[8z + 10 = 40\]
\[2z = 40\]
\[z = 20\]
The solution set is 20.

54. \[1.4(z + 5) = 0.2 + 0.5(6z + 8)\]
\[1.4z + 7 = 0.2 + 3z + 4\]
\[1.4z + 7.2 = 3z + 4\]
To clear the equation of decimals, multiply both sides by 10.
\[10(1.4z + 7.2) = 10(3z + 4)\]
\[14z + 72 = 30z + 40\]
\[14z + 30 = 32\]
\[16z = 32\]
\[z = 2\]
The solution set is 2.

55. \[0.01(x + 4) = 0.04 + 0.01(5x + 4)\]
\[0.01x + 0.4 = 0.04 + 0.05x + 0.4\]
\[0.01x + 0.36 = 0.05x + 0.4\]
To clear the equation of decimals, multiply both sides by 100.
\[100(0.01x + 0.36) = 100(0.05x + 0.4)\]
\[x + 36 = 5x + 40\]
\[x + 5 = 40\]
\[4x = 40\]
\[x = 10\]
The solution set is 1.

56. \[0.02(x + 2) = 0.06 + 0.01(x + 1)\]
\[0.02x + 0.04 = 0.06 + 0.01x + 0.01\]
\[0.02x + 0.04 = 0.01x + 0.05\]
To clear the equation of decimals, multiply both sides by 100.
\[100(0.02x + 0.04) = 100(0.01x + 0.05)\]
\[2x + 4 = 5\]
\[2x + 9 = 5\]
\[3x = 9\]
\[x = 3\]
The solution set is 3.

57. \[0.6(x + 300) = 0.65x + 205\]
\[0.6x + 180 = 0.65x + 205\]
To clear the equation of decimals, multiply both sides by 100.
\[100(0.6x + 180) = 100(0.65x + 205)\]
\[60x + 18,000 = 65x + 20,500\]
\[60x + 65x = 38,500\]
\[5x = 38,500\]
\[x = 7700\]
The solution set is 7700.

58. \[0.05(7x + 36) = 0.4x + 1.2\]
\[0.35x + 1.8 = 0.4x + 1.2\]
To clear the equation of decimals, multiply both sides by 100.
\[100(0.35x + 1.8) = 100(0.4x + 1.2)\]
\[35x + 180 = 40x + 120\]
\[35x + 40 = 60\]
\[5x = 60\]
\[x = 12\]
The solution set is 12.

59. \[3x + 7 = 3x + 1\]
\[3x + 7 = 3x + 3\]
\[3x + 7 = 3x + 3 \times 3\]
\[7 = 3\]
The original equation is equivalent to the false statement 7 = 3, so the equation is inconsistent and has no solution. The solution set is .
60. \[2x \ 5 \ 2x \ 10 \]
   \[2x \ 10 \ 2x \ 10 \]
   \[2x \ 10 \ 2x \ 2x \ 10 \ 2x \]
   \[10 \ 10 \]

   The original equation is equivalent to the false statement 10 10, so the equation is inconsistent and has no solution.
   The solution set is \(\emptyset\).

61. \[2x \ 4 \ 4x \ 5 \ 2x \ 3 \]
   \[2x \ 8 \ 2x \ 8 \]

   The original equation is equivalent to the true statement 8 8, so the equation is an identity and the solution set is all real numbers
   \(x \neq \) is a real number.

62. \[3x \ 3 \ 3x \ 6 \ 5x \ 9 \]
   \[3x \ 3 \ 3x \]

   The original equation is equivalent to the true statement 3 3, so the equation is an identity and the solution set is all real numbers
   \(x \neq \) is a real number.

64. \[2 \ 32x \ 7 \ 9 \ 43x \ 1 \]
   \[2 \ 6x \ 21 \ 9 \ 12x \ 4 \]
   \[6x \ 19 \ 12x \ 5 \]
   \[18x \ 19 \ 5 \]

   The solution set is \(\frac{4}{3}\).

65. \[4x \ 1 \ 5x \ 5 \ 4 \]
   \[x \ 1 \ 5 \ x \ 4 \]
   \[x \ 1 \ 1 \ x \]
   \[x \ 1 \ x \ 1 \ x \ x \]
   \[1 \ 1 \]

   The original equation is equivalent to the true statement 1 1, so the equation is an identity and the solution set is all real numbers
   \(x \neq \) is a real number.

66. \[5x \ 5 \ 3x \ 7 \ 2x \ 2 \]

   The original equation is equivalent to the true statement 5 5, so the equation is an identity and the solution set is all real numbers
   \(x \neq \) is a real number.

67. \[4x \ 9 \ 4x \ 6 \]
   \[4x \ 19 \ 4x \ 4x \ 6 \]

   Since 9 6 is a false statement, the original equation is inconsistent and has no solution. The solution set is \(\emptyset\).
68. \[ \begin{align*}
5x & \quad 3x \quad 1 \quad 2x \quad 3 \quad 5 \\
5x & \quad 3x \quad 3 \quad 2x \quad 6 \quad 5 \\
2x & \quad 3 \quad 2x \quad 1 \\
2x & \quad 3 \quad 2x \quad 2x \quad 1 \quad 2x
\end{align*} \]

Since \( 3 \cdot 1 \) is a false statement, the original equation is inconsistent and has no solution. The solution set is \( \emptyset \).

69. \[ \begin{align*}
3x & \quad 2x \quad 3 \\
3 & \quad x \quad 2x \quad 3 \\
3 & \quad 3x \quad 3 \\
0 & \quad 3x \\
0 & \quad 3x \\
3 & \quad 3
\end{align*} \]

The solution set is 0.

70. \[ \begin{align*}
5x & \quad 4x \quad 5 \\
5x & \quad 4x \quad 4x \quad 5 \quad 4x \\
5x & \quad 5 \\
5x & \quad 0 \\
5x & \quad 0 \\
5 & \quad 5
\end{align*} \]

The solution set is 0.

71. \[ \begin{align*}
\frac{x}{3} & \quad 2 \quad \frac{x}{3}
\end{align*} \]

Multiply by the LCD, which is 3.\[ \begin{align*}
3 & \quad \frac{x}{3} \quad 2 \quad 3 \quad \frac{x}{3} \\
3 & \quad 3 \\
x & \quad 6 \quad x \\
x & \quad x \quad 6 \quad x \quad x \\
6 & \quad 0
\end{align*} \]

Since \( 6 \cdot 0 \) is a false statement, the original equation has no solution. The solution set is \( \emptyset \).

72. \[ \begin{align*}
\frac{x}{4} & \quad 3 \quad \frac{x}{4}
\end{align*} \]

Multiply by the LCD, which is 4.\[ \begin{align*}
4 \quad \frac{x}{3} \quad 4 \quad \frac{x}{4} \\
4 & \quad 4 \\
x & \quad 12 \quad x \\
x & \quad 12 \quad x \quad x \quad x \\
12 & \quad 0
\end{align*} \]

Since \( 12 \cdot 0 \) is a false statement, the original equation has no solution. The solution set is \( \emptyset \).

73. \[ \begin{align*}
\frac{x}{2} & \quad \frac{x}{4} \quad 4 \quad x \quad 4
\end{align*} \]

Multiply by the LCD, which is 4.\[ \begin{align*}
4 \quad \frac{x}{4} \quad \frac{x}{4} \quad 4 \quad x \quad 4 \\
4 & \quad 4 \\
x & \quad 16 \quad 4x \quad 16 \\
2 & \quad 4 \\
x & \quad 16 \quad 4x \quad 16 \\
x & \quad 16 \quad 4x \quad 16 \\
16 & \quad 16 \\
3x & \quad 16 \quad 16 \quad 16 \\
0 & \quad 3x \\
0 & \quad 3x \\
3 & \quad 3 \\
0 & \quad x
\end{align*} \]

The solution set is 0.

74. \[ \begin{align*}
\frac{x}{2} & \quad \frac{2x}{3} \quad x \quad 3
\end{align*} \]

Multiply both sides by the LCD which is 6.\[ \begin{align*}
6 \quad \frac{x}{2} \quad \frac{2x}{3} \quad 3 \quad 6x \quad 3 \\
3x & \quad 4x \quad 18 \\
7x & \quad 18 \\
x & \quad 18 \\
x & \quad 0
\end{align*} \]

The solution set is 0.
75. \( \frac{2}{3}x - \frac{5}{6}x \)
Multiply both sides by the LCD which is 6.
\[
6 \cdot \frac{2}{3}x - 6 \cdot \frac{5}{6}x
\]
\[
2x - 5x
\]
\[
4x
\]
\[
4x 5x 12 5x 5x
\]
\[
9x 12
\]
\[
\frac{9x}{12}
\]
\[
\frac{x}{4}
\]
\[
\frac{3}{9}
\]
The solution set is \( \frac{4}{3} \).

76. \( \frac{2}{3}x + \frac{1}{4}x = 8 \)
Multiply both sides by the LCD which is 12.
\[
12 \cdot \frac{2}{3}x + 12 \cdot \frac{1}{4}x = 12 \cdot 8
\]
\[
8x 3x 96
\]
\[
5x 96
\]
\[
x 96
\]
The solution set is \( \frac{96}{5} \).

77. \( 0.06(x 5) 0.03(2x 7) 0.09 \)
\( 0.06x 0.3 0.06x 0.21 0.09 \)
\( 0.06x 0.3 0.06x 0.3 \)
To clear the equation of decimals, multiply both sides by 100.
\( 100(0.06x 0.3) 100(0.06x 0.3) \)
\( 6x 30 6x 30 \)
\( 30 30 \)
The original equation is equivalent to the true statement 30 30, so the equation is an identity and the solution set is all real numbers
\( x \neq 1 \) is a real number.

78. \( 0.04(x 2) 0.02(6x 3) 0.02 \)
\( 0.04x 0.08 0.12x 0.06 0.02 \)
\( 0.04x 0.08 0.12x 0.08 \)
To clear the equation of decimals, multiply both sides by 100.
\( 100(0.04x 0.08) 100(0.12x 0.08) \)
\( 4x 8 12x 8 \)
\( 4x 12x \)
\( 8x 0 \)
\( x 0 \)
The solution set is 0.

79. \( \frac{x}{3} \)
\( \frac{x}{3} \)
\( \frac{x}{3} \)
\( \frac{x}{3} \)
\( \frac{x}{3} \)
The solution set is \( \frac{3}{1} \).

80. \( \frac{x}{\Delta} \Delta \frac{\Delta}{\Delta} \)
\( \frac{x}{\Delta} \Delta \frac{\Delta}{\Delta} \)
\( \frac{x}{\Delta} \Delta \frac{\Delta}{\Delta} \)
\( \frac{x}{\Delta} \Delta \frac{\Delta}{\Delta} \)
\( \frac{x}{\Delta} \Delta \frac{\Delta}{\Delta} \)
The solution set is \( \frac{\Delta}{\Delta} \).
81. First solve the equation for \( x \).
\[
\frac{x}{5} + 2 \cdot \frac{x}{3} = \frac{x}{2} - \frac{x}{15}
\]
\[
5\frac{5x}{15} + 30 = 2\frac{3x}{15} + 10
\]
\[
152 = 2x
\]
Now evaluate the expression \( x^2 \) for \( x = 15 \).
\[
x^2 = (15)^2 = 225
\]
82. First solve the equation for \( x \).
\[
\frac{3x}{2} + \frac{3x}{4} = \frac{x}{4}
\]
\[
4\frac{3x}{2} = \frac{3x}{4} + \frac{x}{4}
\]
\[
2x = 4
\]
Now evaluate the expression \( x^2 \) for \( x = 2 \).
\[
x^2 = (2)^2 = 4
\]
83. \[ \frac{1}{x} - \frac{1}{x} = 16 \]
\[
3 - 5
\]
84. \[ \frac{2}{5}x - \frac{1}{4} \]
\[
2 \quad \frac{1}{5}
\]
\[
20 \quad x \quad 20 \quad 13
\]
\[
8x \quad 5x \quad 260
\]
\[
13x \quad 260
\]
\[
\frac{13}{3x} \quad 260
\]
\[
13 \quad 13
\]
\[
x \quad 20
\]
The number is 20.
85. \[ \frac{3}{4}x - \frac{1}{2} \]
\[
4 \quad \frac{3}{x} \quad 43 \quad \frac{1}{x}
\]
\[
4 \quad 2
\]
\[
3x \quad 12 \quad 2x
\]
\[
3x \quad 2x \quad 12 \quad 2x \quad 2x \quad 12
\]
\[
0
\]
\[
x \quad 12 \quad 12 \quad 0 \quad 12
\]
\[
x \quad 12
\]
The number is 12.
86. \[ \frac{7}{8} - \frac{1}{2} \]
\[
8 \quad \frac{7}{8} \quad 30 \quad \frac{1}{2} \quad x
\]
\[
7x \quad 240 \quad 4x
\]
\[
240 \quad 3x
\]
\[
240 \quad 3x
\]
\[
3 \quad 3
\]
87. \[ F \]
\[
10 \quad x \quad 65 \quad 50
\]
\[
250 \quad 10 \quad x \quad 65 \quad 50
\]
\[
250 \quad 50 \quad 10 \quad x \quad 65 \quad 50 \quad 50
\]
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.3  Solving Linear Equations

LCD = 15

\[ \begin{align*}
15 \cdot \frac{1}{x} & \quad 15 \cdot \frac{1}{x} \quad 1516 \\
3 & \quad 5 \\
5x & \quad 3x \quad 240 \\
8x & \quad 240 \\
8x & \quad 240 \\
8 & \quad 8 \\
x & \quad 30 \\
\end{align*} \]

The number is 30.

\[ \begin{align*}
200 & \quad 10x \quad 650 \\
200 & \quad 650 \quad 10x \quad 650 \quad 650 \\
850 & \quad 10x \\
850 & \quad 10x \\
85 & \quad x \\
\end{align*} \]

A person receiving a $250 fine was driving 85 miles per hour.
88.  
\[ F = 10x \times 65 \times 50 \]
\[ 400 \times 10x \times 650 \times 50 \]
\[ 400 \times 10x \times 600 \]
\[ 1000 \times 10x \]
\[ 100 \times x \]

A person receiving a $400 fine was driving 100 miles per hour.

89.  
\[ \frac{W}{2} = 3H \times 53 \]
\[ \frac{W}{2} = 3(6) \times 53 \]
\[ \frac{W}{2} = 18 \times 53 \]
\[ \frac{W}{2} = 18 \times 18 \times 53 \times 18 \]

He descended to a depth of 409.2 feet below the surface.

According to the formula, the healthy weight of a person of height 5' 6" is 142 pounds. This is 13 pounds below the upper end of the range shown in the bar graph.

90.  
\[ \frac{W}{2} = 3H \times 53 \]
\[ \frac{W}{2} = 3(12) \times 53 \]
\[ \frac{W}{2} = 36 \times 53 \]
\[ \frac{W}{2} = 36 \times 36 \times 53 \times 36 \]
\[ \frac{W}{2} = 89 \]
\[ \frac{W}{2} = 2 \times 89 \]
\[ \frac{W}{2} = 178 \]

The pressure is 20 pounds per square foot at a depth of 11 feet.

According to the formula, the healthy weight of a person of height 6' is 178 pounds. This is 6 pounds below the upper end of the range shown in the bar graph.

91.  
\[ p = 15 \frac{5d}{11} \]
\[ 201 = 15 \frac{5d}{11} \]
\[ 201 = 15 \times \frac{5d}{11} \]
\[ 186 = 5d \times \frac{11}{11} \]
\[ 11186 = 11 \times \frac{5d}{11} \]
\[ 2046 = 5d \times \frac{11}{11} \]
\[ 2046 = d \times \frac{5}{11} \]
\[ 409.2 = d \]

92.  
\[ p = 15 \frac{5d}{11} \]
\[ 20 = 15 \frac{5d}{11} \]
\[ 115 = 11 \times \frac{5d}{11} \]
\[ 55 = 5d \times \frac{11}{11} \]

The pressure is 20 pounds per square foot at a depth of 11 feet.

93. – 97. Answers will vary.

98. makes sense

99. makes sense

100. does not make sense; Explanations will vary.

101. does not make sense; Explanations will vary.

102. false; Changes to make the statement true will vary.

103. false; Changes to make the statement true will vary.

104. true
105. false; Changes to make the statement true will vary.

A sample change is: The equation \( x + \frac{1}{3} \geq \frac{1}{2} \)

is equivalent to \( 6x + 6 \frac{1}{3} \geq 6 \frac{1}{2} \) or \( 6x \geq 2 \frac{3}{2} \).

106. \( f \quad 0.432h \quad 10.44 \)
\( 16 \quad 0.432h \quad 10.44 \)
\( 16 \quad 10.44 \quad 0.432h \quad 10.44 \quad 10.44 \)
\( 26.44 \quad 0.432h \)
\( 26.44 \quad 0.432h \)
\( 0.432 \quad 0.432 \)

61.2 \( h \)
The woman’s height was about 61 inches or 5 feet 1 inch, so the partial skeleton could be that of the missing woman.

107.
\[
\begin{array}{c|cc|cc|cc}
2x^3 & x^3 & x^5 & 2 & 1 & 6 \\
9 & 2 & 6
\end{array}
\]
\[
\begin{array}{c|cc|cc|cc}
2x^3 & x^3 & x^5 & 18 & 5 & 1 \\
9 & 2 & 6
\end{array}
\]
\[
\begin{array}{c|cc|cc|cc}
2x^3 & \frac{x^3}{3} & \frac{x^5}{18} & 18 & 1 \\
9 & 2 & 6
\end{array}
\]
\[
\begin{array}{c|cc|cc|cc}
22x^3 & 9x^3 & 3x^5 & 3x^5 & 18 & 1 \]
\end{array}
\]

4x \( 6 \) 9x 27 3x 15 18
13x 33 3x 3
13x 33 3x 3 3x
10x 33 3
10x 33 3 3 3 3

\[
\begin{array}{c|cc|cc|cc}
10x & 30 & \frac{10}{3} & 10
\end{array}
\]

The solution set is 3.

108. \( 23x \ 4 \quad 3x \quad 2 \)
\( 3 \quad 1 \quad 2 \)
\( 6x \quad 8 \quad 3x \quad 2 \quad 3 \quad 2 \)
\( 6x \quad 8 \quad 3x \quad 2 \quad 3 \quad 1 \)
\( 6x \quad 8 \quad 3x \quad 6x \quad 2 \)
\( 6x \quad 8 \quad 9x \quad 2 \)
\( 6x \quad 8 \quad 9x \quad 9x \quad 2 \quad 9x \)
\( 3x \quad 8 \quad 2 \)
\( 3x \quad 8 \quad 8 \quad 2 \quad 8 \)
\( 3x \quad 10 \)
\( \frac{3x}{3} \quad 10 \)

The solution set is 3.

109. 24 20 because 24 lies further to the left on a number line.

110. \( \frac{1}{3} \quad \frac{1}{5} \) because \( \frac{1}{3} \) lies further to the left on a number line.

111. 9 11 7 3 9 11 7 3

112. a. \( T \quad D \quad pm \)
\( T \quad D \quad pm \)

b. \( T \quad D \quad pm \)
\( T \quad D \quad pm \quad p \)
\( T \quad D \quad mp \)

113. \( 4 \quad 0.25B \)
\( 4 \quad 0.25B \)
\( 0.25 \quad 0.25 \)
\( 16 \quad B \)
The solution set is 16.
114. \( 1.3 \) \( P \) 26

\[
\begin{array}{c}
1.3 \quad P \quad 26 \\
26 \quad 26 \\
0.05 \quad P
\end{array}
\]

The solution set is 0.05.

2.4 Check Points

1. \( A \) lw

\[
\begin{array}{c}
A \quad lw \\
\end{array}
\]

2. \( 2l \) 2w \( P \)

\[
\begin{array}{c}
2l \quad 2w \quad P \quad 2w \\
2l \quad P \quad 2w \\
2l \quad P \quad 2w \\
2 \quad 2 \\
\end{array}
\]

3. \( T \) \( D \) \( pm \)

\[
\begin{array}{c}
T \quad D \quad pm \\
p \quad p \\
T \quad D \quad m \\
p
\end{array}
\]

4. \( \frac{x}{3} \) \( 4y \) \( 5 \)

\[
\begin{array}{c}
\frac{x}{3} \quad 4y \quad 35 \\
3 \quad \frac{x}{3} \quad 4y \quad 35 \\
x \quad 12y \quad 15
\end{array}
\]

5. Use the formula \( A \) \( PB \): \( A \) is \( P \) percent of \( B \).

\[
\begin{array}{c}
\text{What number} | 0.09 | 50 \\
A \quad 4.5
\end{array}
\]

6. Use the formula \( A \) \( PB \): \( A \) is \( P \) percent of \( B \).

\[
\begin{array}{c}
9 \quad 0.60 | B \\
9 \quad 0.60B \\
0.60 \quad 0.60 \\
15 \quad B
\end{array}
\]

7. Use the formula \( A \) \( PB \): \( A \) is \( P \) percent of \( B \).

\[
\begin{array}{c}
18 \quad \text{what percent} \quad 50 \quad 40? \\
18 \quad P \quad 50 \\
18 \quad 50P \\
50 \quad 50 \\
0.36 \quad P
\end{array}
\]

To change 0.36 to a percent, move the decimal point two places to the right and add a percent sign. 0.36 \( \rightarrow \) 36%

8. Use the formula \( A \) \( PB \): \( A \) is \( P \) percent of \( B \).

Find the price decrease: $940 $611 $329

\[
\begin{array}{c}
\text{The price} \quad \text{what} \quad \text{the original} \\
decrease \quad P \quad \text{pet cent} \quad \text{iff} \quad \text{price?} \\
329 \quad P \quad 940 \\
329 \quad P \quad 940 \\
329 \quad 940P \\
940 \quad 940 \\
0.35 \quad P
\end{array}
\]

To change 0.35 to a percent, move the decimal point two places to the right and add a percent sign. 0.35 \( \rightarrow \) 35%
\[ x 12y 12y 15 12y x 15 \]
\[ 12y \]
9. a. | Year | Tax Paid the Year Before | increase/decrease | Taxes Paid This Year |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1200</td>
<td>20% decrease: 0.20 $1200 $240</td>
<td>$1200 $240 $960</td>
</tr>
<tr>
<td>2</td>
<td>$960</td>
<td>20% increase: 0.20 $960 $192</td>
<td>$960 $192 $1152</td>
</tr>
</tbody>
</table>

The taxes for year 2 will be $1152.

b. The taxes for year 2 are less than those originally paid.

Find the tax decrease: $1200 $1152 $48

The tax decrease is percent of the original tax.

48 = rate P 1200

\[
\begin{align*}
48 & = 1200P \\
48 & = 1200P \\
0.04 & = P
\end{align*}
\]

To change 0.04 to a percent, move the decimal point two places to the right and add a percent sign.

0.04 = 4%

The overall tax decrease is 4%.

2.4 Concept and Vocabulary Check

1. isolated on one side
2. A lw
3. P 2l 2w
4. A PB
5. subtract b; divide by m

2.4 Exercise Set

1. \( d \ rt \) for \( r \)

\[
\begin{align*}
d & = \frac{rt}{t} \\
d & = \frac{r}{t} \\
d & = \frac{d}{t} \text{ or } \frac{d}{t}
\end{align*}
\]

This is the distance traveled formula:

distance = rate \cdot time.

2. \( d \ rt \) for \( t \)

\[
\begin{align*}
d & = \frac{rt}{r} \\
d & = \frac{t}{r} \\
d & = \frac{d}{r} \text{ or } \frac{d}{r}
\end{align*}
\]

This is the motion formula:

distance = rate \cdot time.
3. \( I = Prt \) for \( P \)

\[
\frac{I}{rt} = \frac{Prt}{rt}
\]

\[
\frac{I}{rt} \quad \text{or} \quad \frac{I}{rt}
\]

This is the formula for simple interest:

\( \text{interest} = \text{principal} \cdot \text{rate} \cdot \text{time} \).

4. \( I = Prt \) for \( r \)

\[
\frac{I}{Prt} = \frac{Prt}{Prt}
\]

\[
\frac{I}{Prt} = \frac{Prt}{Prt}
\]

\[
P \quad \text{or} \quad P
\]

This is the formula for simple interest:

\( \text{interest} = \text{principal} \cdot \text{rate} \cdot \text{time} \).

5. \( C = 2\pi r \) for \( r \)

\[
\frac{C}{2\pi r} = \frac{2\pi}{2\pi r}
\]

\[
\frac{C}{r} = \frac{2\pi}{2\pi r}
\]

This is the formula for finding the circumference of a circle if you know its radius.

6. \( C = \pi d \) for \( d \)

\[
\frac{C}{\pi d} = \frac{\pi}{\pi d}
\]

\[
\frac{C}{d} = \frac{\pi}{\pi d}
\]

This is the formula for finding the circumference of a circle if you know its diameter.

7. \( E = mc^2 \)

\[
\frac{E}{c^2} = \frac{mc^2}{c^2}
\]

\[
\frac{E}{c^2} \quad \text{or} \quad \frac{E}{c^2}
\]

This is Einstein’s formula relating energy, mass, and the speed of light.

9. \( y = mx + b \) for \( m \)

\[
y = mx
\]

\[
y = mx
\]

This is the slope-intercept formula for the equation of a line.

10. \( y = mx + b \) for \( x \)

\[
y = mx
\]

\[
y = mx
\]

This is the slope-intercept formula for the equation of a line.

11. \( T = \frac{D}{pm} \) for \( D \)

\[
T = \frac{D}{pm}
\]

\[
T = \frac{D}{pm}
\]

\[
T = \frac{D}{pm}
\]

\[
T = \frac{D}{pm}
\]

This is the formula for finding the circumference of a circle if you know its radius.

12. \( P = \frac{MC}{C} \) for \( M \)

\[
P = \frac{MC}{C}
\]

\[
P = \frac{MC}{C}
\]

\[
P = \frac{MC}{C}
\]

\[
P = \frac{MC}{C}
\]

This is the formula for finding the circumference of a circle if you know its diameter.

13. \( A = \frac{1}{2} bh \) for \( b \)

\[
2A = \frac{1}{2} bh
\]

\[
2A = \frac{1}{2} bh
\]

\[
2A = \frac{1}{2} bh
\]

\[
2A = \frac{1}{2} bh
\]

\[
2A = \frac{1}{2} bh
\]

\[
2A = \frac{1}{2} bh
\]
8. \( V \pi r^2 h \) for \( h \)

\[
\frac{V}{\pi r^2} \pi r^2 = \frac{\pi r^2 h}{\pi r^2} = \frac{V}{\pi r^2} h \text{ or } h \frac{V}{\pi r^2}
\]

This is the volume of a cylinder.

\( h \) or \( h \)

This is the formula for the area of a triangle: area =

\[
\frac{1}{2} \text{ base} \cdot \text{height}.
\]
14. \[ A = \frac{1}{2}bh \text{ for } h \]
\[
2A \quad 2 \cdot \frac{1}{2}bh
\]
\[
2A \quad bh
\]
\[
2A \quad \frac{bh}{b}
\]
\[
\frac{2A}{h} \text{ or } h \cdot \frac{2A}{b}
\]
This is the formula for the area of a triangle: area = \[ \frac{1}{2} \text{ base} \cdot \text{ height} \].

15. \[ M = \frac{n}{5} \text{ for } n \]
\[
5
\]
\[
5M = \frac{5}{5}n
\]
\[
5
\]
\[
5M \text{ or } n \cdot 5M
\]

16. \[ M = \frac{A}{740} \text{ for } A \]
\[
740M = \frac{740}{740}A
\]
\[
740M \quad A \text{ or } A \cdot 740M
\]

17. \[ \frac{c}{2} = 80 \quad 2F \text{ for } c \]
\[
\frac{c}{2} = \frac{80}{2} \quad 2F
\]
\[
\frac{2}{2} = \frac{2F}{80}
\]
\[
2 \cdot \frac{c}{2} = 22F \quad 80
\]
\[
c = 4F \quad 160
\]

18. \[ p = 15 \frac{5d}{11} \text{ for } d \]
\[
11p = 11 \cdot 15 \frac{5d}{11}
\]
\[
11p = 165 \cdot 5d
\]
\[
11p = 165 \cdot 5d
\]
\[
11p = 165 \quad d \text{ or } d = 11p
\]

19. \[ A = \frac{1}{2}a \quad b \text{ for } a \]
\[
2A \quad 2 \cdot \frac{1}{2}a \quad b
\]
\[
2A \quad a \quad b
\]
\[
2A \quad b \quad a \quad b \quad b
\]
\[
2A \quad b \quad a \quad or \quad a \quad 2A \quad b
\]
This is the formula for finding the average of two numbers.

20. \[ A = \frac{1}{2}a \quad b \text{ for } b \]
\[
2A \quad 2 \cdot \frac{1}{2}a \quad b
\]
\[
2A \quad a \quad b
\]
\[
2A \quad a \quad b \text{ or } b \quad 2A \quad a
\]
This is the formula for finding the average of two numbers.

21. \[ SPPr \text{ for } r \]
\[
SP \quad PP \quad Prt \quad PS \quad P
\]
\[
Prt
\]
\[
SP \quad Prt \quad P
\]
\[
Pr \quad r \text{ or } r \quad SP
\]
\[
Prt
\]
This is the formula for finding the sum of principle and interest for simple interest problems.

22. \[ SPPr \text{ for } t \]
\[
SP \quad Prt
\]
\[
Pr \quad Pr
\]
\[
SP \quad t \text{ or } t \quad SP
\]
\[
Pr
\]
This is the formula for finding the sum of principle and interest for simple interest problems.
23. \( A = \frac{1}{2} \cdot h \cdot a \cdot b \) for \( b \)

\[
2A \quad 2 \cdot \frac{1}{2} \cdot h \cdot a \\
2A \quad h \cdot a \\
2A \quad h \cdot a \\
2A \quad h \cdot a \\
\]

This is the formula for the area of a trapezoid.

24. \( A = \frac{1}{2} \cdot h \cdot a \cdot b \) for \( a \)

\[
2A \quad 2 \cdot \frac{1}{2} \cdot h \cdot a \\
2A \quad h \cdot a \\
2A \quad h \cdot a \\
\]

This is the formula for finding the area of a trapezoid.

25. \( Ax \cdot By = C \) for \( x \)

\[
Ax \quad C \cdot By \\
A \quad A \\
A \quad A \\
A \quad A \\
\]

This is the standard form of the equation of a line.

26. \( Ax \cdot By = C \) for \( y \)

\[
By \quad C \cdot Ax \\
B \quad B \\
B \quad B \\
B \quad B \\
\]

This is the standard form of the equation of a line.

27. \( A \cdot PB; P \) 3\% 0.03, \( B \) 200

\[
A \cdot PB \\
A \quad 0.03 \quad 200 \\
A \quad 6 \\
3\% \text{ of } 200 \text{ is } 6. \\
\]

28. \( A \cdot PB; P \) 8\% 0.08, \( B \) 300

\[
A \cdot PB \\
A \quad 0.08 \quad 300 \quad 24 \\
A \quad 0.18 \quad 40 \\
18\% \text{ of } 40 \text{ is } 7.2. \\
\]

29. \( A \cdot PB; P \) 18\% 0.18, \( B \) 40

\[
A \cdot PB \\
A \quad 0.18 \quad 40 \\
A \quad 7.2 \\
18\% \text{ of } 40 \text{ is } 7.2. \\
\]

30. \( A \cdot PB; P \) 16\% 0.16, \( B \) 90

\[
A \cdot PB \\
A \quad 0.16 \quad 90 \quad 14.4 \\
A \quad 0.16 \quad 90 \quad 14.4 \\
16\% \text{ of } 90 \text{ is } 14.4. \\
\]

31. \( A \cdot PB; A \) 3\% 0.6

\[
3 \quad 0.6 B \\
A \quad 0.6 \\
5 \quad B \\
\]

form of the equation of a line.
Section 2.4 Formulas and Percents

Chapter 2 Linear Equations and Inequalities in One Variable

3 is 60% of 5.

32. \[ \frac{A}{PB}; A \quad 8, P \quad 40\% \quad 0.4 \]
   \[ \begin{array}{c}
   A \\
   PB \\
   8 \\
   B \\
   \hline
   8 & 0.4B \\
   0.4 & 0.4 \\
   20 & B \\
   \end{array} \]

8 is 40% of 20.

33. \[ \frac{A}{PB}; A \quad 40.8, P \quad 24\% \quad 0.24 \]
   \[ \begin{array}{c}
   A \\
   PB \\
   40.8 \\
   0.24B \\
   \hline
   40.8 & 0.24B \\
   0.24 & 0.24 \\
   170 & B \\
   \end{array} \]

24% of 170 is 40.8.
### Section 2.4 Formulas and Percents

#### Chapter 2 Linear Equations and Inequalities in One Variable

---

34. \( A \ PB; A \ 51.2, P \ 32\% \ 0.32 \)

\[
\begin{align*}
A & \ PB \\
51.2 & 0.32 \\
0.32 & 0.32 \\
160 & B \\
\end{align*}
\]

51.2 is 32% of 160.

35. \( A \ PB; A \ 3, B \ 15 \)

\[
\begin{align*}
A & \ PB \\
3 & P15 \\
3 & 15 \\
0.2 & P \\
0.2 & = 20\% \\
3 & \text{is 20}\% \text{ of 15.}
\end{align*}
\]

36. \( A \ PB; A \ 18; B \ 90 \)

\[
\begin{align*}
A & \ PB \\
18 & P90 \\
18 & 90 \\
0.2 & P \\
0.2 & = 20\% \\
18 & \text{is 20}\% \text{ of 90.}
\end{align*}
\]

37. \( A \ PB; A \ 0.3, B \ 2.5 \)

\[
\begin{align*}
A & \ PB \\
0.3 & P2.5 \\
0.3 & 2.5 \\
0.12 & P \\
0.12 & = 12\% \\
0.3 & \text{is 12}\% \text{ of 2.5.}
\end{align*}
\]

38. \( A \ PB; A \ 0.6, B \ 7.5 \)

\[
\begin{align*}
A & \ PB \\
0.6 & P7.5 \\
0.6 & 7.5 \\
0.08 & P \\
0.08 & 8\% \\
0.6 & \text{is 8}\% \text{ of 7.5.}
\end{align*}
\]

39. The increase is 8 5 3.

\[
\begin{align*}
A & \ PB \\
3 & P5 \\
5 & 5 \\
0.60 & P \\
\end{align*}
\]

This is a 60% increase.

40. The increase is 9 5 4.

\[
\begin{align*}
A & \ PB \\
4 & P5 \\
5 & 5 \\
0.80 & P \\
\end{align*}
\]

This is an 80% increase.

41. The decrease is 4 1 3.

\[
\begin{align*}
A & \ PB \\
3 & P4 \\
4 & 4 \\
0.75 & P \\
\end{align*}
\]

This is a 75% decrease.

42. The decrease is 8 6 2.

\[
\begin{align*}
A & \ PB \\
2 & P8 \\
8 & 8 \\
0.25 & P \\
\end{align*}
\]

This is a 25% decrease.

43. \( y \ a \ b \ x \)

\[
\begin{align*}
y & \ a \ bx \\
a & \ a \ b \\
\end{align*}
\]

\[
\begin{align*}
y & \ x \ \text{or} \ \ x & \ y \\
a & \ b & \ a \ b \\
\end{align*}
\]

44. \( y \ a \ b \ x \)

\[
\begin{align*}
y & \ a \ bx \\
a & \ a \ b \\
\end{align*}
\]

\[
\begin{align*}
y & \ x \ \text{or} \ \ x & \ y \\
a & \ b & \ a \ b \\
\end{align*}
\]
45. \[ y \ a \ b \ x \ 5 \]
\[ y \ 5 \ a \ b \ x \ 5 \ 5 \]
\[ y \ 5 \ a \ b \ x \]
\[ y 5 \ a \ bx \]
\[ \frac{y 5}{a b} \]
\[ \frac{a b}{a b} \]
\[ \frac{y 5}{x} \quad \text{or} \quad \frac{y 5}{x} \]
\[ \frac{a b}{a b} \]

46. \[ y \ a \ b \ x \ 8 \]
\[ y \ 8 \ a \ b \ x \ 8 \ 8 \]
\[ y \ 8 \ a \ b \ x \]
\[ y 8 \ a \ bx \]
\[ \frac{y 8}{a b} \]
\[ \frac{a b}{a b} \]
\[ \frac{y 8}{x} \quad \text{or} \quad \frac{y 8}{x} \]
\[ \frac{a b}{a b} \]

47. \[ y \ c \ d \ x \]
\[ y \ c \ d \ x \]
\[ \frac{y}{c d} \]
\[ \frac{c d}{c d} \]
\[ \frac{y}{x} \quad \text{or} \quad \frac{y}{x} \]
\[ \frac{c d}{c d} \]

48. \[ y \ c \ d \ x \]
\[ y \ c \ d \ x \]
\[ \frac{y}{c d} \]
\[ \frac{c d}{c d} \]
\[ \frac{y}{x} \quad \text{or} \quad \frac{y}{x} \]
\[ \frac{c d}{c d} \]

49. \[ y \ A \ x \ B \ x \ C \]
\[ y \ A \ B \ x \ C \]
\[ y \ C \ A \ B \ x \ C \ C \]

50. \[ y \ A \ x \ B \ x \ C \]
\[ y \ C \ A \ B \ x \ C \]
\[ y \ C \ A \ B \ x \ C \]
\[ y \ C \ A \ B \ x \]
\[ \frac{y C}{A B x} \]
\[ A B \quad \text{or} \quad \frac{y C}{A B} \]
\[ A B \quad \text{or} \quad \frac{y C}{A B} \]

51. a. \[ A \ \frac{\bar{xy} \bar{z}}{3} \quad \text{for} \ z \]
\[ 3 \ \bar{A} \ \frac{\bar{xy} \bar{z}}{3} \]
\[ 3 \bar{A} \] \[ x \ y \ z \]
\[ 3 \bar{A} \] \[ x \ y \] \[ x \ z \ y \]
\[ 3 \bar{A} \] \[ x \ y \ z \]

b. A 90, x 86, y 88

You need to get 96% on the third exam to have an average of 90%.

52. a. \[ A \ \frac{\bar{xy} \bar{z} \bar{w}}{4} \quad \text{for} \ w \]
\[ 4 \bar{A} \ 4 \ \frac{\bar{xy} \bar{z} \bar{w}}{4} \]
\[ 4 \bar{A} \] \[ x \ y \ z \ w \]
\[ 4 \bar{A} \] \[ x \ y \] \[ z \ w \]
\[ 4 \bar{A} \] \[ x \ y \ z \ w \]

y C A B x
Section 2.4 Formulas and Percents

You need to get 87% on the fourth exam to have an average of 80%.
53. a. \[ \frac{d}{rt} \text{ for } t \]
\[ \frac{d}{r} \frac{r}{t} \]
\[ \frac{d}{r} \]

b. \[ t = \frac{d}{r}; d = 100, r = 40 \]
\[ t = \frac{100}{40} 2.5 \]
You would travel for 2.5 or \( 2 \frac{1}{2} \) hours.

54. a. \[ F = \frac{9}{5}C + 32 \text{ for } C \]
\[ 5F = \frac{9}{5}C + 32 \]
\[ 5F = 9C + 160 \]
\[ 5F = 9C \]
\[ 5F = 160 \]
\[ 9 \]

b. \[ C = \frac{5F}{9} \text{ for } F \]
\[ C = \frac{5F}{9} \]
\[ C = 559160 \]
\[ 9 \]
\[ C = 295160 \]
\[ 9 \]
\[ 135 \]
\[ C = 9 \]
\[ 59F = 15C \]

55. 0.291800 522
522 workers stated that religion is the most taboo topic to discuss at work.

56. 0.141800 252
252 workers stated that politics is the most taboo topic to discuss at work.

57. a. This is the equivalent of asking: 5.85 is 5\% of what number?
\[ A \quad P \quad B \]
\[ 5.85 \quad 0.05B \]
\[ 5.85 \quad 0.05B \]
\[ 0.05 \quad 0.05 \]
117 \[ B \]
117 million households in the United States.

b. This is the equivalent of asking: $332,960 is 180\% of what number?
\[ A \quad P \quad B \]
\[ 332,960 \quad 1.8B \]
\[ 332,960 \quad 1.8 \quad 1.8 \]

184,978 \[ B \]
The average income in 1975, for the richest 5\% of American households, was about $184,978.

58. a. This is the equivalent of asking: 35.1 is 30\% of what number?
\[ A \quad P \quad B \]
\[ 35.1 \quad 0.3B \]
\[ 35.1 \quad 0.3B \]
\[ 0.3 \quad 0.3 \]
117 \[ B \]
117 million households in the United States.

b. This is the equivalent of asking: $16,095 is 107\% of what number?
\[ A \quad P \quad B \]
\[ 16,095 \quad 1.07B \]
\[ 16,095 \quad 1.07B \]
\[ 1.07 \quad 1.07 \]
15,042 \[ B \]
The average income in 1975, for the poorest 30\% of American households, was about $15,042.

59. This is the equivalent of asking: 540 is what\% of 1500?
\[ A \quad P \quad B \]
\[ 540 \quad 0.36 \]
540 \[ P \]
1500P
1500\[ P \]
0.36 \[ P \]

36\% of those surveyed said the police departments did a poor job at holding officers accountable.
60. This is the equivalent of asking: 105 is what\% of 1500?

\[
\begin{array}{ccc}
A & PB \\
105 & 1500 \\
1500 & 1500 \\
0.07 & P
\end{array}
\]

7\% of those surveyed said the police departments did an excellent job at holding officers accountable.

61. \( A \ PB; A \ 7500, B \ 60,000 \)

\[
\begin{array}{ccc}
A & PB \\
7500 & 60,000 \\
7500 & 60,000 \\
60,000 & 60,000 \\
0.125 & P
\end{array}
\]

The charity has raised 0.125 = 12.5\% of its goal.

62. This question is equivalent to, “225,000 is what percent of $500,000?”

\[
\begin{array}{ccc}
A & PB \\
225,000 & 500,000 \\
500,000 & 500,000 \\
0.45 & P
\end{array}
\]

The charity has raised 45\% of the goal.

63. \( A \ PB; p \ 15\% \ 0.15, B \ 60 \)

A 0.15 60 09

The tip was $9.

64. $3502 0.28$35,000 $23,000

$3502 0.28$12,000

$3502 $3360

$6862

The income tax on a taxable income of $35,000 is $6862.

65. a. The sales tax is 6\% of $16,800.

0.06 16,800 1008

The sales tax due on the car is $1008.

b. The total cost is the sum of the price of the car and the sales tax.

$16,800 $1008 $17,808

The car’s total cost is $17,808.

66. a. The sales tax is 7\% of $96.

0.07 96 6.72

The sales tax due on the graphing calculator is $6.72.

b. The total cost is the sum of the price of the calculator and the sales tax.

$96 $6.72 $102.72

The calculator’s total cost is $102.72.

67. a. The discount is 12\% of $860.

0.12 860 103.20

The discount amount is $103.20.

b. The sale price is the regular price minus the discount amount:

$860 $103.20 $756.80

68. a. The discount amount is 40\% of $16.50.

0.4 16.50 6.60

The discount amount is $6.60.

b. The sale price is the regular price minus the discount amount.

$16.50 $6.60 $9.90

The sale price is $9.90.

69. The decrease is $840 − $714 = $126.

\[
\begin{array}{ccc}
A & PB \\
126 & 840 \\
840 & 840 \\
0.15 & P
\end{array}
\]

This is a 0.15 = 15\% decrease.

70. The decrease is $380 − $266 = $114.

\[
\begin{array}{ccc}
A & PB \\
114 & 380 \\
380 & 380 \\
0.30 & P
\end{array}
\]

This is a 0.30 = 30\% decrease.
71. Investment dollars decreased in year 1 are 0.30 $10,000 $3000 . This means that $10,000 \times 0.7$ = $7000 remains. Investment dollars increased in year 2 are 0.40 $7000 $2800 . This means that $7000 + $2800 = $9800 of the original investment remains. This is an overall loss of $200 over the two years.

\[
\begin{array}{c|c|c}
A & P & B \\
\hline
200 & P & 10,000 \\
10,000 & 10,000 & 0.02 \\
\end{array}
\]

The financial advisor is not using percentages properly. Instead of a 10% gain, this is a 0.02 = 2% loss.

72. No; the first sale price is 70% of the original amount and the second sale price is 80% of the first sale price. The second sale price would be obtained by the following computation:

\[
\begin{align*}
A & \times P \times B \\
0.80 & \times 0.7 & \times P & \times B \\
0.56 & \times B & & \\
\end{align*}
\]

The second sale price is 56% of the original price, so there is 44% reduction overall.

73. – 74. Answers will vary.

75. makes sense

76. does not make sense; Explanations will vary. Sample explanation: Sometimes you will solve for one variable in terms of other variables.

77. does not make sense; Explanations will vary. Sample explanation: $100 is more than enough because 20% of $80 is $20 $80 $16.

78. does not make sense; Explanations will vary. Sample explanation: Since the sale price cannot be negative, the percent decrease cannot be more than 100%.

79. false; Changes to make the statement true will vary.

A sample change is: If \( ax \leq b \), then \( ax \leq 0 \) and \( x \leq \frac{b}{a} \).

80. false; Changes to make the statement true will vary.

A sample change is: If \( A \leq h \), then \( w \geq \frac{A}{h} \).

81. false; Changes to make the statement true will vary.

A sample change is: If \( A \leq \frac{1}{2} bh \), then \( 2A \leq bh \).

82. true

83. \( Q \leq \frac{100M}{C} \) for \( C \)

\[
\begin{align*}
CQ & \leq 100M \\
& \leq C \\
& \leq 100M \\
Q & \geq Q \\
C & \geq Q \\
& \geq 100M \\
Q & \geq Q \\
Q & \geq C \\
& \geq 100M \\
3 & \geq 3 \\
x & \geq 12 \\
\end{align*}
\]

84. \( 5x \geq 20 \geq 8x \geq 16 \)

\[
\begin{align*}
5x & \geq 20 \geq 8x \geq 16 \geq 8x \\
3x & \geq 20 \geq 16 \geq 20 \\
& \geq 3x \\
& \geq 36 \\
& \geq x \\
& \geq 12 \\
\end{align*}
\]

Check:

\[
\begin{align*}
512 & \geq 20 \geq 812 \geq 16 \\
60 & \geq 20 \geq 96 \geq 16 \\
& \geq 80 \\
& \geq 80 \\
\end{align*}
\]

The solution set is 12.
Chapter 2  Linear Equations and Inequalities in One Variable

Mid-Chapter Check Point - Chapter 2

1. Begin by multiplying both sides of the equation by 4, the least common denominator.

\[
\frac{x}{2} = \frac{12}{4} \quad \frac{x}{4} = \frac{412}{4x} \\
2x = 48 \quad 3x = 48 \\
\]

The solution set is 16.

2. \(5x \ 42 \ 57\)
   \(5x \ 42 \ 42 \ 57 \ 42\)
   \(5x \ 15\)
   \(5\)
   \(5\)

The solution set is 3.

3. \(H \ \frac{EC}{825}\)
   \(H \ 825 \ \frac{EC}{825}\)
   \(825H \ \frac{EC}{E}\)
   \(\frac{825H}{E} \ \frac{EC}{C}\)

4. \(A \ P \ B\)
   \(A \ 0.06140\)
   \(A \ 8.4\)
   \(8.4 \text{ is } 6\% \text{ of } 140.\)

5. \(\frac{x}{10} = \frac{3}{10} \ 10 \ rac{x}{10} = \frac{3}{10}\)

The solution set is 30.

6. \(1 \ 3 \ y \ 5 \ 42 \ 3y\)
   \(1 \ 3 \ y \ 15 \ 8 \ 12y\)
   \(3y \ 16 \ 8 \ 12y\)
   \(3y \ 12y \ 16 \ 8 \ 12y \ 12y\)
   \(9y \ 16 \ 8\)
   \(9y \ 16 \ 16 \ 8 \ 16\)
   \(9y \ 8\)
   \(9y \ 8\)

The solution set is 8.
The solution set is $\frac{8}{9}$. 

7. \[ S = 2\pi rh \]
   \[ \frac{S}{2\pi h} = \frac{2\pi rh}{2\pi h} = r \]

8. \[ A = PB \]
   \[ 12 = 0.30B \]
   \[ \frac{12}{0.30} = \frac{0.30B}{0.30} = 40\]
   12 is 30% of 40.

9. \[ \frac{3y}{5} \cdot \frac{y}{2} = \frac{5y}{4} \cdot 3 \]
   To clear fractions, multiply both sides by the LCD, 20.
   \[ 20 \cdot \frac{3y}{5} = 20 \cdot \frac{y}{2} = 20 \cdot \frac{5y}{4} = 203 \]
   \[ \frac{43y}{10} = \frac{10y}{25} = \frac{55y}{60} \]
   \[ 12y = 10y \]
   \[ 25y = 25y \]
   \[ 22y = 25y \]
   \[ 22y = 25y \]
   \[ 3y = 25y \]
   \[ 3y = 60 \]
   \[ 3y = 60 \]

10. \[ 2.4x + 1.4x + 0.5(6x - 9) \]
    \[ 2.4x + 1.4x + 3x + 4.5 \]
    \[ 2.4x + 6.4x + 4.5 \]
    To clear decimals, multiply both sides by 10.
    \[ 10(2.4x + 6) = 10(4.4x + 4.5) \]
    \[ 24x + 60 = 44x + 45 \]
    \[ 24x + 44x + 105 \]
    \[ 20x + 105 \]
    \[ 20x + 105 \]
    \[ x = 5.25 \]
    The solution set is 5.25.

11. \[ 5z + 7 + 6z + 2 + 4z + 3 \]
    \[ 5z + 7 + 6z + 12 + 8z + 12 \]
    \[ 5z + 7 + 2z \]
    \[ 5z + 5z + 2z + 5z \]
    \[ 7 + 7z \]
    \[ 7 + 7z \]
    \[ 1z \]
    The solution set is 1.

12. \[ Ax + By + C \]
    \[ Ax + By + C \]
    \[ Ax + C \]
    \[ \frac{Ax}{A} + \frac{By}{A} + \frac{C}{A} \]

13. \[ 6y + 7 + 3y + 33y + 1 \]
    \[ 9y + 7 + 9y + 3 \]
    \[ 9y + 9y + 7 + 9y + 3 \]
    \[ 7 + 3 \]
    Since this is a false statement, there is no solution or

14. \[ 10 \cdot \frac{1}{2} \cdot x + 3 \]
    \[ 10 \cdot \frac{1}{2} \cdot x + 10 \cdot \frac{3}{4} \cdot x + 5 \]
    \[ 2 \cdot 101 \]
    \[ 5x + 30 + 6x + 10 \]
    \[ 5x + 5x + 30 + 6x + 5x + 10 \]
    \[ 30 \cdot x + 10 \]
    \[ 30 \cdot 10 \cdot x + 10 \]
    \[ 40 \cdot x \]
    The solution set is 40.

15. \[ A = PB \]
    \[ \frac{50}{50} \cdot \frac{P}{400} \]
    \[ \frac{50}{50} \cdot \frac{P}{400} \]
    \[ 0.125 \cdot P \]
50 is 0.125 = 12.5% of 400.
16. \[
\frac{3m}{2} + 2m = 3
\]
\[
4 \left( \frac{3m}{2} + 2m \right) = 42m - 3
\]
\[
3m \cdot 6 + 8m \cdot 12 = 3m \cdot 3m + 6m \cdot 12
\]
\[
6 \cdot 5m + 12 \cdot 5m \cdot 12 = 6 \cdot 5m
\]
\[
\frac{5}{6} \cdot m
\]

The solution set is \( \frac{6}{5} \).

17. The increase is \( 50 - 40 = 10 \).
\[
A \quad P \quad B
\]
\[
10 \quad 40 \quad 10 \quad P \quad 40
\]
\[
40 \quad 40 \quad 0.25 \quad P
\]

This is a 0.25 = 25% increase.

18. \[
12w = 4 \cdot 8w = 4 \cdot 45w = 2
\]
\[
20w = 8 \cdot 20w = 8 \cdot 8
\]

Since \(-8 = -8\) is a true statement, the solution is all real numbers or \(x \neq 0\) is a real number.

19. a. \[
B \quad \frac{5}{2} \quad a = 82
\]
\[
B \quad \frac{5}{(14)} \quad a = 82
\]
\[
35 \quad 82
\]

47

According to the formula, 47% of 14-year-olds believe that reading books is important.

This underestimates the actual percentage shown in the bar graph by 2%.

b. \[
B \quad \frac{5}{2} \quad a = 82
\]
\[
22 \quad \frac{5}{2} \quad a = 82
\]
\[
2(22) \quad 2 \quad \frac{5}{2} \quad a = 82
\]
\[
2
\]
\[
44 \quad 5a = 164
\]
\[
120 \quad 5a
\]
\[
24 \quad a
\]

According to the formula, 22% of 24-year-olds will believe that reading books is important.

2.5 Check Points

1. Let \(x\) = the number.
\[
6x = 4 \quad 68
\]
\[
6x = 4 \quad 4 \quad 68 \quad 4
\]
\[
6x = 72
\]
\[
x = 12
\]

The number is 12.

2. Let \(x\) = the median starting salary, in thousands of dollars, for English majors.

Let \(x = 18\) the median starting salary, in thousands of dollars, for computer science majors.
\[
x \quad (x = 18) = 100
\]
\[
x \quad x = 18 = 100
\]
\[
2x = 18 = 100
\]
\[
2x = 82
\]
\[
x = 41
\]
\[
x = 18 = 59
\]

The average salary for English majors is $41 thousand and the average salary for computer science majors is $41 $18 $59.

3. Let \(x\) = the page number of the first facing page.

Let \(x = 1\) the page number of the second facing page.
\[
x \quad (x = 1) = 145
\]
\[
x \quad x = 1 = 145
\]
\[
2x = 145
\]
\[
2x = 1 \quad 145 = 1
\]
\[
2x = 144
\]
\[
x = 72
\]
\[
x = 1 \quad 73
\]

The page numbers are 72 and 73.
4. Let \( x = \) the number of eighths of a mile traveled.
\[
\begin{align*}
2 & 0.25x & 10 \\
2 & 0.25x & 10 & 2 \\
\text{ } & 0.25x & 8 \\
\text{ } & 0.25 & 8 \\
\text{ } & x & 32 \\
\end{align*}
\]
You can go 32 eighths of a mile. That is equivalent to \( \frac{32}{8} \) or 4 miles.

5. Let \( x = \) the width of the swimming pool.
Let \( 3x \) = the length of the swimming pool.
\[
P \div 2 \div 2w \\
320 & 2 \times 2x \\
320 & 6x \times 2x \\
320 & 8x \\
\frac{320}{8} & 8x \\
40 & x \\
x & 40 \\
3x & 120 \\
\]
The pool is 40 feet wide and 120 feet long.

6. Let \( x = \) the original price.
\[
\begin{array}{c|c|c}
\text{Original} & \text{the reduction} & \text{the reduced price} \\
\hline
x & 0.4x & 564 \\
\hline
0.4x & 564 \\
0.6x & 564 \\
0.6x & 564 \\
x & 940 \\
\end{array}
\]
The original price was $940.

2.5 Concept and Vocabulary Check

1. \( 4x \) 6
2. \( x \) 215
3. \( x \) 1
4. \( 125 \cdot 0.15x \)

2.5 Exercise Set

1. \( x \) 60 410
\( x \) 60 60 410 60
\( x \) 350
The number is 350.

2. \( x \) 43 107
\( x \) 43 43 107 43
\( x \) 64
The number is 64.

3. \( x \) 23 214
\( x \) 23 23 214 23
\( x \) 237
The number is 237.

4. \( x \) 17 96
\( x \) 17 17 96 17
\( x \) 113
The number is 113.

5. \( 7x \) 126
\( \frac{7x}{7} \) 126
\( x \) 18
The number is 18.

6. \( 8x \) 272
\( \frac{8x}{8} \) 272
\( x \) 34
The number is 34.

7. \( x \) 19
\( \frac{x}{19} \) 5
\( 19 \cdot \frac{x}{19} \) 195
\( x \) 95
The number is 95.

8. \( \frac{x}{14} \) 8
\( \frac{14}{14} \cdot \frac{x}{14} \) 148
5. \( 24x \) 2x
or \( 2x < 4x \)

\[
\begin{array}{c}
1 \\
1 \\
2
\end{array}
\]

The number is 1, 1, 2.

6. \( x < 0.35x \) or \( 0.65x \)
9. \[\begin{align*}
4 &\cdot 2x \quad 56 \\
2x &\cdot 52 \\
\hline
2x &\cdot 52 \\
x &\cdot 26
\end{align*}\]
The number is 26.

10. \[\begin{align*}
5 &\cdot 3x \quad 59 \\
3x &\cdot 54 \\
x &\cdot 18
\end{align*}\]
The number is 18.

11. \[\begin{align*}
5x &\cdot 7 \quad 178 \\
5x &\cdot 7 \quad 178 \quad 7 \\
5x &\cdot 185 \\
\hline
5x &\cdot 185 \\
x &\cdot 5 \\
x &\cdot 37
\end{align*}\]
The number is 37.

12. \[\begin{align*}
6x &\cdot 8 \quad 298 \\
6x &\cdot 306 \\
x &\cdot 51
\end{align*}\]
The number is 51.

13. \[\begin{align*}
x &\cdot 5 \quad 2x \\
x &\cdot 5 \quad x \quad 2x \quad x \\
\hline
5 &\cdot x
\end{align*}\]
The number is 5.

14. \[\begin{align*}
x &\cdot 12 \quad 4x \\
12 &\cdot 3x \\
4 &\cdot x
\end{align*}\]
The number is 4.

15. \[\begin{align*}
2x &\cdot 4 \quad 36 \\
2x &\cdot 8 \quad 36 \\
2x &\cdot 28 \\
\hline
x &\cdot 14
\end{align*}\]
The number is 14.

16. \[\begin{align*}
35 &\cdot x \quad 48 \\
15 &\cdot 3x \quad 48 \\
3x &\cdot 33
\end{align*}\]

17. \[\begin{align*}
9x &\cdot 30 \quad 3x \\
6x &\cdot 30 \\
x &\cdot 5
\end{align*}\]
The number is 5.

18. \[\begin{align*}
5 &\cdot 4x \quad x \quad 35 \\
5 &\cdot 3x \quad 35 \\
x &\cdot 10
\end{align*}\]
The number is 10.

19. \[\begin{align*}
\frac{3x}{5} &\cdot 4 \quad 34 \\
\frac{3x}{5} &\cdot 30 \\
3x &\cdot 150 \\
x &\cdot 50
\end{align*}\]
The number is 50.

20. \[\begin{align*}
\frac{3x}{4} &\cdot 3 \quad 9 \\
\frac{3x}{4} &\cdot 12 \\
3x &\cdot 48 \\
x &\cdot 16
\end{align*}\]
The number is 16.

21. Let \(x\) the number of years spent watching TV.

Let \(x \cdot 19\) the number of years spent sleeping.

\[\begin{align*}
x &\cdot (x \cdot 19) \quad 37 \\
x &\cdot x \quad 19 \quad 37 \\
2x &\cdot 19 \quad 37 \\
x &\cdot x \quad 19 \quad 28
\end{align*}\]
Americans will spend 9 years watching TV and 28 years sleeping.

22. Let \(x\) the number of years spent eating.

Let \(x \cdot 24\) the number of years spent sleeping.

\[\begin{align*}
x &\cdot 11
\end{align*}\]
The number is 11.
Section 2.5 An Introduction to Problem Solving

Chapter 2 Linear Equations and Inequalities in One Variable

\[ x \text{ (years eating)} \]
\[ \frac{x}{24} \text{ and 28 years sleeping.} \]

\[ \frac{2}{x} \]
\[ \frac{4}{x} \]

\[ 3 \]
\[ \frac{2}{x} \]
\[ \frac{x}{2} \]
\[ \frac{2}{x} \]

\[ 8 \]
\[ \frac{x}{2} \]

\[ 4 \]
\[ \frac{x}{2} \]

\[ 2 \]
\[ \frac{4}{x} \]

\[ 2 \]
\[ \frac{8}{x} \]

Americans will spend 4 years eating and 28 years sleeping.
Chapter 2 Linear Equations and Inequalities in One Variable

Section 2.5 An Introduction to Problem Solving

23. Let \( x \) the average salary, in thousands, for an American whose final degree is a bachelor’s.

Let \( 2x \) the average salary, in thousands, for an American whose final degree is a master’s.

\[
\begin{align*}
\text{x (2x)} & \quad 173 \\
2x & \quad 70 \\
x & \quad 81 \\
\end{align*}
\]

The average salary for an American whose final degree is a bachelor’s is $81 thousand and for an American whose final degree is a master’s is $92 thousand.

24. Let \( x \) the average salary, in thousands, for an American whose final degree is a bachelor’s.

Let \( 2x \) the average salary, in thousands, for an American whose final degree is a doctorate.

\[
\begin{align*}
\text{x (2x)} & \quad 198 \\
2x & \quad 45 \\
x & \quad 81 \\
\end{align*}
\]

The average salary for an American whose final degree is a bachelor’s is $81 thousand and for an American whose final degree is a doctorate is $117 thousand.

25. Let \( x \) = the number of the left-hand page.

Let \( x + 1 \) = the number of the right-hand page.

\[
\begin{align*}
\text{x x} & \quad 1629 \\
x & \quad 1629 \\
2x & \quad 629 \\
2x & \quad 629 1 \\
2x & \quad 628 \\
2x & \quad 628 \\
x & \quad 314 \\
\end{align*}
\]

The pages are 314 and 315.

26. Let \( x \) = the number of the left-hand page.

Let \( x + 1 \) = the number of the right-hand page.

\[
\begin{align*}
\text{x x} & \quad 525 \\
x & \quad 525 \\
2x & \quad 524 \\
x & \quad 262 \\
\end{align*}
\]

27. Let \( x \) the first consecutive odd integer (Babe Ruth).

Let \( x \) the second consecutive odd integer (Roger Maris).

\[
\begin{align*}
\text{x (x)} & \quad 120 \\
x & \quad 59 \\
x & \quad 61 \\
\end{align*}
\]

Babe Ruth had 59 home runs and Roger Maris had 61.

28. Let \( x \) the first consecutive even integer (Hank Greenberg).

Let \( x \) the second consecutive even integer (Babe Ruth).

\[
\begin{align*}
\text{x (x)} & \quad 118 \\
x & \quad 58 \\
x & \quad 60 \\
\end{align*}
\]

Hank Greenberg had 58 home runs and Babe Ruth had 60.

29. Let \( x \) the number of miles you can travel in one week for $320.

\[
\begin{align*}
200 & \quad 0.15x \quad 320 \\
200 & \quad 0.15 \quad 200 \quad 320 \quad 200 \\
0.15 & \quad 120 \\
0.15 & \quad 100 \\
x & \quad 800 \\
\end{align*}
\]

You can travel 800 miles in one week for $320. This checks because $200 + 0.15($800) = $320.

30. Let \( x \) the number of miles you can travel in one week for $395.

\[
\begin{align*}
180 & \quad 0.25x \quad 395 \\
180 & \quad 0.25 \quad 180 \quad 395 \quad 180 \\
0.25 & \quad 215 \\
\end{align*}
\]

The smaller page number is 262. The larger page number is 262 + 1 = 263.
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.5  An Introduction to Problem Solving

You can travel 860 miles in one week for $395.
31. Let \(x\) the number of years after 2014.
\[
37,600 \begin{array}{c}
1250x \\
1250x
\end{array} 46,350
\]
\[
\begin{array}{c}
1250 \\
1250
\end{array}
\]
\[
x 7
\]
7 years after 2014, or in 2021, the average price of a new car will be $46,350.

32. Let \(x\) the number of years after 2014.
\[
11.3 \begin{array}{c}
0.2x \\
0.2x
\end{array} 12.3
\]
\[
0.2x \begin{array}{c}
0.2 \\
x
\end{array} 1
\]
5 years after 2014, or in 2019, the average age of vehicles on U.S. roads will be 12.3 years.

33. Let \(x\) the width of the field.
Let \(4x\) the length of the field.
\[
P \begin{array}{c}
2l \\
500
\end{array} 2x
\]
\[
500 \begin{array}{c}
8x \\
10
\end{array} 2x
\]
\[
500 \begin{array}{c}
10x \\
x
\end{array} 10
\]
\[
50 \begin{array}{c}
x \\
x
\end{array} 50
\]
\[
4x \begin{array}{c}
200 \\
x
\end{array}
\]
The field is 50 yards wide and 200 yards long.

34. Let \(x\) the width of the field.
Let \(5x\) the length of the field.
\[
P \begin{array}{c}
2l \\
288
\end{array} 2x
\]
\[
288 \begin{array}{c}
10x \\
12x
\end{array} 2x
\]
\[
288 \begin{array}{c}
12x \\
24
\end{array} 5x
\]
The field is 24 yards wide and 120 yards long.

35. Let \(x\) the width of a football field.
Let \(x 200\) the length of a football field.
\[
P \begin{array}{c}
2l \\
1040
\end{array} 2x
\]
\[
1040 \begin{array}{c}
400 2x \\
400
\end{array}
\]
\[
640 \begin{array}{c}
4x \\
x
\end{array} 160
\]
\[
x 200 360
\]
A football field is 160 feet wide and 360 feet long.

36. Let \(x\) the width of a basketball court.
Let \(x 13\) the length of a basketball court.
\[
P \begin{array}{c}
2l \\
86
\end{array} 2x
\]
\[
86 \begin{array}{c}
26 2x \\
26
\end{array}
\]
\[
60 \begin{array}{c}
4x \\
x
\end{array} 15
\]
\[
x 15
\]
\[
x 28
\]
A basketball court is 15 meters wide and 28 meters long.

37. As shown in the diagram,
let \(x = \) the height and \(3x = \) the length.
To construct the bookcase, 3 heights and 4 lengths are needed.
Since 60 feet of lumber is available,
\[
3x \begin{array}{c}
4(3x) 60 \\
40
\end{array}
\]
\[
3x \begin{array}{c}
12x 60 \\
12
\end{array}
\]
\[
15x 60
\]
\[
x 4
\]
\[
3x 12
\]
The bookcase is 12 feet long and 4 feet high.
38. As shown in the diagram, let \( x = \) the length of a shelf and \( x + 3 = \) the height of the bookcase, 4 shelves and 2 heights are needed. Since 18 feet of lumber is available, 
\[
4x \times 2 \times 3 \times 18 \\
6x \times 6 \times 18 \\
x \times 2 \\
x \times 3 \times 5 
\]
The length of each shelf is 2 feet and the height of the unit is 5 feet.

39. Let \( x = \) the price before the reduction. 
\[
x \times 0.20 \times 320 \\
0.80 \times x \times 320 \\
\]
The price before the reduction was $400.

40. Let \( x = \) the price before the reduction. 
\[
x \times 0.30 \times 98 \\
0.70 \times x \times 98 \\
0.70 \times x \times 0.70 \times 140 
\]
The DVD player’s price before the reduction was $140.

41. Let \( x = \) the last year’s salary. 
\[
x \times 0.08 \times 50,220 \\
1.08 \times x \times 50,220 \\
\]
Last year’s salary was $46,500.

42. Let \( x = \) the last year’s salary. 
\[
x \times 0.09 \times 42,074 \\
1.09 \times x \times 42,074 \\
\]
Last year’s salary was $38,600.

43. Let \( x = \) the price of the car without tax. 
\[
x \times 0.06 \times 23,850 \\
1.06 \times x \times 23,850 \\
1.06 \times x \times 23,850 \\
1.06 \times x \times 22,500 
\]
The price of the car without sales tax was $14,500.

44. Let \( x = \) the nightly cost without tax. 
\[
x \times 0.08 \times 172.80 \\
1.08 \times x \times 172.80 \\
1.08 \times x \times 1.08 \times 160 
\]
The nightly cost without tax is $160.

45. Let \( x = \) the number of hours of labor. 
\[
63 \times 35 \times 448 \\
63 \times 35 \times 63 \times 448 \times 63 \\
35 \times x \times 385 \\
35 \times x \times 385 \\
x \times 35 \times 35 \times 11 
\]
It took 11 hours of labor to repair the car.

46. Let \( x = \) the number of hours of labor. 
\[
532 \times 63 \times 1603 \\
532 \times 63 \times 532 \times 1603 \times 532 \\
63 \times x \times 1071 \\
63 \times x \times 1071 \\
\]
It took 17 hours of labor to repair the sailboat.

47 – 50. Answers will vary.

51. does not make sense; Explanations will vary.

52. makes sense

53. makes sense

54. does not make sense; Explanations will vary.

Sample explanation: It is correct to use \( x \times 2 \) for 

Last year’s salary was $38,600.
the second consecutive odd integer because any odd integer is 2 more than the previous odd integer. In other words, adding 2 to the first odd integer will skip over the even integer and take you to the next odd integer.
55. false; Changes to make the statement true will vary.
   A sample change is: This should be modeled by
   \[ x = 10 \ 160. \]

56. false; Changes to make the statement true will vary.
   A sample change is: This should be modeled by
   \[ x = 0.35 \times 780. \]

57. true

58. true

59. Let \( x \) = the number of inches over 5 feet.
   \[ W \ 100 \ 5x \]
   \[ 135 \ 100 \ 5x \]
   \[ 135 \ 100 \ 100 \ 100 \ 5x \]
   \[ 35 \ 5x \]
   \[ 35 \ \frac{5x}{5} \]
   \[ 7 \ x \]

   The height 5' 7" corresponds to 135 pounds.

60. Let \( x \) = the number of minutes.
   Note that \$0.55 is the cost of the first minute and
   \$0.40(\( x \) 1) is the cost of the remaining minutes.
   \[ 0.55 \ 0.40 \times 1 \ 6.95 \]
   \[ 0.55 \ 0.4x \ 0.40 \ 6.95 \]
   \[ 0.4x \ 0.15 \ 6.95 \]
   \[ 0.4x \ 0.15 \ 0.15 \ 6.95 \ 0.15 \]
   \[ 0.4x \ 6.80 \]

   \[ \frac{0.4x}{6.80} \]
   \[ 0.4 \ 0.4 \]
   \[ x \ 17 \]

   The phone call lasted 17 minutes.

61. Let \( x \) = the woman's age.
   Let \( 3x \) = the "uncle's" age.
   \[ 3x \ 20 \ 2x \ 20 \]
   \[ 3x \ 20 \ 2x \ 40 \]
   \[ 3x \ 2x \ 20 \ 2x \ 2x \ 40 \]
   \[ x \ 20 \ 40 \]
   \[ x \ 20 \ 20 \ 40 \ 20 \]
   \[ x \ 20 \]

   The woman is 20 years old and the "uncle" is
   \( 3x = 3(20) = 60 \) years old.

62. Let \( x \) = weight of unpeeled bananas.
   Let \( \frac{1}{x} \) = the weight of banana peel and \( \frac{7}{x} \) = the

   The information in the cartoon translates into the equation.
   \[ \frac{7}{x} \ 7 \]
   \[ x \ \frac{8}{8} \]

   To solve this equation, first eliminate fractions by
   multiplying both sides by the LCD, which is 8.
   \[ 8x \ \frac{8}{8} \]
   \[ \frac{7}{8} \]
   \[ \frac{7}{8} \]

   The unpeeled banana weighs 7 ounces.

63. \[ \frac{4}{5} \ x \ 16 \]
   \[ \frac{5}{4} \ x \ \frac{5}{16} \]
   \[ 4 \ 5 \ 4 \]
   \[ x \ 20 \]

   Check:
   \[ \frac{4}{5} \ 20 \ 16 \]
   \[ \frac{4}{5} \ 20 \ 16 \]
   \[ \frac{80}{5} \]
   \[ 16 \ 16 \]

   The solution set is 20.

64. \[ 6y \ 1 \ 7 \ 9 \ y \ y \ y \]
   \[ 6y \ 6 \ 7 \ 9 \ y \ y \ 1 \]
   \[ 6y \ 1 \ 8 \ y \ 1 \]
   \[ 6y \ 1 \ 1 \ 8 \ y \ 1 \ 1 \]
   \[ 6y \ 8 \ y \]
   \[ 6y \ 8 \ y \ 8 \ y \ 8 \ y \]
   \[ 2y \ 0 \]
   \[ y \ 0 \]

   Check:
   \[ 60 \ 1 \ 7 \ 9 \ 0 \ 0 \ 1 \]
   \[ 6 \ 10 \ 7 \ 0 \ 0 \ 1 \]
   \[ 1 \ 1 \]

   The solution set is 0.
weight of peeled banana.
2. Use the formulas for the area and circumference of a circle. The radius is 20 ft.

A \( \frac{1}{2} \pi r \)

A \( \pi (20)^2 \)

40\(\pi \)

1256 or 1257

The area is \( 400\pi \) \( \text{ft}^2 \) or approximately 1256 \( \text{ft}^2 \) or 1257 \( \text{ft}^2 \).

C \( 2\pi r \)

C \( 2\pi (20) \)

40\(\pi \)

126

The circumference is \( 40\pi \) \( \text{ft} \) or approximately 126 ft.

3. The radius of the large pizza is 9 inches, and the radius of the medium pizza is 7 inches.

large pizza:

A \( \frac{1}{2} \pi r^2 \) \( \pi (9 \text{ in.})^2 \) 81\(\pi \) \( \text{in.}^2 \) 254 \( \text{in.}^2 \)

medium pizza:

A \( \frac{1}{2} \pi r^2 \) \( \pi (7 \text{ in.})^2 \) 49\(\pi \) \( \text{in.}^2 \) 154 \( \text{in.}^2 \)

For each pizza, find the price per inch by dividing the price by the area.

Price per square inch for the large pizza

\[
\begin{array}{c|c|c}
\text{Price} & \text{price per inch} \\
\hline
\$20.00 & \frac{1}{81\pi} \text{ in.}^2 \\
\$20.00 & \frac{1}{254} \text{ in.}^2 \\
\$0.08 & \frac{1}{\pi} \text{ in.}^2 \\
\end{array}
\]

Price per square inch for the medium pizza

\[
\begin{array}{c|c|c}
\text{Price} & \text{price per inch} \\
\hline
\$14.00 & \frac{1}{49\pi} \text{ in.}^2 \\
\$14.00 & \frac{1}{154} \text{ in.}^2 \\
\$0.09 & \frac{1}{\pi} \text{ in.}^2 \\
\end{array}
\]

The large pizza is the better buy.

4. Smaller cylinder: \( r = 3 \text{ in.} \), \( h = 5 \text{ in.} \)

\( V = \pi r^2 h \)

\( V = \pi (3)^2 5 \)

45\(\pi \)

The volume of the smaller cylinder is 45\(\pi \) \( \text{in.}^3 \).

Larger cylinder: \( r = 3 \text{ in.} \), \( h = 10 \text{ in.} \)

\( V = \pi r^2 h \)

\( V = \pi (3)^2 10 \)

90\(\pi \)

The volume of the smaller cylinder is 90\(\pi \) \( \text{in.}^3 \).

The ratio of the volumes of the two cylinders is

\[
\frac{V_{\text{larger}}}{V_{\text{smaller}}} = \frac{90\pi \text{ in.}^3}{45\pi \text{ in.}^3} = 2
\]

2.6 Check Points

1. \( A \ 24, b \ 4 \)

\( A = \frac{1}{2} \ bh \)

24 \(\frac{1}{2} \ 4 \ h \)

24 \( 2h \)

12 \( h \)

The height of the sail is 12 ft.
So, the volume of the larger cylinder is 2 times the volume of the smaller cylinder.
5. Use the formula for the volume of a sphere. The radius is 4.5 in.

\[ V = \frac{4}{3} \pi r^3 \]

\[ V = \frac{4}{3} \pi (4.5)^3 \]

\[ 121.5\pi \]

\[ 382 \]

The volume is approximately 382 in.\(^3\). Thus the 350 cubic inches will not be enough to fill the ball. About 32 more cubic inches are needed.

6. Let \(3x\) the measure of the first angle.
Let \(x\) the measure of the second angle.

Let \(x\) 20 the measure of the third angle.

\[3x \times (x + 20) = 180\]

\[5x + 20 = 180\]

\[5x = 200\]

\[x = 40\]

\[3x = 120\]

\[x + 20 = 20\]

The three angle measures are 120°, 40°, and 20°.

7. **Step 1** Let \(x\) = the measure of the angle.

**Step 2** Let \(90 - x\) = the measure of its complement.

**Step 3** The angle’s measure is twice that of its complement, so the equation is

\[x = 2(90 - x)\]

**Step 4** Solve this equation

\[x = 2(90 - x)\]

\[x = 180 - 2x\]

\[x = 180 - 2x + 2x\]

\[3x = 180\]

\[x = 60\]

The measure of the angle is 60°.

**Step 5** The complement of the angle is

\[90 - 60 = 30\] and 60° is indeed twice 30°.

2.6 Concept and Vocabulary Check

1. \(A = \frac{1}{2}bh\)

2. \(A = \pi r^2\)

3. \(C = 2\pi r\)

4. radius; diameter

5. \(V = lwh\)

6. \(V = \pi r^2h\)

7. 180°

8. complementary

9. supplementary

10. 90 \(x\); 180 \(x\)

2.6 Exercise Set

1. Use the formulas for the perimeter and area of a rectangle. The length is 6 m and the width is 3 m.

\[P = 2l + 2w\]

\[2(6) + 2(3) = 12 + 6 = 18\]

\[A = lw\]

\[6 \times 3 = 18\]

The perimeter is 18 meters, and the area is 18 square meters.

2. Use the formulas for the perimeter and area of a rectangle. The length is 4 ft and the width is 3 ft.

\[P = 2l + 2w\]

\[24 + 23 = 47\]

\[P = 8 + 6 + 14\]

The perimeter is 14 ft.

\[A = lw\]

\[4 \times 3 = 12\]

The area is 12 ft\(^2\).

3. Use the formula for the area of a triangle. The base is 14 in and the height is 8 in.

\[A = \frac{1}{2}bh\]

\[\frac{1}{2} \times 14 \times 8 = 56\]

The area is 56 square inches.
4. Use the formula for the area of a triangle. The base is 30 m and the height is 33 m.
   \[ A = \frac{1}{2}bh \]
   \[ A = \frac{1}{2} 	imes 30 \times 33 \]
   \[ A = 495 \text{ m}^2 \]

5. Use the formula for the area of a trapezoid. The bases are 16 m and 10 m and the height is 7 m.
   \[ A = \frac{1}{2}(a + b)h \]
   \[ A = \frac{1}{2}(16 + 10) \times 7 \]
   \[ A = 7 \times 16 \]
   \[ A = 91 \text{ square meters} \]

6. Use the formula for the area of a trapezoid. The bases are 37 meters and 26 meters and the height is 18 meters.
   \[ A = \frac{1}{2}(a + b)h \]
   \[ A = \frac{1}{2}(37 + 26) \times 18 \]
   \[ A = 567 \text{ m}^2 \]

7. \[ A = 1250, \ w = 25 \]
   \[ A = lw \]
   \[ 1250 \times 25 \]
   \[ 50 \text{ l} \]
   The length of the swimming pool is 50 feet.

8. \[ A = 2450, \ w = 35 \]
   \[ A = lw \]
   \[ 2450 \times 35 \]
   \[ 70 \text{ l} \]
   The length of the swimming pool is 70 ft.

9. \[ A = 20, \ h = 5 \]
   \[ A = \frac{1}{2}bh \]
   \[ 20 \times \frac{1}{2} \times 5 \]
   \[ 20 \times \frac{5}{2} \]
   \[ 2 (20) \times \frac{5}{2} \]
   \[ 8 \text{ h} \]
   The height of the triangle is 8 feet.

10. \[ A = 30, \ b = 6 \]
    \[ A = \frac{1}{2}bh \]
    \[ 30 \times \frac{6}{2} \]
    \[ 60 \text{ h} \]
    \[ 10 \ h \]
    The height is 10 ft.

11. \[ P = 188, \ w = 44 \]
    \[ 188 \times 2l \ (244) \]
    \[ 188 \times 2l \ 88 \]
    \[ 100 \times 2l \]
    \[ 50 \ l \]
    The length of the rectangle is 50 cm.

12. \[ P = 2l \ 2w \]
    \[ 208 \times 2l \ 246 \]
    \[ 208 \times 2l \ 92 \]
    \[ 116 \times 2l \]
    \[ 58 \ l \]
    The length of the rectangle is 58 cm.

13. Use the formulas for the area and circumference of a circle. The radius is 4 cm.
    \[ A = \pi r^2 \]
    \[ A = \pi (4)^2 \]
    \[ 16\pi \]
    \[ 50 \]
    The area is 16\pi \text{ cm}^2 or approximately 50 \text{ cm}^2.
    \[ C = 2\pi r \]
    \[ C = 2\pi(4) \]
    \[ 8\pi \]
    \[ 25 \]
    The circumference is 8\pi \text{ cm} or approximately 25 cm.
14. Use the formula for the area and circumference of a circle. The radius is 9 m.

\[ A = \pi r^2 \]
\[ A = \pi 9^2 \]

\[ 81\pi \]
\[ 254 \]

The area is \( 81\pi \text{ m}^2 \) or approximately 254 m².

\[ C = 2\pi r \]
\[ C = 2\pi 9 \]
\[ 18\pi \]
\[ 57 \]

The circumference is \( 18\pi \text{ m} \) or approximately 57 m.

15. Since the diameter is 12 yd, the radius is \( \frac{12}{2} = 6 \text{ yd} \).

\[ A = \pi r^2 \]
\[ A = \pi (6)^2 \]
\[ 36\pi \]
\[ 113 \]

The area is \( 36\pi \text{ yd}^2 \) or approximately 113 yd².

\[ C = 2\pi r \]
\[ C = 2\pi 6 \]
\[ 12\pi \]
\[ 38 \]

The circumference is \( 12\pi \text{ yd} \) or approximately 38 yd.

16. Since the diameter is 40 ft, the radius is \( \frac{40}{2} = 20 \text{ ft} \).

\[ A = \pi r^2 \]
\[ A = \pi 20^2 \]
\[ 400\pi \]
\[ 1257 \]

The area is \( 400\pi \text{ ft}^2 \) or approximately 1257 ft².

\[ C = 2\pi r \]
\[ C = 2\pi 20 \]
\[ 40\pi \]
\[ 126 \]

The circumference is \( 40\pi \text{ ft} \) or approximately 126 ft.

17. \[ C = 2\pi r \]
\[ 14\pi = 2\pi r \]
\[ 2\pi = 2\pi \]
\[ \frac{14\pi}{2\pi} = \frac{2\pi}{2\pi} \]
\[ \frac{7}{r} \]

The radius is 7 in. and the diameter is \( 2(7 \text{ in}) = 14 \text{ in} \).

18. \[ C = 2\pi r \]
\[ \frac{16\pi}{2\pi} = \frac{2\pi r}{2\pi} \]
\[ 8 \]

The radius is 8 in. and the diameter is \( 2(8 \text{ in}) = 16 \text{ in} \).

19. Use the formula for the volume of a rectangular solid. The length and width are each 3 inches and the height is 4 inches.

\[ V = lwh \]
\[ V = 3 \times 3 \times 4 \]
\[ 36 \]

The volume is \( 36 \text{ in}^3 \).

20. Use the formula for the volume of a rectangular solid. The length is 5 cm and width and height are each 3 cm.

\[ V = lwh \]
\[ V = 5 \times 3 \times 3 \]
\[ 45 \]

The volume is \( 45 \text{ cm}^3 \).

21. Use the formula for the volume of a cylinder. The radius is 5 cm and the height is 6 cm.

\[ V = \pi r^2 h \]
\[ V = \pi 5^2 \times 6 \]
\[ 150\pi \]
\[ 471 \]

The volume of the cylinder is \( 150\pi \text{ cm}^3 \) or approximately 471 cm³.

22. Use the formula for the volume of a cylinder. The radius is 6 cm and the height is 8 cm.

\[ V = \pi r^2 h \]
\[ V = \pi 6^2 \times 8 \]
\[ 288\pi \]
\[ 905 \]

The volume is \( 288\pi \text{ cm}^3 \) or approximately 905 cm³.
23. Use the formula for the volume of a sphere. The diameter is 18 cm, so the radius is 9 cm.
\[ V = \frac{4}{3} \pi r^3 \]
\[ V = \frac{4}{3} \pi (9)^3 \]
972\pi
3052
The volume is 972\pi cm³ or approximately 3052 cm³.

24. Use the formula for the volume of a sphere. The diameter is 24 in., so the radius is 12 in.
\[ V = \frac{4}{3} \pi r^3 \]
\[ V = \frac{4}{3} \pi 12^3 \]
2304\pi
7238
The volume is 2304\pi in³ or approximately 7238 in³.

25. Use the formula for the volume of a cone. The radius is 4 m and the height is 9 m.
\[ V = \frac{1}{3} \pi r^2 h \]
\[ V = \frac{1}{3} \pi (4)^2 9 \]
48\pi
151
The volume is 48\pi m³ or approximately 151 m³.

26. Use the formula for the volume of a cone. The radius is 5 m and the height is 16 m.
\[ V = \frac{1}{3} \pi r^2 h \]
\[ V = \frac{1}{3} \pi 5^2 16 \]
\[ \frac{400 \pi}{3} \]
419
The volume is \( \frac{400}{3} \pi \) m³ or approximately 419 m³.

27.

28. \[ V = \frac{1}{3} \pi r^2 h \]
\[ \frac{1}{3} \pi \]
\[ 3V \]
\[ \frac{\pi r^2 h}{3} \]
\[ 3V \]
\[ \frac{\pi r^2 h}{3} \]

29. Smaller cylinder: \( r = 3 \) in, \( h = 4 \) in.

\[ V = \pi r^2 h = \pi (3)^2 4 \]

36\pi
The volume of the smaller cylinder is 36\pi in³.

Larger cylinder: \( r = 3(3 \text{ in}) = 9 \) in, \( h = 4 \) in.

\[ V = \pi r^2 h = \pi (9)^2 4 \]

324\pi
The volume of the larger cylinder is 324\pi in³.

The ratio of the volumes of the two cylinders is
\[ V_{\text{larger}} : 324\pi \]
\[ V_{\text{smaller}} : 36\pi \]

So, the volume of the larger cylinder is 9 times the volume of the smaller cylinder.

30. Smaller cylinder: \( r = 2 \) in., \( h = 3 \) in.

\[ V = \pi r^2 h \]

\[ V = \pi 2^2 3 \]

12\pi
The volume of the smaller cylinder is 12\pi in³.

Large cylinder: \( r = 4(2 \text{ in.}) = 8 \) in., \( h = 3 \) in.

\[ V = \pi r^2 h \]

\[ V = \pi 8^2 3 \]

192\pi
The volume of the larger cylinder is 192\pi in³.

The ratio of the volumes of the two cylinders is
\[ V_{\text{larger}} : 192\pi \]
\[ V_{\text{smaller}} : 12\pi \]

So the volume of the larger cylinder is 16 times the volume of the smaller cylinder.
\[
\begin{align*}
\frac{\pi r^2}{30} &= 180 \\
\frac{3x}{30} &= 180 \\
x &= 60 \\
\frac{5}{180} &= 0 \\
\frac{V}{\pi r^2} h &= 30 \\
x &= 50 \\
x &= 30 \\
x &= 80 \\
\end{align*}
\]

The three angle measures are 50, 50, and 80.
32. The sum of the measures of the three angles of a triangle is 180°.  
   \[3x \times 40 = 180\]  
   \[5x \times 180\]  
   \[5x \times 140\]  
   \[x \times 28\]  
   \[3x \times 84\]  
   \[x \times 40 = 68\]  
   The three angle measures are 28°, 84°, and 68°.

33. \[4x (3x + 4) (2x + 5) = 180\]  
   \[9x \times 9 = 180\]  
   \[9x \times 171\]  
   \[x \times 19\]  
   \[3x \times 4 = 61\]  
   \[2x \times 5 = 43\]  
   The three angle measures are 76°, 61°, and 43°.

34. \[x \times 4x = 5x = 180\]  
   \[10x = 180\]  
   \[x = 18\]  
   \[4x = 72\]  
   \[5x = 90\]  
   The three angle measures are 18°, 72°, and 90°.

35. Let \(x\) = the measure of the smallest angle.  
   Let \(2x\) = the measure of the second angle.  
   Let \(x + 20\) = the measure of the third angle.  
   \[x \times 2x = (x + 20) = 180\]  
   \[4x \times 20 = 180\]  
   \[4x \times 160\]  
   \[x \times 40\]  
   \[2x \times 80\]  
   \[x \times 20 = 60\]  
   The three angle measures are 40°, 80°, and 60°.

36. Let \(x\) = the measure of the smallest angle.  
   Let \(3x\) = the measure of the second angle.  
   Let \(x + 30\) = the measure of the third angle.  
   \[x \times 3x = x \times 30 = 180\]  
   \[5x \times 30 = 180\]  
   \[5x \times 150\]  
   \[x \times 30\]  
   \[3x \times 90\]  
   \[x \times 30 = 60\]  
   The three angle measures are 30°, 90°, and 60°.

37. If the measure of an angle is 58°, the measure of its complement is \(90° - 58° = 32°\).

38. If the measure of an angle is 41°, the measure of its complement is \(90° - 41° = 49°\).

39. If the measure of an angle is 88°, the measure of its complement is 2°.

40. If the measure of an angle is 2°, the measure of its complement is \(90° - 2° = 88°\).

41. If the measure of an angle is 132°, the measure of its supplement is \(180° - 132° = 48°\).

42. If the measure of an angle is 93°, the measure of its supplement is \(180° - 93° = 87°\).

43. If the measure of an angle is 90°, the measure of its supplement is 180° - 90°.

44. If the measure of an angle is 179.5°, the measure of its supplement is \(180° - 179.5° = 0.5°\).

45. **Step 1** Let \(x\) = the measure of the angle.

**Step 2** Let \(90° - x\) = the measure of its complement.

**Step 3** The angle’s measure is 60° more than that of its complement, so the equation is \(x = (90° - x) + 60°\).

**Step 4** Solve this equation  
   \[x \times 90 = x \times 60\]  
   \[x \times 150\]  
   \[2x \times 150\]  
   \[x \times 75\]  
   The measure of the angle is 75°.

**Step 5** The complement of the angle is  
   \(90° - 75° = 15°\); and 75° is 60° more than 15°.
46. **Step 1** Let \( x \) be the measure of the angle.

**Step 2** Then \( 90 - x \) is the measure of its complement.

**Step 3** The angle’s measure is \( 78 \)° less than that of its complement, so the equation is 
\[
x = 90 - 78.
\]

**Step 4** Solve this equation
\[
x = 90 - 78 \\
x = 12 \\
2x = 12 \\
x = 6
\]
The measure of the angle is \( 6 \)°.

**Step 5** The complement of the angle is \( 90 - 6 = 84 \)°, and \( 6 \)° is \( 78 \)° less than \( 84 \)°.

47. **Step 1** Let \( x \) be the measure of the angle.

**Step 2** Then \( 180 - x \) is the measure of its supplement.

**Step 3** The angle’s measure is three times that of its supplement, so the equation is 
\[
x = 3(180 - x).
\]

**Step 4** Solve this equation
\[
x = 3(180 - x) \\
x = 540 - 3x \\
x = 4x \\
x = 540 \\
x = 135
\]
The measure of the angle is \( 135 \)°.

**Step 5** The measure of its supplement is 
\[
180 - 135 = 45, \text{ and } 135 = 3(45),
\]
so the proposed solution checks.

48. **Step 1** Let \( x \) be the measure of the angle.

**Step 2** Then \( 180 - x \) is the measure of its supplement.

**Step 3** The angle’s measure is \( 16 \)° more than three times that of its supplement, so the equation is 
\[
x = 3 \times 180 - x \\
x = 540 - 3x \\
x = 556 - 3x \\
x = 556 \\
x = 139
\]
The measure of the angle is \( 139 \)°.

**Step 4** Solve this equation
\[
x = 3 \times 180 - x \\
x = 540 - 3x \\
x = 556 - 3x \\
x = 556 \\
x = 139
\]
The measure of the angle is \( 139 \)°.

**Step 5** The measure of its supplement is 
\[
180 - 139 = 41, \text{ and } 139 = 3(41) + 16,
\]
so the proposed solution checks.

49. **Step 1** Let \( x \) be the measure of the angle.

**Step 2** Let \( 180 - x \) be the measure of its supplement, and \( 90 - x \) is the measure of its complement.

**Step 3** The measure of the angle’s supplement is \( 10 \)° more than three times that of its complement, so the equation is 
\[
180 - x = 3(90 - x) + 10.
\]

**Step 4** Solve this equation
\[
180 - x = 3(90 - x) + 10 \\
180 - x = 270 - 3x + 10 \\
180 - x = 280 - 3x \\
2x = 100 \\
x = 50
\]
The measure of the angle is \( 50 \)°.

**Step 5** The measure of its supplement is \( 130 \)° and the measure of its complement is \( 40 \)°. Since \( 130 = 3(40) + 10 \), the proposed solution checks.
50. **Step 1** Let $x$ be the measure of the angle.

**Step 2** Let $180 - x$ be the measure of its supplement, and $90 - x$ be the measure of its complement.

**Step 3** The measure of the angle’s supplement is $10^\circ$ more than three times that of its complement, so the equation is $180 - (90 - x) = 10$.

**Step 4** Solve this equation

\[
180 - x = 290 - 52
\]
\[
180 - x = 180 - 2x - 52
\]
\[
180 - x = 232 - 2x
\]
\[
180 - x = 232 - 2x
\]
\[
180 - x = 52
\]

The measure of the angle is $52^\circ$.

**Step 5** The measure of its supplement is $128^\circ$ and the measure of its complement is $38^\circ$. Since $128^\circ = 2(38^\circ) + 52^\circ$, the proposed solution checks.

51. Divide the shape into two rectangles.

\[
A_{\text{entire figure}} = 38,493
\]
\[
A_{\text{bottom rectangle}} = 24,412
\]
\[
A_{\text{side rectangle}} = 24,487
\]

The area of the figure is 72 square meters.

52. Divide the shape into a triangle and a rectangle.

\[
A_{\text{entire figure}} = A_{\text{triangle}} + A_{\text{rectangle}}
\]
\[
A_{\text{entire figure}} = \frac{1}{2}bh
\]
\[
1024 = \frac{1}{2} \times 24\times5 \times 10
\]
\[
240 \times \frac{1}{2} = 24.5
\]
\[
240 \times 60 = 300
\]

The area of the figure is $300 \text{ m}^2$.

53. Divide the shape into a rectangle and a triangle.

\[
A_{\text{entire figure}} = A_{\text{rectangle}} + A_{\text{triangle}}
\]
\[
A_{\text{entire figure}} = \frac{1}{2}bh
\]
\[
106 = \frac{1}{2} \times 310 \times 3
\]
\[
60 = \frac{1}{2} \times 37
\]
\[
60 = 10.5 \times 70.5
\]

The area of the figure is $70.5 \text{ cm}^2$.

54. Subtract the area of the two smaller circles from the area of the larger circle. Note that the radius of the large circle is 4 and note that the two smaller circles are the same size.

\[
A_{\text{shaded}} = A_{\text{larger circle}} - 2A_{\text{smaller circle}}
\]
\[
A_{\text{shaded}} = \pi R^2 - 2\pi r^2
\]
\[
A_{\text{shaded}} = \pi(4)^2 - 2\pi(2)^2
\]
\[
A_{\text{shaded}} = \pi(16) - 2\pi(4)
\]
\[
A_{\text{shaded}} = 16\pi - 8\pi
\]
\[
A_{\text{shaded}} = 8\pi
\]

The shaded area is $8\pi \text{ cm}^2$. 
55. Subtract the volume of the three hollow portions from the volume of the whole rectangular solid.

\[
V_{\text{cement block}} = \frac{1}{3} LWH \quad V_{\text{rectangular solid}} = 3V_{\text{hollow}}
\]

\[
L = 8816 \quad W = 3468 \quad H = 1024 \quad 576
\]

The volume of the cement block is 448 cubic inches.

56. Subtract the volume of the smaller cylinder from the volume of the larger cylinder.

\[
V_{\text{shaded}} = V_{\text{larger cylinder}} - V_{\text{smaller cylinder}}
\]

\[
\pi R^2 h - \pi r^2 h = \frac{6^2}{2} - \frac{2^2}{2} \pi = 10 \pi - 2 \pi = 8 \pi
\]

The volume of the shaded region is \(80\pi\) cubic inches.

57. The area of the office is \(20 \text{ ft}^2\). Use a proportion to determine how much of the yearly electric bill is deductible.

Let \(x\) = the amount of the electric bill that is deductible.

\[
\frac{320}{4800} = \frac{x}{2200} \quad 2200x = 320 \times 2200 \quad 2200x = 1,536,000
\]

\[
x = \frac{1,536,000}{2200} = 698.18
\]

$698.18 of the yearly electric bill is deductible.

58. a. The area of the lot is 500 ft \(200\text{ ft}^2\).

The area of the house is 100 ft \(60 \text{ ft}^2\).

The area of the shed is 20 ft \(20 \text{ ft}^2\).

The area of the driveway is 20 ft \(100 \text{ ft}^2\).

Therefore, the area of the lawn is

59. The radius of the large pizza is \(\frac{1}{2}14 = 7\) inches, and the radius of the medium pizza is \(\frac{1}{2}7\) inches \(3.5\) inches.

Large pizza:

\[
A = \pi r^2 = \pi (7\text{ in.})^2 = 49\pi \text{ in.}^2
\]

Medium pizza:

\[
A = \pi r^2 = \pi (3.5\text{ in.})^2 = 12.25\pi \text{ in.}^2
\]

For each pizza, find the price per inch by dividing the price by the area.

Price per square inch for the large pizza

\[
\frac{12.00}{49\pi} \approx \frac{0.08}{\pi}\text{ per square inch}
\]

and the price per square inch for the medium pizza

\[
\frac{5.00}{12.25\pi} \approx \frac{0.41}{\pi}\text{ per square inch}
\]

The large pizza is the better buy.

60. The radius of the large pizza is \(\frac{1}{2}16 = 8\) inches, and the radius of each small pizza is \(\frac{1}{2}10\) inches = 5 inches.

Large pizza:

\[
A = \pi r^2 = \pi (8\text{ in.})^2 = 64\pi \text{ in.}^2
\]

Small pizza:

\[
A = \pi r^2 = \pi (5\text{ in.})^2 = 25\pi \text{ in.}^2
\]

The area of one large pizza is about 201 \(\text{in.}^2\) and the area of two small pizzas is about \(2(79 \text{ in.}^2) = 158 \text{ in.}^2\). Since the price of one large pizza is the same as the price of two small pizzas and the large pizza has the greater area, the large pizza is the better buy. (Because the prices are the same, it is not necessary to find the prices per square inch in this case.)

61. The area of the larger circle is \(A = \pi r^2 = \pi 50^2 = 2500\pi \text{ ft}^2\). The area of the smaller circle is
100,000 6000 400 2000 91,600 ft$^2$.

Since each bag of fertilizer covers 4000 square feet and $\frac{91,600}{22.9}$, 23 bags of fertilizer will be needed.

b. The cost of the fertilizer is $23\times 25 = $575.

\[ A = \pi r^2 = \pi \times 40^2 = 1600\pi \quad \text{ft}^2. \]

The area of the circular road is the difference between the area of the larger circle and the area of the smaller circle.

\[ A = 2500\pi \quad \text{ft}^2 - 1600\pi \quad \text{ft}^2 = 900\pi \quad \text{ft}^2 \]

The cost to pave the circular road is $0.80(900\pi) = $2262.
62. The area of the rectangular portion of the floor is 
(60 ft)(40 ft) = 2400 ft\(^2\). Since the radius of each semicircle is 20 ft and the 
two semicircles together make one circle, the area of the two semicircular portion of the floor is 
\(\pi \times 20 \text{ ft}^2 \times 400\pi \text{ ft}^2\). Therefore, the area of the dance floor is 
2400 ft\(^2\) \times 400\pi \text{ ft}^2\). Since the flooring costs $10.00 per square foot, the cost of hardwood flooring for the dance floor will 
be about $102400 \times 400\pi \times 36,566.

63. To find the perimeter of the entire window, first find 
the perimeter of the lower rectangular portion. This 
is the bottom and two sides of the window, which is 
3 ft + 6 ft + 6 ft = 15 ft. Next, find the perimeter or 
circumference of the semicircular portion of the 
window. The radius of the semicircle

\[
\frac{1}{2} \times 3 \text{ ft} = 1.5 \text{ ft, so the circumference is} \\
\frac{1}{2} \times 2\pi \times 3.14(1.5) = 4.7 \text{ ft.} \\
\text{So, approximately 15 ft + 4.7 ft = 19.7 ft of} 
\text{stripping would be needed to frame the window.}
\]

64. The circumference of the garden is 
\(2\pi(30 \text{ ft}) = 60\pi \text{ ft.}
\)
Since 6 in. = \(\frac{1}{2} \text{ ft.}, the number of plants needed is

\[
\frac{60\pi}{1} \times 260\pi \times 120\pi \times 377. \\
\frac{1}{2}\]
To the nearest whole number, 377 plants are 

needed.

65. First, find the volume of water when the reservoir 
was full.

\[V = \text{length} \times \text{width} \times \text{height} = 50 \times 0 \times 30 = 0.000 \text{yd}^3\]

The volume was 30,000 yd\(^3\). Next, find the volume when the height of the water 
was 6 yards.

\[V = \frac{50 \times 30 \times 6}{9000} \text{ yd}^3\]

The volume was 9000 yd\(^3\). The amount of water 
used in the three-month period was 30,000 yd\(^3\) – 
9000 yd\(^3\) = 21,000 yd\(^3\).

66. The volume of the foundation is (4 yd)(3 yd) \times (2 yd) 
\(= 24 \text{ yd}^3\). Since each truck holds 6 \text{ yd}^3 of dirt, 
\(\frac{24}{6} = 4 \text{ truckloads will be needed. Since the charge} 
\text{to remove the dirt is } \$10 \text{ per load, the cost to have} 
\text{all the dirt hauled away is } 4(\$10) = \$40.

67. For the first can, the diameter is 6 in. so the radius is 
3 in. and \(V = \pi r^2 h \pi (3)^2 = 45\pi \text{ in}^3\). The volume of the first can is 141.3 in\(^3\). For the second can, 
the diameter is 5 in., so the radius is 2.5 in. and \(V = \pi r^2 h = \pi (2.5)^2 \times 6 \times 37.5\pi = 117.75 \text{ in}^3\).

The volume of the second can is 117.75 in\(^3\). Since 
the cans are the same price, the can with the greater 
volume is the better buy. Choose the can with the 
diameter of 6 inches and height of 5 inches.

68. The volume of each tunnel is 
\(V = \frac{1}{2} \pi r^2 h \text{ ft}^3\)

\[
\frac{1}{2} \times \pi \times 4^2 \times 50,000 \\
\pi \times 400,000 \pi
\]
The volume of each tunnel is 400,000\(\pi \text{ m}^3\). So, the 
volume of all three tunnels, which is the total 
amount of dirt that had to be removed, is 
3400,000\(\pi\) \text{ ft}^3 \times 1,200,000\pi \text{ m}^3 = 3,769,900 \text{ m}^3.

69. Find the volume of a cylinder with radius 3 feet and 
height 2 feet 4 inches.

\[
2 \text{ ft} 4 \text{ in} = 2 \frac{1}{3} \text{ feet} = \frac{7}{3} \text{ feet} \\
V = \pi r^2 h
\]

\[
\pi (3)^2 \times \frac{7}{3} \times \pi \times 9 \times \frac{7}{3} \times 2\pi = 65.94
\]
The volume of the tank is approximately 65.94 ft\(^3\). 
This is a little over 1 ft\(^3\) smaller than 67 ft\(^3\) so it is 
too small to hold 500 gallons of water. Yes, you 
should be able to win your case.

70. – 78. Answers will vary.

79. does not make sense; explanations will vary. 
Sample explanation: Though the heights of the 
books are proportional to the data, the widths are 
also changing. This cause the larger values to be 
visually exaggerated.

80. does not make sense; explanations will vary.
Sample explanation: The sum of the three angles of the triangle must be 180, but these three values total 181.
81. does not make sense; Explanations will vary. Sample explanation: If the radius is doubled, the area is multiplied by 4.
\[ A_{\text{radius}} = \pi r^2 \]
\[ A_{\text{radius\ 2x}} = \pi (2r)^2 = 4\pi r^2 \]
82. makes sense
83. true
84. true
85. false; Changes to make the statement true will vary. A sample change is: 90 does not have a complement.
86. true
87. Area of smaller deck (8 ft)(10) 80 ft².
Area of larger deck (12 ft)(15) 180 ft².
Find the ratio of the areas.
\[ \frac{A_{\text{larger}}}{A_{\text{smaller}}} = \frac{180 \text{ ft}^2}{80 \text{ ft}^2} = \frac{225}{1} \]
The cost will increase 2.25 times.
88. Consider the following diagram:

The area of the outer rectangle (pool plus path) is (36 ft)(20 ft) = 720 ft². The area of the inner rectangle (pool only) is (30 ft)(14 ft) = 420 ft². Therefore, the area of the walk is 720 ft² – 420 ft² = 300 ft². Since the cost to resurface the path is $2 per square foot, the total cost of resurfacing the path is 300($2) = $600.
89. Let \( x \) = the radius of the original sphere.
Let \( 2x \) = the radius of the larger sphere.
Find the ratio of the volumes of the two spheres.
\[ \frac{4}{3} \]
90. If the length, width, and height of a rectangular solid are each multiplied by 10, the volume will be multiplied by \( 10 \times 10 \times 10 = 1000 \). The volume of the car will be 1000 times that of the model.
91. The angles marked \( 2x \) and \( 2x \) in the figure are supplementary, so their sum is 180.
\[ 2x \ 2x \ 40 \ 180 \]
\[ 2x \ 40 \ 180 \]
\[ 4x \ 10 \]
\[ x \ 35 \]
The angle of inclination is 35.
92. \[ P = 2s \ 2b \] for \( s \)
\[ P = 2s \]
\[ \frac{P}{b} = \frac{2s}{b} \]
\[ \frac{P}{s} = \frac{s}{2} \]
93. \[ \frac{x}{2} = \frac{7}{13} = \frac{x}{4} \]
Multiply both sides by the LCD, 4.
\[ 4 \frac{x}{2} = \frac{7}{13} = \frac{4}{4} \]
\[ 2x \ 28 \ 52 \ x \]
\[ 2x \ 28 \ x \ 52 \ x \]
\[ 3x \ 28 \ 28 \ 52 \ 28 \]
\[ 3x \ 24 \]
\[ \frac{3x}{3} = \frac{24}{3} \]
\[ x \ 8 \]
The solution set is 8.
94. \[ 3 \ 12 \ x^2 \ 3 \ 2 \]
\[ 2 \]
\[ 3 \ 12 \ 4 \ 3 \ 2 \]
\[ 3 \ 3 \ 2 \ 30^2 \ 2 \ 0^2 \ 0 \]
95. \( x \ 3 \ 8 \)
\[ A_{\text{larger}} = \frac{\pi (2x)^3}{3} = \frac{8\pi x^3}{3} \]
\[ A_{\text{original}} = \frac{4}{3} \pi x^3 = \frac{x^3}{3} \]

or 8:1

If the radius of a sphere is doubled, the volume increases 8 times.

\[ \frac{\pi (2x)^3}{3} = \frac{8\pi x^3}{3} \]

2 3 8

5 8, true

2 is a solution to the inequality.
2.7 Check Points

1. a. 

b. 

c. 

2. a. 0

b. .5

3. \( x > 0 \)

The solution set is \( x > 0 \).

4. \( 8x \geq 4 \)

The solution set is \( x \geq 4 \).

5. a. \( x \leq 2 \)

The solution set is \( x \leq 2 \).

b. \( y \geq 18 \)

The solution set is \( y \geq 18 \).

6. \( 5y \geq 17 \)

The solution set is \( y \geq 3 \).

7. \( 6x \leq 5x \)

The solution set is \( x \leq 5 \).
8. \(2(x + 3) \leq 3(x + 2) + 4\)
   \(2x + 6 \leq 3x + 6 + 14\)
   \(2x + 7 \geq 3x + 8\)
   \(2x \geq x + 1\)
   \(x \geq 1\)

   The solution set is \(x \geq 1\), or \(x \geq 1\).

9. \(4(x + 2) = 4x + 15\)
   \(4x + 8 = 4x + 15\)
   \(8 = 15\), false

   There is no solution or \(x\).

10. \(3(x + 1) = 2x + 1 + x\)
    \(3x + 3 = 3x + 1 + x\)
    \(3 = 1 + x\)
    \(x = 2\), true

   The solution is \(x = 2\), or \(x = 2\) is a real number.

11. Let \(x\) your grade on the final examination.
    \[
    \begin{array}{c|c}
    82 & 74 \\
    78 & 80 \\
    \hline
    5 & \frac{234}{5} \\
    \hline
    \end{array}
    \]
    \[\frac{234}{5} \geq 80\]
    \[5 \geq \frac{234}{5} \geq 80\]
    \[5 \geq 234 \geq 400\]
    To earn a B you must get at least 83% on the final examination.

12. Let \(x\) the number of people you invite to the picnic.
    \[
    95 \geq 35x + 1600 \\
    35x \geq 1505 \\
    \frac{35x}{35} \geq \frac{1505}{35} \\
    x \geq 43
    \]
    To can invite at most 43 people to the picnic.

2.7 Concept and Vocabulary Check
1. \((,5)\)
2. \((,)\)
3. \(b, c\)
4. \(bc\)
5. \(be\)
6. subtracting 4; dividing; 3; direction; >; <
7. or the empty set
8. \((,\)\)

2.7 Exercise Set
1. \(x > 5\)
2. \(x \leq 3\)
3. \(x < -2\)
4. \(x < 0\)
5. \(x \geq 4\)
6. \(x \leq 6\)
Section 2.7 Solving Linear Inequalities

7. \( x < 4.5 \)
   \(-2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8\)

8. \( x < 7.5 \)
   \(-2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10\)

9. \( 2x < 6 \)
   \(-3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7\)

10. \( 3x < 6 \)
    \(-4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7\)

11. \( x < 3 \)
    \(-3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7\)

12. \( 2x < 0 \)
    \(-6 \quad -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4\)

13. \( .3 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

14. \( .5 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

15. \( 5 \frac{1}{2} \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

16. \( 7 \frac{1}{2} \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

17. \( .0 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

18. \( .1 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

19. \( .4 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

20. \( .5 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5\)

21. \( x < 3 \)
    \(-7 \quad -6 \quad -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9\)

22. \( x < 5 \)
    \(-1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9\)

23. \( x < 10 \)
    \(-2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9\)

24. \( x < 2 \)
    \(-2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9\)

25. \( y < 0 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8\)

26. \( y < 3 \)
    \(-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8\)

27. \( 3x < 2 \)
    \(-3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9\)
28. \[2x + 9 = 2 \]
\[2x = 1 \]
\[x = \frac{1}{2} \]
\[3\]

29. \[5x + 9 = 4x + 7 \]
\[5x = 4x - 2 \]
\[x = -2 \]
\[\frac{1}{8} \]

30. \[3x + 8 = 2x + 11 \]
\[3x = 2x + 3 \]
\[x = 3 \]
\[\frac{1}{3} \]

31. \[7x + 7 = 6x + 3 \]
\[7x = 6x - 4 \]
\[x = 4 \]
\[\frac{1}{4} \]

32. \[8x + 9 = 7x + 3 \]
\[8x = 7x - 6 \]
\[x = 6 \]
\[\frac{1}{6} \]

33. \[x + \frac{2}{3} \]
\[x + \frac{2}{3} \]
\[x + \frac{2}{3} \]
\[x = \frac{2}{3} \]
\[\frac{1}{2} \]

34. \[x \cdot \frac{5}{3} \leq \frac{6}{3} \]
\[x \cdot \frac{5}{6} \leq 2 \]
\[x \leq \frac{2}{5} \]
\[\frac{1}{6} \]

35. \[y + \frac{7}{2} \leq \frac{8}{2} \]
\[y + \frac{7}{2} \leq 4 \]
\[y \leq \frac{1}{2} \]
\[\frac{3}{8} \]

36. \[y + \frac{3}{4} \leq 4 \]
\[y + \frac{3}{4} \leq 3 \]
\[y \leq \frac{1}{2} \]
\[\frac{5}{12} \]

37. \[15y + 13 \leq 13 + 16y \]
\[15y + 13 \leq 13 + 16y \]
\[y \leq 13 \]
\[\frac{13}{16} \]

\[y \leq 13 \]
\[\frac{13}{13} \]

\[y \leq 13 \]
\[\frac{13}{13} \]

\[y \leq 13 \]
\[\frac{13}{13} \]

\[y \leq 13 \]
\[\frac{13}{13} \]

\[y \leq 13 \]
\[\frac{13}{13} \]

\[y \leq 13 \]
\[\frac{13}{13} \]

\[y \leq 13 \]
\[\frac{13}{13} \]
Chapter 2 Linear Equations and Inequalities in One Variable

Section 2.7 Solving Linear Inequalities

38. \[ 12 \leq 17 \leq 20 \leq 13y \]
\[ 12 \leq 13y \leq 20 \leq 17 \]
\[ y \geq 3 \]

39. \[ \frac{1}{2} x + 4 \]
\[ 2 \frac{1}{2} x = 24 \]
\[ 2 \]
\[ 1x = 8 \]
\[ x = 8 \]

40. \[ \frac{1}{3} x - 3 \]
\[ 2 \frac{1}{3} x = 23 \]
\[ 2 \]
\[ x = 6 \]

41. \[ \frac{x}{3} \geq 2 \]
\[ 3 \frac{x}{3} \geq 32 \]
\[ 3 \]
\[ x \geq 6 \]

42. \[ \frac{x}{4} \leq 1 \]
\[ 4 \frac{x}{4} \leq 41 \]
\[ 4 \]
\[ x \leq 4 \]

43. \[ 4x + 20 \]
\[ \frac{4x}{4} + 20 \]
\[ x = 5 \]
\[ .5 \]

44. \[ 6x + 18 \]
\[ \frac{6x}{6} + 18 \]
\[ 6 \]
\[ x = 6 \]
\[ .3 \]

45. \[ 3x + 21 \]
\[ \frac{3x}{3} + 21 \]
\[ x = 7 \]

46. \[ 7x + 56 \]
\[ \frac{7x}{7} + 56 \]
\[ x = 8 \]

47. \[ 3x + 15 \]
\[ \frac{3x}{3} + 15 \]
\[ x = 5 \]

48. \[ 7x + 21 \]
\[ \frac{7x}{7} + 21 \]
\[ x = 3 \]
49. \[ 3x \leq 15 \]
   \[ 3x \leq 15 \]
   
   \[ x \leq 5 \]
   
   \[ x \leq 5 \]

50. \[ 7x \leq 21 \]
   \[ 7x \leq 21 \]
   
   \[ 7 \leq 7 \]
   
   \[ x \leq 3 \]

51. \[ 16x \geq 48 \]
   \[ 16x \geq 48 \]
   
   \[ 16 \geq 16 \]
   
   \[ x \geq 3 \]

52. \[ 20x \leq 140 \]
   \[ 20x \leq 140 \]
   
   \[ 20 \leq 20 \]
   
   \[ x \leq 7 \]

53. \[ 4y \geq \frac{1}{2} \]
   \[ 24y \geq \frac{1}{2} \]
   
   \[ 8y \geq 1 \]
   
   \[ 8y \geq \frac{1}{8} \]
   
   \[ y \geq \frac{1}{8} \]

54. \[ 2y \geq \frac{1}{2} \]
   \[ \frac{1}{2}y \geq \frac{1}{2} \]
   
   \[ 2 \geq 2 \]
   
   \[ y \geq \frac{1}{4} \]

55. \[ x \geq 4 \]
   \[ 1x \geq 14 \]
   
   \[ x \geq 4 \]

56. \[ x \geq 3 \]
   \[ 1x \geq 13 \]
   
   \[ x \geq 3 \]

57. \[ 2x \geq 7 \]
   \[ 2x \geq 7 \]
   
   \[ 2x \geq 7 \]
   
   \[ 2x \geq 10 \]
   
   \[ x \geq 5 \]

58. \[ 3x \geq 14 \]
   \[ 3x \geq 14 \]
   
   \[ 3x \geq 14 \]
   
   \[ 3x \geq 12 \]
   
   \[ x \geq 4 \]
Section 2.7 Solving Linear Inequalities

59. \[3x + 18\]
\[\begin{array}{c}
3x + 3 + 18 + 3 \\
3x + 15 \\
\hline
3x + 15 \\
\hline
\end{array}\]
\[\frac{3x}{3} \quad \frac{15}{3}\]
\[x = 5\]
\[x = 5\]

60. \[8x + 4l2\]
\[\begin{array}{c}
8x + 4 + 12 + 4 \\
8x + 16 \\
\hline
8x + 16 \\
\hline
8 \quad 8 \\
\hline
x = 2 \\
\hline
\end{array}\]
\[2,\]

61. \[3.7x + 17\]
\[\begin{array}{c}
3.7x + 3 + 17 + 3 \\
7x + 14 \\
\hline
7x + 14 \\
\hline
7 \quad 7 \\
\hline
x = 2 \\
\hline
\end{array}\]
\[2,\]

62. \[5.3x + 20\]
\[\begin{array}{c}
5.3x + 5 + 20 + 5 \\
3x + 15 \\
\hline
3x + 15 \\
\hline
3 \quad 3 \\
\hline
x = 5 \\
\hline
\end{array}\]
\[.5\]

63. \[2x + 3\]
\[\begin{array}{c}
2x + 3 + 3 + 3 \\
2x + 6 \\
\hline
2x + 6 \\
\hline
2 \quad 2 \\
\hline
\end{array}\]

64. \[3x + 14 + 5\]
\[\begin{array}{c}
3x + 14 + 14 + 5 + 14 \\
3x + 9 \\
\hline
\frac{3x}{3} \quad \frac{9}{3} \\
\hline
\end{array}\]
\[x = 3\]

65. \[5x + 1\]
\[\begin{array}{c}
5x + 5 + 1 + 5 \\
4x + 4 \\
\hline
4x + 4 \\
\hline
1x + 14 \\
\hline
4,\]

66. \[3x + 3\]
\[\begin{array}{c}
3x + 3 + 3 + 3 \\
1x + 16 \\
\hline
1x + 6 \\
\hline\]
\[.6\]

67. \[2x + 5 \quad x + 6\]
\[\begin{array}{c}
2x + 5 + x + 6 + x \\
3x + 5 + 6 \\
3x + 5 + 6 + 5 \\
\hline
3x + 11 \\
\hline
\frac{3x}{3} \quad \frac{11}{3} \\
\hline
\end{array}\]
\[\frac{11}{3}\]
Chapter 2  Linear Equations and Inequalities in One Variable

Section 2.7  Solving Linear Inequalities

\[ x \geq 3 \]

\[ x \leq 3 \]

\[ -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \]
68. \[ 6x + 24x + 6 \]
\[ 6x + 24x + 6x + 6x \]
\[ 2x + 26 \]
\[ 2x + 2262 \]
\[ 2x + 8 \]
\[ 2x + 8 \]
\[ x + 4 \]
\[ \frac{4}{-5 - 4 - 3 - 2 - 1 0 1 2 3 4 5} \]

69. \[ 2y + 55y + 11 \]
\[ 2y + 55y + 5y + 11 + 5y \]
\[ 3y + 511 \]
\[ 3y + 5515 \]
\[ 3y + 6 \]
\[ 3y + 6 \]
\[ y + 2 \]
\[ \frac{2}{-5 - 4 - 3 - 2 - 1 0 1 2 3 4 5} \]

70. \[ 4y + 79y + 2 \]
\[ 4y + 79y + 9y + 29y \]
\[ 5y + 72 \]
\[ 5y + 7727 \]
\[ 5y + 5 \]
\[ 5y + 5 \]
\[ y + 1 \]
\[ \frac{1}{-5 - 4 - 3 - 2 - 1 0 1 2 3 4 5} \]

71. \[ 32y + 19 \]
\[ 6y + 39 \]
\[ 6y + 3393 \]
\[ 6y + 12 \]
\[ 6y + 12 \]
\[ 6y + 6 \]
\[ y + 2 \]
\[ \frac{2}{-5 - 4 - 3 - 2 - 1 0 1 2 3 4 5} \]

72. \[ 42y + 112 \]
\[ 8y + 412 \]
\[ 8y + 44124 \]
\[ 8y + 16 \]
\[ \frac{8y + 16}{8 8} \]
\[ y + 2 \]
\[ \frac{2}{-5 - 4 - 3 - 2 - 1 0 1 2 3 4 5} \]

73. \[ 3x + 152x + 1 \]
\[ 3x + 352x + 1 \]
\[ 3x + 22x + 1 \]
\[ 3x + 22x + 12x + 21 \]
\[ x + 2212 \]
\[ x + 3 \]
\[ \frac{3}{-5 - 4 - 3 - 2 - 1 0 1 2 3 4 5} \]

74. \[ 4x + 123x + 6 \]
\[ 4x + 423x + 6 \]
\[ 4x + 63x + 6 \]
\[ 4x + 63x + 6x + 6 \]
\[ x + 6666 \]
\[ x + 0 \]
\[ \frac{0}{-5 - 4 - 3 - 2 - 1 0 1 2 3 4 5} \]

75. \[ 8x + 332x + 1x + 5 \]
\[ 8x + 36x + 3x + 5 \]
\[ 8x + 35x + 8 \]
\[ 8x + 35x + 5x + 85x \]
\[ 3x + 38 \]
\[ 3x + 3383 \]
\[ 3x + 5 \]
\[ x + 5 \]
\[ x + \frac{5}{3} \]
\[ \frac{5}{3} \]
Section 2.7 Solving Linear Inequalities
76. \[
\begin{align*}
7y &+ 45y = 12y + 7y \\
152y &+ 510y = 2y + 10 + 10y \\
8y &+ 10 = y + \frac{5}{4} \\
\end{align*}
\]

77. \[
\begin{align*}
\frac{x}{3} &+ 21 = \frac{x}{3} + 22 + 12 \\
\frac{x}{3} &+ 33 = 3 - 33 \\
\frac{x}{3} &+ 9 = x + 9, \\
\end{align*}
\]

78. \[
\begin{align*}
\frac{x}{4} &+ 31 = \frac{x}{4} + 33 + 13 \\
\frac{x}{4} &+ 44 = 4 - 44 \\
x &+ 16 = x + 16 \\
\end{align*}
\]

79. \[
\begin{align*}
\frac{1}{2}x &+ 14 = 1x + 6 \\
\frac{x}{2} &+ 23 = 2x + 6 \\
1x &+ 6 = x + 6 \\
\end{align*}
\]

80. \[
\begin{align*}
\frac{1}{2}x &+ 5 = \frac{x}{2} + 5 \\
\frac{1}{2}x &+ 15 = \frac{x}{2} + 4 \\
2\frac{x}{2} &+ 24 = x + 8 \\
\end{align*}
\]

81. \[
\begin{align*}
4x &+ 44 = 4x + 20 \\
4x &+ 44 = 4x + 20 = 4 \\
4x &+ 16 = 4x + 16 = 16 \\
4x &+ 4x = 4x + 16 = 4x \\
4x &+ 4x = 4x + 16 = 4x \\
\end{align*}
\]

The original inequality is equivalent to the false statement \(0 < -16\), so the inequality has no solution. The solution set is \(\emptyset\).

82. \[
\begin{align*}
3x &+ 5 = 3x + 2 \\
3x &+ 5 = 3x + 6 \\
3x &+ 5 = 3x + 6 = 3x \\
5 &+ 6 = 5 \\
\end{align*}
\]

The original inequality is equivalent to the false statement \(5 \neq 6\), so the inequality has no solution. The solution set is \(\emptyset\).
83. \[x < 7\]
\[x < 3 \quad 7\]

The solution set is the set of all real numbers, written \(x < 7\), is a real number.

84. \[x > 10\]
\[x > 4 \quad 10\]

The solution set is the set of all real numbers, written \(x > 10\), is a real number.

85. \[7x > 2\]
\[7x > 14\]
\[7x > 7x \quad 14 \quad 7x\]
\[0 \quad 14\]

Since 0 < 14 is a false statement, the original inequality has no solution.
The solution set is \(x < 0\),.

86. \[3x > 2\]
\[3x > 6\]
\[3x > 3x \quad 6 \quad 3x\]
\[1 \quad 6\]

Since 1 < 6 is a false statement, the original inequality has no solution.
The solution set is \(x < 6\),.

87. \[6 > 1\]
\[2x > 1\]
\[2x > 6 \quad 2x\]
\[2x > 2x \quad 1 \quad 2x\]
\[6 \quad 1\]

Since 6 > 1 is a true statement, the original inequality is true for all real numbers. The solution set is \(x > 1\), is a real number.

88. \[5x > 10\]
\[5x > 20 \quad 5x\]
\[5x > 20 \quad 5x \quad 10 \quad 5x\]
\[20 \quad 10\]

Since 20 > 10 is a true statement, the original inequality is true for all real numbers. The solution set is \(x > 10\), is a real number.

89. \[5x > 1\]
\[5x > 4 \quad 4x \quad 1\]

The solution set is \(x > 1\), is a real number.

90. \[6x < 3 \quad 3x \quad 3\]
\[6x < 3 \quad 3x \quad 3\]

The solution set is \(x < 3\), is a real number.

91. \[3x > a \quad b\]
\[3x > b \quad a\]

The solution set is \(x > a\),.

92. \[2x > a \quad b\]
\[2x > a \quad a \quad b\]

The solution set is \(x > a\),.

93. \[y > mx \quad b\]
\[yb > mx \quad m\]

The solution set is \(y > b\),.

\[yb > x \quad or \quad x > yb\]

\[m \quad m\]
94. \[ \frac{y mx b}{y b mx b b y b} \]
\[ \frac{mx}{y b mx m} \]
\[ \frac{y b}{x} \quad \text{or} \quad \frac{y b}{m} \]

95. \( x \) is between \(-2\) and \(2\), so \( |x| 2 \).

96. \( x \) is between \(3\) and \(3\), so \( |x| 3 \).

97. \( x \) is less than \(-2\) or greater than \(2\), so \( |x| 2 \).

98. \( x \) is greater than \(3\) or less than \(3\), so \( |x| 3 \).

99. weird, cemetery, accommodation

100. weird

101. supersede, inoculate

102. supersede, inoculate

103. harass

104. cemetery, accommodation, harass

105. a. \[
\begin{array}{l}
p \quad 0.4x 16 \\
0.430 16 \\
12 16 \\
4
\end{array}
\]
According to the formula 4% of U.S. college freshman had an average grade of C in high school. This is the same as the bar graph.

b. \[
\begin{array}{l}
p \quad 0.4x 16 \\
1.2 \quad 0.4x 16 \\
14.8 \quad 0.4x \\
37
\end{array}
\]
37 years after 1980, or from 2017 onward.

106. a. \[
\begin{array}{l}
p \quad 0.4x 16 \\
0.420 16 \\
8 16 \\
8
\end{array}
\]
According to the formula 8% of U.S. college

b. \[
\begin{array}{l}
p \quad 0.4x 16 \\
0.8 \quad 0.4x 16 \\
15.2 \quad 0.4x \\
38
\end{array}
\]
38 years after 1980, or from 2018 onward.

107. a. Let \( x \) = your grade on the final exam.

\[
\begin{array}{l}
86 88 x \\
3
\end{array}
\]

3 \[
\begin{array}{l}
86 88 x \\
3
\end{array}
\]
390

86 88 x 270
174 x 270
174 x 174 270 174

\( x \) 96
You must get at least a 96% on the final exam to earn an A in the course.

b. \[
\begin{array}{l}
86 88 x \\
3
\end{array}
\]
80

3 \[
\begin{array}{l}
86 88 x \\
3
\end{array}
\]
380
86 88 x 240
174 x 240
174 x 174 240 174

\( x \) 66
If you get less than a 66 on the final exam, your grade will be below a B.

108. a. If you get 100 on the final, your average will be \[
\frac{887886 100}{4} \quad \frac{354}{88} \quad \frac{4}{4}
\]
Since 88 90 and it is not possible to get more than 100 on the final, an A in the course is not possible.

b. Let \( x \) = your grade on the final exam.

\[
\begin{array}{l}
88 78 86 x \\
4
\end{array}
\]
80

\[
\begin{array}{l}
887886 x \\
4
\end{array}
\]
480
freshman had an average grade of C in high school. The formula overestimates by 1%.
Section 2.7 Solving Linear Inequalities

88 78 86 x 320
252 x 320
252 x 252 320 252
x 68

You must get at least 68 to get a B in the course.
109. Let \( x = \) number of miles driven.
\[
\begin{align*}
80 & \quad 0.25x \quad 400 \\
80 & \quad 0.25x \quad 80 \quad 400 \quad 80 \\
0.25x & \quad 320 \\
0.25 & \quad 0.25 \\
x & \quad 1280
\end{align*}
\]
You can drive up to 1280 miles.

110. Let \( x = \) the number of miles driven.
\[
\begin{align*}
60 & \quad 0.50 \quad 600 \\
60 & \quad 0.50x \quad 60 \quad 600 \quad 60 \\
0.50 & \quad 540 \\
0.50 & \quad 0.50 \\
x & \quad 1080
\end{align*}
\]
You can drive up to 1080 miles.

111. Let \( x = \) number of cement bags.
\[
\begin{align*}
245 & \quad 95x \quad 3000 \\
245 & \quad 95x \quad 245 \quad 3000 \quad 245 \\
95x & \quad 2755 \\
95 & \quad 95 \\
x & \quad 29
\end{align*}
\]
Up to 29 bags of cement can safely be listed on the elevator in one trip.

112. Let \( x = \) the number of cement bags.
\[
\begin{align*}
265 & \quad 65x \quad 2800 \\
265 & \quad 65x \quad 265 \quad 2800 \quad 265 \\
65x & \quad 2535 \\
65 & \quad 65 \\
x & \quad 39
\end{align*}
\]
Up to 39 bags of cement can safely be lifted on the elevator in one trip.

113–116. Answers will vary.

117. makes sense

118. makes sense

119. makes sense

122. false; Changes to make the statement true will vary. A sample change is: The statement “\( x \) is at most 5” is written \( x \leq 5 \).

123. false; Changes to make the statement true will vary. A sample change is: The inequality \( 4x \geq 20 \) is equivalent to \( x \geq 5 \).

124. true

125. Let \( x = \) number of miles driven.
Weekly cost for Basic Rental: $260.
Weekly cost for Continental: \( $80 + 0.25x \)
The cost for Basic Rental is a better deal if \( 80 \geq 0.25 \times 260 \).

Solve this inequality.
\[
\begin{align*}
80 & \quad 0.25x \quad 80 \quad 260 \quad 80 \\
0.25x & \quad 180 \\
0.25 & \quad 0.25 \\
x & \quad 720
\end{align*}
\]
Basic Car Rental is a better deal if you drive more than 720 miles in a week.

126. Let \( x = \) the number of hours a person works out at the fitness club yearly.

Yearly cost at first club (in dollars)
500 \( 1x \) \( 500 \ x \)
Yearly cost at second club 440 \( 1.75x \)
The first club will be cheaper if \( 500 \geq 440 \times 1.75 \).

Solve this inequality.
\[
\begin{align*}
500 & \quad 1.75x \quad 440 \quad 1.75x \quad 500 \\
0.75x & \quad 440 \\
0.75 & \quad 0.75 \\
x & \quad 60
\end{align*}
\]
\( x \leq 80 \)
The first club will be cheaper if the person works out more than 80 hours a year.

127. \( \frac{1.45 \times 7.23}{1.442} \)
\[
\begin{align*}
1.45 & \quad 7.23 \quad 1.45 \\
7.23 & \quad 2.892
\end{align*}
\]
120. makes sense

121. false; Changes to make the statement true will vary.
A sample change is: The inequality \( x > 0 \) is equivalent to \( x > 3 \).
128.  
\[
\begin{align*}
126.8 &\quad 9.4 \quad 4.8 \quad y \quad 34.5 \\
126.8 &\quad 9.4 \quad y \quad 4.8 \quad y \quad 34.5 \quad 4.8 \quad y \\
126.8 &\quad 14.2 \quad y \\
126.8 &\quad 14.2 \quad y \\
126.8 &\quad 14.2 \quad y \\
126.8 &\quad 14.2 \\
y &\quad 6.5 \\
6.5,
\end{align*}
\]

129. \( A = PB, A = 8, P = 40\% = 0.4 \)

\[
\begin{align*}
A &= PB \\
8 &= 0.4B \\
8 &= 0.4B \\
0.4 &= 0.4 \\
20 &= B \\
8 \text{ is 40\% of 20.}
\end{align*}
\]

130. Let \( x \) the width of the rectangle.

Let \( x \) 5 the length of the rectangle. 

\[
\begin{align*}
P &= 2l + 2w \\
34 &= 2(x \cdot 5) + 2x \\
34 &= 2x + 10 + 2x \\
34 &= 4x + 10 \\
34 &= 4x + 10 \\
24 &= 4x \\
6 &= x \\
x &= 5 \text{ 11} \\
\text{The width is 6 inches and the length is 11 inches.}
\end{align*}
\]

\[
5x = 16 \\
3x = 8
\]

131. 

\[
\begin{align*}
5x &= 16 \\
3x &= 24 \\
5x &= 16 \\
3x &= 24 \\
3x &= 24 \\
2x &= 24 \\
2x &= 24 \\
2x &= 24 \\
2x &= 8 \\
2x &= 8 \\
2 &= 2 \\
2 &= 2 \\
x &= 4 \\
\text{Check: } 54 &= 16 \quad 34 \quad 8 \\
20 &= 16 \quad 312 \\
36 &= 36, \text{ true}
\end{align*}
\]

132. \( x \cdot 4y \quad 14 \\
2 \quad 4(3) \quad 14 \\
2 \quad 12 \quad 14 \\
14 \quad 14, \text{ true}
\]

Yes, the values make it a true statement.

133. \( x \cdot 4y \quad 14 \\
12 \quad 4(1) \quad 14 \\
12 \quad 4 \quad 14 \\
8 \quad 14, \text{ false}
\]

No, the values make it a false statement.

134. \( y = \frac{2}{3} \quad 1 \\
y = \frac{2}{3} \quad (6) \quad 1 \\
y = 4 \quad 1 \\
y = 3
\]

Chapter 2 Review Exercises

1. \( x \quad 10 \quad 22 \\
2x &= 10 \quad 22 \quad 10 \\
2x &= 32 \quad x \\
The solution is set is 32.
\]

2. \( 14 \quad y \quad 8 \\
14 \quad 8 \quad y \quad 8 \quad 8 \\
22 \quad y \\
The solution is set is 22.
\]

3. \( 7z \quad 3 \quad 6z \quad 9 \\
7z \quad 3 \quad 6z \quad 6z \quad 9 \quad 6z \quad z \quad 3 \quad 9 \\
z \quad 3 \quad 3 \quad 3 \quad 3 \quad 3 \\
z \quad 12 \quad 12 \\
The solution is set is 12.
Chapter 2 Linear Equations and Inequalities in One Variable

4. \[4x 3 \quad 3x 10 \]
\[4x 12 \quad 3x 10 \]
\[4x 12 3x \quad 3x 10 3x \]
\[x 12 10 \]
\[x 12 12 \quad 10 12 \]
\[x 22 \]
The solution is set is 22.

5. \[6x 3x 9 1 5x 7x 3 \]
\[3x 8 2x 3 \]
\[3x 8 2x \quad 2x 3 2x \]
\[x 8 3 \]
\[x 8 8 3 8 \]
\[x 5 \]
The solution is set is 5.

6. \[\frac{x}{8} 10 \]
\[8 \frac{x}{8} 810 \]
\[x 80 \]
The solution is set is 80.

7. \[\frac{y}{8} 7 \]
\[8 \frac{y}{8} 87 \]
\[x 8 \]
\[y 56 \]
The solution is set is 56.

8. \[7z 77 \]
\[7z 77 \]
\[7 \quad 7 \]
\[z 11 \]
The solution is set is 11.

9. \[36 9y \]
\[\frac{36}{9} \quad 9y \]
\[9 \quad 9 \]
\[4 \quad y \]
The solution is set is 4.

10. \[\frac{3}{5}x \quad 9 \]
\[\frac{5}{3} \quad \frac{3}{x} \quad \frac{5}{5} \]
\[3 \quad 5 \quad 3 \]
\[1x \quad 15 \]
\[x 15 \]
The solution is set is 15.

11. \[\frac{x}{30} \quad \frac{y}{5} \]
\[\frac{2}{30} \quad \frac{2}{y} \quad \frac{5}{5} \]
\[5 \quad 5 \quad 2 \]
\[12 \quad y \]
The solution is set is 12.

12. \[x 25 \]
\[1x \quad 125 \]
\[x 25 \]
The solution is set is 25.

13. \[\frac{x}{10} \]
\[10 \quad \frac{x}{10} \quad 101 \]
\[x 10 \]
\[1x \quad 110 \]
\[x 10 \]
The solution is set is 10.

14. \[4x \quad 9 \quad 33 \]
\[4x \quad 9 \quad 9 \quad 33 \quad 9 \]
\[4x \quad 24 \]
\[4x \quad 24 \]
\[\frac{4}{4} \quad \frac{4}{4} \]
\[x \quad 6 \]
The solution is set is 6.

15. \[3y \quad 2 \quad 13 \]
\[3y \quad 2 \quad 2 \quad 13 \quad 2 \]
\[3y \quad 15 \]
\[3y \quad 15 \]
\[3y \quad 15 \]
The solution is set is 5.
16. \(5z \ 20 \ 3z\)
\(5z \ 20 \ 3z \ 3z \ 3z\)
\(2z \ 20 \ 0\)
\(2z \ 20 \ 20 \ 0 \ 20\)
\(2z \ 20\)
\(2z \ 20\)
\(2\ 2\)
\(z \ 10\)
The solution is set is 10.

17. \(5x \ 3 \ x \ 5\)
\(5x \ 3 \ x \ 5 \ x\)
\(4x \ 3 \ 5\)
\(4x \ 3 \ 3 \ 5 \ 3\)
\(4x \ 8\)
\(4x \ 8\)
\(4 \ 4\)
\(x \ 2\)
The solution is set is 2.

18. \(3 \ 2x \ 9 \ 8x\)
\(3 \ 2x \ 8x \ 9 \ 8x \ 8x\)
\(3 \ 6x \ 9\)
\(3 \ 6x \ 3 \ 9 \ 3\)
\(6x \ 6\)
\(6x \ 6\)
\(6\)
\(x \ 1\)
The solution is set is 1.

\(p \ 0.9n \ 15\)
\(p \ 0.9(5) \ 15 \ 19.5\)
According to the formula, 19.5% of Americans were religiously unaffiliated in 2012. The formula underestimates the actual value given in the bar graph by 0.1%.

b. \(p \ 0.9n \ 15\)
\(24 \ 0.9n \ 15\)
\(9 \ 0.9n\)
\(9 \ 0.9n\)
\(0.9 \ 0.9\)
\(10 \ n\)

20. \(5x \ 9 \ 7x \ 6 \ x \ 18\)
\(2x \ 15 \ x \ 18\)
\(2x \ 15 \ x \ x \ 18 \ x\)
\(3x \ 15 \ 18\)
\(3x \ 15 \ 15 \ 18 \ 15\)
\(3x \ 3\)
\(\frac{3x}{x} \ 3\)
\(3 \ 3\)
\(x \ 1\)
The solution is set is 1.

21. \(3x \ 4 \ 5x \ 12\)
\(3x \ 12 \ 5x \ 12\)
\(3x \ 12 \ 5x \ 5x \ 12 \ 5x\)
\(2x \ 12 \ 12\)
\(2x \ 12 \ 12 \ 12\)
\(2x \ 24\)
\(2x \ 24\)
\(2 \ 2\)
\(x \ 12\)
The solution is set is 12.

22. \(1 \ 26 \ y \ 3y \ 2\)
\(1 \ 12 \ 2y \ 3y \ 2\)
\(2y \ 11 \ 3y \ 2 \ 3y\)
\(y \ 11 \ 2\)
\(y \ 11 \ 11 \ 2 \ 11\)
\(y \ 13\)
\(y \ 13\)
The solution is set is 13.

23. \(2x \ 8 \ 3x \ 15 \ 2x \ 2\)
\(5x \ 7 \ 2x \ 2\)
\(5x \ 7 \ 2x \ 2x \ 2 \ 2x\)
\(3x \ 7 \ 2\)
\(3x \ 7 \ 7 \ 2 \ 7\)
\(3x \ 9\)
\(3x \ 9\)
\(\frac{3}{3} \ 3\)

If trends continue, 24% of Americans will be
religiously unaffiliated in 10 years after 2007, or in 2017.

The solution is set $x = 3$. 
24. \[
\begin{align*}
2y + 4 & \quad 3y + 2 \quad 2y + 2 \\
2y + 8 & \quad 3y + 2 \quad 2y + 2 \\
5y + 10 & \quad 6y \\
5y + 10 & \quad 6y + 6y \\
10 & \quad y + 0 \\
10y + 10 & \quad 0 \\
y + 10 & 
\end{align*}
\]
The solution is set is 10.

25. \[
\frac{2x}{3} \quad \frac{x}{6} \quad 1
\]
To clear fractions, multiply both sides by the LCD, which is 6.
\[
\begin{align*}
6 \frac{2x}{3} & \quad 6 \frac{x}{6} \quad 1 \\
3 & \quad 6 &
\end{align*}
\]
\[
\begin{align*}
6 \frac{2x}{3} & \quad \frac{x}{6} \quad 61 \\
3 & \quad 6 &
\end{align*}
\]
\[
\begin{align*}
4x & \quad x \quad 6 \\
x & \quad x \quad 6 \\
3x & \quad 6 \\
3 & \quad 3 &
\end{align*}
\]
\[
\begin{align*}
x & \quad 2 \\
\end{align*}
\]
The solution is set is 2.

26. \[
\frac{x}{2} \quad \frac{1}{10} \quad \frac{x}{5} \quad \frac{1}{2}
\]
Multiply both sides by the LCD, which is 10.
\[
\begin{align*}
10 \frac{x}{2} & \quad \frac{1}{10} \quad 10 \frac{x}{5} \quad \frac{1}{2} \\
2 & \quad 10 & \quad 5 & \quad 2
\end{align*}
\]
\[
\begin{align*}
10 \frac{x}{2} & \quad \frac{1}{10} \quad 10 \frac{x}{5} \quad \frac{1}{2} \\
5x & \quad 1 \quad 2x & \quad 5 \\
5x & \quad 1 \quad 2x \quad 2x \quad 5 \quad 2x \\
x & \quad 1 \quad 5 \\
x & \quad 1 \quad 1 \quad 5 \quad 1 \\
x & \quad 6 \\
x & \quad 3 \quad 6 \\
x & \quad 3 \quad 3 &
\end{align*}
\]
The solution is set is 2.

27. Multiply both sides by 100 to clear the decimals.
\[
0.5x \quad 8.75 \quad 13.25
\]
\[
100(0.5x) \quad 87.5 \quad 1325 \\
50x \quad 87.5 \quad 1325 \\
50x \quad 450 \\
x \quad 9
\]
The solution set is 9.

28. First apply the distributive property to remove the parentheses, and then multiply both sides by 100 to clear the decimals.
\[
0.1(x) \quad 3 \quad 1.1 \quad 0.25x \\
0.1x \quad 0.3 \quad 1.1 \quad 0.25x \\
100(0.1x) \quad 0.3 \quad 100(1.1 \quad 0.25x) \\
10x \quad 30 \quad 110 \quad 25x \\
10x \quad 140 \quad 25x \\
35x \quad 140 \\
35 \quad 35 \\
x \quad 4
\]
The solution set is 4.

29. \[
38x \quad 1 \quad 65 \quad 4x \\
24x \quad 3 \quad 30 \quad 24x \\
24x \quad 3 \quad 24x \quad 30 \quad 24x \quad 24x \\
3 \quad 30
\]
Since \(-3 = 30\) is a false statement, the original equation is inconsistent and has no solution or .

30. \[
42x \quad 3 \quad 4 \quad 8x \quad 8
\]
\[
8x \quad 12 \quad 4 \quad 8x \quad 8 \\
8x \quad 8 \quad 8x \quad 8 \\
8x \quad 8x \quad 8x \quad 8x \\
8 \quad 8
\]
Since \(-8 = -8\) is a true statement, the solution is the set of all real numbers, written
\[
x \mid \text{is a real number.}
\]
31. \( H = 0.7220 \ a \)
\[ 133 \ a = 0.7220 \ a \]
\[ 133 \ a = 154 \ a = 154 \ a = 0.7a \]
\[ 21 \ a = 0.7a \]
\[ 0.7 \ a \]
If the optimal heart rate is 133 beats per minute, the person is 30 years old.

32. \( I = Pr \) for \( r \)
\[ \frac{I}{P} = \frac{Pr}{P} \]
\[ \frac{I}{P} = \frac{r}{P} \]
\[ 3 \]
33. \( V = \frac{1}{3} Bh \) for \( h \)
\[ 3V = \frac{1}{3} Bh \]
\[ 3 \]
\[ 3V = Bh \]
\[ 3V = Bh \]
\[ \frac{3V}{h} \text{ or } h \frac{3V}{B} \]
\[ B \]

34. \( P = 2l \ w \) for \( w \)
\[ P = 2l \ w \]
\[ P = 2l \ w \]
\[ P = 2l \ w \]
\[ P = 2l \ w \]
\[ 2 \]
\[ 2 \]
\[ P = \frac{2l}{w} \text{ or } w \frac{2l}{P} \]
\[ 2 \]
\[ 2 \]
35. \( A = \frac{BC}{2} \) for \( B \)
\[ 2A = 2 \frac{BC}{2} \]
\[ 2A = B \]
\[ 2A = B \]
\[ 2A = B \]
\[ 2A = B \]
\[ 2A = B \]
36. \( T = D \ pm \) for \( m \)
\[ T = D \ pm \]
\[ T = D \ pm \]
\[ T = D \]
\[ m \text{ or } m \]
\[ p \]

37. \( A = PB; P = 8% \ 0.08, B = 120 \)
\[ A = 0.08120 \]
\[ 8\% \text{ of } 120 \text{ is } 9.6 \]

38. \( A = PB; A = 90, P = 45\% \ 0.45 \)
\[ 90 \ 0.45B \]
\[ 0.45 \]
\[ 0.45 \]
\[ 200 \ B \]
\[ 90 \text{ is } 45\% \text{ of } 200. \]

39. \( A = PB; A = 36, B = 75 \)
\[ 36 = P \]
\[ 36 = \frac{P}{75} \]
\[ 75 = 75 \]
\[ 0.48 \]
\[ P \]
\[ 36 \text{ is } 48\% \text{ of } 75. \]

40. Increase = Percent \cdot Original
First, find the increase: \( 12 - 6 = 6 \)
\[ 6 = P \]
\[ 6 = 6 \]
\[ 1 \]
The percent increase is 100%.

41. Decrease = Percent \cdot Original
First, find the decrease: \( 5 - 3 = 2 \)
\[ 2 = P \]
\[ 2 = P \]
\[ 5 \]
\[ 5 \]
\[ 0.4 \]
The percent decrease is 40%.

42. Increase = Percent \cdot Original
First, find the increase:

\[
45 - 40 = 5
\]

\[
\frac{5}{5}
\]

\[
P
\]

\[
\begin{array}{cccc}
\hline
4 & 0 \\
\hline
\end{array}
\]

\[
P
\]

\[
\begin{array}{cccc}
\hline
4 & 0 & 4 & 0 \\
\hline
\end{array}
\]

\[
4 & 0 \\
0.125 \times P
\]

The percent increase is 12.5%. 
43. Investment dollars lost last year were

\[
0.10 \times 10,000 \quad $1000 \quad \text{. This means that } $10,000 - $1000 = $9000 \text{ remains. Investment dollars gained this year are } 0.10 \times $9000 \quad $900 \quad \text{. This means that } $9000 + $900 = $9900 \text{ of the original investment remains. This is an overall loss of } 100, \quad \text{decrease = percent \cdot original}
\]

\[
\begin{array}{c|c}
100 & P \times 10,000 \\
10,000 & 10,000 \\
0.01 & P \\
\end{array}
\]

The statement is not true. Instead of recouping losses, there is an overall 1% decrease in the portfolio.

44. a. \( \frac{h}{r} \)

\[
7r \quad \frac{h}{r} \\
7r \quad h \\
7r \quad h \text{ or } h \quad 7r
\]

b. \( h \), \( 7r \); \( r \), \( 9 \)

\[
h \text{ (9) } 63
\]

The woman’s height is 63 inches or 5 feet, 3 inches.

45. \( A \), \( P \), \( B \)

\[
\begin{array}{c|c|c}
91 & 0.26 & B \\
\hline
91 & 0.26 & B \\
0.26 & 0.26 & \\
350 & B & \\
\end{array}
\]

The average U.S. household uses 350 gallons of water per day.

46. Let \( x \) = the unknown number.

\[
6x \quad 20 \quad 4x \\
6x \quad 20 \quad 4x \quad 4x \quad 4x \\
2x \quad 20 \quad 0 \\
2x \quad 20 \quad 20 \quad 0 \quad 20 \\
2x \quad 20 \\
x \quad 10
\]

The number is 10.

47. Let \( x \) = Buffett’s net worth.

Let \( x \), \( 14 \) = Gate’s net worth.

\[
x \times (x \times 14) \quad 148 \\
x \times 14 \quad 148 \\
2x \quad 14 \quad 148 \\
2x \quad 134 \\
x \quad 67 \\
x \times 14 \quad 81
\]

In 2014 Buffett’s net worth was $67 billion and Gate’s net worth was $81 billion.

48. Let \( x \) = the smaller page number.

Let \( x \), \( 1 \) = the larger page number.

\[
x \times x \quad 93 \\
2x \quad 1 \quad 93 \\
2x \quad 92 \\
x \quad 46
\]

The page numbers are 46 and 47.

49. Let \( x \) = the percentage of females.

Let \( x \), \( 2 \) = the percentage of males.

\[
x \times (x \times 2) \quad 100 \\
x \times 2 \quad 100 \\
2x \quad 2 \quad 100 \quad 2 \\
2x \quad 98 \\
x \quad 49 \\
x \times 2 \quad 51
\]

For Americans under 20, 49% are female and 51% are male.

50. Let \( x \) = number of years after 2001.

\[
7284 \quad 328 \times 12,204 \\
328 \times 4920 \\
328 \times 4920 \\
328 \times 328 \\
328 \times 15
\]

According to this model, the U.S. will spend $12,204 per pupil 15 years after 2001, or in 2016.

51. Let \( x \) = the number of checks written.

\[
6 \times 0.05 \quad 6.90 \\
6 \times 0.05 \quad 6 \quad 6.90 \quad 6 \\
0.05 \times 0.90 \\
0.05 \times 0.90 \\
0.05 \times 0.05
\]
You wrote 18 checks that month.
52. Let \( x \) the width of the field.
   Let \( 3x \) the length of the field.
   
   \[
P = 2l + 2w
   \]
   \[
   \begin{array}{l}
   400 = 23x + 2x \\
   400 = 6x + 2x \\
   400 = 8x \\
   400 = 8x \\
   \hline
   80 = 8 \\
   50 = x \\
   x = 50 \\
   3x = 150
   \end{array}
   \]
   The field is 50 yards wide and 150 yards long.

53. Let \( x \) the original price of the table.
   \[
x = 0.25x + 180
   \]
   \[
   0.75x = 180
   \]
   \[
   \begin{array}{c|c}
   0.75x & 180 \\
   \hline
   0.75 & 0.75 \\
   \end{array}
   \]
   \[
x = 240
   \]
   The table’s price before the reduction was $240.

54. Find the area of a rectangle with length 6.5 ft and width 5 ft.
   \[
   A = lw = (6.5)(5) = 32.5
   \]
   The area is 32.5 ft\(^2\).

55. Find the area of a triangle with base 20 cm and height 5 cm.
   \[
   A = \frac{1}{2}bh = \frac{1}{2}(20)(5) = 50
   \]
   The area is 50 cm\(^2\).

56. Find the area of a trapezoid with bases 22 yd and 5 yd and height 10 yd.
   \[
   A = \frac{1}{2}(a + b)
   \]
   \[
   \begin{array}{l}
   \frac{1}{2}(10)(22.5) \\
   \frac{1}{2} 10 27 135
   \end{array}
   \]
   The area is 135 yd\(^2\).

57. Notice that the height of the middle rectangle is 64 12 12 40 m.

   Using \( A = lw \) we must find the sum of areas of the middle rectangle and the two side rectangles.
   \[A = 3000 \text{ ft}^2\]
   \[3000 + 4608 = 7608\]
   The area is 7608 m\(^2\).

58. Since the diameter is 20 m, the radius is \( \frac{20}{2} = 10 \) m.
   \[
   C = 2\pi \text{ ft} = 2\pi(10) = 20\pi \text{ ft} = 63 \]
   \[
   A = \pi r^2 = \pi(10)^2 = 100\pi \text{ ft}^2 = 314
   \]
   The circumference is \( 20\pi \) m or approximately 63 m; the area is \( 100\pi \text{ m}^2 \) or approximately 314 m\(^2\).

59. \( A = 42, b = 14 \)
   \[
   A = \frac{1}{2}bh
   \]
   \[42 \frac{1}{2} 14 h \]
   \[42 \frac{1}{2} 7h \]
   \[6 h \]
   The height of the sail is 6 ft.

60. Area of floor:
   \[A = bh = (12\text{ ft})(15\text{ ft}) = 180\text{ ft}^2\]
   Area of base of stove:
   \[A = bh = (3\text{ ft})(4\text{ ft}) = 12\text{ ft}^2\]
   Area of bottom of refrigerator:
   \[A = bh = (3\text{ ft})(4\text{ ft}) = 12\text{ ft}^2\]
   The area to be covered with floor tile is \( 180\text{ ft}^2 \).
61. First, find the area of a trapezoid with bases 80 ft and 100 ft and height 60 ft.
\[ A = \frac{1}{2}h(a + b) \]
\[ \frac{1}{2} \cdot 60 \cdot (80 + 100) = 5400 \]
The area of the yard is 5400 ft\(^2\). The cost is $0.35(5400) = $1890.

62. The radius of the medium pizza is
\[ \frac{1}{2} \text{ 14 inches} \]
7 inches, and the radius of each small pizza is \( \frac{1}{2} \text{ 8 inches} \)
4 inches.

Medium pizza:
\[ A = \pi r^2 \pi(7 \text{ in.})^2 \]
\[ 49\pi \text{ in.}^2 = 154 \text{ in.}^2 \]
Small pizza:
\[ A = \pi r^2 \pi(4 \text{ in.})^2 \]
\[ 16\pi \text{ in.}^2 = 50 \text{ in.}^2 \]
The area of one medium pizza is approximately 154 in\(^2\) and the area of two small pizzas is approximately 2(50) 100 in\(^2\). Since the price of one medium pizza is the same as the price of two small pizzas and the medium pizza has the greater area, the medium pizza is the better buy. (Because the prices are the same, it is not necessary to find price per square inch in this case.)

63. Find the volume of a rectangular solid with length 5 cm, width 3 cm, and height 4 cm.
\[ V = lwh \]
\[ 5 \cdot 3 \cdot 4 = 60 \]
The volume is 60 cm\(^3\).

64. Find the volume of a cylinder with radius 4 yd and height 8 yd.
\[ V = \pi r^2h \]
\[ \pi(4)^2 \cdot 8 = 128\pi \quad 402 \]
The volume is 128\pi \text{ yd}^3 \text{ 402 yd}^3.

65. Find the volume of a sphere with radius 6 m.
\[ V = \frac{4}{3}\pi r^3 \]
\[ \frac{4}{3}\pi(6)^3 = \frac{4}{3}\pi\cdot 216 \]
\[ 288\pi \quad 905 \]
The volume is 288\pi \text{ m}^3 \text{ 905 m}^3.

66. Find the volume of each box.
\[ V = lwh \]
(8m)(4m)(3m) = 96m\(^3\)
The space required for 50 containers is
50(96 m\(^3\)) = 4800 m\(^3\).

67. Since the diameter of the fish tank is 6 ft, the radius is 3 ft.
\[ V = \pi r^2h \]
(3 \text{ ft})\(^2\) \pi 84.82
The volume of the tank is approximately 85 ft\(^3\).
Divide by 5 to determine how many fish can be put in the tank.
\[ \frac{84.82}{5} = 16.96 \]
There is enough water in the tank for 16 fish. Round down to 16, since 0.96 of a fish cannot be purchased.

68. The sum of the measures of the angles of any triangle is 180°, so
\[ x + 3x + 2x = 180\]
\[ 6x = 180 \]
\[ x = 30 \]
If \( x = 30 \), then \( 3x = 90 \) and \( 2x = 60 \), so the angles measure \( 30, 60, \) and \( 90 \).

69. Let \( x \) = the measure of the second angle.
Let \( 2x + 15 \) = the measure of the first angle.
Let \( x + 25 \) = the measure of the third angle.
\[ x \quad (2x + 15) \quad (x + 25) = 180 \]
\[ 4x + 40 = 180 \]
\[ 4x = 140 \]
\[ x = 35 \]
If \( x = 35 \), then \( 2x + 15 = 2(35) + 15 = 85 \) and \( x + 25 = 35 + 25 = 60 \). The angles measure \( 85, 35, \) and \( 60 \).

70. If the measure of an angle is 57°, the measure of its complement is 90 - 57 = 33°.

71. If the measure of an angle is 75°, the measure of its supplement is 180 - 75 = 105°.

72. Let \( x \) = the measure of the angle.
Let \( 90 - x \) = the measure of its complement.
\[ x \quad (90 - x) \]
\[ x = 115 \]
\[ 2x = 115 \]
\[ x = 57.5 \]
The measure of the angle is 57.5°.
73. Let \( x \) be the measure of the angle.
Let \( 180 - x \) be the measure of its supplement.
\[
\begin{align*}
180 \times 4x &= 45 \\
180 &= 5x \times 45
\end{align*}
\]
\[
5x = 225
\]
If \( x = 45 \), then \( 180 - x = 135 \). The measure of the angle is 45° and the measure of its supplement is 135°.

74. \( x = 1 \)

75. \( 2x = 4 \)

76. \( \frac{3}{2} \)

77. \( 0 \)

78. \( 2x = 5 \)
\[
\begin{align*}
2x &= 5 \times 3 \\
2x &= 5 \\
2x &= 8 \\
2x &= 2 \\
x &= 4
\end{align*}
\]

79. \( \frac{x}{2} = 4 \)
\[
\begin{align*}
x &= 8 \\
x &= 24 \\
x &= 2 \\
8x &= 8
\end{align*}
\]

80. \( 3 \times 5x = 18 \)
\[
\begin{align*}
3 \times 5x &= 18 \\
5x &= 15 \\
x &= 3
\end{align*}
\]

81. \( 4x = 6 \times 5x \)
\[
\begin{align*}
4x &= 6 \\
x &= 6 \\
4x &= 6 \\
x &= 6 \\
x &= 16 \\
x &= 4
\end{align*}
\]

82. \( 6x = 10 \times 2x + 3 \)
\[
\begin{align*}
6x &= 10 \\
2x &= 6 \\
6x &= 10 \\
2x &= 6 \\
2x &= 10 \\
x &= 4 \\
x &= 4 \\
x &= 4
\end{align*}
\]

83. \( 4x = 32 \times 7 \times 3 \)
\[
\begin{align*}
4x &= 21 \times 3 \\
10x &= 21 \\
x &= 3 \\
10x &= 21 \\
x &= 3 \\
x &= 9 \\
x &= 2 \\
x &= 9
\end{align*}
\]
84. \[22x + 4x + 2 + 6\]
\[4x + 8 + 4x + 6\]
\[4x + 8 + 4x + 2\]
\[4x + 8 + 4x + 4x + 2 + 4x\]

\[8 + 2\]
Since \(8 > 2\) is a true statement, the original inequality is true for all real numbers, and the solution set is \(x \in \mathbb{R}\) is a real number.

85. \[2x + 4 + 3x + 1 + 5x\]
\[2x + 8 + 2x + 1\]
\[2x + 8 + 2x + 2x + 1 + 2x\]

\[8 + 1\]
Since \(8 \leq 1\) is a false statement, the original inequality has no solution. The solution set is \(\emptyset\).

86. Let \(x\) be the student’s score on the third test.
\[\frac{4274x}{3}\]
\[= 60\]

\[3 \cdot \frac{4274x}{3} = 360\]
\[\frac{4274x}{180} = 116\]
\[x = 64\]
The student must score at least 64 on the third test to pass the course.

87. Let \(x\) be the number of people you invite to the picnic.
\[350 \cdot 55x = 2000\]
\[55x = 1650\]
\[\frac{55x}{55} = \frac{1650}{55}\]
\[x = 30\]
To can invite at most 30 people to the party.

**Chapter 2 Test**

1. \[4x + 5 + 13\]
\[4x + 5 + 5 + 13 + 5\]
\[4x + 18\]
\[\frac{4x}{4} \cdot \frac{18}{4} = 9\]
\[4 \cdot 4 = 2\]
\[x = 9\]
The solution set is \(\frac{9}{2}\).

2. \[12x + 4 + 7x + 21\]
\[12x + 4 + 7x + 21 + 7x\]
\[5x + 4 + 21\]
\[5x + 25\]
\[\frac{5x}{5} = \frac{25}{5}\]
\[x = 5\]
The solution set is \(5\).

3. \[8.5x + 2 + x + 26\]
\[8.5x + 10 + x + 26\]
\[18 \cdot 5x + x + 26\]
\[18 \cdot 5x + x + 26 + x\]
\[18 \cdot 6x + 26\]
\[18 \cdot 6x + 26 + 18\]
\[6x \cdot 8\]
\[6x \cdot 8\]
\[6 \cdot 6\]
\[\frac{8}{6} = \frac{4}{3}\]
The solution set is \(\frac{4}{3}\).
4. \[ \begin{align*} 32y & + 4 + 9 + 3y + 1 \\ 6y & + 12 + 9 + 3y + 3 \\ 6y & + 12 + 6 + 3y \\ 6y & + 12 + 3y + 6 + 3y + 3y \\ 9y & + 12 + 6 + 12 \\ 9y & + 18 + 9 + 9 \\ y & + 2 \end{align*} \]

The solution set is \([2]\).

5. \[ \begin{align*} \frac{3}{4} & \times \ 15 \\ \frac{4}{3} & \times \ 4 \div 15 \\ 3 \times 4 & = 3 \\ x & = 20 \end{align*} \]

The solution set is \([20]\).

6. \[ \frac{x}{10} = \frac{1}{3} \times \frac{x}{5} = \frac{1}{2} \]

Multiply both sides by the LCD, 30.

\[ \begin{align*} 30 \times \frac{x}{10} & = 30 \times \frac{1}{3} \\ 10 \times 3 & = 5 \times 2 \end{align*} \]

\[ \begin{align*} 30 \times \frac{x}{30} & = 30 \times \frac{1}{3} \\ 10 \times 3 & = 5 \times 2 \end{align*} \]

\[ \begin{align*} 3x & = 10 \times 6x + 15 \\ 3x & = 10 \times 6x + 6x + 15 + 6x \\ 3x & = 10 \times 10 + 15 + 10 \end{align*} \]

\[ \begin{align*} 3x & = 3 \times 5 \\ 3x & = 3 \times 5 + 5 \\ 3 & = 3 + 3 \\ \frac{5}{3} & = \frac{x}{3} \]

The solution set is \([\frac{5}{3}]\).
11. $P = 0.06, B = 140$
   
   $A = 0.06 \times 140$
   
   $A = 8.4$
   
   6% of 140 is 8.4.
12. \(A \ PB; \ A = 120, \ P = 80\% \ 0.80\)
\[
\begin{align*}
120 & \quad 0.80B \\
120 & \quad 0.80B \\
0.80 & \quad 0.80 \\
150 & \quad B
\end{align*}
\]
120 is 80% of 150.

13. \(A \ PB; \ A = 12, \ B = 240\)
\[
\begin{align*}
12 & \quad P = 240 \\
240 & \quad 240 \\
0.05 & \quad P
\end{align*}
\]
12 is 5% of 240.

14. Let \(x\) be the unknown number.
\[
\begin{align*}
5x & \quad 9 \ 306 \\
5x & \quad 9 \ 306 \ 9 \\
5x & \quad 315 \\
5 & \quad 315 \\
x & \quad 63
\end{align*}
\]
The number is 63.

15. Let \(x\) the average number of vacation days for Americans.

Let \(x = 29\) the average number of vacation days for Italians.
\[
\begin{align*}
x & \quad (x = 29) \ 55 \\
x & \quad x = 29 \ 55 \\
2x & \quad 29 \ 55 \\
2x & \quad 26 \\
x & \quad 13 \\
x & \quad 29 \ 42
\end{align*}
\]
Americans average 13 vacation days and Italians average 42 vacation days.

16. Let \(x\) = number of monthly text messages.
\[
\begin{align*}
15 & \quad 0.05x \ 45 \\
0.05x & \quad 30 \\
x & \quad 30 \\
0.05 & \quad 0.05 \\
x & \quad 600
\end{align*}
\]
You can send 600 text messages.

17. Let \(x\) = the width of the field.
Let \(2x\) the length of the field.
\[
\begin{align*}
P & \quad 2l \ 2w \\
450 & \quad 2x \ 2x \\
450 & \quad 4x \ 2x \\
450 & \quad 6x \\
450 & \quad 6x \\
6 & \quad 6 \\
75 & \quad x \\
x & \quad 75 \\
2x & \quad 150
\end{align*}
\]
The field is 75 yards wide and 150 yards long.

18. Let \(x\) = the book’s original price.
\[
\begin{align*}
x & \quad 0.20 \ 28 \\
0.80x & \quad 28 \\
x & \quad 28 \\
0.80 & \quad 35
\end{align*}
\]
The price of the book before the reduction was $35.

19. Find the area of a triangle with base 47 meters and height 22 meters.
\[
\begin{align*}
A & \quad \frac{1}{2}bh \\
& \quad \frac{1}{2} \times 47 \times 22 \\
& \quad 517
\end{align*}
\]
The area of the triangle is 517 m².

20. Find the area of a trapezoid with height 15 in, lower base 40 in and upper base 30 in.
\[
\begin{align*}
A & \quad \frac{1}{2}h(a + b) \\
& \quad \frac{1}{2} \times 15 \times (40 + 30) \\
& \quad 525
\end{align*}
\]
The area is 525 in².
21. Notice that the height of the side rectangle is 6 ft.

Using \( A = lw \) we must find the sum of areas of the upper rectangle and the side rectangle.

\[
A = (3)(13) + (3)(9) = 39 + 27 = 66
\]

The area is 66 ft\(^2\).

22. Find the volume of a rectangular solid with length 3 in, width 2 in, and height 3 in.

\[
V = lwh = 3 \times 2 \times 3 = 18
\]

The volume is 18 in\(^3\).

23. Find the volume of a cylinder with radius 5 cm and height 7 cm.

\[
V = \pi r^2h = \pi (5)^2 \times 7 = 25 \times 7 = 175\pi \times 500\quad \text{or approximately 550 cm}^3
\]

The volume is 175\(\pi\) cm\(^3\) or approximately 550 cm\(^3\).

24. The area of the floor is \( A = (40\text{ft})(50\text{ft}) = 2000\text{ft}^2 \).

The area of each tile is \( A = (2\text{ft})(2\text{ft}) = 4\text{ft}^2 \).

The number of tiles needed is \( \frac{2000\text{ft}^2}{4\text{ft}^2} = 500 \).

Since there are 10 tiles in a package, the number of packages needed is \( \frac{500}{10} = 50 \).

Since each package costs $13, the cost for enough tiles to cover the floor is 50($13) = $650.

25. \( A \)

\[
A = \frac{1}{2}bh
\]

\[
56 = \frac{1}{2} \times 8 \times h
\]

\[
56 = 4h
\]

\[
h = 14
\]

The height of the sail is 14 feet.

26. Let \( x \) be the measure of the second angle.
Let \( 3x \) be the measure of the first angle.
Let \( x - 30 \) be the measure of the third angle.

\[
x \cdot 3x \quad (x \cdot 30) = 180
\]

\[
5x = 30 \quad 180
\]

\[
5x = 210
\]

\[
x = 42
\]

\[
3x = 126
\]

\[
x = 30 \quad 12
\]

The measure of the first angle is 126.
The measure of the second angle is 42.
The measure of the third angle is 12.

27. Let \( x \) be the measure of the angle.
Let \( 90 - x \) be the measure of its complement.

\[
x = 90 - x \quad 16
\]

\[
x = 106
\]

\[
x = 106
\]

The measure of the angle is 53.

28. \( 2 \)

\[
-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5
\]

29. \( \frac{1}{3} \)

\[
-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5
\]

30. \( \frac{2}{3} \)

\[
2 \quad 3
\]

\[
2 \quad 3
\]

\[
x = 6
\]

Since there are 10 tiles in a package, the number of packages needed is \( \frac{500}{10} = 50 \).

Since each package costs $13, the cost for enough tiles to cover the floor is 50($13) = $650.
32.  
\[
\begin{align*}
4x & \geq 2x + 6 \\
4x & \geq 2x + 12 \\
4x & \geq 2x + 12 + 2x \\
2x & \geq 2x \\
2x & \geq 2x + 14 \\
x & \geq 7
\end{align*}
\]

7. 

33. Let \( x \) = the student’s score on the fourth exam.

\[
\frac{768072x}{80} = 4
\]

\[
\frac{768072x}{480} = 4
\]

\[
768072x = 320
\]

\[
x = 320
\]

The student must score at least 92 on the fourth exam to have an average of at least 80.

34. Let \( x \) = the width of the rectangle.

\[
2(20) \geq 2x \\
40 \geq 2x \\
40 \geq 2x + 56 \\
40 \geq 2x + 40 \\
2x \geq 16 \\
x \geq 8
\]

The perimeter is greater than 56 inches when the width is greater than 8 inches.

5. The rational numbers are

\[
4, \quad \frac{1}{3}, \quad 4\sqrt{2}, \quad \text{and} \quad 1063.
\]

6. \( \frac{5}{x} \)

7. \(-10,000 < -2\) since \(-10,000\) is to the left of \(-2\) on the number line.

8. \( 6(4x + 5y) \quad 6(4x) \quad 6(1) \quad 6(5y) \)

\( \quad 24x \quad 630y \)

9. \( A \quad 0.9n \quad 80 \)

\( A \quad 0.9(0) \quad 80 \)

A 80

According to the formula, 80% of seniors had used alcohol in 2000. This is the same as the actual value shown in the bar graph.

10. \( A \quad 0.9n \quad 80 \)

\( 62 \quad 0.9n \quad 80 \)

\( 18 \quad 0.9n \)

\( 18 \quad 0.9n \)

\( 0.9 \quad 0.9 \)

\( 20 \quad n \)

If trends continue, 62% of seniors will use alcohol 20 years after 2000, or 2020.

11.  

\[
\begin{align*}
5 \quad 6(x + 2) \quad x \quad 14 \\
5 \quad 6x \quad 12 \quad x \quad 14 \\
7 \quad 6x \quad x \quad 14 \\
7 \quad 6x \quad x \quad 14 \quad x \\
7 \quad 7x \quad 14 \quad 7 \\
7 \quad 7x \quad 7 \quad 7 \\
7 \quad 7 \quad 7 \quad 7
\end{align*}
\]

\( x \quad 1 \)

The solution set is 1.

Cumulative Review Exercises (Chapters 1-2)

1. \( 8 \quad 12 \quad 16 \quad 8 \quad 4 \quad 8 \quad 4 \quad 4 \)

2. \( 32 \quad 24 \quad 6 \quad 8 \quad 2 \)

3. \( 8 \quad 10^3 \quad 7 \quad 11^2 \quad 2^3 \quad 4^2 \)

\( 816 \quad 128 \)

4. \( 25x \quad 3x \quad 7 \)

\( 25x \quad 3x \quad 21 \)

\( 254x \quad 21 \)

\( 20x \quad 105 \)

\( 103 \quad 20x \)
12. \( \frac{x}{5} + 2 \frac{x}{3} \)

Multiply both sides by the LCD, 15.

\[ 15 \frac{x}{5} + 15 \frac{x}{3} \]

\[ 5 \quad 3 \]

\[ 15 \frac{x}{5} + 15 \frac{x}{3} \]

\[ 3x \quad 30 \quad 5x \]

\[ 3x \quad 30 \quad 5x \quad 3x \]

\[ 30 \quad 2x \]

\[ 2 \quad 2 \]

\[ 15 \quad x \]

The solution set is 15.

13. \( V \frac{1}{3} Ah \) for \( A \)

\[ V \frac{1}{3} Ah \]

\[ \frac{3}{3} \]

\[ V \frac{1}{3} Ah \]

\[ 3 \]

\[ 3V \quad \frac{3}{3} Ah \]

\[ 3 \]

\[ 3V \quad Ah \]

\[ \frac{h}{h} \]

\[ \frac{3V}{h} A \text{ or } \frac{3V}{h} \]

14. \( A = PB; A = 48, P = 30\% = 0.30 \)

\[ 48 \quad 0.30B \]

\[ 48 \quad 0.30B \]

\[ 0.30 \quad 0.30 \]

\[ 160 \quad B \]

48 is 30\% of 160.

15. Let \( x \) = the width of the parking lot.

Let \( 2x \) = the length of the parking lot.

\[ P \frac{2l}{2w} \]

\[ 400 \quad 2(2x) \quad 10 \quad 2x \]

\[ 400 \quad 4x \quad 20 \quad 2x \]

\[ 400 \quad 6x \quad 20 \]

\[ 400 \quad 20 \quad 6x \quad 20 \quad 20 \]

\[ 420 \quad 6x \]

\[ 420 \quad 6x \]

\[ 6 \quad 6 \]

\[ 70 \quad x \]

\[ x \quad 70 \]

\[ 2x \quad 10 \quad 130 \]

The parking lot is 70 yards wide and 130 yards long.

16. Let \( x \) = number of gallons of gasoline.

\[ 0.40x \quad 30,000 \]

\[ \frac{0.40x}{30,000} \]

\[ \frac{0.40}{0.40} \]

\[ x \quad 75,000 \]

75,000 gallons of gasoline must be sold.

17. \( \frac{1}{2} \)

\[ \frac{1}{2} \]

18. \( 3 \ 3x \ 12 \)

\[ 3 \ 3x \ 3 \ 12 \ 3 \]

\[ 3x \ 9 \]

\[ \frac{3x}{9} \]

\[ 3 \ 3 \]

\[ x \ 3 \]
19. \( 5 \cdot 2(3 \cdot x) - 2(2 \cdot x) - 5 \cdot 1 \\
5 \cdot 6 \cdot 2 \cdot x - 4 \cdot 10 \cdot 1 \\
2 \cdot x - 4 \cdot x - 11 \\
2 \cdot x - 4 \cdot x - 11 - 4 \cdot x \\
2 \cdot x - 11 \\
2 \cdot x - 11 - 11 - 1 \\
2 \cdot x - 12 \\
2 \cdot x - 12 \\
2 \cdot 2 \\
2 \cdot x - 6 \\
6, \\

20. Let \( x \) value of medical supplies sold. \\
600 \cdot 0.04 \cdot x - 2500 \\
600 \cdot 0.04 \cdot x - 600 - 2500 - 600 \\
0.04 \cdot x - 1900 \\
0.04 \cdot x - 1900 \\
0.04 \cdot 0.04 \\
0.04 \cdot x - 47,500 \\

You must sell more than $47,500 worth of medical supplies.

Introductory and Intermediate Algebra for College Students 5th Edition
Blitzer SOLUTIONS MANUAL
Full download at:

Introductory and Intermediate Algebra for College Students 5th Edition
Blitzer TEST BANK
Full download at:

introductory & intermediate algebra for college students (5th edition) pdf
introductory and intermediate algebra 4th edition
introductory and intermediate algebra for college students 4th edition pdf
introductory and intermediate algebra for college students 4th edition by robert blitzer pdf
introductory and intermediate algebra 5th edition access code
introductory and intermediate algebra for college students (5th edition) access code
introductory and intermediate algebra for college students blitzer pdf
introductory and intermediate algebra for college students custom edition