Extra Practice: Skills

Chapter 1

Simplify each expression. (1-1, 1-2)

1. $5 + (4 \times 8)$
2. $(3 + 7) \times 2$
3. $(30 \times 3) + (5 \times 2)$
4. $(40 \div 4) - (9 - 5)$
5. $(30 + 3) \times (4 + 2)$
6. $(40 - 4) \div (9 - 5)$
7. $9 + 7 - 2 \times 8 \div 4$
8. $32 \div 8 + 3 \times 7 - 6$
9. $4 \times 6 - 16 \div 2 + 7$

Evaluate each expression if $e = 2$, $f = 3$, $g = 4$, $u = 0$, $v = 5$, and $w = 1$. (1-1, 1-2)

10. $ev - f$
11. $5g + 4w$
12. $(uv) + (fg)$
13. $w(v - f) + g$
14. $(3g) \cdot (e + u)$
15. $(v - u)w + g$
16. $(e + f)(g + v)$
17. $e(u + v - w)$
18. $(4e - 2f)(v + w)$
19. $\frac{e + g}{v - f}$
20. $\frac{gv - 5e}{5 - 3u}$
21. $f(we + v) + \frac{g}{e}$

Solve each equation if $x \in \{0, 1, 2, 3, 4, 5, 6\}$. (1-3)

22. $7 + x = 12$
23. $x - 4 = 2$
24. $8 - x = 3$
25. $x - x = 0$
26. $6x = 18$
27. $0 = 5x$
28. $8x = 32$
29. $x \cdot x = 36$
30. $x \cdot x = 1$
31. $\frac{1}{2}x = 2$
32. $\frac{1}{3}x = 2$
33. $x \cdot x = 5x$
34. $3x + 9 = 26$
35. $15 = 9x - 3$
36. $4x = x \cdot 4$
37. $x(9 - x) = 0$

Translate each phrase into a variable expression. (1-4)

38. Three more than twice the number m
39. Four less than half the number z
40. Two more than eight times the number k
41. The difference of five times a number w and one
42. Three times the sum of a number h and six

Complete each statement with a variable expression. (1-4)

43. In x weeks there are ___?___ days.
44. In y yards there are ___?___ feet.
45. A house is x years old. Four years ago it was ___?___ years old.
46. Tony weighs w lb. Ray is 7 lb heavier than Tony. Ray weighs ___?___ lb.
47. My car is 5 years older than my sister's car. If my car is n years old, then her car is ___?___ years old.

In Exercises 48–50, (1-5)

a. Choose a variable to represent the number described by the words in parentheses.

b. Write an equation that represents the given information.

48. A package of a dozen pencils costs \$1.39. (Cost of one pencil in cents)

49. The perimeter of a square is 52 m. (Length of a side in meters)

50. All but 5 of the 34 invited guests came to the party. (Number of guests at the party)

Translate each problem into an equation. Drawing a sketch may help you. (1-6)

51. Henry is 4 years older than Celia. If the product of their ages is 140, find each person's age.

52. The length of a rectangle is 5 cm more than its width. If the area of the rectangle is 176 cm^2, find the dimensions of the rectangle.

Solve using the five-step plan. Write out each step. A choice of possible numbers for one unknown is given. (1-7)

53. The number of tickets Cynthia sold is 12 less than half the number Holly sold. Together they sold 114 tickets. How many tickets did each sell? Choices for the number Holly sold: 68, 72, 84

54. Jim weighs 40 lb more than Stephanie. Stephanie weighs three fourths as much as Jim. How much does each weigh? Choices for Stephanie's weight: 100 lb, 118 lb, 120 lb

Write a number to represent each situation. Then write the opposite of that situation and write a number to represent it. (1-8)

55. 400 ft above sea level

56. A bank withdrawal of \$50

57. Ten losses

58. Seven floors up

Graph the given numbers on a number line. (1-8)

59. $5, -2, \frac{1}{2}, 3, -4$

60. $-3, 0, 1, -2.5, 2$

Simplify. (1-9)

61. $-(7 - 4)$

62. $[-(-8)] + 10$

63. $3 + [-(-6)]$

64. $2 + |-9|$

65. $|-3| + |0|$

66. $|6| - |6|$

67. $|-3.2| + |-0.8|$

68. $|-4.7| + |4.7|$

Replace each ? with one of the symbols < or > to make a true statement. (1-9)

69. $9 - 8 \;?\; -1$

70. $7 \;?\; 6 + 5$

71. $|0| \;?\; 1$

72. $-4.3 \;?\; -4.4$

73. $-(7 + 3) \;?\; |-14|$

74. $-\frac{3}{7} \;?\; -\frac{2}{7}$

Chapter 2

Simplify. (2-1)

1. $237 + 75 + 13 + 25$
2. $456 + 29 + 44 + 21$
3. $0.2 + 16.4 + 2.8 + 0.6$
4. $3.75 + 4.85 + 1.25 + 3.15$
5. $6\frac{3}{8} + 1\frac{2}{7} + 4\frac{5}{8} + 3\frac{5}{7}$
6. $25\frac{3}{4} + \frac{4}{5} + \frac{1}{4} + 2\frac{1}{5}$
7. $8 + 3m + 4$
8. $15 + 5f + 7$
9. $9 + 6w + 3$
10. $5(7u)$
11. $(8n)(11)$
12. $(4b)9$
13. $(3p)(4q)(5r)$
14. $(2x)(5k)(7l)$
15. $(10w)(3h)(2m)$

Simplify. If necessary, draw a number line to help you. (2-2)

16. $(-4 + 8) + 9$
17. $(-7 + 10) + (-3)$
18. $[16 + (-21)] + 4$
19. $[-5 + (-13)] + 6$
20. $[0 + (-7)] + [-8 + (-22)]$
21. $[27 + (-7)] + [1 + (-1)]$
22. $-3 + (-4) + (-9)$
23. $(-5) + (-8) + (-6)$
24. $-7.2 + (-3.5) + 10.7$
25. $5.4 + (-3.1) + (-7.9)$

Add. (2-3)

26. $9 + 8 + (-3) + 4$
27. $-6 + (-7) + 10 + 2$
28. $112 + (-32) + (-40) + (-25)$
29. $-265 + (-88) + 105 + 95$
30. $-[24 + (-8)] + [-(-4 + 6)]$
31. $[-9 + (-2)] + [-(-9 + 2)]$

Evaluate each expression if $x = 2$, $y = -5$, and $z = 3$. (2-3)

32. $-8 + x + (-y)$
33. $-z + y + (-4)$
34. $1 + (-x) + z$
35. $|x + y + z|$
36. $x + (-z) + (-12)$
37. $-|z + (-y) + x|$

Simplify. (2-4, 2-5)

38. $48 - 218$
39. $53 - (-47)$
40. $-18 - (-5)$
41. $-27 - 56$
42. $133 - (62 - 59)$
43. $186 - (40 - 69)$
44. $(33 - 44) - (66 - 77)$
45. $(54 - 32) - (-8 + 13)$
46. $[14 - (-8) - [6 - (-3)]$
47. $-18 - 7 - [-6 - (-11)]$
48. $6 + x - (6 - x) - x$
49. $y - (-4) - [y + (-4)] - 4$
50. $30\left(\frac{1}{6} + \frac{1}{3}\right)$
51. $\frac{1}{5}(24) + \frac{1}{5}(16)$
52. $\frac{1}{4}(16 + 12)$
53. $(0.25)(34) + (0.75)(34)$
54. $(37 \times 22) - (7 \times 22)$
55. $(16 \times 58) - (6 \times 58)$
56. $14m + 7m$
57. $15q + (-8)q$
58. $53n - 110n$
59. $79a - 37a$
60. $3u + 7u + 8$
61. $7(c + 3) + 6$

Simplify. (2-5, 2-6)

62. $26 + 4(h + 3)$ **63.** $8(j - 4) + 17$ **64.** $23 + 6(t - 2)$

65. $5x + 9 + 3x + 11$ **66.** $(-5)m + 3 + 13m + 17$

67. $14u - 8 - 12u + 13$ **68.** $4h + 8k + (-2)h + 12k$

69. $9f + 3g - 7f + 7g$ **70.** $10x + 14y - 6x - 3y$

71. $(-27)(-5)$ **72.** $38(-2)$ **73.** $(-4)45$

74. $(-8)(-6)(30)$ **75.** $(-5)(-9)(-3)$ **76.** $(-13)(-14)(0)$

77. $5(-4)(-12)(-2)$ **78.** $-3(-2 - 9)$ **79.** $(-17 + 6)(-1)$

80. $(-6 \times 13) + (-6 \times 15)$ **81.** $[27 \times (-5)] - (27 \times 5)$

82. $-16 \times (-1) - [-16 \times (-11)]$ **83.** $7(-m + 6p)$

84. $-5(2u - h)$ **85.** $-4(6n - 9v)$

86. $-x + 7 + 6x - 5$ **87.** $4 - t - 8 - 7t$ **88.** $-l + 9 + 6l - 4$

89. $3(x + 4y) + (-4)(8x - y)$ **90.** $-4(2u + v) + 5(u - v)$

91. $-2(3c + d) - 3(5d - c)$ **92.** $7(e - f) - 3(2e - 3f)$

Write an equation to represent the given relationship among integers. (2-7)

93. The sum of three consecutive integers is 75.

94. The sum of three consecutive odd integers is 87.

95. The sum of three consecutive even integers is 138.

96. The product of two consecutive integers is 156.

97. The greater of two consecutive odd integers is eight more than three times the lesser.

98. The smaller of two consecutive even integers is one less than half of the greater.

Simplify each expression. (2-8, 2-9)

99. $-\frac{1}{11}(55)$ **100.** $-5000\left(\frac{1}{50}\right)$ **101.** $-\frac{1}{9}(-63)$

102. $112\left(-\frac{1}{7}\right)\left(-\frac{1}{2}\right)$ **103.** $-\frac{1}{5}(80)\frac{1}{4}$ **104.** $6uv\left(-\frac{1}{6}\right)$

105. $44xy\left(\frac{1}{4}\right)$ **106.** $\frac{1}{m}(3mn),\ m \neq 0$ **107.** $(8fg)\left(\frac{1}{f}\right),\ f \neq 0$

108. $\frac{1}{5}(-35a + 15)$ **109.** $(27h - 18)\frac{1}{3}$ **110.** $-\frac{1}{4}(-32e + 40f)$

111. $(42x - 63y)\left(-\frac{1}{7}\right)$ **112.** $\frac{1}{12}(-480 - 144m)$ **113.** $(-50p - 100q)\left(-\frac{1}{10}\right)$

114. $-392 \div 56$ **115.** $216 \div (-27)$ **116.** $55 \div \left(-\frac{1}{5}\right)$ **117.** $0 \div (-29)$

118. $\dfrac{-36}{-\frac{1}{6}}$ **119.** $\dfrac{8}{-\frac{1}{5}}$ **120.** $\dfrac{-12}{\frac{1}{4}}$ **121.** $\dfrac{0}{-\frac{1}{3}}$

122. $\frac{168m}{-12}$ **123.** $\frac{252a}{-8}$ **124.** $\frac{-756x}{7x}$, $x \neq 0$ **125.** $\frac{-253u}{-23u}$, $u \neq 0$

126. $-\frac{c}{17}(-17)$ **127.** $-9 \cdot \frac{x}{9}$ **128.** $\frac{8w}{7} \cdot 7$ **129.** $-\frac{5h}{3}(-3)$

Chapter 3

Solve. Check your answers. (3-1, 3-2, 3-3)

1. $a - 13 = 17$ **2.** $c + 8 = 22$ **3.** $s - 20 = -12$

4. $y + 14 = -33$ **5.** $15 + h = 0$ **6.** $0 = k - 13$

7. $f - 4 = |16|$ **8.** $g + 7 = |-2|$ **9.** $-x + 6 = 9$

10. $23 - y = 47$ **11.** $-5 - m = 7$ **12.** $13 = -q + 8$

13. $(e + 4) + 3 = 9$ **14.** $6 = 10 + (n + 3)$ **15.** $-5 + (1 + z) = 8$

16. $13u = 338$ **17.** $-396 = 22a$ **18.** $-12x = -444$ **19.** $126 = -9w$

20. $\frac{1}{7}t = 13$ **21.** $\frac{1}{8}h = -8$ **22.** $11 = -\frac{1}{4}v$ **23.** $-10 = -\frac{1}{5}m$

24. $-42 = \frac{n}{7}$ **25.** $-\frac{c}{4} = 32$ **26.** $-\frac{m}{27} = 0$ **27.** $-\frac{m}{3} = -40$

28. $4x = -\frac{2}{7}$ **29.** $-\frac{3}{2} = -9z$ **30.** $\frac{1}{4}v = 2\frac{3}{4}$ **31.** $3\frac{1}{2} = \frac{1}{2}u$

32. $5k + 8 = 43$ **33.** $7h - 6 = 36$ **34.** $-3 + 3m = -45$

35. $2n + 8n = 80$ **36.** $9v - 5v = 44$ **37.** $3c - 8c = 65$

38. $\frac{n}{5} + 9 = -11$ **39.** $-\frac{x}{3} - 2 = 7$ **40.** $\frac{5}{6}u + 15 = 0$

41. $x - 5 - 6x = -25$ **42.** $0 = y - 14 - 3y$ **43.** $e + 3e + 4e = 48$

44. $5(k + 3) = -10$ **45.** $-\frac{4}{3}(n - 6) = 12$ **46.** $2(v + 7) - 9 = 19$

Solve each problem using the five-step plan to help you. (3-4)

47. The sum of 37 and three times a number is 67. Find the number.

48. Four times a number, decreased by 24, is -20. Find the number.

49. The perimeter of a rectangle is 108. If the length is 33, find the width.

50. A large bucket holds 3 L more than twice as much as a small bucket. It took 2 small buckets and 5 large buckets to fill a 63 L tank. How much does a large bucket hold?

51. The lengths, in meters, of the sides of a triangle are consecutive even integers. The perimeter is 18 m. How long are the sides?

52. Bruce's savings account contains \$122 more than his younger brother's account. Together, they have \$354. Find the amount in each account.

Solve each equation. If the equation is an identity or if it has no solution, write *identity* or *no solution*. (3-5)

53. $10w = 8w + 14$

54. $x = 45 - 4x$

55. $48 - 6k = -12k$

56. $9m + 3 = 6m + 21$

57. $27 + u = 3 - 3u$

58. $4n + 1 = -1 + 4n$

59. $2(v - 8) = 6v$

60. $3x = 5(x - 6)$

61. $7y - 3 = 6(y + 2)$

62. $\frac{1}{3}(18 - 9c) = 6 - 3c$

63. $m - 5 = \frac{1}{2}(12 - 14m)$

64. $\frac{4}{5}(25x - 15) = 50x + 38$

65. $5(3 + h) = 4(h + 2)$

66. $(6x - 3)2 = (4x + 7)3$

67. $7(n - 3) = 5(n - 3)$

Solve. Use a chart to help you solve the problem. (3-6, 3-7)

68. Jay's salary is $\frac{2}{3}$ of his wife's salary. In January, when they both get $2000 raises, their combined income will be $49,000. What are their current salaries?

69. Erin's three test scores were consecutive odd integers. If her next test score is 18 points more than the highest score of the three tests, her total number of points will be 328. Find Erin's test scores.

70. Julius weighs twice as much as each of his twin brothers. If each of the twins gains 5 lb and Julius gains twice that amount, the sum of the three brothers' weights will be 240 lb. How much does each weigh now?

71. The width of a rectangle is 6 cm less than the length. A second rectangle, with a perimeter of 54 cm, is 3 cm wider and 2 cm shorter than the first. What are the dimensions of each rectangle?

72. Martha has some nickels and dimes worth $6.25. She has three times as many nickels as dimes. How many nickels does she have?

73. Elliot paid $1.50 a dozen for some flowers. He sold all but 5 dozen of them for $2 a dozen, making a profit of $18. How many dozen flowers did he buy?

74. Rachel spent $16.18 for some cans of dog food costing 79 cents each and some cans of cat food costing 69 cents each. She bought two more cans of cat food than of dog food. How many cans of each did she buy?

75. Victor earns $3 an hour working after school and $4 an hour working on Saturdays. Last week he earned $43, working a total of 13 h. How many hours did he work on Saturday?

State a reason for each step in Exercises 76–78. (3-8)

76.
$$\begin{aligned} 6 + (15 + 4) &= 6 + (4 + 15) && \underline{?} \\ &= (6 + 4) + 15 && \underline{?} \\ &= 10 + 15 = 25 && \underline{?} \end{aligned}$$

77.
$$\begin{aligned} 20 + (-4) &= (16 + 4) + (-4) && \underline{?} \\ &= 16 + [4 + (-4)] && \underline{?} \\ &= 16 + 0 && \underline{?} \\ &= 16 && \underline{?} \end{aligned}$$

78. $-7 + 19 = 19 + (-7)$?
$= 12 + 7 + (-7)$?
$= 12 + 0$?
$= 12$?

Chapter 4

Simplify. (4-1)

1. 7^3 **2.** $(-5)^4$ **3.** $-3 \cdot 2^4$ **4.** $(-2 \cdot 5)^3$

5. $7 + 5^2$ **6.** $(8 - 4)^3$ **7.** $6 - 2^5$ **8.** $(4 + 7)^2$

9. $5^3 \div (3^2 + 4^2)$ **10.** $(8^2 - 6^2) \div 7$ **11.** $4(9^2 - 4^3)$

Evaluate if $a = -3$ and $b = 2$. (4-1)

12. $3a + b^2$ **13.** $(3a + b)^2$ **14.** $4a - b^3$ **15.** $(4a - b)^3$

16. $7 + ab^2$ **17.** $(7 + ab)^2$ **18.** $-\frac{3a}{b^2}$ **19.** $\left(-\frac{3a}{b}\right)^2$

Add. (4-2)

20. $4x - 3$
$7x + 8$

21. $3b + 4$
$-2b - 6$

22. $5m + 8$
$4m + 3$

23. $-2t - 7$
$6t - 3$

24. $5k - 6l + 4$
$-5k + 8l + 2$

25. $6x^2 - 2xy + 3y^2$
$4x^2 - xy - y^2$

26. $2m^2 - 3mn - 5n$
$-8m^2 \quad - n$

27. $5a^2 - 6ab$
$-2a^2 + 9ab - b^2$

28–35. In Exercises 20–27, subtract the lower polynomial from the upper one.

Simplify. (4-3, 4-4)

36. $e^6 \cdot e^3 \cdot e$ **37.** $(4f^3)(2f^4)$ **38.** $(-3c^2d)(-4cd^2)$

39. $(-2gh^2)(5g^3h)$ **40.** $(3mn)(6m^2n)(2n^2)$ **41.** $(-5j^4k^2)(4jl^3)(-3kl^2)$

42. $\left(\frac{8}{3}x^5y\right)\left(\frac{9}{2}xy^6\right)$ **43.** $(-6a^3)\left(\frac{1}{6}a^3\right)$ **44.** $(3u^2v)(-7v^3)\left(\frac{4}{9}u^2\right)$

45. $3^w \cdot 3^{5-w} \cdot 3$ **46.** $4^2 \cdot 4^{a+1} \cdot 4^a$ **47.** $2^5 \cdot 2^{b+3} \cdot 2^{3-b}$

48. $(3p^5)(5p^2) + (7p^3)(2p^4)$ **49.** $(8d^3)(2d^7) - (3d^6)(4d^4)$

50. $(w^5)^2$ **51.** $(x^2)^5$ **52.** $y^2 \cdot y^5$ **53.** $z^n \cdot z^n$

54. $(a^n)^3$ **55.** $(b^3)^n$ **56.** $c^3 \cdot c^n$ **57.** $d^n \cdot d^n \cdot d^n$

58. $(5f)^2$ **59.** $(gh)^4$ **60.** $(6m^3)^2$ **61.** $(4mn^5)^3$

62. $(2u^3v)^5$ **63.** $(3a^5b^4)^2$ **64.** $(-7x^4)^2$ **65.** $-(8x^5)^3$

66. $(3k)^2(3k)^4$ **67.** $(-2x^3)^3 \cdot (5x^2)^2$ **68.** $-(4t^2)^2(3t)^3$ **69.** $(5x^2y)^3 \cdot 3xy^2$

Multiply. (4-5, 4-6)

70. $7(x + 3)$ **71.** $5(y - 4)$ **72.** $-3(n - 2)$ **73.** $-8(1 + 4m)$

74. $3n(n + 5)$ **75.** $-4t(3 - 2t)$ **76.** $6k(2k - 7)$ **77.** $-5h(8h + 3)$

78. $9a(a^2 - 3a - 4)$ **79.** $-5b^2(3b^2 - 2b + 6)$

80. $\frac{1}{3}c(6c^2 - 3cd + 9d^2)$ **81.** $\frac{1}{2}uv^2(10u^2 - 4uv + 8v^2)$

82. $(m + 4)(m + 2)$ **83.** $(n - 3)(n + 5)$ **84.** $(a - 6)(a - 7)$

85. $(5x - 2)(x + 7)$ **86.** $(4y - 2)(3y - 1)$ **87.** $(6m + 4)(5m + 3)$

88. $(u + 3)(u^2 + 2u + 5)$ **89.** $(v - 1)(3v^2 + 4v + 7)$ **90.** $(3c - 5)(2c^2 - c + 8)$

91. $7x - 4y$ / $3x - 2y$ **92.** $5a - 8b$ / $4a + b$ **93.** $e^2 + ef + f^2$ / $e + f$ **94.** $3m^2 - 4mn + n^2$ / $5m + n$

Solve the given formula for the variable shown in color. State the restrictions, if any, for the formula obtained to be meaningful. (4-7)

95. $A = \frac{1}{2}ap$; a **96.** $V = \frac{1}{3}Bh$; h **97.** $A = \frac{1}{2}h(b_1 + b_2)$; b_1

98. $y = mx + b$; b **99.** $A = \pi r^2$; r **100.** $S = (n - 2)180$; n

101. $F = \frac{9}{5}C + 32$; C **102.** $P = \frac{A}{1 + rt}$; A **103.** $r = \frac{I}{Pt}$; t

Solve. Use a chart to help you solve the problem. (4-8)

104. Two buses leave a depot at the same time, one traveling north and the other south. The speed of the northbound bus is 15 mi/h greater than the speed of the southbound bus. After 3 h on the road, the buses are 255 mi apart. What are their speeds?

105. Exactly 10 min after Alex left his grandparents' house, his cousin Alison set out from there to overtake him. Alex drives at 36 mi/h. Alison drives at 40 mi/h. How long did it take Alison to overtake Alex?

106. A plane flew from the Sky City airport to the Plainsville airport at 800 km/h and then returned to Sky City at 900 km/h. The return trip took 30 min less than the flight to Plainsville. How far apart are the airports and how long did the trip to Plainsville take?

107. A poster is three times as long as it is wide. It is framed by a mat such that there is a 4 in. border around the poster. Find the dimensions of the poster if the area of the mat is 488 in^2. (4-9)

108. A square piece of remnant material is on sale. A rectangular piece of the same material, whose length is 1 yd longer than a side of the square and whose width is $\frac{5}{9}$ yd shorter than a side of the square, is also on sale. If the square and the rectangle have the same area and you purchase both remnants, how much material will you get?

Chapter 5

List all pairs of factors of each integer. (5-1)

1. 42 **2.** 80 **3.** 91 **4.** 72 **5.** 52

6–10. Find the prime factorization of each integer in Exercises 1–5.

Give the GCF of each group of numbers. (5-1)

11. 126, 168 **12.** 144, 84 **13.** 65, 52 **14.** 90, 330

Simplify. Assume that no denominator equals 0. (5-2)

15. $\frac{12x^5}{4x}$ **16.** $\frac{25m^4n}{-15mn^6}$ **17.** $\frac{-7ab}{21ab^5}$ **18.** $\frac{-8(uv)^7}{-10(uv)^5}$

19. $\frac{(w^4)^2}{(w^5)^4}$ **20.** $\frac{(5k)^2}{5k^2}$ **21.** $\frac{(-3y)^3}{(y^3)^2}$ **22.** $\frac{(2c^5)(4c^3)}{(8c^2)^3}$

Divide. (5-3)

23. $\frac{12e + 8}{4}$ **24.** $\frac{6x - 9y + 12}{3}$ **25.** $\frac{2x^3 + 6x^2 + x}{x}$

26. $\frac{18ab - 24a^2}{-6a}$ **27.** $\frac{15m - 25m^2 - 5m^3}{5m}$ **28.** $\frac{28h^5k^3 - 35hk^2}{7hk^2}$

Factor each polynomial as the product of its greatest monomial factor and another polynomial. (5-3)

29. $15w^2 - 10w + 5$ **30.** $9x^2 + 18x$ **31.** $7u^3 + 14u^2$

32. $12a^3 - 6a^2 + 18a$ **33.** $15c^2 + 3cd$ **34.** $8m^2n - 24mn^2$

Write each product as a trinomial. (5-4)

35. $(x + 5)(x + 3)$ **36.** $(b - 2)(b - 4)$ **37.** $(n - 3)(n + 7)$

38. $(e - 8)(e + 6)$ **39.** $(3 + m)(2 + m)$ **40.** $(3f + 2)(f + 5)$

41. $(4y - 3)(2y - 1)$ **42.** $(8z + 7)(z - 2)$ **43.** $(5n - 3)(4n - 2)$

44. $a(6a - 4)(5a - 3)$ **45.** $h(3h + 7)(4h + 9)$ **46.** $2x(9x - 1)(2x + 3)$

Write each product as a binomial. (5-5)

47. $(k - 5)(k + 5)$ **48.** $(3 - y)(3 + y)$ **49.** $(4d - 8)(4d + 8)$

50. $(w^2 - 6)(w^2 + 6)$ **51.** $(5m^2 + n)(5m^2 - n)$ **52.** $(ab + c^2)(ab - c^2)$

Factor. You may use a calculator or the table of squares. (5-5)

53. $16e^2 - 9$ **54.** $36u^2 - 25$ **55.** $81 - f^2$ **56.** $144a^2 - 64b^2$

57. $49 - 100y^2$ **58.** $v^4 - w^4$ **59.** $s^6 - 4$ **60.** $16x^8 - 625$

Express each square as a trinomial. (5-6)

61. $(g + 7)^2$ **62.** $(k - 3)^2$ **63.** $(2x + 6)^2$ **64.** $(5y - 3)^2$

65. $(2m + 3n)^2$ **66.** $(7a - 5b)^2$ **67.** $(ef - 8)^2$ **68.** $(-4 + 9f)^2$

Factor. (5-6)

69. $x^2 - 6x + 9$ **70.** $e^2 + 18e + 81$ **71.** $4 - 28h + 49h^2$

72. $64x^2 + 80xy + 25y^2$ **73.** $4m^2 - 36mn + 81n^2$ **74.** $16w^2 + 24wz + 9z^2$

Factor. Check by multiplying the factors. If the polynomial is not factorable, write *prime*. (5-7, 5-8, 5-9)

75. $k^2 + 8k + 7$ **76.** $v^2 - 9v + 20$ **77.** $a^2 - 2a + 1$

78. $35 + 12u + u^2$ **79.** $n^2 - 16n + 48$ **80.** $w^2 + 18w + 80$

81. $x^2 + 13xy + 42y^2$ **82.** $m^2 - 10mn + 21n^2$ **83.** $e^2 - 15ef + 44f^2$

84. $c^2 + 3c - 18$ **85.** $x^2 - 2x - 35$ **86.** $k^2 + 8k - 32$

87. $h^2 - 7h - 18$ **88.** $b^2 + 7b - 30$ **89.** $y^2 - 4y - 45$

90. $a^2 - 2ab - 3b^2$ **91.** $u^2 + 3uv - 4v^2$ **92.** $m^2 - mn - 20n^2$

93. $2x^2 + 11x + 12$ **94.** $10e^2 - 12e + 3$ **95.** $10d^2 + d - 3$

96. $-10 - 26y - 12y^2$ **97.** $-7 - 39z - 18z^2$ **98.** $-10 + 24z - 8z^2$

99. $15x^2 + 13xy + 2y^2$ **100.** $8a^2 - 22ab + 12b^2$ **101.** $14m^2 - mn - 3n^2$

Factor. Check by multiplying. (5-10)

102. $8(m - 3) - 5m(3 - m)$ **103.** $6a(a + 2) + 4(a + 2)$

104. $u(u - 2v) - (2v - u)$ **105.** $b(b - 2)(b + 1) - 3 - 3b$

106. $a^2 + 2a + ab + 2b$ **107.** $7cw + 3c - 7w^2 - 3w$

108. $n^3 + n^2 - 6n - 6$ **109.** $64 - 64m^2 + m^4 - m^6$

Factor completely. Check by multiplying. (5-11)

110. $42x^3 + 68x^2 + 16x$ **111.** $60y^3 - 18y^2 - 6y$ **112.** $12x^5 - 20x^4 + 3x^3$

113. $16a^4 - 144a^2$ **114.** $4n^5 - 100n$ **115.** $28w^7 - 102w^5$

116. $36m^2 + 24mn + 4n^2$ **117.** $24cd - 12c^2 - 12d^2$ **118.** $-7x^3 + 14x^2y - 7xy^2$

Solve and check. (5-12)

119. $(a + 13)(a + 8) = 0$ **120.** $(f - 16)(f - 27) = 0$ **121.** $(2x - 4)(3x - 5) = 0$

122. $(6h - 5)(6h + 5) = 0$ **123.** $7w(4w + 3) = 0$ **124.** $m(2m + 7)(3m - 4) = 0$

125. $a^2 + 7a + 6 = 0$ **126.** $q^2 - 21q = -20$ **127.** $d^2 = 14d - 45$

128. $y^2 - 7y - 18 = 0$ **129.** $c^2 - 36 = -5c$ **130.** $h^2 = -3h + 54$

131. $6 - 23z - 4z^2 = 0$ **132.** $3m^2 + 1 = 4m$ **133.** $2n^2 = 10 + n$

134. $e^2 - 49 = 0$ **135.** $36g^2 = 16$ **136.** $w^3 - 9w = 0$

137. The sum of a number and its square is 56. Find the number. (5-13)

138. Find two consecutive negative odd integers whose product is 143.

139. The length of a rectangle is 5 cm less than twice the width. If the area of the rectangle is 88 cm^2, find the dimensions of the rectangle.

140. Find two numbers that total 12 and whose squares total 74.

Chapter 6

Simplify. Give the restrictions on the variable. (6-1)

1. $\frac{5m - 15}{m - 3}$ **2.** $\frac{2a + 1}{6a + 3}$ **3.** $\frac{7c - 7d}{7c + 7d}$ **4.** $\frac{6k - k^2}{36 - k^2}$

5. $\frac{3uv}{u^2v - v^2u}$ **6.** $\frac{8w^3}{8w^2 - 12w}$ **7.** $\frac{x^2 - 64}{x^2 - x - 56}$ **8.** $\frac{(e - 7)^2}{49 - e^2}$

9. $\frac{15m + 6n}{25m^2 - 4n^2}$ **10.** $\frac{a^2 + ab}{a^2 - ab}$

11. $\frac{(k - 3)(7k - 2)}{(2 - 7k)(k - 3)}$ **12.** $\frac{3x^2 + 17xy + 20y^2}{3x^2 - xy - 10y^2}$

13. $\frac{14 - 9t + t^2}{t^2 - 4}$ **14.** $\frac{u^2 - v^2}{u^2 + 2uv + v^2}$

15. $\frac{(5w - x)^5}{(x - 5w)^7}$ **16.** $\frac{(4s - 6)^2(3s - 2)}{(2 - 3s)(6 - 4s)}$

Multiply. Express each product in simplest form. (6-2)

17. $\frac{5}{8} \cdot \frac{32}{15}$ **18.** $\frac{4}{3} \cdot \frac{3}{5} \cdot \frac{5}{7}$ **19.** $\left(\frac{-2}{5}\right)^2 \cdot \frac{15}{16}$ **20.** $\left(-\frac{3}{2}\right)^3 \cdot \frac{24}{9}$

21. $\frac{e}{f} \cdot \frac{f}{g} \cdot \frac{g}{h}$ **22.** $\frac{5}{w} \cdot \frac{w^2}{10}$ **23.** $\frac{8m}{3} \cdot \frac{9}{12m}$ **24.** $\frac{a^2}{3b} \cdot \frac{b^2}{4a}$

25. $\frac{14v}{12v^2} \cdot \frac{4uw^2}{7v^2}$ **26.** $\frac{a + 5}{a} \cdot \frac{a^2}{a^2 - 25}$

27. $\frac{4x - xy}{8x^2y} \cdot \frac{2}{16 - y^2}$ **28.** $\frac{m + n}{m - n} \cdot \frac{m^2 - n^2}{3m + 3n}$

Simplify. Use the rules of exponents for a power of a product and a power of a quotient. (6-2)

29. $(5k^3)^2$ **30.** $\left(\frac{x}{7}\right)^2$ **31.** $\left(\frac{3x}{4}\right)^2$ **32.** $\left(\frac{2m}{3n^2}\right)^3$

33. $\left(-\frac{x^2}{5}\right)^3$ **34.** $\left(\frac{e}{f}\right)^3 \cdot \frac{e}{f}$ **35.** $\left(\frac{4c}{d}\right)^3 \cdot \frac{c^2}{8}$ **36.** $\left(\frac{7a}{b}\right)^2 \cdot \frac{3ab}{14}$

Divide. Express the answers in simplest form. (6-3)

37. $\frac{4}{9} \div \frac{16}{3}$

38. $\frac{a^2}{4} \div \frac{a}{12}$

39. $\frac{m}{3n} \div \frac{mn}{6}$

40. $\frac{8x^2}{5y} \div 4xy$

41. $\frac{e+f}{5} \div \frac{3e+3f}{15}$

42. $\frac{u^2-v^2}{u^2+v^2} \div (u+v)$

43. $\frac{5}{n^2-25} \div \frac{5n-15}{n+5}$

44. $\frac{4n-12}{4} \div \frac{5n-15}{8}$

45. $\frac{x^4-y^4}{2x^2+8x} \div \frac{x^2+y^2}{x^2-16}$

46. $\frac{4a^2-25}{6a^2} \div \frac{12a-30}{3a^4}$

47. $\frac{m^2+n^2}{8s-10t} \div \frac{7m+7n}{4t-6s}$

Simplify. (6-3)

48. $\frac{1}{3} \div \frac{2}{6} \cdot \frac{5}{7}$

49. $\frac{x}{7} \div \frac{y^2}{x} \cdot \frac{7}{y}$

50. $\frac{e^2}{3} \cdot \frac{f^2}{e} \div \frac{e}{f}$

51. $\left(\frac{c}{3}\right)^2 \div \frac{c}{9} \cdot \frac{c}{3}$

52. $\left(\frac{w}{4}\right)^2 \div \left(\frac{w}{8} \cdot \frac{w}{2}\right)$

53. $\frac{a-b}{a+3b} \cdot \frac{3b+a}{b+a} \div \frac{b-a}{b+a}$

Complete. (6-4)

54. $\frac{5x}{11} = \frac{?}{33}$

55. $\frac{h-4}{7} = \frac{?}{14}$

56. $\frac{3k-5}{2} = \frac{?}{8}$

57. $\frac{6m-n}{7} = \frac{?}{35}$

58. $\frac{c}{d} = \frac{?}{c^3d}$

59. $\frac{4s}{5t} = \frac{?}{15st^2}$

60. $\frac{8}{7d+2} = \frac{?}{(7d+2)^2}$

61. $\frac{5}{e-1} = \frac{?}{e^2-1}$

62. $\frac{3}{h-2} = \frac{?}{2-h}$

63. $\frac{5}{z-3} = \frac{?}{z^2-3z}$

64. $\frac{w}{w+4} = \frac{?}{w^2+4w}$

65. $\frac{3}{a^2b} = \frac{?}{a^3b^2}$

Write each group of fractions with their LCD. (6-4)

66. $\frac{2}{3}, \frac{4}{5}, \frac{3}{7}$

67. $\frac{x-2}{16}, \frac{x+3}{12}$

68. $\frac{3m-n}{10}, \frac{3m+n}{15}$

69. $\frac{1}{3cd}, \frac{4}{cd^2}$

70. $\frac{7}{e+f}, \frac{5}{e}, \frac{6}{f}$

71. $\frac{2w}{3x-9}, \frac{1}{x^2-9}$

Simplify. (6-5)

72. $\frac{3}{a} + \frac{5}{a} - \frac{4}{a}$

73. $\frac{7}{2x} + \frac{6}{2x} - \frac{5}{2x}$

74. $\frac{u}{7} - \frac{3u+5}{7}$

75. $\frac{k+3}{5} - \frac{2k+7}{5}$

76. $\frac{c}{c-3} + \frac{1}{c-3} - \frac{8-c}{c-3}$

77. $\frac{4}{g-3} - \frac{3}{3-g}$

78. $\frac{3m}{m-n} + \frac{3n}{n-m}$

79. $\frac{5}{y^2} + \frac{3}{y}$

80. $\frac{4}{5x} - \frac{1}{15x^2}$

81. $\frac{1}{5wx} - \frac{3}{10w}$

82. $\frac{3k-2}{2k^3} + \frac{6}{k^2}$

83. $\frac{2}{3(x+2)} + \frac{x}{x+2}$

84. $\frac{5a-4}{6}+\frac{a-2}{9}$ **85.** $\frac{2h+4}{8}-\frac{h}{4}+\frac{3h-2}{10}$ **86.** $\frac{4(m-n)}{16}-\frac{3(m+n)}{12}$

87. $\frac{3}{x+2}-\frac{1}{x+3}$ **88.** $\frac{3z}{z^2-16}+\frac{z}{z-4}$ **89.** $\frac{u}{u-4}+\frac{3}{4-u}$

Write each expression as a fraction in simplest form. (6-6)

90. $7\frac{1}{3}$ **91.** $5+\frac{1}{n}$ **92.** $4m-\frac{3}{m}$ **93.** $\frac{x}{y}+3$

94. $6-\frac{5}{k+3}$ **95.** $\frac{n}{n-2}+7$ **96.** $\frac{x+3}{x}-2$ **97.** $8h-\frac{h}{h+3}$

98. $3y+\frac{y}{2y+7}$ **99.** $5-\frac{e+3}{e^2-1}$ **100.** $a+\frac{5a+3}{a+3}$ **101.** $2w-\frac{w+3}{w-3}$

102. $n-\frac{7}{n+2}-\frac{3n-1}{n+2}$ **103.** $\frac{v}{u+v}+\frac{u}{v-u}+1$ **104.** $\frac{x}{x-4}+\frac{x}{x+4}-3$

Divide. Write the answer as a polynomial or mixed expression. (6-7)

105. $\frac{x^2+7x+10}{x+2}$ **106.** $\frac{y^2-2y-35}{y-7}$ **107.** $\frac{a^2-5a-3}{a+2}$ **108.** $\frac{n^2-16}{n+4}$

109. $\frac{7+k^2-4k}{k-5}$ **110.** $\frac{8y^2+6}{2y-1}$ **111.** $\frac{b^3-1}{b+1}$ **112.** $\frac{x^3+5}{x+3}$

113. $\frac{w^3+w^2+2w-4}{w-1}$ **114.** $\frac{u^3+2u^2-16}{u-2}$ **115.** $\frac{2n^2-13n+20}{2n-5}$

116. $\frac{2-9h+7h^2}{7h-2}$ **117.** $\frac{v^3+v^2+v+1}{v-2}$ **118.** $\frac{5n^2+6n^3+9}{3+2n}$

Chapter 7

Write each ratio in simplest form. (7-1)

1. 40 s:2 min **2.** 4 m:250 cm **3.** 3 kg:45 g

4. $6y:15y$ **5.** $36d^2:10d$ **6.** $(4a)^2:6a$

7. The ratio of old cars to new cars if there are 180 cars and 55 are new.

8. The ratio of wins to losses for a baseball team that played 84 games and won 48 of them.

Solve each proportion. (7-2)

9. $\frac{3}{5}=\frac{x}{15}$ **10.** $\frac{5}{7}=\frac{25}{a}$ **11.** $\frac{24}{7}=\frac{4}{c}$

12. $\frac{3x}{2}=\frac{2}{5}$ **13.** $\frac{15a}{64}=\frac{45}{32}$ **14.** $\frac{17d}{25}=\frac{51}{125}$

15. $\frac{x-4}{x}=\frac{7}{9}$ **16.** $\frac{3w}{10w+2}=\frac{2}{7}$ **17.** $\frac{8a-5}{5a-4}=\frac{13}{8}$

Solve and check. If the equation has no solution, write *No Solution*. (7-3, 7-4)

18. $\frac{a}{3} - \frac{a}{9} = 2$

19. $\frac{2x}{3} - \frac{x}{2} = 12$

20. $\frac{6}{7}x - \frac{1}{2}x = 5$

21. $\frac{2}{3}x - \frac{5}{9}x = -1$

22. $\frac{y+2}{2} = \frac{2y}{3}$

23. $\frac{x+1}{5} - \frac{3}{2} = \frac{3x-6}{10}$

24. $\frac{12}{z} = \frac{4+4z}{z}$

25. $\frac{1}{x} + \frac{1}{3} = \frac{1}{2}$

26. $\frac{4}{5y} + \frac{y-2}{y} = -\frac{1}{5}$

27. $\frac{c}{c+3} = \frac{2}{5}$

28. $\frac{3m+5}{6} - \frac{10}{m} = \frac{m}{2}$

29. $\frac{h}{2h+4} - \frac{1}{h+2} = 1$

Evaluate. (7-5)

30. 80% of 700

31. 45% of 450

32. 3.25% of 48

33. 18 is 60% of what number?

34. 63 is 150% of what number?

35. What percent of 180 is 45?

36. What percent of 36 is 54?

Solve. (7-5, 7-6, 7-7, 7-8)

37. $1.2x = 48$

38. $0.6z = 180$

39. $0.08y = 64$

40. $0.4a - 0.7 = 2.9$

41. $0.3b + 0.03b = 99$

42. $0.05c = 6.6 - 0.06c$

43. How many kilograms of zinc are contained in 30 kg of an alloy containing 28% zinc?

44. Ed Jefferson bought a new suit that cost \$140. If he also paid \$6.30 in sales tax, find the sales tax rate.

45. A camera that originally cost \$150 is on sale at 15% off the original price. Find the sale price.

46. How many kilograms of water must be added to 12 kg of a 30% salt solution to produce a 20% solution?

47. How many kilograms of water must be evaporated from 40 kg of a 10% salt solution to produce a 25% solution?

48. A coin-sorting machine can sort a certain number of coins in 15 min. A second machine can sort the same number of coins in 30 min. How long would it take both machines working together to do the job?

49. An air conditioner takes 20 min to cool a room. If a second air conditioner is used together with the first, it takes only 12 min to cool the room. How long would it take the second air conditioner alone to cool the room?

Evaluate. (7-9)

50. 6^{-2}

51. 5^{-3}

52. 7^{-2}

53. 9^{-3}

54. $2^{-4} \cdot 2^{-3}$

55. $(6^{-2})^{-1}$

56. $\frac{3^{-4}}{3^{-3}}$

57. $\frac{8^{-2}}{8^{-4}}$

Simplify. Give answers in terms of positive exponents. (7-9)

58. $5y^{-2}$ **59.** $(9y)^{-3}$ **60.** x^2y^{-5} **61.** $a^{-2}b^{-3}$

62. $uv^{-2}w^{-1}$ **63.** $d^{-4}e^2f^{-2}$ **64.** $(a^{-2}b^3)^2$ **65.** $(x^{-4}y^{-5}z^3)^{-3}$

Write each of the following numbers in scientific notation. (7-10)

66. 64,800,000 **67.** 147,000,000 **68.** 643 billion

69. 0.0000098 **70.** 0.000000006 **71.** 0.00000000001

Chapter 8

State whether each ordered pair of numbers is a solution of the given equation. (8-1)

1. $x - 2y = 6$
$(3, 0), (0, -3)$

2. $x + 3y = 9$
$(3, 2), (-3, 4)$

3. $2x - y = 5$
$(4, -1), (1, -7)$

4. $2x + 3y = 7$
$(1, 2), (5, -1)$

5. $4x + 2y = 6$
$\left(\frac{3}{2}, 0\right), (1, 1)$

6. $-3x + 4y = -7$
$(1, -1), \left(2, \frac{1}{4}\right)$

Solve each equation if x and y are whole numbers. (8-1)

7. $x + 2y = 8$ **8.** $3x + y = 5$ **9.** $4x + 3y = 12$

10. $xy = 5$ **11.** $x + 4y = 10$ **12.** $2xy + 12 = 14$

Graph each equation. (8-2)

13. $y = -7$ **14.** $x = 4$ **15.** $y = 3x + 2$

16. $y = 2x - 5$ **17.** $5x = 3y$ **18.** $8x - 2y = 0$

19. $3x + y = -6$ **20.** $4x + 3y = 12$ **21.** $2x + 3y = 7$

Find the slope of the line through the given points. (8-3)

22. $(1, 2), (4, 6)$ **23.** $(-7, 1), (-1, 2)$ **24.** $(-1, 6), (0, 0)$

25. $(-4, -3), (2, -3)$ **26.** $(2, 1), (8, -2)$ **27.** $(-7, -7), (6, -4)$

Find the slope of each line. If the line has no slope, say so.

28. $y = 7x - 3$ **29.** $x = 5$ **30.** $3x - 2y = 8$

31. $y - 9 = 0$ **32.** $5x + 4y = 16$ **33.** $y = 1 - x$

Determine whether the given points are collinear. (8-3)

34. $(2, 1), (0, -3), (4, 5), (-2, -7)$ **35.** $(0, 4), (9, -2), (-3, 6), (6, 0)$

36. $(-3, -2), (2, -4), (6, -5), (-5, 2)$ **37.** $(-5, 3), (0, 3), (5, 3), (-2, 3)$

Through the given point, draw a line with the given slope. (8-3)

38. $P(3, 1)$; slope 2

39. $P(-4, 5)$; slope 0

40. $P(0, -6)$; slope 5

41. $P(7, 0)$; slope -3

42. $P(-2, -3)$; slope $\frac{1}{4}$

43. $P(3, 4)$; slope $-\frac{2}{3}$

Change each equation to the slope-intercept form. Use only the slope and *y*-intercept to draw the graph of each equation. (8-4)

44. $x + y = -3$

45. $7x = 2y$

46. $4x - y = 3$

47. $2x + 2y = 6$

48. $-x + 5y = 10$

49. $3x - 4y - 5 = 0$

Use the slope-intercept form to show that the lines whose equations are given are parallel. (8-4)

50. $x - y = 2$
$y - x = -3$

51. $3x - 2y = 6$
$-2y = 12 - 3x$

52. $-x - 5y = 1$
$2x + 10y = 2$

Write an equation in slope-intercept form of the line that has the given slope and *y*-intercept. (8-5)

53. $m = 3$, $b = \frac{1}{2}$

54. $m = -4$, $b = \frac{3}{5}$

55. $m = \frac{1}{3}$, $b = 6$

56. $m = 0$, $b = -3.5$

57. $m = -\frac{3}{7}$, $b = \frac{3}{8}$

58. $m = -1.5$, $b = 2.7$

Write an equation in slope-intercept form of the line that has the given slope and passes through the given point. (8-5)

59. $m = 3$; $(-3, -5)$

60. $m = -2$; $(3, -4)$

61. $m = \frac{3}{4}$; $(0, -2)$

62. $m = 0$; $\left(\frac{1}{2}, 3\right)$

63. $m = -\frac{1}{5}$; $(-5, 0)$

64. $m = \frac{7}{3}$; $(3, 7)$

Write an equation in slope-intercept form of the line passing through the points. (8-5)

65. $(2, 1)$, $(6, 4)$

66. $(2, -1)$, $(1, -7)$

67. $(0, 0)$, $(6, -1)$

68. $(-3, 2)$, $(-3, -4)$

69. $(-2, 8)$, $(1, 2)$

70. $(6, -4)$, $(-7, -7)$

State the domain and range of the function shown by each table. (8-6)

71.

Longest Suspension Bridges	
Mackinac Straits	3800 ft
Humber Estuary	4626 ft
Golden Gate	4200 ft
Ataturk	3524 ft
Verrazano Narrows	4260 ft

72.

Airports in U.S.	
1930	1782
1940	2331
1950	6403
1960	6881
1970	11,261

73. Make a bar graph for the function shown in Exercise 71.

74. Make a broken-line graph for the function shown in Exercise 72.

Given f: $x \rightarrow 5 - 3x$, find the following values of f. (8-7)

75. $f(4)$ **76.** $f\left(-\frac{1}{3}\right)$ **77.** $f(0)$ **78.** $f(-5)$

Given $G(n) = n^3 + 2n$, find the following values of G. (8-7)

79. $G(0)$ **80.** $G(-2)$ **81.** $G\left(\frac{1}{2}\right)$ **82.** $G(3)$

Find all the values of each function. (8-7)

83. $h(x) = 5 - 2x - x^2$, $D = \{1, 2, 3\}$ **84.** $M(u) = \frac{6}{4u + 2}$, $D = \{-1, 0, 1\}$

Find the range of each function. (8-7)

85. r: $z \rightarrow -3 - 4z$, $D = \{-2, -1, 0\}$ **86.** N: $s \rightarrow \frac{10}{s - 3}$, $D = \{2, 4, 8\}$

87. G: $w \rightarrow (w - 1)(w + 1)$, $D = \{-2, 0, 2\}$ **88.** k: $v \rightarrow v^2 - 4v + 2$, $D = \{3, 4, 5\}$

Find the vertex and the axis of symmetry of the graph of each equation. Use the vertex and at least four other points to graph the equation. (8-8)

89. $y = 4x^2$ **90.** $y = -2x^2$ **91.** $y = \frac{1}{5}x^2$

92. $y = -x^2 + 3x$ **93.** $y = x^2 - 2x + 5$ **94.** $y = 4 - \frac{1}{2}x^2$

Find the vertex. Then give the least value of the function. (8-8)

95. f: $x \rightarrow x^2 + 7x$ **96.** g: $x \rightarrow x^2 - 3x - 4$ **97.** h: $x \rightarrow \frac{1}{2}x^2$

Find the vertex. Then give the greatest value of the function. (8-8)

98. $f(x) = x - 3x^2$ **99.** $g(x) = 2 - \frac{1}{3}x^2$ **100.** $h(x) = -x^2 - x - 1$

In Exercises 101 and 102, find the constant of variation. (8-9)

101. y varies directly as x, and $y = 12$ when $x = 60$.

102. q is directly proportional to p, and $q = 144$ when $p = 24$.

103. If n varies directly as m, and $n = 300$ when $m = 5$, find n when $m = 15$.

104. If b is directly proportional to a, and $b = 28.7$ when $a = 4.1$, find b when $a = 13$.

(x_1, y_1) and (x_2, y_2) are ordered pairs of the same direct variation. Find each missing value. (8-9)

105. $x_1 = 35$, $y_1 = 7$
$x_2 = 105$, $y_2 =$?

106. $x_1 = 5.2$, $y_1 = 5$
$x_2 =$?, $y_2 = 1$

107. $x_1 = \frac{3}{8}$, $y_1 =$?
$x_2 = \frac{2}{5}$, $y_2 = \frac{1}{10}$

For each variation described, state (a) a formula and (b) a proportion. (8-9, 8-10)

108. The circumference, C, of a circle is directly proportional to the diameter, d, of the circle.

109. The elongation, e, of a coil spring varies directly as the mass, m, suspended from it.

110. The length, l, of the shadow of a vertical object at a given time and location varies directly with the height, h, of the object.

111. The monthly rent, r, for each roommate in an apartment is inversely proportional to the number, n, of roommates.

112. The height, h, of a triangle of constant area varies inversely as the base length, b.

113. The number of tickets remaining to be sold, n, varies inversely as the number of tickets sold, s.

Graph each equation if the domain and the range are both the set of non-zero real numbers. (8-10)

114. $xy = 4$ **115.** $3xy = 1$ **116.** $x = \frac{10}{y}$ **117.** $\frac{x}{2} = \frac{4}{y}$

(x_1, y_1) and (x_2, y_2) are ordered pairs of the same inverse variation. Find each missing value. (8-10)

118. $x_1 = 5,\ y_1 = 8$
$x_2 = 4,\ y_2 = \underline{?}$

119. $x_1 = 0.6,\ y_1 = 1.2$
$x_2 = \underline{?},\ y_2 = 0.4$

120. $x_1 = \frac{1}{4},\ y_1 = \underline{?}$
$x_2 = \frac{1}{6},\ y_2 = \frac{1}{2}$

Chapter 9

Solve each system by the graphic method. (9-1)

1. $x + y = 6$
$x - y = 2$

2. $x + y = 9$
$y = 2x$

3. $x + y = 0$
$x + 2y = 2$

4. $y = 3 - x$
$x + y = 5$

5. $y = \frac{2}{3}x + 1$
$y = -\frac{2}{3}x + 5$

6. $y = \frac{1}{2}x + 1$
$x + 2 = 2y$

Solve by the substitution method. (9-2)

7. $3x + y = 5$
$y = 2x$

8. $m - 3n = -4$
$2m + 6n = 5$

9. $2a + b = 4$
$b = 1 - a$

10. $4c - 3d = 9$
$2c - d = 5$

11. $x + 3y = 2$
$2x + 3y = 7$

12. $3x - 2y = 5$
$x + 2y = 15$

Solve by using a system of two equations in two variables. (9-3)

13. On a jury there are 3 fewer men than twice the number of women. If there were 2 more women on the jury, the numbers of men and women would be equal. How many men are on the jury?

14. Janet and Lynn live 8 mi apart in opposite directions from their office. If Lynn lives 1 mi less than twice as far from the office as Janet does, how far does each live from the office?

Solve by the addition-or-subtraction method. (9-4)

15. $r - s = -3$
$r + s = 9$

16. $c + 2n = -20$
$c - 2n = 30$

17. $x - 3y = 2$
$x + 4y = 16$

18. $6r + 5y = -8$
$2r - 5y = -16$

19. $12m + 3n = 51$
$7m - 3n = 44$

20. $8g + 7h = 26$
$8g - 10h = 60$

Solve by using multiplication with the addition-or-subtraction method. (9-5)

21. $v + w = 3$
$3v - 5w = 17$

22. $4a - 3b = -1$
$a - b = -1$

23. $3x - y = 3$
$x + 3y = 11$

24. $3x + 4y = -25$
$2x - 3y = 6$

25. $2w - 3z = -1$
$3w + 4z = 24$

26. $5a - 2b = 0$
$2a - 3b = -11$

Solve by using a system of two equations in two variables. (9-6, 9-7)

27. A plane can fly 1120 km in 80 min with the wind. Flying against the same wind, the plane travels the same distance in 84 min. Find the speed of the wind and the speed of the plane in still air.

28. The sum of the digits of a two-digit number is 7. With the digits reversed the number is 5 times the tens digit of the original number. Find the original number.

29. In five years Jenny will be two thirds as old as her aunt. Three years ago she was half as old as her aunt is now. How old are Jenny and her aunt now?

30. The numerator of a fraction is 1 less than the denominator. If 1 is subtracted from the numerator, and the denominator is unchanged, the resulting fraction has a value of $\frac{3}{4}$. Find the original fraction.

Chapter 10

Classify each statement as true or false. (10-1)

1. $-8 > 7 > 6$

2. $-5 < -4 < 5$

3. $-1.5 < -1 < -0.05$

4. $-\frac{1}{2} < 0 < 1$

5. $7 > 0 > 2$

6. $-10 < -15 < -20$

7. $|-0.6| < 0.4$

8. $\left|-\frac{1}{3}\right| \geq 0$

9. $|5 - 3| \leq |3 - 5|$

Solve each inequality if $x \in \{-4, -3, -2, -1, 0, 1, 2, 3, 4\}$. (10-1)

10. $5x \leq 15$ **11.** $-7x > 14$ **12.** $-4 - x \geq 0$ **13.** $x^2 < 10$

Graph each inequality over the given domain. (10-1)

14. $4 < x$; {the positive numbers}

15. $-6 \leq k < 2$; {the negative integers}

16. $3 > t \geq -4$; {the integers}

17. $-2 < n < 2$; {the real numbers}

Solve each inequality and graph its solution set. (10-2)

18. $e - 8 > 12$ **19.** $13 > n + 9$ **20.** $4q < -20$

21. $-\frac{x}{7} < 14$ **22.** $\frac{m}{3} - 5 > -2$ **23.** $-3 > 7 + \frac{4}{5}k$

24. $5v + 3 > 18$ **25.** $48 - 6y < 0$ **26.** $7n < 6n + 8$

27. $8f - 5 > 4f + 11$ **28.** $-6(v - 3) \leq 42$ **29.** $5(m + 2) > 4(m - 1)$

30. $\frac{4}{9}h + 3 \leq \frac{1}{3}$ **31.** $2(w - 1) < \frac{3}{2}w$ **32.** $2x - \frac{1}{4}(3x + 8) > 0$

In Exercises 33–37: (10-3)

a. Choose a variable to represent the number indicated in color.

b. Use the variable to write an inequality based on the given information. (Do not solve.)

33. Marquita sold 9 fewer magazine subscriptions than twice the number Juanita sold. Marquita sold at most 43 subscriptions.

34. Rick, who is not yet 16 years old, is 3 years older than Sam. (Sam's age)

35. Andrea lives 10 mi less than half as far as Roger lives from the beach. Andrea lives at least 25 mi from the beach.

36. The number of San Marcos High School students who ride the bus is one third the number who walk or ride their bikes. The total number of students is at least 1800.

37. Six years ago, Buford was less than half as old as he is now. (His present age)

Solve each open sentence and graph its solution set. (10-4)

38. $-3 < n + 5 < 7$ **39.** $-6 < -6 + w \leq 2$

40. $-4 \leq 3a - 1 < 5$ **41.** $-1 \leq 8m + 7 \leq 23$

42. $u - 2 < -5$ or $u - 2 \geq 4$ **43.** $k + 6 \leq -3$ or $k + 6 > 2$

44. $4n + 3 < -1$ or $4n + 3 > 7$ **45.** $2x - 2 \leq -8$ or $8 < 2x - 2$

46. $-5e < 15$ and $6 + 3e < 0$ **47.** $h - 4 \geq 2$ or $4 - h \geq 2$

Solve each open sentence and graph its solution set. (10-5, 10-6)

48. $|v - 6| = 3$ **49.** $|8 - k| = 5$ **50.** $|m| > 2\frac{1}{2}$

51. $|x| \leq 1.5$ **52.** $|y + 5| > 2$ **53.** $|3 + z| \leq 4$

54. $|7 - f| < 6$ **55.** $|-4 - g| > 7$ **56.** $|-a - 2| \geq 1$

57. $4|s| + 2 \leq 8$ **58.** $5 - 3|z| < 14$ **59.** $9 - |3 - b| > 2$

60. $|8k| = 16$ **61.** $\left|\frac{a}{2}\right| \geq 3$ **62.** $\left|\frac{c}{4}\right| \leq 1$

63. $|5x - 3| = 17$ **64.** $|7 + 6n| < 19$ **65.** $|2w - 3| > 5$

66. $\left|\frac{u}{3} + 4\right| = 1$ **67.** $\left|\frac{v}{2} - 1\right| \leq 3$ **68.** $\left|\frac{a}{4} + 2\right| \geq 1$

69. $|5 - (3 - 2x)| < 6$ **70.** $7 + 3|2m + 1| = 13$ **71.** $10 - 6|2 - k| \geq 22$

Graph each inequality. (10-7)

72. $x < 3$ **73.** $x \geq -4$ **74.** $y > 0$ **75.** $y \leq -2$

76. $y > x - 1$ **77.** $y \leq -x + 2$ **78.** $y < 3 + 4x$ **79.** $y \geq -5x - 1$

Transform each inequality into an equivalent inequality with y as one side. Then graph the inequality. (10-7)

80. $x - y \geq 5$ **81.** $4x + y \leq -2$ **82.** $x - 3y > 6$

83. $6x - y < 2$ **84.** $y - 5x \geq 3$ **85.** $4y - 5x < 0$

86. $7x + 6y \geq x - 3$ **87.** $3y - 2 > 6x - 4$ **88.** $8y - 7 \leq 3(x + 2y)$

Graph each pair of inequalities and indicate the solution set of the system with crosshatching or shading. (10-8)

89. $y \leq 0$, $x > 0$ **90.** $y \geq -3$, $x \leq 2$ **91.** $y > 4x$, $x < 3$ **92.** $x \geq -1$, $y < 2x - 5$

93. $y < x + 3$, $y > 3 - x$ **94.** $y \leq 5x - 4$, $y \geq 2x + 1$ **95.** $x + y > 2$, $x - y < 6$ **96.** $3x - 4y \leq 0$, $x - 2y \geq -6$

Chapter 11

Replace the ? with $<$, $=$, or $>$ to make a true statement. (11-1)

1. $\frac{17}{23} \;?\; \frac{15}{19}$ **2.** $-\frac{87}{29} \;?\; -\frac{39}{13}$ **3.** $\frac{197}{6} \;?\; 33\frac{2}{7}$

Arrange each group of numbers in order from least to greatest. (11-1)

4. $-\frac{39}{8}, -4.7, -\frac{41}{9}$ **5.** $\frac{5}{7}, \frac{2}{3}, \frac{11}{15}, \frac{12}{17}$ **6.** $-\frac{4}{9}, -\frac{5}{8}, -\frac{6}{11}, -\frac{5}{7}$

Find the number halfway between the given numbers. (11-1)

7. $\frac{27}{41}, \frac{31}{37}$ 8. $-\frac{17}{140}, -\frac{11}{32}$ 9. $-5\frac{2}{7}, 9\frac{1}{4}$

If $x \in \{0, 1, 2, 3\}$ state whether each fraction increases or decreases in value as x takes on its values in increasing order. (11-1)

10. $\frac{5}{x+1}$ 11. $\frac{x-3}{7}$ 12. $\frac{8}{x+2}$ 13. $\frac{6-x}{4}$ 14. $\frac{10}{5+2x}$

Express each rational number as a terminating or repeating decimal. (11-2)

15. $\frac{4}{9}$ 16. $-\frac{29}{24}$ 17. $3\frac{11}{20}$ 18. $-7\frac{5}{11}$ 19. $\frac{41}{55}$

Express each rational number as a fraction in simplest form. (11-2)

20. 0.77 21. $0.\overline{6}$ 22. $-0.31\overline{8}$ 23. $2.\overline{37}$ 24. $0.\overline{4135}$

Find the number halfway between the given numbers. (11-2)

25. $\frac{5}{8}$ and 0.63 26. 0.66 and $0.\overline{6}$ 27. $\frac{7}{11}$ and $0.6\overline{28}$

Express both numbers as fractions. Then find their product. (11-2)

28. $\frac{2}{5}$ and 0.85 29. $0.\overline{4}$ and $\frac{2}{3}$ 30. -2.2 and $0.\overline{3}$

Find the indicated square roots. (11-3)

31. $\sqrt{441}$ 32. $\sqrt{784}$ 33. $\sqrt{2704}$ 34. $\sqrt{5184}$ 35. $\sqrt{10816}$
36. $\sqrt{0.04}$ 37. $\sqrt{0.64}$ 38. $\sqrt{1.96}$ 39. $\sqrt{0.0144}$ 40. $\sqrt{0.0036}$
41. $\sqrt{\frac{81}{225}}$ 42. $\sqrt{\frac{1}{289}}$ 43. $\sqrt{\frac{324}{1936}}$ 44. $\sqrt{\frac{32}{50}}$ 45. $\sqrt{\frac{320}{405}}$

Simplify. (11-4)

46. $\sqrt{63}$ 47. $\sqrt{176}$ 48. $2\sqrt{52}$ 49. $4\sqrt{99}$ 50. $5\sqrt{175}$
51. $10\sqrt{162}$ 52. $\sqrt{192}$ 53. $\sqrt{672}$ 54. $\sqrt{224}$ 55. $\sqrt{2646}$

Approximate to the nearest tenth by using a calculator or the square root table at the back of the book. (11-4)

56. $\sqrt{720}$ 57. $-\sqrt{800}$ 58. $\sqrt{440}$ 59. $\sqrt{8400}$ 60. $-\sqrt{5400}$

Simplify. (11-5)

61. $\sqrt{169m^2}$ 62. $\sqrt{48a^2}$ 63. $\sqrt{125x^4}$ 64. $\sqrt{54e^3}$ 65. $-\sqrt{36t^6}$
66. $\sqrt{98u^2v^2}$ 67. $-2\sqrt{72x^3y^2}$ 68. $\sqrt{324r^4s^6}$ 69. $-\sqrt{4.84w^4}$ 70. $\sqrt{5.76c^6}$

71. $\sqrt{\frac{a^4b^6}{12c^2}}$ **72.** $\sqrt{\frac{48u^5v^2}{4uv^4}}$ **73.** $\sqrt{\frac{144k^8}{256}}$ **74.** $\sqrt{\frac{3600}{81m^{36}}}$ **75.** $\sqrt{\frac{225x^{40}}{16}}$

76. $\sqrt{x^2 + 8x + 16}$ **77.** $\sqrt{a^2 - 4a + 4}$ **78.** $\sqrt{81 + 18k + k^2}$

Solve. (11-5)

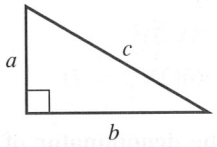
79. $g^2 = 49$ **80.** $h^2 - 64 = 0$ **81.** $25m^2 = 16$

82. $9x^2 - 4 = 0$ **83.** $6y^2 - 54 = 0$ **84.** $32t^2 - 27 = 0$

Find both roots of each equation to the nearest tenth. (11-5)

85. $a^2 = 132$ **86.** $b^2 - 208 = 0$ **87.** $11c^2 = 473$

In Exercises 88–95, refer to the right triangle shown at the right. Find the missing length correct to the nearest hundredth. (11-6)



88. $a = 3, b = 4, c =$? **89.** $a = 5, b = 8, c =$?

90. $a =$?, $b = 9, c = 13$ **91.** $a =$?, $b = 10, c = 15$

92. $a = 8, b =$?, $c = 16$ **93.** $a = 20, b =$?, $c = 30$

94. $a = 12, b = \frac{3}{4}a, c =$? **95.** $a = \frac{2}{3}b, b = 15, c =$?

State whether or not the three numbers given could represent the lengths of the sides of a right triangle. (11-6)

96. 21, 28, 35 **97.** 9, 9, 12 **98.** 45, 60, 75

99. 31, 41, 51 **100.** $6a$, $8a$, $10a$, $a > 0$ **101.** $5a$, $7a$, $9a$, $a > 0$

Simplify. (11-7)

102. $\sqrt{3} \cdot 4\sqrt{3}$ **103.** $2\sqrt{5} \cdot 3\sqrt{5}$ **104.** $\sqrt{7} \cdot \sqrt{6} \cdot \sqrt{2}$

105. $\sqrt{7} \cdot \sqrt{7} \cdot \sqrt{4}$ **106.** $5\sqrt{2} \cdot \sqrt{3}$ **107.** $8\sqrt{162}$

108. $\sqrt{\frac{5}{9}} \cdot \sqrt{\frac{9}{5}}$ **109.** $\sqrt{\frac{7}{5}} \cdot \sqrt{\frac{45}{14}}$ **110.** $\sqrt{5\frac{5}{6}} \cdot \sqrt{2\frac{4}{7}}$

111. $\frac{1}{4}\sqrt{\frac{16}{3}} \cdot \frac{1}{2}\sqrt{\frac{3}{2}}$ **112.** $\frac{12\sqrt{20}}{4\sqrt{3}}$ **113.** $\frac{11\sqrt{6}}{\sqrt{98}}$

Simplify. Assume all variables represent positive real numbers. (11-7)

114. $(3\sqrt{y})(-5\sqrt{x^2y})$ **115.** $\sqrt{n}(\sqrt{n^3} + 3)$ **116.** $(7\sqrt{3})(-4\sqrt{6})(5\sqrt{22})$

Simplify. (11-8)

117. $9\sqrt{3} - 5\sqrt{3}$ **118.** $7\sqrt{2} + 6\sqrt{2}$ **119.** $3\sqrt{54} - 2\sqrt{6}$

120. $4\sqrt{28} + 6\sqrt{112}$ **121.** $-10\sqrt{18} - 5\sqrt{32}$ **122.** $\sqrt{242} - 3\sqrt{363}$

Simplify. (11-8)

123. $\sqrt{8} - \sqrt{\frac{5}{6}}$ **124.** $\sqrt{\frac{2}{3}} - \sqrt{\frac{3}{2}}$ **125.** $5\sqrt{\frac{16}{7}} + \sqrt{\frac{9}{8}}$

126. $3\sqrt{63} + 2\sqrt{28} - \sqrt{35}$ **127.** $\sqrt{120} - \sqrt{270} + \sqrt{300}$

128. $2\sqrt{\frac{5}{3}} + 4\sqrt{\frac{3}{8}} - \frac{1}{2}\sqrt{68}$ **129.** $3\sqrt{5}(\sqrt{75} - 2\sqrt{12})$

Simplify. (11-9)

130. $(5 - \sqrt{3})(5 + \sqrt{3})$ **131.** $(\sqrt{7} + 6)(\sqrt{7} - 6)$

132. $(\sqrt{6} - \sqrt{5})(\sqrt{6} + \sqrt{5})$ **133.** $(4 + \sqrt{2})^2$

134. $(5 - \sqrt{5})^2$ **135.** $(3\sqrt{2} - 4)^2$

136. $(\sqrt{11} + 3\sqrt{7})^2$ **137.** $2\sqrt{6}(5\sqrt{2} - 4\sqrt{3})$

138. $(4\sqrt{5} - 6)(2\sqrt{7} + 7)$ **139.** $(3\sqrt{14} + 2\sqrt{7})(5\sqrt{14} + 3\sqrt{7})$

Rationalize the denominator of each fraction. (11-9)

140. $\frac{5}{3 + \sqrt{7}}$ **141.** $\frac{2 + \sqrt{3}}{1 - \sqrt{5}}$

Solve. (11-10)

142. $\sqrt{m} = 7$ **143.** $\sqrt{6x} = \frac{3}{2}$ **144.** $\sqrt{a} - 5 = 4$

145. $\frac{1}{5} + \sqrt{y} = 1$ **146.** $\sqrt{\frac{x}{3}} = 6$ **147.** $\sqrt{n - 2} = 9$

148. $4\sqrt{5t} = 8$ **149.** $\sqrt{3z} + 2 = 5$ **150.** $\sqrt{4k - 5} + 1 = 8$

151. $\sqrt{\frac{5u}{2}} - 3 = -2$ **152.** $\sqrt{\frac{4c - 3}{7}} = 3$ **153.** $8\sqrt{n} = 24\sqrt{5}$

Chapter 12

Solve. Express irrational solutions in simplest radical form. If the equation has no solution, write "no solution." (12-1)

1. $m^2 = \frac{25}{49}$ **2.** $5a^2 = 60$ **3.** $w^2 + 52 = 0$

4. $x^2 - 108 = 0$ **5.** $7u^2 - 112 = 0$ **6.** $4c^2 + 7 = 23$

7. $3t^2 - 12 = -3$ **8.** $2n^2 + 9 = 4$ **9.** $(v + 5)^2 = 16$

10. $(z - 5)^2 = 6$ **11.** $3(k + 4)^2 = 81$ **12.** $4(f - 1)^2 = 60$

13. $2(h + 7)^2 = 42$ **14.** $(2x + 3)^2 = 100$ **15.** $7(3y - 1)^2 = 168$

16. $e^2 + 6e + 9 = 64$ **17.** $a^2 - 12a + 36 = 49$ **18.** $m^2 + 18m + 81 = 36$

Solve by completing the square. Give irrational roots in simplest form and then approximate them to the nearest tenth. (12-2)

19. $x^2 + 16x = -15$ **20.** $y^2 - 8y + 7 = 0$ **21.** $n^2 - 12n - 202 = 8$

22. $4a^2 + 10a = 12$ **23.** $b^2 - 3b = 5$ **24.** $3c^2 + 6c - 1233 = 0$

Solve the equations by (a) completing the square and (b) factoring. (12-2)

25. $e^2 - 10e + 21 = 0$ **26.** $4f^2 - 18f = 10$ **27.** $6h^2 + 9h - 42 = 0$

Solve. Write irrational roots in simplest radical form. (12-2)

28. $\frac{m^2}{3} - 2m = 7$ **29.** $n^2 + \frac{n}{2} = 5$ **30.** $\frac{x^2}{2} - \frac{x}{4} = 2$

Use the quadratic formula to solve each equation. Give irrational roots in simplest radical form and then approximate them to the nearest tenth. (12-3)

31. $z^2 + 7z + 3 = 0$ **32.** $w^2 + 8w - 4 = 0$ **33.** $2u^2 - 10u - 6 = 0$

34. $5y^2 = -9y - 1$ **35.** $3k^2 + 2 = 5k$ **36.** $6m = 3 - 2m^2$

37. $x^2 + 0.3x - 0.2 = 0$ **38.** $n^2 + \frac{2}{3}n - \frac{1}{2} = 0$ **39.** $\frac{1}{2}y^2 - \frac{7}{2}y = 1$

Write the value of the discriminant of each equation. Then use it to decide how many different real-number roots the equation has. (Do not solve the equations.) (12-4)

40. $x^2 - 6x + 2 = 0$ **41.** $5n^2 + 3n + 7 = 0$ **42.** $-2t^2 + 4t - 2 = 0$

43. $3k^2 - 1.2k + 1.1 = 0$ **44.** $3s^2 + 6s + 3 = 0$ **45.** $\frac{1}{3}b^2 - b - 3 = 0$

Without drawing the graph of the given equation, determine (a) how many x-intercepts the parabola has, and (b) whether its vertex lies above, below, or on the x-axis. (12-4)

46. $y = 3x^2 + 2x - 5$ **47.** $y = -6 + 3x - 2x^2$ **48.** $y = x^2 - 4x + 16$

Solve each equation by the most appropriate method. Write irrational answers in simplest radical form. (12-5)

49. $x^2 + 7x + 12 = 0$ **50.** $13x^2 = 52$

51. $5x^2 - 9x = 0$ **52.** $3x^2 - 11x = 2$

53. $x^2 + 8x + 3 = 0$ **54.** $(x - 3)^2 = 6$

55. $6x^2 + 4x = 1$ **56.** $\frac{(x + 4)^2}{3} = 8$

57. $\frac{3}{4}x^2 - \frac{2}{3}x = 1$ **58.** $\frac{1}{2x} = \frac{3x - 2}{3}$

59. $1.2x^2 - 0.4x = 0.2$ **60.** $\frac{2x - 1}{4x + 3} = \frac{x + 1}{3x - 2}$

61. $4x(x - 2) + 3(x + 8) = 27 + 5x^2$ **62.** $(x + 6)^2 + 2(x - 1) = 13$

Solve. Give irrational roots to the nearest tenth. Use your calculator or the Table of Square Roots at the back of the book as necessary. (12-6)

63. The length of a rectangle is 6 times the width. The area of the rectangle is 84 cm^2. Find the length and width.

64. The difference of a number and its square is 56. Find the number.

65. The altitude of a triangle is 2 m less than the base. The area of the triangle is 84 m^2. Find the base.

66. Theresa is crocheting an afghan that is already 30 in. wide by 40 in. long. If she continues to crochet by increasing the width and the length by the same number of inches until the afghan's area is doubled, what will be the new dimensions?

Translate each statement into a formula. Use k as the constant of variation where needed. (12-7, 12-8)

67. The height, h, of a right circular cylinder of a given volume is inversely proportional to the square of the radius, r.

68. Wind pressure, p, on a flat surface varies directly as the square of the wind velocity, v.

69. The lateral area, L, of a cylinder varies jointly as the radius, r, of the base, and the height, h.

70. The volume, V, of a cone varies jointly as the height, h, and the square of the radius, r, of the base.

71. The rate of speed, r, of a moving body varies inversely as the time traveled, t, and directly as the distance traveled, d.

72. Centrifugal force, F, varies inversely as the radius, r, of the circular path, and directly as the square of the velocity, v, of a moving body.

Extra Practice: Problem Solving

Chapter 1

Use the five-step plan to solve each problem. (1-7)

1. A train is traveling at an average speed of 90 km/h. How far will it travel in 2.5 h?
2. If a number is decreased by 27, the result is 36. Find the number.
3. A football team finished its 12-game season with no ties. The team won twice as many games as it lost. How many games did the team win?
4. A store sold 102 record albums during a two-day sale. Twice as many albums were sold the second day as the first. How many albums were sold the first day?
5. If three times a number is increased by 11, the result is 68. Find the number.
6. A bank contains 57 nickels, dimes, and quarters. There are 8 more dimes than quarters and 5 more nickels than dimes. How much money is in the bank?

Chapter 2

Solve. (2-3)

1. A football team gained 23 yd on one play. However, the ball was brought back to the line of scrimmage and then the team was given a 15 yd penalty. How far was the ball from where it would have been had no penalty been assessed?
2. An elevator left the twenty-sixth floor of a building and went up eight floors, then down twelve, and back up four. On what floor was the elevator then?
3. At the beginning of the month the Cranes had $250 in their vacation fund. They were able to add $10 per week for four weeks. Then they had to take out $85 for emergency household repairs. How much was in the fund at the end of the month?
4. A neighborhood association collected $85 in dues, earned $280 at a garage sale, and got $124 in donations. The association needs $500 to build a playground. How much more must it collect?
5. An 8:00 A.M. flight from Boston to Minneapolis took three hours. The time in Minneapolis is one hour earlier than Boston. What time was it in Minneapolis when the flight arrived?

6. A train is traveling at the rate of 100 km/h. A conductor is walking toward the back of the train at 5 km/h. What is the conductor's speed relative to the ground?

Solve. (2-4)

1. Neon freezes at $-248.61°$ C and boils at $-246.09°$ C. Find the difference between the boiling point and the freezing point.
2. The highest point in California is Mount Whitney at 4418 m above sea level. The lowest point is Death Valley at 86 m below sea level. Find the difference in altitude.
3. A candidate goes door to door along Main Street from a point 16 blocks west of campaign headquarters to a point 12 blocks east of headquarters. How many blocks has she gone?
4. Find the difference in degrees of longitude between Chicago at about 88° W and Rome at about 12° E.
5. Mount Everest at 8848 m above sea level is 9245 m higher than the Dead Sea. Find the altitude of the Dead Sea.
6. One winter day the temperature in Marshview reached a record high of 18.3° C. That was 22.7° C higher than the average temperature for that day. Find the average temperature.

Chapter 3

Solve. (3-1)

1. A number increased by 13 is -5. Find the number.
2. A glass of milk costs 70¢. If a glass of milk and a sandwich cost \$2.50, how much does the sandwich cost?
3. Fifteen less than a number is 43. Find the number.
4. A plane flew 145 km/h faster when it was flying with the wind than it would have flown in still air. If its speed with the wind was 970 km/h, find the speed of the plane in still air.
5. The Booster Club had \$425 in its treasury. The members earned \$642 selling refreshments. They donated \$320 to the football team for bus rentals. How much money did they have left?
6. Seventy-six tickets were sold in advance for a museum field trip. Thirteen tickets were sold the day of the trip. Seven people had to return their tickets and did not go. How many people went altogether?

Solve. (3-2)

1. The opposite of seven times a number is 238. Find the number.
2. One fourth of a number is 73. Find the number.
3. A 2.5 kg bag of apples costs \$1.40. Find the cost per kilogram of the apples.

4. Frank works the same number of hours each week at a part-time job. In the last 8 weeks he worked 68 h. How many hours does Frank work each week?
5. A rectangle is 24 cm long and has a perimeter of 72 cm. Find the width.
6. A restaurant cuts its large pizza into 8 slices and sells each slice for 90¢. If the pizzas were cut into 6 slices, how much would the restaurant have to charge for each slice to make the same amount?

Solve. (3-4)

1. If you subtract 34 from the product of 15 and a number, you get 146. Find the number.
2. The perimeter of a rectangle is 152 cm. The width is 35 cm. Find the length.
3. Charlene paid $131.44, including tax, for a desk. The tax was 31 cents less than $\frac{1}{16}$ the cost of the desk. Find the cost of the desk.
4. Twin Cinema I seats 150 more people than Twin Cinema II. If the cinemas seat 1250 people altogether, find the number of seats in Twin Cinema II.
5. A bank contains 36 nickels, dimes, and quarters. There are 4 more dimes than quarters and twice as many nickels as quarters. How many of each coin are in the bank?
6. The longest side of a triangle is 8 cm longer than the shortest side and 5 cm longer than the third side. If the perimeter of the triangle is 56 cm, find the lengths of the three sides.

Solve. (3-5)

1. The larger of two consecutive integers is 10 more than twice the smaller. Find the integers.
2. Find a number whose product with 6 is the same as its sum with 45.
3. Five times a number, increased by 3, is the same as three times the number, increased by 27. Find the number.
4. The sum of two numbers is 20. Twice one number is 4 more than four times the other. Find the numbers.
5. The lengths of the sides of a triangle are consecutive odd integers. If the perimeter is 1 less than four times the shortest side, find the length of each side.
6. A sandwich costs 20¢ more than a salad plate. Six sandwiches cost as much as seven salad plates. Find the cost of each.

Solve. (3-6)

1. Kevin works 3 times as many hours in a week as Karen does. If each were to work 6 h more per week, Kevin would be working twice as many hours as Karen does. How many hours does each work now?

2. Aaron, Betsy, and Charita work part-time at the public library. Betsy works 4 h more each week than Aaron, and together they work half as many hours as Charita. How long does each person work if their total time is 45 h?
3. Zach's last quiz score was 30 points less than twice his first score. What was his first quiz score if the sum of his two scores is 150?
4. The length of a rectangle is 18 cm more than the width. A second rectangle is 6 cm shorter and 3 cm wider than the first and has a perimeter of 126 cm. Find the dimensions of each rectangle.
5. Becky has as many dimes as Ryan and Amy have together. Ryan has 2 more dimes than Amy, and Amy has one third as many dimes as Becky has. How many dimes does each have?
6. A cup of skim milk has 10 more than half the calories of a cup of whole milk. A cup of whole milk has 40 more calories than a glass of apple juice. If the total number of calories in one cup of each is 370, find the number of calories in each.

Solve. (3-7)

1. A collection of quarters and dimes is worth \$6.75. The number of dimes is 4 less than three times the number of quarters. How many of each are there?
2. A total of 720 people attended the school basketball game. Adult tickets cost \$2.50 each and student tickets cost \$1.50 each. If \$1220 worth of tickets were sold, how many students and how many adults attended?
3. A worker earns \$9 per hour for a regular workday and \$13.50 per hour for additional hours. If the worker was paid \$114.75 for an 11-hour workday, what is the length of a regular workday?
4. Carrots cost 75¢ per kilogram and potatoes cost 70¢ per kilogram. A shopper bought 9 kg of the vegetables for \$6.60. How many kilograms of each did the shopper buy?
5. A collection of 102 nickels, dimes, and quarters is worth \$13.60. There are 14 more nickels than dimes. How many quarters are there?

Chapter 4

Solve. (4-8)

1. Two trains leave a station at the same time, heading in opposite directions. One train is traveling at 80 km/h, the other at 90 km/h. How long will it take for the trains to be 425 km apart?
2. Grace leaves home at 8:00 A.M. Ten minutes later, Will notices Grace's lunch and begins bicycling after her. If Grace walks at 5 km/h and Will cycles at 15 km/h, how long will it take him to catch up with her?

3. A jet took one hour longer flying to Lincoln from Adams at 800 km/h than to return at 1200 km/h. Find the distance from Lincoln to Adams.
4. Gene spent 10 min riding his bicycle to a friend's house. He left his bike there and, with his friend, walked for 15 min to the gym. Gene rides his bicycle 10 km/h faster than he walks. If the entire trip covered a distance of 2.75 km, how far is it from his friend's house to the gym?
5. At noon, Sheila left a boat landing and paddled her canoe 20 km downstream and 20 km back. If she traveled 10 km/h downstream and 4 km/h upstream, what time did she arrive back at the landing?

Solve. (4-9)

1. A rectangle is 4 m longer than it is wide. If the length and width are both increased by 5 m, the area is increased by 115 m^2. Find the original dimensions.
2. A rectangle is 3 cm longer and 2 cm narrower than a square with the same area. Find the dimensions of each figure.
3. A rectangular swimming pool is 4 m longer than it is wide. It is surrounded by a cement walk 1 m wide. The area of the walk is 32 m^2. Find the dimensions of the pool.
4. When the length of a square is increased by 6 and the width is decreased by 4, the area remains unchanged. Find the dimensions of the square.
5. A print is 10 cm longer than it is wide. It is mounted in a frame 1.5 cm wide. The area of the frame is 399 cm^2. Find the dimensions of the print.

Solve. (4-10)

1. Find two consecutive integers whose sum is 104.
2. A plane averaged 1000 km/h on the first half of a round trip, but heavy winds slowed its speed on the return trip to 600 km/h. If the entire trip took 6 h, find the total distance.
3. Jill earned 12 more points on her quiz than Jack. If they both get 8 bonus points, Jill will have three times as many points as Jack does. How many points does each have?
4. The side of a square is 2 cm longer than the side of a second square. The area of the first square exceeds that of the second by 220 cm^2. Find the side of each square.
5. Find three consecutive integers whose sum is four times the greatest integer.

Chapter 5

Solve. (5-13)

1. The sum of a number and its square is 132. Find the number.
2. The sum of the squares of two consecutive positive odd integers is 202. Find the numbers.

3. A rectangle is 8 cm longer than it is wide. The area is 240 cm^2. Find the dimensions.
4. The sum of two numbers is 12 and the sum of their squares is 74. Find the numbers.
5. A rectangular flower garden is planted in a rectangular yard that is 16 m by 12 m. The garden occupies $\frac{1}{6}$ of the area of the yard and leaves a uniform strip of grass around the edges. Find the dimensions of the garden.
6. The edge of one cube is 4 cm longer than the edge of a second cube. The volumes of the cubes differ by 316 cm^3. Find the length of the edge of each cube.

Chapter 7

Solve. (7-1)

1. Two numbers are in the ratio 2:3 and their sum is 125. Find the numbers.
2. The measures of the angles of a triangle are in the ratio 2:3:5. Recall that the sum of the measures of the angles of a triangle is 180°. Find the measure of each angle.
3. Three numbers are in the ratio 2:3:5 and their sum is 200. Find the numbers.
4. The ratio of teachers to assistants to children at a day care center is 2:1:9. Of the 96 people at the center, how many are children?
5. A collection of quarters, dimes, and nickels is worth $22.80. If the ratio of quarters to dimes to nickels is 5:3:7, how many coins are there?
6. Two trains leave a station at the same time heading in opposite directions. After 2 h, the trains are 376 km apart. If the ratio of their speeds is 22:25, find the speed of each train.

Solve. (7-2)

1. A 1.5-lb steak costs $5.80. Find the cost of a 2-lb steak.
2. A poll showed that 400 voters out of 625 favor Question 1 in the town election. If there are 7500 voters altogether, how many can be expected to vote in favor of the question?
3. Group-rate admissions to a museum cost $140.70 for a group of 42. How much would it cost for a group of 50?
4. The tax on a restaurant meal that costs $24 is $1.44. Find the tax on a meal that costs $35.
5. The Sommers' scale is inaccurate. If it registers 120 lb for Karen, who actually weighs 116 lb, how much will it register for Neil, who actually weighs 174 lb?

6. On a wall map, 1 cm represents 25 km. Colorado is represented by a rectangle 25.8 cm long and 18.4 cm wide. Find the approximate area of Colorado in square kilometers.

Solve. (7-3)

1. Juan spent \$2 more on books than Sylvia did. If they each spent \$4 less, Sylvia would have spent exactly $\frac{5}{6}$ of what Juan spent. How much did each spend?
2. Three fifths of a number added to one fourth of the number is 51. Find the number.
3. Bart's age is one third of his mother's age. Seven years ago, his age was one fifth of hers. How old are both now?
4. A rectangle is 11 cm narrower than it is long. The length is two sevenths of the perimeter. Find the length and the width.
5. Two thirds of the coins in a collection of quarters and dimes are quarters. The collection is worth \$12. How many dimes are there?
6. A bus, traveling at 90 km/h, takes 15.2 h longer to get from Ardmore to Zepher than a plane flying at 850 km/h. How far is it from Ardmore to Zepher?

Solve. (7-4)

1. The sum of a number and its reciprocal is $\frac{25}{12}$. Find the number.
2. The sum of a number and its reciprocal is $\frac{29}{10}$. Find the number.
3. The denominator of a fraction is 2 more than the numerator. If the numerator and denominator are increased by 2, the new fraction is $\frac{4}{15}$ greater than the original fraction. Find the original fraction.
4. The denominator of a fraction is 2 more than the numerator. The sum of the fraction and its reciprocal is $\frac{34}{15}$. Find the fraction.
5. If the speed limit is decreased by 10 km/h on a 100 km stretch of a highway, the trip will take a half hour longer than usual. What is the usual speed limit?
6. Sue can ride her bike 14 km/h faster than she can walk. It takes 17.5 min longer to walk 2.5 km than to ride. Find Sue's walking speed.

Solve. (7-5)

1. If there is a 6% tax on clothing, find the tax on a suit that costs \$175.
2. A real estate agent makes a 7% commission on all sales. How much does the agent make on a sale of \$182,500?
3. A discount store sold a sweater for \$32. If the discount was 20%, find the original price.
4. If the Gannons' \$84 monthly gas bill goes up 8%, what will be their new monthly payment?

5. An $840 personal computer is discounted 25%. What is the final cost?
6. How much greater is the income on $3600 invested at 12% than on $4200 invested at 8%?

Solve. (7-6)

1. Last season, when a football team was doing poorly, weekly attendance averaged 42,000. This season weekly attendance averages 56,700. What is the percent of increase?
2. A single monthly issue of *Sports Spotlight* costs $2.25 at the newsstand. A yearly subscription of 12 issues costs $21.60. Find the percent of discount from the newsstand price.
3. Enrollment in the summer recreation program this year increased by 16% to 1711 people. How many people enrolled last year?
4. The Katchners invested $7500 at 8% and $3500 at 5%. Find the total annual income from the two investments.
5. The Ozakas invested a sum of money at 10%. They could have earned the same interest by investing $1600 less at 12%. How much did they invest?
6. The Sanjurjos invested three fourths of their money at 12% and the rest at 8%. If their annual income from the investment is $1320, how much have they invested?

Chemistry

Solve. (7-7)

1. How many liters of water must be added to 20 L of a 75% acid solution to produce a solution that is 15% acid?
2. How many liters of acid should be added to 4 L of a 10% acid solution to make a solution that is 80% acid?
3. A chemist mixes 16 L of a 40% acid solution and 24 L of a 16% acid solution. What is the percent of acid of the mixture?
4. How many kilograms of water must be evaporated from 84 kg of a 5% salt solution to produce a solution that is 35% salt?

Grocery

Solve. (7-7)

1. Students working at a refreshment stand mixed cranberry juice at 50¢ per liter and apple juice at 35¢ per liter to make 120 L of a fruit drink worth 40¢ per liter. How many liters of each did they use?

2. A grocer mixes a premium blend worth \$17 per kilogram with a blend worth \$7 per kilogram to make 36 kg of a blend worth \$11 per kilogram. How many kilograms of each type are included?
3. A butcher mixes 12 lb of ground pork at \$1.25 per pound with 24 lb of ground beef at \$2 per pound to sell as meat loaf mix. What should be the cost per pound of the mixture?
4. How many kilograms of cranberries at \$2.10 per kilogram should a grocer mix with 10 kg of pineapple chunks at \$1.20 per kilogram to make a relish worth \$1.35 per kilogram?

Investment and Wages

Solve. (7-7)

1. A worker earns $1\frac{1}{2}$ times the regular wage for overtime. In one week the worker's total income was \$625 for 35 h of regular work plus 10 h of overtime. What is the regular hourly wage?
2. The Esperanzas invested part of their \$8000 at 12% and part at 8%. If their annual investment income is \$825, how much is invested at each rate?
3. The Lees invested two thirds of their money at 12.5%, one fourth at 8%, and the rest at 6%. If their annual investment income is \$1625, how much did they invest altogether?
4. An investor has \$10,000 invested in two stocks. If one stock pays 15% and the other 16%, and the total annual income is \$1520, how much is invested in each?

Solve. (7-8)

1. Joe can do a job in 6 h and Charlie can do the same job in 5 h. What part of the job can they finish by working together for 2 h?
2. Charlotte can finish her paper route in 2 h. When Ralph helps, they finish in 45 min. How long would it take Ralph working alone?
3. A crew of 2 could put siding on a house in 30 h. Another crew of 3 could do the same job in 24 h. How long would it take all 5 people working together?
4. Flora can finish her chores in 4 h. One week, after Flora worked alone for 1 h, she was joined by her younger sister Fiona and they finished the job in 2 h. How long would it have taken Fiona working alone?
5. One pipe can fill a tank in 50 min and a second pipe can fill it in 90 min. When the tank was empty, the first pipe was opened for 20 min, then shut. How long will it take the second pipe to finish the job?
6. One machine can produce an order of Wonder Widgets in 45 min. A second machine takes 60 min, and a third takes 90 min. How long would it take all three working together?

Solve. (7-9)

1. The population of a certain area in t years is expected to be $10(1.03)^t$ thousand people. Find the population (a) now, (b) last year, and (c) next year.
2. A certain isotope has a half-life of 100 years. Starting with 100 g of the isotope, in t years there will be $100(0.5)^{t/100}$ g left. (a) How much will be left in 1000 years? (b) How much was there 1000 years ago?
3. A certain bacteria culture quadruples every 2 days. The number present t days from now will be $1{,}000{,}000(4)^{t/2}$. How many bacteria were there 2 weeks ago?
4. A \$10,000 investment earning 8%, compounded annually, will be worth $\$10{,}000(1.08)^t$ in t years. What was the amount 4 years ago?
5. The growth rate of a certain city is such that its population t years from now is given by the formula $12{,}000(1.06)^t$. What was the population 10 years ago?
6. In one country the cost of living has been increasing so that an item costing one dollar now will cost $(1.05)^t$ dollars t years from now. How much did today's one-dollar item cost 5 years ago?

Solve. (7-10)

1. The speed of light is about 3.00×10^5 km/s. The average distance from Earth to the moon is about 3.84×10^5 km. How long does it take light reflected from Earth to reach the moon?
2. At its farthest, the moon is about 4.07×10^5 km from Earth. At its closest, it is about 3.56×10^5 km from Earth. Find the difference between the two distances.
3. The average distance from the sun to Pluto is about 6.10×10^9 km. About how long does it take light from the sun to reach Pluto? (See Exercise 1 above.)
4. **a.** A parsec is about 3.3×10^3 light years. The star Deneb is about 5.0×10^2 parsecs from the sun. How many light years is that?
   b. A light year is about 9.5×10^{12} km. Find the distance from Deneb to the sun in kilometers.
5. The approximate wavelength of visible light is 6.0×10^3 Angstrom units. An Angstrom unit is equal to 1.0×10^{-8} cm. Find the wavelength of visible light in centimeters.

Chapter 8

Solve. (8-9)

1. A beam bends 1.6 cm with a mass of 32 kg on it. If the amount of bending is directly proportional to the mass, find the amount of bending caused by a mass of 62 kg.

2. A baker uses 18 cups of flour to make 48 sandwich rolls. How many cups of flour are needed to make 104 sandwich rolls?
3. A grocer uses 22 kg of premium nuts in making 54 kg of a mixture. How much of the premium nuts is needed for 81 kg of the mixture?
4. On a scale drawing, a child 4 ft tall is represented by a figure 6 in. tall. How tall a figure should be used to represent an 11 ft elephant?
5. On a map, 1 cm represents 60 km. Find the actual area of a region represented on the map by a rectangle 7.5 cm by 8.4 cm.
6. A factory is to be built in the shape of a rectangular solid. The actual building will be 62 m long, 30 m wide, and 12 m high. A scale model is built with a scale of 1 cm to 5 m. Find the volume of the model.

Solve. (8-10)

1. The time required to drive a given distance is inversely proportional to the speed. If it takes 7.5 h to cover a distance at 84 km/h, how long will it take at 90 km/h?
2. A gear with 36 teeth revolves at 800 r/min and meshes with a gear with 24 teeth. Find the speed of the second gear if the speed varies inversely as the number of teeth.
3. How much would you have to invest at 8% to earn as much interest as $1250 invested at 12%?
4. A room is to be partitioned into a row of carrels. If each carrel is 1.8 m wide, there will be room for 16 carrels. How many carrels will fit if each is 1.92 m wide?
5. A mass of 18 g and a mass of 22 g are on the ends of a meter stick. Where should a fulcrum be placed to balance the meter stick?
6. A lever has a mass of 400 g on one end and a mass of 250 g on the other. The lever is balanced when the mass of 400 g is 0.75 m closer to the fulcrum than the other mass. How far from the fulcrum is the mass of 250 g?

Chapter 9

Solve. (9-3)

1. A collection of 77 quarters and dimes is worth $12.50. How many quarters are there?
2. The sum of two numbers is 32. One number is 4 more than the other. Find the numbers.
3. The length of a rectangle is 3 less than twice the width. The perimeter is 54. Find the dimensions.
4. The sum of two numbers is 66. If the smaller number is subtracted from two thirds of the larger number, the result is one third the positive difference of the original numbers. Find the numbers.

5. If 1 is subtracted from the numerator of a fraction, the resulting fraction is $\frac{1}{3}$. If 2 is subtracted from the denominator, the resulting fraction is $\frac{1}{2}$. Find the original fraction.
6. If 2 is added to the numerator of a fraction, the resulting fraction is $\frac{2}{3}$. If 1 is subtracted from the denominator, the resulting fraction is $\frac{1}{2}$. Find the original fraction.

Solve. (9-4)

1. The sum of two numbers is 36 and their difference is 6. Find the numbers.
2. The sum of two numbers is 73. When the smaller number is subtracted from twice the greater number, the result is 50. Find the numbers.
3. There are 158 members in the soccer program. There are 16 more boys than girls. How many boys are there?
4. If Cathy walks for 2 h and rides her bicycle for 1 h, she can travel 36 km. If she walks for 2 h and rides her bicycle for 2 h, she can travel 56 km. How fast can she walk? How fast can she ride her bicycle?
5. Craig has 38 quarters and dimes. If he had twice as many quarters, he would have \$11. How many of each coin does he have?
6. Olivia has \$30 more than Carl. If they each had \$7 less, the sum of their funds would equal the amount that Olivia has now. How much money does each have now?

Solve. (9-5)

1. The sum of two numbers is 51 and their difference is 13. Find the numbers.
2. A collection of 27 nickels and dimes is worth \$1.95. How many of each coin are there?
3. The side of a square house is 24 ft long, and the house is located on a lot which is 50 ft longer than it is wide. The perimeter of the lot is 20 ft more than 5 times the perimeter of the house. Find the length of the lot.
4. Museum passes cost \$5 for adults and \$2 for children. One day the museum sold 1820 passes for \$6100. How many of each type were sold?
5. In a math contest, each team is asked 50 questions. The teams earn 15 points for each correct answer and lose 8 for each incorrect answer. One team finished with a score of 566. How many questions did this team answer correctly?
6. A grocer mixes two types of nuts, Brand A and Brand B. If the mix includes 4 kg of Brand A and 6 kg of Brand B, the mix will cost \$6.20 per kilogram. If it includes 2 kg of Brand A and 8 kg of Brand B, it will cost \$5.60 per kilogram. Find the cost per kilogram of each brand.

Solve. (9-6)

1. A boat can travel 16 km/h against the current. The same boat can travel 30 km/h with the current. Find the rate of the boat in still water and the rate of the current.

2. A jet flies with the wind at 1100 km/h and against the same wind at 750 km/h. Find the rate of the wind and the speed of the jet in still air.
3. A swimmer can swim 4 km with the current in 24 min. The same distance would take 40 min against the current. Find the rate of the current and the speed of the swimmer.
4. A plane flies the first half of a 5600 km flight into the wind in 3.5 h. The return trip, with the same wind, takes 2.5 h. Find the speed of the wind and the speed of the plane in still air.
5. A plane has a speed of 840 km/h in still air. It can travel 3120 km with the wind in the same time it would take to travel 1920 km against the wind. Find the speed of the wind.
6. A rowboat can travel a distance of 66 km in 3 h with the current. The rowboat can travel 33 km in 3 h against the current. Find the rate of the current and the rate of the rowboat in still water.

Chapter 10

Solve. (10-3)

1. The sum of two consecutive integers is less than 83. Find the pair of such integers with the greatest sum.
2. A collection of quarters and dimes is worth more than $20. There are twice as many quarters as dimes. At least how many dimes are there?
3. Four members of a bowling team had scores of 240, 180, 220, and 200. Find the lowest score a fifth person must get to maintain an average for the group of at least 220.
4. The sum of three consecutive even integers is less than 80. Find the greatest such integers.
5. When road repairs begin, the current speed limit will be cut by 40 km/h. It will then take at least 3.6 h to cover the same distance that can be covered in 2 h now. What is the speed limit now?
6. The length of a rectangle is 1 cm greater than twice the width. If each dimension were increased by 5 cm, the area would be at least 150 cm^2 greater. Find the least possible dimensions.

Chapter 11

Solve. (11-5)

1. A square has an area of 184 cm^2. Find the length of a side to the nearest tenth of a centimeter.
2. A square has the same area as a rectangle that is 25 m by 18 m. Find the length of a side of the square to the nearest tenth of a meter.

3. A square has the same area as a triangle that has a base of 8 cm and a height of 5 cm. Find the length of a side of the square to the nearest tenth of a centimeter.
4. A circle inside a square just touches its sides. The area of the circle is 226.08 m^2. Find the length of a side of the square to the nearest tenth of a meter. Use 3.14 as an approximation for π.
5. A circular wading pool covers an area of 34.54 m^2. Find the radius of the pool to the nearest tenth of a meter. Use 3.14 as an approximation for π.
6. A circular flower bed is surrounded by a crushed-stone walk that is 1 m wide. If the area of the whole region is 21.98 m^2, find the radius of the flower bed to the nearest tenth of a meter. Use 3.14 as an approximation for π.

Solve. Approximate each square root to the nearest hundredth. **(11-6)**

1. A small park in the shape of a rectangle has dimensions 50 m by 20 m. A road through the park follows the diagonal of the rectangle. Find the length of the road.
2. A rope from the top of a mast of a sailboat is attached to a point 2 m from the mast. If the rope is 6 m long, how tall is the mast?
3. The length of one leg of a right triangle is one centimeter less than twice the length of the second leg. The hypotenuse is one centimeter more than twice the length of the second leg. Find the length of each leg.
4. The bottom of a 7 m ramp is 5 m from the base of a loading platform. Find the height of the platform.
5. The length of the longer leg of a right triangle is 3 cm more than the length of the shorter leg. The length of the hypotenuse is 3 cm more than the length of the longer leg. Find the length of each leg.

Solve. **(11-10)**

1. One fourth the square root of a number is 7. Find the number.
2. When 8 is subtracted from 3 times a number, the square root of the result is 10. Find the number.
3. Four times the square root of a number is 28. Find the number.
4. When 5 is subtracted from the square root of twice a number, the result is 9. Find the number.
5. The geometric mean of two positive numbers is the positive square root of their product. Find two consecutive even integers whose geometric mean is $8\sqrt{15}$.
6. Find two consecutive positive odd integers whose geometric mean is $15\sqrt{3}$.

Chapter 12

Solve. (12-6)

1. The sum of a number and its square is 30. Find the number.
2. The foundation of a house is 13 m by 7 m. If the builder increases each dimension by the same amount, the area of the foundation will increase to 135 m^2. Find the new dimensions.
3. The perimeter of a rectangular yard is 138 m and the area is 540 m^2. Find the dimensions of the yard.
4. The sum of the squares of two consecutive even integers is 340. Find the integers.
5. One work crew can finish a job in 18 h less than a second crew. Working together, they can finish the job in 40 h. How long would each crew take working alone?
6. One number is 2 more than 3 times another. The sum of their squares is 212. Find the numbers.

Solve. (12-7)

1. The stopping distance of a car varies directly as the square of its speed. If the stopping distance is 112 m at 64 km/h, find the stopping distance at 56 km/h.
2. The price of a diamond varies directly as the square of its mass. If a 1.4 carat diamond costs \$1764, find the cost of a similar stone with a mass of 1.7 carats.
3. The height of a cone of given volume is inversely proportional to the square of the radius of the base. If a cone that is 4 units high has a base with radius 3 units, find the height of a cone of equal volume with a base of radius 6 units.
4. The time needed to fill a tank varies inversely as the square of the radius of the hose. If a hose of radius 3.5 cm takes 8 min to fill a tank, how long will it take using a hose of radius 2 cm?
5. The force between two magnets varies inversely as the square of the distance between them. Two magnets are initially 4 cm apart. They are moved 8 cm farther apart. What is the effect on the force?
6. The distance an object falls varies directly as the square of the time it falls. If an object falls 175.5 m in 6 s, how long would it take to fall 487.5 m?

Solve. (12-8)

1. The cost of operating an appliance varies jointly as the number of watts, hours of operation, and the cost per kilowatt-hour. It costs 45¢ to operate a 3000-watt air conditioner for 2 h at a cost of 7.5¢ per kilowatt-hour. Find the cost of operating a 1200-watt dishwasher for 40 min.

2. The number of persons needed to do a job varies directly as the amount of work to be done and inversely as the time in which the job is to be done. If 8 factory workers can produce 520 items in 4 days, how many workers will be needed to produce 585 items in 3 days?
3. If 2 painters can cover 320 ft^2 in 3 h, how long will it take 3 painters to cover 840 ft^2? (See Exercise 2 above.)
4. The mass of a metal disc varies directly as the thickness and the square of the radius. A disc 2 cm thick with radius 5 cm has a mass of 840 g. Find the mass of a disc of the same metal that has radius 3 cm and is 0.5 cm thick.