

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.  $6 + (15 + 4) = 6 + (4 + 15)$      ?  
 $= (6 + 4) + 15$      ?  
 $= 10 + 15 = 25$      ?

77.  $20 + (-4) = (16 + 4) + (-4)$      ?  
 $= 16 + [4 + (-4)]$      ?  
 $= 16 + 0$      ?  
 $= 16$      ?

- 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?
- 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?
- 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.
- 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?
- 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.**

- 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?
- 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?
- 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?
- 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?
- A collection of 102 nickels, dimes, and quarters is worth \$13.60. There are 14 more nickels than dimes. How many quarters are there?

(3-7)

## Chapter 4

**Solve.**

- 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?
- 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?

(4-8)

# Chapter 4

Simplify.

1.  $7^3$

5.  $7 + 5^2$

9.  $5^3 \div (3^2 + 4^2)$

2.  $(-5)^4$

6.  $(8 - 4)^3$

3.  $-3 \cdot 2^4$

7.  $6 - 2^5$

10.  $(8^2 - 6^2) \div 7$

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

8.  $(4 + 7)^2$

11.  $4(9^2 - 4^3)$

Evaluate if  $a = -3$  and  $b = 2$ .

12.  $3a + b^2$

16.  $7 + ab^2$

13.  $(3a + b)^2$

17.  $(7 + ab)^2$

14.  $4a - b^3$

18.  $-\frac{3a}{b^2}$

15.  $(4a - b)^3$

19.  $\left(-\frac{3a}{b}\right)^2$

Add.

20.  $\begin{array}{r} 4x - 3 \\ 7x + 8 \\ \hline \end{array}$

24.  $\begin{array}{r} 5k - 6l + 4 \\ -5k + 8l + 2 \\ \hline \end{array}$

26.  $\begin{array}{r} 2m^2 - 3mn - 5n \\ -8m^2 \quad \quad - n \\ \hline \end{array}$

21.  $\begin{array}{r} 3b + 4 \\ -2b - 6 \\ \hline \end{array}$

22.  $\begin{array}{r} 5m + 8 \\ 4m + 3 \\ \hline \end{array}$

25.  $\begin{array}{r} 6x^2 - 2xy + 3y^2 \\ 4x^2 - xy - y^2 \\ \hline \end{array}$

27.  $\begin{array}{r} 5a^2 - 6ab \\ -2a^2 + 9ab - b^2 \\ \hline \end{array}$

23.  $\begin{array}{r} -2t - 7 \\ 6t - 3 \\ \hline \end{array}$

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

Simplify.

36.  $e^6 \cdot e^3 \cdot e$

39.  $(-2gh^2)(5g^3h)$

42.  $\left(\frac{8}{3}x^5y\right)\left(\frac{9}{2}xy^6\right)$

45.  $3^w \cdot 3^{5-w} \cdot 3$

48.  $(3p^5)(5p^2) + (7p^3)(2p^4)$

50.  $(w^5)^2$

54.  $(a^n)^3$

58.  $(5f)^2$

62.  $(2u^3v)^5$

66.  $(3k)^2(3k)^4$

37.  $(4f^3)(2f^4)$

40.  $(3mn)(6m^2n)(2n^2)$

43.  $(-6a^3)\left(\frac{1}{6}a^3\right)$

46.  $4^2 \cdot 4^{a+1} \cdot 4^a$

49.  $(8d^3)(2d^7) - (3d^6)(4d^4)$

52.  $y^2 \cdot y^5$

56.  $c^3 \cdot c^n$

60.  $(6m^3)^2$

64.  $(-7x^4)^2$

68.  $-(4t^2)^2(3t)^3$

38.  $(-3c^2d)(-4cd^2)$

41.  $(-5j^4k^2)(4jl^3)(-3kl^2)$

44.  $(3u^2v)(-7v^3)\left(\frac{4}{9}u^2\right)$

47.  $2^5 \cdot 2^{b+3} \cdot 2^{3-b}$

53.  $z^n \cdot z^n$

57.  $d^n \cdot d^n \cdot d^n$

61.  $(4mn^5)^3$

65.  $-(8x^5)^3$

69.  $(5x^2y)^3 \cdot 3xy^2$

**Multiply.**

70.  $7(x + 3)$

74.  $3n(n + 5)$

78.  $9a(a^2 - 3a - 4)$

80.  $\frac{1}{3}c(6c^2 - 3cd + 9d^2)$

82.  $(m + 4)(m + 2)$

85.  $(5x - 2)(x + 7)$

88.  $(u + 3)(u^2 + 2u + 5)$

91.  $\frac{7x - 4y}{3x - 2y}$

92.  $\frac{5a - 8b}{4a + b}$

93.  $\frac{e^2 + ef + f^2}{e + f}$

94.  $\frac{3m^2 - 4mn + n^2}{5m + n}$

71.  $5(y - 4)$

75.  $-4t(3 - 2t)$

72.  $-3(n - 2)$

76.  $6k(2k - 7)$

79.  $-5b^2(3b^2 - 2b + 6)$

81.  $\frac{1}{2}uv^2(10u^2 - 4uv + 8v^2)$

83.  $(n - 3)(n + 5)$

86.  $(4y - 2)(3y - 1)$

89.  $(v - 1)(3v^2 + 4v + 7)$

84.  $(a - 6)(a - 7)$

87.  $(6m + 4)(5m + 3)$

90.  $(3c - 5)(2c^2 - c + 8)$

(4-5, 4-6)

73.  $-8(1 + 4m)$

77.  $-5h(8h + 3)$

**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<sup>2</sup>.

(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?

- 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.
- 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?
- 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)

- 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  $115 \text{ m}^2$ . Find the original dimensions.
- A rectangle is 3 cm longer and 2 cm narrower than a square with the same area. Find the dimensions of each figure.
- 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  $32 \text{ m}^2$ . Find the dimensions of the pool.
- 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.
- 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  $399 \text{ cm}^2$ . Find the dimensions of the print.

Solve.

(4-10)

- Find two consecutive integers whose sum is 104.
- 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.
- 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?
- 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  $220 \text{ cm}^2$ . Find the side of each square.
- Find three consecutive integers whose sum is four times the greatest integer.

## Chapter 5

(5-13)

Solve.

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

# 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.  $\frac{(2c^5)(4c^3)}{(8c^2)^3}$

(5-3)

Divide.

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.  $\frac{28h^5k^3 - 35hk^2}{7hk^2}$

(5-3)

Factor each polynomial as the product of its greatest monomial factor and another polynomial.

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.  $8m^2n - 24mn^2$

(5-4)

Write each product as a trinomial.

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.  $2x(9x - 1)(2x + 3)$

(5-5)

Write each product as a binomial.

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.  $(ab + c^2)(ab - c^2)$

(5-5)

Factor. You may use a calculator or the table of squares.

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.  $16x^8 - 625$

...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?

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stream 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.**

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  $115 \text{ m}^2$ . Find the original dimensions. (4-9)
2. A rectangle is 3 cm longer and 2 cm narrower than a square with the same area. Find the dimensions of each figure.
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1. Find two consecutive integers whose sum is 104. (4-10)
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?
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## Chapter 5

**Solve.**

1. The sum of a number and its square is 132. Find the number. (5-13)
2. The sum of the squares of two consecutive positive odd integers is 202. Find the numbers.

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

## Chapter 7

### Solve.

- Two numbers are in the ratio 2:3 and their sum is 125. Find the numbers. (7-1)
- 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  $180^\circ$ . Find the measure of each angle.
- Three numbers are in the ratio 2:3:5 and their sum is 200. Find the numbers.
- 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?
- 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?
- 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.

- A 1.5-lb steak costs \$5.80. Find the cost of a 2-lb steak. (7-2)
- 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?
- Group-rate admissions to a museum cost \$140.70 for a group of 42. How much would it cost for a group of 50?
- The tax on a restaurant meal that costs \$24 is \$1.44. Find the tax on a meal that costs \$35.
- 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?



Express each square as a trinomial.

61.  $(g + 7)^2$

65.  $(2m + 3n)^2$

62.  $(k - 3)^2$

66.  $(7a - 5b)^2$

63.  $(2x + 6)^2$

67.  $(ef - 8)^2$

64.  $(5y - 3)^2$

68.  $(-4 + 9f)^2$

(5-6)

Factor.

69.  $x^2 - 6x + 9$

72.  $64x^2 + 80xy + 25y^2$

70.  $e^2 + 18e + 81$

73.  $4m^2 - 36mn + 81n^2$

71.  $4 - 28h + 49h^2$

74.  $16w^2 + 24wz + 9z^2$

(5-6)

Factor. Check by multiplying the factors. If the polynomial is not factorable, write *prime*.

(5-7, 5-8, 5-9)

75.  $k^2 + 8k + 7$

78.  $35 + 12u + u^2$

81.  $x^2 + 13xy + 42y^2$

84.  $c^2 + 3c - 18$

87.  $h^2 - 7h - 18$

90.  $a^2 - 2ab - 3b^2$

93.  $2x^2 + 11x + 12$

96.  $-10 - 26y - 12y^2$

99.  $15x^2 + 13xy + 2y^2$

76.  $v^2 - 9v + 20$

79.  $n^2 - 16n + 48$

82.  $m^2 - 10mn + 21n^2$

85.  $x^2 - 2x - 35$

88.  $b^2 + 7b - 30$

91.  $u^2 + 3uv - 4v^2$

94.  $10e^2 - 12e + 3$

97.  $-7 - 39z - 18z^2$

100.  $8a^2 - 22ab + 12b^2$

77.  $a^2 - 2a + 1$

80.  $w^2 + 18w + 80$

83.  $e^2 - 15ef + 44f^2$

86.  $k^2 + 8k - 32$

89.  $y^2 - 4y - 45$

92.  $m^2 - mn - 20n^2$

95.  $10d^2 + d - 3$

98.  $-10 + 24z - 8z^2$

101.  $14m^2 - mn - 3n^2$

Factor. Check by multiplying.

(5-10)

102.  $8(m - 3) - 5m(3 - m)$

104.  $u(u - 2v) - (2v - u)$

106.  $a^2 + 2a + ab + 2b$

108.  $n^3 + n^2 - 6n - 6$

103.  $6a(a + 2) + 4(a + 2)$

105.  $b(b - 2)(b + 1) - 3 - 3b$

107.  $7cw + 3c - 7w^2 - 3w$

109.  $64 - 64m^2 + m^4 - m^6$

Factor completely. Check by multiplying.

(5-11)

110.  $42x^3 + 68x^2 + 16x$

113.  $16a^4 - 144a^2$

116.  $36m^2 + 24mn + 4n^2$

111.  $60y^3 - 18y^2 - 6y$

114.  $4n^5 - 100n$

117.  $24cd - 12c^2 - 12d^2$

112.  $12x^5 - 20x^4 + 3x^3$

115.  $28w^7 - 102w^5$

118.  $-7x^3 + 14x^2y - 7xy^2$

Solve and check.

(5-12)

119.  $(a + 13)(a + 8) = 0$

122.  $(6h - 5)(6h + 5) = 0$

125.  $a^2 + 7a + 6 = 0$

128.  $y^2 - 7y - 18 = 0$

131.  $6 - 23z - 4z^2 = 0$

134.  $e^2 - 49 = 0$

120.  $(f - 16)(f - 27) = 0$

123.  $7w(4w + 3) = 0$

126.  $q^2 - 21q = -20$

129.  $c^2 - 36 = -5c$

132.  $3m^2 + 1 = 4m$

135.  $36g^2 = 16$

121.  $(2x - 4)(3x - 5) = 0$

124.  $m(2m + 7)(3m - 4) = 0$

127.  $d^2 = 14d - 45$

130.  $h^2 = -3h + 54$

133.  $2n^2 = 10 + n$

136.  $w^3 - 9w = 0$

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

## Chapter 7

Solve.

(7-1)

- Two numbers are in the ratio 2:3 and their sum is 125. Find the numbers.
- 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  $180^\circ$ . Find the measure of each angle.
- Three numbers are in the ratio 2:3:5 and their sum is 200. Find the numbers.
- 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?
- 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?
- 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)

- A 1.5-lb steak costs \$5.80. Find the cost of a 2-lb steak.
- 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?
- Group-rate admissions to a museum cost \$140.70 for a group of 42. How much would it cost for a group of 50?
- The tax on a restaurant meal that costs \$24 is \$1.44. Find the tax on a meal that costs \$35.
- 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?

Write each expression as a fraction in simplest form.

$$90. 7\frac{1}{3}$$

$$91. 5 + \frac{1}{n}$$

$$94. 6 - \frac{5}{k+3}$$

$$95. \frac{n}{n-2} + 7$$

$$98. 3y + \frac{y}{2y+7}$$

$$99. 5 - \frac{e+3}{e^2-1}$$

$$102. n - \frac{7}{n+2} - \frac{3n-1}{n+2}$$

$$103. \frac{v}{u+v} + \frac{u}{v-u} + 1$$

$$100. a + \frac{5a+3}{a+3}$$

$$104. \frac{x}{x-4} + \frac{x}{x+4} - 3$$

$$89. \frac{u}{u-4} + \frac{3}{4-u}$$

(6-6)

$$93. \frac{x}{y} + 3$$

$$97. 8h - \frac{h}{h+3}$$

$$101. 2w - \frac{w+3}{w-3}$$

Divide. Write the answer as a polynomial or mixed expression.

$$105. \frac{x^2 + 7x + 10}{x+2}$$

$$106. \frac{y^2 - 2y - 35}{y-7}$$

$$107. \frac{a^2 - 5a - 3}{a+2}$$

$$108. \frac{n^2 - 16}{n+4}$$

$$109. \frac{7 + k^2 - 4k}{k-5}$$

$$110. \frac{8y^2 + 6}{2y-1}$$

$$111. \frac{b^3 - 1}{b+1}$$

$$112. \frac{x^3 + 5}{x+3}$$

$$113. \frac{w^3 + w^2 + 2w - 4}{w-1}$$

$$114. \frac{u^3 + 2u^2 - 16}{u-2}$$

$$115. \frac{2n^2 - 13n + 20}{2n-5}$$

$$116. \frac{2 - 9h + 7h^2}{7h-2}$$

$$117. \frac{v^3 + v^2 + v + 1}{v-2}$$

$$118. \frac{5n^2 + 6n^3 + 9}{3+2n}$$

(6-7)

## Chapter 7

Write each ratio in simplest form.

$$1. 40 \text{ s} : 2 \text{ min}$$

$$2. 4 \text{ m} : 250 \text{ cm}$$

$$3. 3 \text{ kg} : 45 \text{ g}$$

$$4. 6y : 15y$$

$$5. 36d^2 : 10d$$

$$6. (4a)^2 : 6a$$

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.

$$9. \frac{3}{5} = \frac{x}{15}$$

$$10. \frac{5}{7} = \frac{25}{a}$$

$$11. \frac{24}{7} = \frac{4}{c}$$

$$12. \frac{3x}{2} = \frac{2}{5}$$

$$13. \frac{15a}{64} = \frac{45}{32}$$

$$14. \frac{17d}{25} = \frac{51}{125}$$

$$15. \frac{x-4}{x} = \frac{7}{9}$$

$$16. \frac{3w}{10w+2} = \frac{2}{7}$$

$$17. \frac{8a-5}{5a-4} = \frac{13}{8}$$

(7-2)

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

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.

1. Juan spent \$2 more on books than Sylvia did. If they each spent \$4 less, Sylvia would have spent exactly  $\frac{5}{8}$  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?

(7-3)

Solve.

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.

(7-4)

(7-5)

Solve.

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?

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

53.  $10w = 8w + 14$  {7}  
 56.  $9m + 3 = 6m + 21$  {6}  
 59.  $2(v - 8) = 6v$  {-4}  
 62.  $\frac{1}{3}(18 - 9c) = 6 - 3c$   
 65.  $5(3 + h) = 4(h + 2)$  {-7}
63.  $\left\{\frac{11}{8}\right\}$  64.  $\left\{-\frac{5}{3}\right\}$   
 54.  $x = 45 - 4x$  {9}  
 57.  $27 + u = 3 - 3u$  {-6}  
 60.  $3x = 5(x - 6)$  {15}  
 63.  $m - 5 = \frac{1}{2}(12 - 14m)$   
 66.  $(6x - 3)2 = (4x + 7)3$   
 no solution
55.  $48 - 6k = -12k$  {-8}  
 58.  $4n + 1 = -1 + 4n$  no sol.  
 61.  $7y - 3 = 6(y + 2)$  {15}  
 64.  $\frac{4}{5}(25x - 15) = 50x + 38$   
 67.  $7(n - 3) = 5(n - 3)$  {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? **Jay, \$18,000; wife, \$27,000**
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. **75, 77, 79, 97**
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?  
**Julius, 110 lb; twins, 55 lb each**
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?  
**16 cm by 10 cm;  
 14 cm by 13 cm**
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? **75 nickels**
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? **56 dozen**
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?  
**10 cans dog food; 12 cans cat food**
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? **4 h**

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

76.  $6 + (15 + 4) = 6 + (4 + 15)$  ? Comm. prop. of add.  
 $= (6 + 4) + 15$  ? Assoc. prop. of add.  
 $= 10 + 15 = 25$  ? Substitution principle
77.  $20 + (-4) = (16 + 4) + (-4)$  ? Substitution principle  
 $= 16 + [4 + (-4)]$  ? Assoc. prop. of add.  
 $= 16 + 0$  ? Prop. of opposites  
 $= 16$  ? Ident. prop. of add.

$$\begin{aligned}
 78. \quad -7 + 19 &= 19 + (-7) \\
 &= 12 + 7 + (-7) \\
 &= 12 + 0 \\
 &= 12
 \end{aligned}$$

$\frac{?}{?}$  Comm. prop. of add.  
 $\frac{?}{?}$  Substitution principle  
 $\frac{?}{?}$  Prop. of opposites  
 $\frac{?}{?}$  Identity prop. of add.

## Chapter 4

Simplify.

1.  $7^3$  343  
 2.  $(-5)^4$  625  
 3.  $-3 \cdot 2^4 - 48$   
 4.  $(-2 \cdot 5)^3 - 1000$   
 5.  $7 + 5^2$  32  
 6.  $(8 - 4)^3$  64  
 7.  $6 - 2^5 - 26$   
 8.  $(4 + 7)^2$  121  
 9.  $5^3 \div (3^2 + 4^2)$  5  
 10.  $(8^2 - 6^2) \div 7$  4  
 11.  $4(9^2 - 4^3)$  68

Evaluate if  $a = -3$  and  $b = 2$ .

12.  $3a + b^2 - 5$   
 13.  $(3a + b)^2 - 49$   
 14.  $4a - b^3 - 20$   
 15.  $(4a - b)^3 - 2744$   
 16.  $7 + ab^2 - 5$   
 17.  $(7 + ab)^2 - 1$   
 18.  $-\frac{3a}{b^2} \cdot \frac{9}{4}$   
 19.  $\left(-\frac{3a}{b}\right)^2 \cdot \frac{81}{4}$

Add.

20.  $4x - 3$   
 $\frac{7x + 8}{11x + 5}$   
 21.  $3b + 4$   
 $\frac{-2b - 6}{b - 2}$   
 22.  $5m + 8$   
 $\frac{4m + 3}{9m + 11}$   
 23.  $-2t - 7$   
 $\frac{6t - 3}{4t - 10}$   
 24.  $5k - 6l + 4$   
 $\frac{-5k + 8l + 2}{2l + 6}$   
 25.  $6x^2 - 2xy + 3y^2$   
 $\frac{4x^2 - xy - y^2}{10x^2 - 3xy + 2y^2}$   
 26.  $2m^2 - 3mn - 5n$   
 $\frac{-8m^2}{-n - 6m^2 - 3mn - 6n}$   
 27.  $5a^2 - 6ab$   
 $\frac{-2a^2 + 9ab - b^2}{3a^2 + 3ab - b^2}$

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

- Simplify. 41.  $60j^5k^3l^5$  44.  $-\frac{28u^4v^4}{3}$   
 36.  $e^6 \cdot e^3 \cdot e^{10}$  37.  $(4f^3)(2f^4) 8f^7$  38.  $\frac{12c^3d^3}{(-3c^2d)(-4cd^2)}$   
 39.  $(-2gh^2)(5g^3h) - 10g^4h^3$  40.  $(3mn)(6m^2n)(2n^2) 36m^3n^4$  41.  $(-5j^4k^2)(4jl^3)(-3kl^2)$   
 42.  $\left(\frac{8}{3}x^5y\right)\left(\frac{9}{2}xy^6\right) 12x^6y^7$  43.  $(-6a^3)\left(\frac{1}{6}a^3\right) -a^6$  44.  $(3u^2v)(-7v^3)\left(\frac{4}{9}u^2\right)$   
 45.  $3^w \cdot 3^{5-w} \cdot 3$  729 46.  $4^2 \cdot 4^{a+1} \cdot 4^a 4^{2a+3}$  47.  $2^5 \cdot 2^{b+3} \cdot 2^{3-b} 2048$   
 48.  $(3p^5)(5p^2) + (7p^3)(2p^4) 29p^7$  49.  $(8d^3)(2d^7) - (3d^6)(4d^4) 4d^{10}$   
 50.  $(w^5)^2 w^{10}$  51.  $(x^2)^5 x^{10}$  52.  $y^2 \cdot y^5 y^7$  53.  $z^n \cdot z^n z^{2n}$   
 54.  $(a^n)^3 a^{3n}$  55.  $(b^3)^n b^{3n}$  56.  $c^3 \cdot c^n c^{n+3}$  57.  $d^n \cdot d^n \cdot d^n d^{3n}$   
 58.  $(5f)^2 25f^2$  59.  $(gh)^4 g^4h^4$  60.  $(6m^3)^2 36m^6$  61.  $(4mn^5)^3 64m^3n^{15}$   
 62.  $(2u^3v)^5 32u^{15}v^5$  63.  $(3a^5b^4)^2 9a^{10}b^8$  64.  $(-7x^4)^2 49x^8$  65.  $-(8x^5)^3 -512x^{15}$   
 66.  $(3k)^2(3k)^4$  67.  $(-2x^3)^3 \cdot (5x^2)^2$  68.  $-(4t^2)^2(3t)^3$  69.  $(5x^2y)^3 \cdot 3xy^2$   
 $729k^6$   $-200x^{13}$   $-432t^7$   $375x^7y^5$

### Additional Answers

28.  $-3x - 11$   
 29.  $5b + 10$   
 30.  $m + 5$   
 31.  $-8t - 4$   
 32.  $10k - 14l + 2$   
 33.  $2x^2 - xy + 4y^2$   
 34.  $10m^2 - 3mn - 4n$   
 35.  $7a^2 - 15ab + b^2$   
 41.  $60j^5k^3l^5$   
 44.  $-\frac{28u^4v^4}{3}$

**Additional Answers**

- 82.  $m^2 + 6m + 8$
- 83.  $n^2 + 2n - 15$
- 84.  $a^2 - 13a + 42$
- 85.  $5x^2 + 33x - 14$
- 86.  $12y^2 - 10y + 2$
- 87.  $30m^2 + 38m + 12$
- 95.  $a = \frac{2A}{p}; p \neq 0$
- 96.  $h = \frac{3V}{B}; B \neq 0$
- 97.  $b_1 = \frac{2A - b_2h}{h}; h \neq 0$
- 98.  $b = y - mx$
- 99.  $r = \sqrt{\frac{A}{\pi}}, A \geq 0$
- 100.  $n = \frac{S + 360}{180}$
- 101.  $C = \frac{5}{9}(F - 32)$
- 102.  $A = P + Prt$
- 103.  $t = \frac{I}{Pr}; Pr \neq 0$

**Multiply.**

- 70.  $7(x + 3)$
- 71.  $5(y - 4)$
- 72.  $-3(n - 2)$
- 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.  $(3c - 5)(2c^2 - c + 6)$
- 91.  $7x - 4y$
- 92.  $5a - 8b$
- 93.  $e^2 + ef + f^2$
- 94.  $3m^2 - 4mn + 5m + n$
- 95.  $21x^2 - 26xy + 8y^2$
- 96.  $20a^2 - 27ab - 8b^2$
- 97.  $e^3 + 2e^2f + 2ef^2 + f^3$
- 98.  $15m^3 - 17m^2n + mn^2$

Solve the given formula for the variable shown in color. State the restrictions, if any, for the formula obtained to be meaningful.

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

- 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? **35 mi/h, 50 mi/h**
- 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? **90 min**
- 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? **3600 km; 4.5 h**
- 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<sup>2</sup>. **13.25 in. by 39.75 in.**
- 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?  **$3\frac{1}{8}$  yd<sup>2</sup>**



# Chapter 5

List all pairs of factors of each integer.

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

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

6.  $2 \cdot 3 \cdot 7$    7.  $2^4 \cdot 5$    8.  $7 \cdot 13$    9.  $2^3 \cdot 3^2$    10.  $2^2 \cdot 13$

Give the GCF of each group of numbers.

11. 126, 168   42      12. 144, 84   12      13. 65, 52   13      14. 90, 330   30

Simplify. Assume that no denominator equals 0.

15.  $\frac{12x^5}{4x} \cdot 3x^4$       16.  $\frac{25m^4n}{-15mn^6} - \frac{5m^3}{3n^5}$       17.  $\frac{-7ab}{21ab^5} - \frac{1}{3b^4}$       18.  $\frac{-8(uv)^7}{-10(uv)^5} \cdot \frac{4u^2v^2}{5}$   
 19.  $\frac{(w^4)^2}{(w^5)^4} \cdot \frac{1}{w^{12}}$       20.  $\frac{(5k)^2}{5k^2} \cdot 5$       21.  $\frac{(-3y)^3}{(y^3)^2} - \frac{27}{y^3}$       22.  $\frac{(2c^5)(4c^3)}{(8c^2)^3} \cdot \frac{c^2}{64}$

Divide.

23.  $\frac{12e + 8}{4} \cdot 3e + 2$       24.  $\frac{6x - 9y + 12}{3} \cdot 2x - 3y + 4$       25.  $\frac{2x^2 + 6x + 1}{2x^3 + 6x^2 + x} \cdot x$   
 26.  $\frac{18ab - 24a^2}{-6a} \cdot -3b + 4a$       27.  $\frac{15m - 25m^2 - 5m^3}{5m} \cdot 3 - 5m - m^2$       28.  $\frac{28h^5k^3 - 35hk^2}{7hk^2} \cdot 4h^4k - 5$

Factor each polynomial as the product of its greatest monomial factor and another polynomial.

29.  $5(3w^2 - 2w + 1)$       30.  $9x(x + 2)$       31.  $7u^2(u + 2)$   
 $15w^2 - 10w + 5$        $9x^2 + 18x$        $7u^3 + 14u^2$   
 32.  $6a(2a^2 - a + 3)$       33.  $3c(5c + d)$       34.  $8mn(m - 3n)$   
 $12a^3 - 6a^2 + 18a$        $15c^2 + 3cd$        $8m^2n - 24mn^2$

Write each product as a trinomial.

35.  $(x + 5)(x + 3) \cdot x^2 + 8x + 15$       36.  $(b - 2)(b - 4) \cdot b^2 - 6b + 8$       37.  $(n - 3)(n + 7)$   
 38.  $(e - 8)(e + 6) \cdot e^2 - 2e - 48$       39.  $(3 + m)(2 + m) \cdot 6 + 5m + m^2$       40.  $(3f + 2)(f + 5)$   
 41.  $(4y - 3)(2y - 1) \cdot 8y^2 - 10y + 3$       42.  $(8z + 7)(z - 2) \cdot 8z^2 - 9z - 14$       43.  $(5n - 3)(4n - 2)$   
 44.  $a(6a - 4)(5a - 3) \cdot 30a^3 - 38a^2 + 12a$       45.  $h(3h + 7)(4h + 9) \cdot 12h^3 + 55h^2 + 63h$       46.  $2x(9x - 1)(2x + 3) \cdot 36x^3 + 50x^2 - 6x$

Write each product as a binomial.

47.  $(k - 5)(k + 5) \cdot k^2 - 25$       48.  $(3 - y)(3 + y) \cdot 9 - y^2$       49.  $(4d - 8)(4d + 8) \cdot 16d^2 - 64$   
 50.  $(w^2 - 6)(w^2 + 6) \cdot w^4 - 36$       51.  $(5m^2 + n)(5m^2 - n) \cdot 25m^4 - n^2$       52.  $(ab + c^2)(ab - c^2) \cdot a^2b^2 - c^4$

Factor. You may use a calculator or the table of squares.

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.  $16x^8 - 625$   
 $(7 - 10y)(7 + 10y)$        $(v - w)(v + w)(v^2 + w^2)$        $(s^3 - 2)(s^3 + 2)$

## Additional Answers

1. 1, 42; 2, 21; 3, 14; 6, 7; -1, -42; -2, -21; -3, -14; -6, -7  
 2. 1, 80; 2, 40; 4, 20; 5, 16; 8, 10; -1, -80; -2, -40; -4, -20; -5, -16; -8, -10  
 3. 1, 91; 7, 13; -1, -91; -7, -13  
 4. 1, 72; 2, 36; 3, 24; 4, 18; 6, 12; 8, 9; -1, -72; -2, -36; -3, -24; -4, -18; -6, -12; -8, -9  
 5. 1, 52; 2, 26; 4, 13; -1, -52; -2, -26; -4, -13

**Additional Answers**

75.  $(k + 7)(k + 1)$   
 76.  $(v - 5)(v - 4)$   
 77.  $(a - 1)^2$   
 78.  $(7 + u)(5 + u)$   
 79.  $(n - 12)(n - 4)$   
 80.  $(w + 8)(w + 10)$   
 81.  $(x + 6y)(x + 7y)$   
 82.  $(m - 7n)(m - 3n)$   
 83.  $(e - 4f)(e - 11f)$   
 84.  $(c + 6)(c - 3)$   
 85.  $(x - 7)(x + 5)$   
 86. prime  
 87.  $(h - 9)(h + 2)$   
 88.  $(b + 10)(b - 3)$   
 89.  $(y - 9)(y + 5)$   
 90.  $(a - 3b)(a + b)$   
 91.  $(u + 4v)(u - v)$   
 92.  $(m - 5n)(m + 4n)$   
 93.  $(2x + 3)(x + 4)$   
 94. prime  
 95.  $(5d + 3)(2d - 1)$   
 96.  $-2(5 + 3y)(1 + 2y)$   
 97. prime  
 98.  $-2(2z - 1)(2z - 5)$   
 99.  $(5x + y)(3x + 2y)$   
 100.  $2(a - 2b)(4a - 3b)$   
 101.  $(7m + 3n)(2m - n)$
110.  $2x(3x + 4)(7x + 2)$   
 111.  $6y(5y + 1)(2y - 1)$   
 112.  $x^3(6x - 1)(2x - 3)$   
 113.  $16a^2(a - 3)(a + 3)$   
 114.  $4n(n^2 - 5)(n^2 + 5)$   
 115.  $2w^5(14w^2 - 51)$   
 116.  $4(3m + n)^2$   
 117.  $-12(c - d)^2$   
 118.  $-7x(x - y)^2$

Express each square as a trinomial.

61.  $g^2 + 14g + 49$   
 62.  $k^2 - 6k + 9$   
 63.  $4x^2 + 24x + 36$   
 64.  $25y^2 - 30y + 9$   
 65.  $(2m + 3n)^2$   
 66.  $(7a - 5b)^2$   
 67.  $(ef - 8)^2$   
 68.  $(-4 + 9f)^2$   
 69.  $4m^2 + 12mn + 9n^2$   
 70.  $49a^2 - 70ab + 25b^2$   
 71.  $e^2f^2 - 16ef + 64$   
 72.  $81f^2 - 72f + 16$

Factor.

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.  $16w^2 + 24wz + 9z^2$   
 75.  $x^2 - 6x + 9$   
 76.  $e^2 + 18e + 81$   
 77.  $4 - 28h + 49h^2$   
 78.  $64x^2 + 80xy + 25y^2$   
 79.  $4m^2 - 36mn + 81n^2$   
 80.  $16w^2 + 24wz + 9z^2$

Factor. Check by multiplying the factors. If the polynomial is not factorable, write *prime*.

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.

102.  $8(m - 3) - 5m(3 - m)$   
 103.  $2(a + 2)(3a + 2)$   
 104.  $u(u - 2v) - (2v - u)$   
 105.  $(b - 3)(b + 1)^2$   
 106.  $a^2 + 2a + ab + 2b$   
 107.  $6a(a + 2) + 4(a + 2)$   
 108.  $n^3 + n^2 - 6n - 6$   
 109.  $b(b - 2)(b + 1) - 3 - 3b$   
 110.  $a^2 + 2a + ab + 2b$   
 111.  $7cw + 3c - 7w^2 - 3w$   
 112.  $n^3 + n^2 - 6n - 6$   
 113.  $64 - 64m^2 + m^4 - m^6$   
 114.  $(a + 2)(a + b)$   
 115.  $(7w + 3)(c - w)$   
 116.  $n^3 + n^2 - 6n - 6$   
 117.  $(1 + m)(1 - m)(64 + m^4)$   
 118.  $(n + 1)(n^2 - 6)$   
 119.  $(1 + m)(1 - m)(64 + m^4)$

Factor completely. Check by multiplying.

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.  $-7x^3 + 14x^2y - 7xy^2$

119.  $\{-13, -8\}$   
 120.  $\{16, 27\}$   
 121.  $\{2, \frac{5}{3}\}$   
 122.  $\{\frac{5}{6}, -\frac{5}{6}\}$   
 123.  $\{0, -\frac{3}{4}\}$   
 124.  $\{0, -\frac{7}{2}, \frac{4}{3}\}$   
 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.  $w^3 - 9w = 0$

84.  $\frac{5a-4}{6} + \frac{a-2}{17a^9-16}$  85.  $\frac{2h+4}{8} - \frac{h}{4} + \frac{3h-2}{10}$  86.  $\frac{4(m-n)}{16} - \frac{3(m+n)}{12} - \frac{n}{2}$   
 87.  $\frac{3}{x+2} - \frac{18}{2x+7}$  88.  $\frac{3z}{z^2-16} + \frac{z}{z-4} - \frac{10}{z(z+7)}$  89.  $\frac{u}{u-4} + \frac{3}{4-u} - \frac{u-3}{u-4}$

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

90.  $7\frac{1}{3} - \frac{22}{3}$  91.  $5 + \frac{1}{n} - \frac{5n+1}{n}$  92.  $4m - \frac{3}{m} - \frac{4m^2-3}{m}$  93.  $\frac{x}{y} + 3 - \frac{x+3y}{y}$   
 94.  $6 - \frac{5}{k+3} - \frac{6k+13}{k+3}$  95.  $\frac{n}{n-2} + 7 - \frac{8n-14}{n-2}$  96.  $\frac{x+3}{x} - 2 - \frac{3-x}{x}$  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.  $\frac{u^3+2u^2-16}{u-2} - \frac{u^2+4u+8}{u^2+4u+8}$  115.  $\frac{2n^2-13n+20}{2n-5} - n - 4$   
 116.  $\frac{2-9h+7h^2}{7h-2} - h - 1$  117.  $\frac{v^3+v^2+v+1}{v-2} - \frac{v^2+3v+7}{v-2} + \frac{15}{v-2}$  118.  $\frac{5n^2+6n^3+9}{3+2n} - \frac{3n^2-2n+3}{3+2n}$

## Chapter 7

Write each ratio in simplest form.

1. 40 s : 2 min 1:3  
 2. 4 m : 250 cm 8:5  
 3. 3 kg : 45 g 200:3  
 4. 6y : 15y 2:5  
 5.  $36d^2 : 10d$  18d:5  
 6.  $(4a)^2 : 6a$  8a:3

7. The ratio of old cars to new cars if there are 180 cars and 55 are new. 25:11  
 8. The ratio of wins to losses for a baseball team that played 84 games and won 48 of them. 4:3

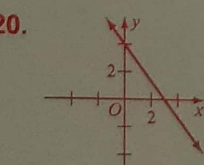
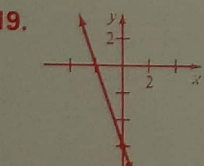
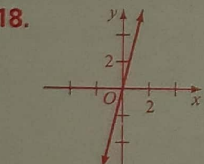
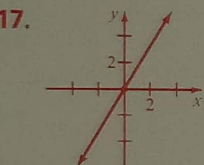
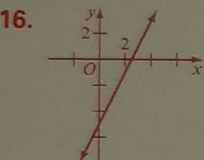
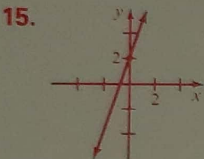
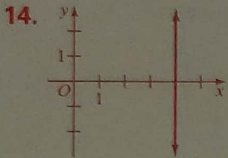
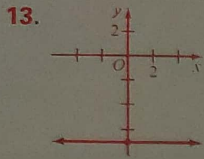
Solve each proportion. (7-2)

9.  $\frac{3}{5} = \frac{x}{15}$  {9}  
 10.  $\frac{5}{7} = \frac{25}{a}$  {35}  
 11.  $\frac{24}{7} = \frac{4}{c} - \frac{7}{6}$   
 12.  $\frac{3x}{2} = \frac{2}{5} - \frac{4}{15}$   
 13.  $\frac{15a}{64} = \frac{45}{32}$  {6}  
 14.  $\frac{17d}{25} = \frac{51}{125} - \frac{3}{5}$   
 15.  $\frac{x-4}{x} = \frac{7}{9}$  {18}  
 16.  $\frac{3w}{10w+2} = \frac{2}{7}$  {4}  
 17.  $\frac{8a-5}{5a-4} = \frac{13}{8}$  {12}

## Additional Answers

97.  $\frac{h(8h+23)}{h+3}$   
 98.  $\frac{2y(3y+11)}{2y+7}$   
 99.  $\frac{5e^2-e-8}{(e+1)(e-1)}$   
 100.  $\frac{a^2+8a+3}{a+3}$   
 101.  $\frac{2w^2-7w-3}{w-3}$   
 102.  $n-3$   
 103.  $\frac{2v^2}{(v+u)(v-u)}$   
 104.  $\frac{-x^2+48}{(x+4)(x-4)}$   
 105.  $x+5$   
 106.  $y+5$   
 107.  $a-7 + \frac{11}{a+2}$   
 108.  $n-4$   
 109.  $k+1 + \frac{12}{k-5}$   
 110.  $4y+2 + \frac{8}{2y-1}$   
 111.  $b^2-b+1 - \frac{2}{b+1}$   
 112.  $x^2-3x+9 - \frac{22}{x+3}$

**Additional Answers, page 653**



(continued)

Solve and check. If the equation has no solution, write *No Solution*.

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

19.  $\frac{2x}{3} - \frac{x}{2} = 12$  {72}

20.  $\frac{6}{7}x - \frac{1}{2}x = 5$  {14} (7-3, 7-4)

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

22.  $\frac{y+2}{2} = \frac{2y}{3}$  {6}

23.  $\frac{x+1}{5} - \frac{3}{2} = \frac{3x-6}{10}$  {-7}

24.  $\frac{12}{z} = \frac{4+4z}{z}$  {2}

25.  $\frac{1}{x} + \frac{1}{3} = \frac{1}{2}$  {6}

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

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

28.  $\frac{3m+5}{6} - \frac{10}{m} = \frac{m}{2}$  {12}

29.  $\frac{h}{2h+4} - \frac{1}{h+2} = 1$  {-6}

Evaluate.

30. 80% of 700 **560**

31. 45% of 450 **202.5**

32. 3.25% of 48 **1.56** (7-5)

33. 18 is 60% of what number? **30**

34. 63 is 150% of what number? **42**

35. What percent of 180 is 45? **25%**

36. What percent of 36 is 54? **150%**

Solve.

37.  $1.2x = 48$  {40}

38.  $0.6z = 180$  {300}

39.  $0.08y = 64$  {800} (7-5, 7-6, 7-7, 7-8)

40.  $0.4a - 0.7 = 2.9$  {9}

41.  $0.3b + 0.03b = 99$  {300}

42.  $0.05c = 6.6 - 0.06c$  {60}

43. How many kilograms of zinc are contained in 30 kg of an alloy containing 28% zinc? **8.4 kg**

44. Ed Jefferson bought a new suit that cost \$140. If he also paid \$6.30 in sales tax, find the sales tax rate. **4.5%**

45. A camera that originally cost \$150 is on sale at 15% off the original price. Find the sale price. **\$127.50**

46. How many kilograms of water must be added to 12 kg of a 30% salt solution to produce a 20% solution? **6 kg**

47. How many kilograms of water must be evaporated from 40 kg of a 10% salt solution to produce a 25% solution? **24 kg**

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? **10 min**

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? **30 min**

Evaluate.

50.  $6^{-2} \frac{1}{36}$

51.  $5^{-3} \frac{1}{125}$

52.  $7^{-2} \frac{1}{49}$

53.  $9^{-3} \frac{1}{729}$  (7-9)

54.  $2^{-4} \cdot 2^{-3} \frac{1}{128}$

55.  $(6^{-2})^{-1} 36$

56.  $\frac{3^{-4}}{3^{-3}} \frac{1}{3}$

57.  $\frac{8^{-2}}{8^{-4}} 64$

**652 Extra Practice**

- 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? **Aaron, 5.5 h; Betsy, 9.5 h; Charita, 30 h**
- 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? **60**
- 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. **24 cm by 42 cm; 27 cm by 36 cm**
- 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? **Becky, 6; Ryan, 4; Amy, 2 dimes**
- 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. **whole milk, 160 calories; skim milk, 90 calories; apple juice, 120 calories**

**Solve.**

- 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? **13 quarters, 35 dimes** (3-7)
- 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? **580 students, 140 adults**
- 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? **7.5 h**
- 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? **6 kg of carrots, 3 kg of potatoes**
- A collection of 102 nickels, dimes, and quarters is worth \$13.60. There are 14 more nickels than dimes. How many quarters are there? **36 quarters**

## Chapter 4

**Solve.**

- 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? **2.5 h** (4-8)
- 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? **5 min**

- 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. **2400 km**
- 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? **0.65 km**
- 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? **7:00 P.M.**

Solve.

(4-9)

- 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  $115 \text{ m}^2$ . Find the original dimensions. **7 m by 11 m**
- A rectangle is 3 cm longer and 2 cm narrower than a square with the same area. Find the dimensions of each figure. **4 cm by 9 cm; 6 cm by 6 cm**
- 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  $32 \text{ m}^2$ . Find the dimensions of the pool. **5 m by 9 m**
- 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. **12 by 12**
- 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  $399 \text{ cm}^2$ . Find the dimensions of the print. **60 cm by 70 cm**

Solve.

(4-10)

- Find two consecutive integers whose sum is 104. **No solution**
- 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. **4500 km**
- 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? **No solution**
- 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  $220 \text{ cm}^2$ . Find the side of each square. **56 cm and 54 cm**
- Find three consecutive integers whose sum is four times the greatest integer.  
**-5, -4, -3**

## Chapter 5

(5-13)

Solve.

- The sum of a number and its square is 132. Find the number. **11 or -12**
- The sum of the squares of two consecutive positive odd integers is 202. Find the numbers. **9, 11**

- A rectangle is 8 cm longer than it is wide. The area is  $240 \text{ cm}^2$ . Find the dimensions. **12 cm by 20 cm**
- The sum of two numbers is 12 and the sum of their squares is 74. Find the numbers. **5 and 7**
- A rectangular flower garden is planted in a rectangular yard that is 16 m by 12 m. The garden occupies  $\frac{1}{8}$  of the area of the yard and leaves a uniform strip of grass around the edges. Find the dimensions of the garden. **4 m by 8 m**
- The edge of one cube is 4 cm longer than the edge of a second cube. The volumes of the cubes differ by  $316 \text{ cm}^3$ . Find the length of the edge of each cube. **3 cm; 7 cm**

## Chapter 7

Solve.

- Two numbers are in the ratio 2:3 and their sum is 125. Find the numbers. **50, 75**
- 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  $180^\circ$ . Find the measure of each angle.  **$36^\circ$ ,  $54^\circ$ ,  $90^\circ$**
- Three numbers are in the ratio 2:3:5 and their sum is 200. Find the numbers. **40, 60, 100**
- 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? **72 children**
- 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? **180 coins**
- 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. **88 km/h, 100 km/h**

Solve.

- A 1.5-lb steak costs \$5.80. Find the cost of a 2-lb steak. **\$7.73**
- 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? **4800**
- Group-rate admissions to a museum cost \$140.70 for a group of 42. How much would it cost for a group of 50? **\$167.50**
- The tax on a restaurant meal that costs \$24 is \$1.44. Find the tax on a meal that costs \$35. **\$2.10**
- 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? **180 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. **296,700 km<sup>2</sup>**

(7-3)

Solve.

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? **Juan, \$16; Sylvia, \$14**
2. Three fifths of a number added to one fourth of the number is 51. Find the number. **60**
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? **Bart, 14 years old; mother, 42 years old**
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. **length, 44 cm; width, 33 cm**
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? **20 dimes**
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? **1530 km**

(7-4)

Solve.

1. The sum of a number and its reciprocal is  $\frac{25}{12}$ . Find the number.  **$\frac{3}{4}$  or  $\frac{4}{3}$**
2. The sum of a number and its reciprocal is  $\frac{29}{10}$ . Find the number.  **$\frac{5}{2}$  or  $\frac{2}{5}$**
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.  **$\frac{1}{3}$**
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.  **$\frac{3}{5}$**
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? **50 km/h**
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. **6 km/h**

(7-5)

Solve.

1. If there is a 6% tax on clothing, find the tax on a suit that costs \$175. **\$10.50**
2. A real estate agent makes a 7% commission on all sales. How much does the agent make on a sale of \$182,500? **\$12,775**
3. A discount store sold a sweater for \$32. If the discount was 20%, find the original price. **\$40**
4. If the Gannons' \$84 monthly gas bill goes up 8%, what will be their new monthly payment? **\$90.72**