

CHAPTER 3

Think & Discuss (p. 137)

1., 2.

Minutes swimming, s	Minutes inline skating, i	$12s + 8i$
0	30	240
5	25	260
10	20	280
15	15	300
20	10	320
25	5	340
30	0	360

$12s + 8i$ represents Calories burned.

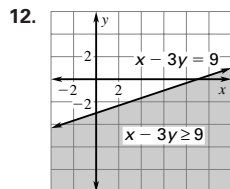
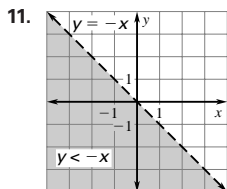
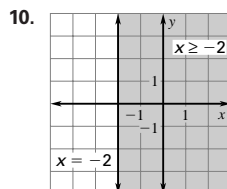
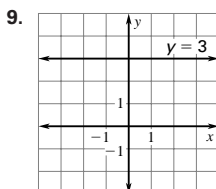
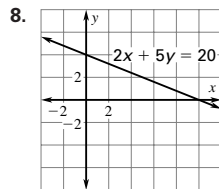
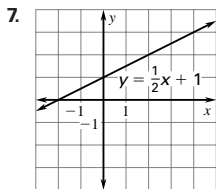
3. Swim for 15 min; skate for 15 min

Study Guide (p. 138)

1. $\frac{2}{3}(0) - 4 \neq -4$; no 2. $-3 = -3$; yes

3. $5(1) + 5 = 10$; yes 4. $5 \geq 0$; yes

5. $2(6) - 3(2) > 6$; no 6. $-7 + 9 \leq 3$; yes



Lesson 3.1

3.1 Guided Practice (p. 142)

1. solution

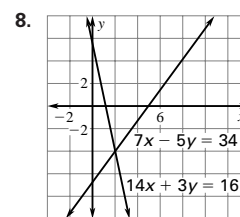
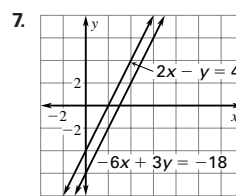
2. Sample answer: If the graph consists of two non-parallel lines, then there is a single solution. If the graph consists of two parallel lines, there is no solution. If the graph of two lines coincide, there are infinitely many solutions.

3. Sample answer: If two lines share two points in common, they are the same line, and every point on that line is a solution.

4. $-2(5) + 4(6) \neq -14$; $3(5) + 6 = 21$; no

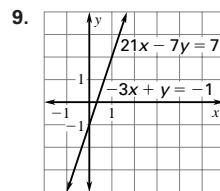
5. $7(5) - 2(6) = 23$; $-5 + 3(6) = 13$; yes

6. $5 + 6 = 11$; $-5 - 6 = -11$; yes



no solution

one solution



10. $8x + 6y = 34$

$x + y = 5$

(2, 3)

infinitely many solutions

3.1 Practice and Applications (pp. 142–145)

11. $4(6) - (-1) = 25$; $-3(6) - 2(-1) = -16$; yes

12. $-3(3) + 2(0) \neq 3$; $10(3) + 0 = 30$; no

13. $2(-2) - (-8) \neq 52$; $9(-2) - (-8) = -10$; no

14. $-(-3) - (-5) = 8$; $2(-3) + 5(-5) = -31$; yes

15. $-4(-4) + 3(1) = 19$; $5(-4) - 7(1) = -27$; yes

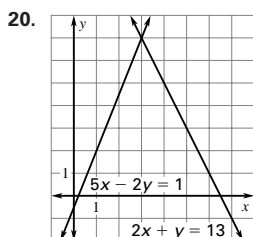
16. $-3(10) - (8) = -38$; $-8(10) + 8(8) = -16$; yes

17. $-3(1) + (-1) = -4$; $7(1) + 2(-1) \neq -5$; no

18. $5(-2) - (-7) = -3$; $-2 + 3(-7) = -23$; yes

19. $17(0) + 8(2) = 16$; $-0 - 4(2) \neq 8$; no

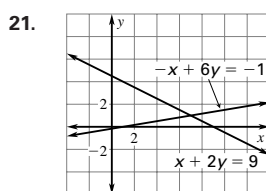
Chapter 3 continued



$$(3, 7)$$

$$2(3) + 7 = 13$$

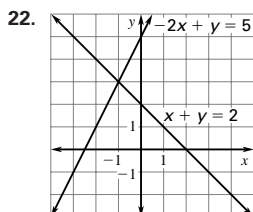
$$5(3) - 2(7) = 1$$



$$(7, 1)$$

$$7 + 2(1) = 9$$

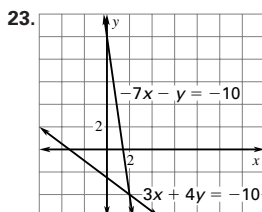
$$-7 + 6(1) = -1$$



$$(-1, 3)$$

$$-2(-1) + 3 = 5$$

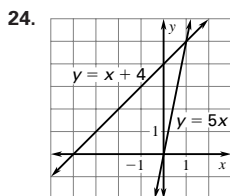
$$-1 + 3 = 2$$



$$(2, -4)$$

$$3(2) + 4(-4) = -10$$

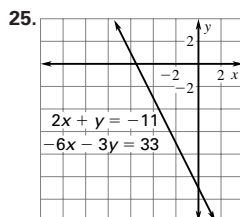
$$-7(2) - (-4) = -10$$



Sample answer: $(-5, -1)$

$$2(-5) + (-1) = -11$$

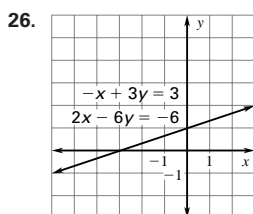
$$-6(-5) - 3(-1) = 33$$



$$(1, 5)$$

$$5 = 5(1)$$

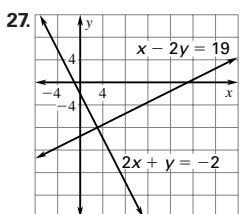
$$5 = 1 + 4$$



Sample answer: $(6, 3)$

$$-(6) + 3(3) = 3$$

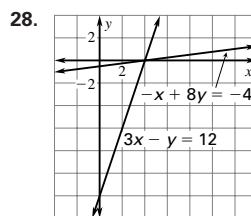
$$2(6) - 6(3) = -6$$



$$(3, -8)$$

$$2(3) + (-8) = -2$$

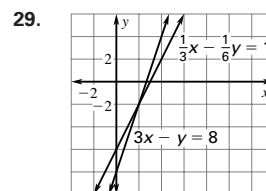
$$3 - 2(-8) = 19$$



$$(4, 0)$$

$$3(4) - (0) = 12$$

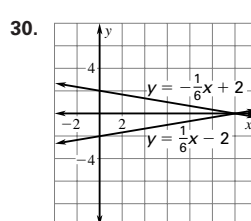
$$-4 + 8(0) = -4$$



$$(2, -2)$$

$$3(2) - (-2) = 8$$

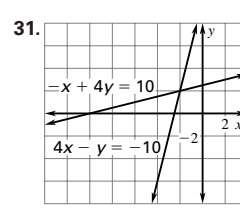
$$\frac{(2)}{3} - \frac{(-2)}{6} = 1$$



$$(12, 0)$$

$$0 = \frac{1}{6}(12) - 2$$

$$0 = -\frac{1}{6}(12) + 2$$



$$(-2, 2)$$

$$-(-2) + 4(2) = 10$$

$$4(-2) - 2 = -10$$

32. Infinitely many solutions; the two lines coincide.

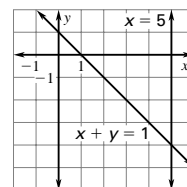
33. No solution; the two lines are parallel and have no points in common. 34. One solution; the two lines intersect in a single point.

35. E; one solution 36. F; no solution

37. B; infinitely many solutions 38. D; one solution

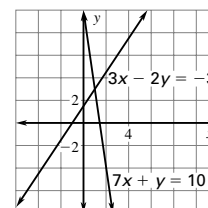
39. A; no solution 40. C; one solution

41. one solution



$$(5, -4)$$

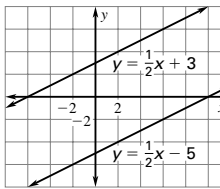
42. one solution



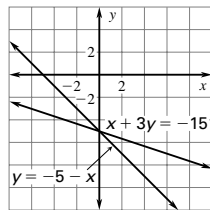
$$(1, 3)$$

Chapter 3 continued

43. no solution

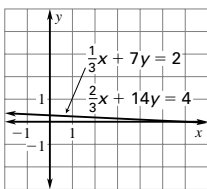


44. one solution

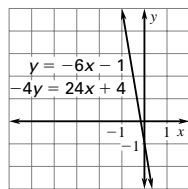


(0, -5)

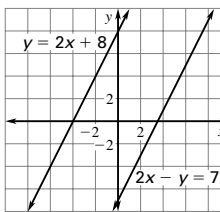
45. infinitely many solutions



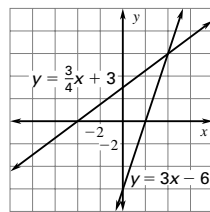
46. infinitely many solutions



47. no solution

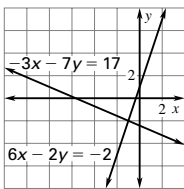


48. one solution



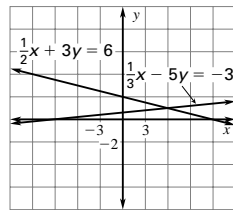
(4, 6)

49. one solution



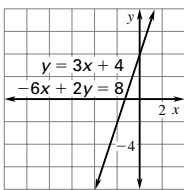
(-1, -2)

50. one solution

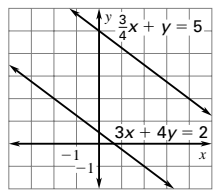


(6, 1)

51. infinitely many solutions



52. no solution

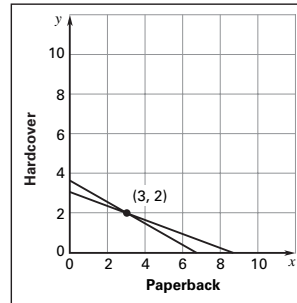


53. a. Sample answer: $2x + 3y = 5$; $4x - 7y = -3$

b. Sample answer: $2x + 3y = 5$; $-4x - 6y = 2$

c. Sample answer: $2x + 3y = 5$; $4x + 6y = 10$

54. $6.95x + 19.95y = 60.75$ You ordered 3 paperbacks
 $2x + 4y = 14$ and 2 hardcovers.



55.

Number of latex balloons	+	Number of mylar balloons	=	Total number of balloons
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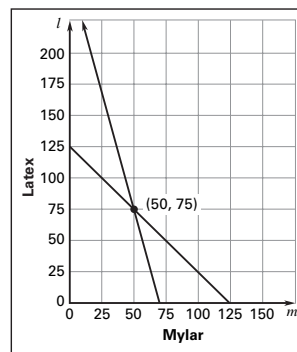
Price per latex balloon	•	Number of latex balloons	+	Price per mylar balloon	•	Number of mylar balloons
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=

Total cost of balloons

$$l + m = 125$$

$$0.1l + 0.5m = 32.50$$



75 latex balloons and
50 mylar balloons

56.

Number of minutes jogged	+	Number of minutes walked	=	Total number of minutes
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Rate for jogging	•	Number of minutes jogged	+	Rate for walking	•	Number of minutes walked
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=

Total number of miles

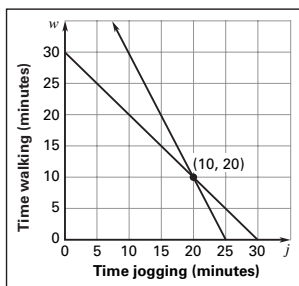
$$j + w = 30$$

$$0.1j + 0.05w = 2.5$$

—CONTINUED—

Chapter 3 continued

56. —CONTINUED—



10 minutes walking
20 minutes jogging

57.

Price of double-density disk • Number of double-density disks + Price of high-density disk •

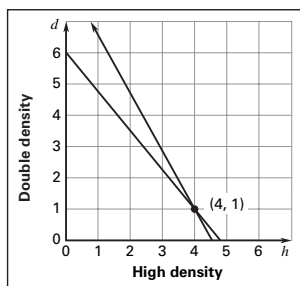
Number of high-density disks = Total amount to spend

Number of K on a double-density disk • Number of double-density disks +

Number of K on a high-density disk • Number of high-density disks = Total number of K needed

$$d + 1.25h = 6$$

$$720d + 1440h = 6480$$



You can buy 4 high-density disks and 1 double-density disk.

58. Number of regular batteries in a pack • Number of regular packs +

Number of alkaline batteries in a pack • Number of alkaline packs = Total number of batteries needed

Cost of regular pack • Number of regular packs + Cost of alkaline pack •

Number of alkaline packs = Total amount to spend

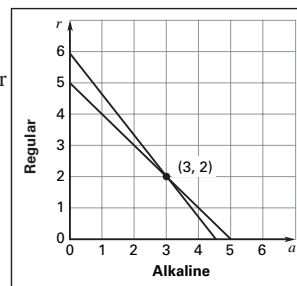
—CONTINUED—

58. —CONTINUED—

$$r + a = 5$$

$$4.25r + 5.5a = 25$$

3 packs of alkaline and 2 packs of regular batteries

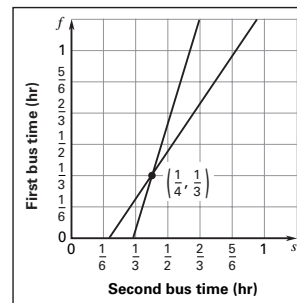


59. Let f = the travel time in hours of the first bus. Let s = the travel time in hours of the second bus.

$$f = s + \frac{1}{12}$$

10 miles from the airport

$$30f = 40s$$

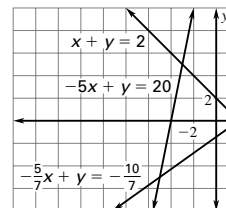


60. consistent and dependent

61. consistent and independent

62. inconsistent

63. triangle;



$(-3, 5), (-5, -5), (2, 0)$;

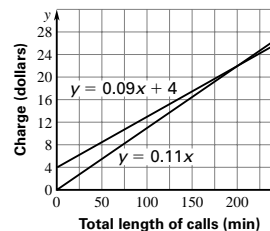
Sample answer: I graphed the lines carefully and found the apparent points of their intersections from the graph. It was easy to see that two of the lines had the same x-intercept, so that was one point. The other points I checked algebraically in the equations to make sure they were solutions.

64. a. $y = 0.09x + 4$

$$y = 0.11x$$

b. (200, 22)

Long-Distance Phone Service



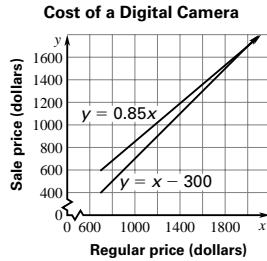
Chapter 3 continued

- c. Sample answer: It represents a charge of \$22 for 200 minutes of long-distance service. If you make more than 200 minutes of long-distance calls most months, then the first company with a 9¢ per minute charge is less. If you call long distance less than 200 minutes most months, then the second, with no monthly service charge, is less expensive.

65. Store 1: $y = 0.85x$

Store 2: $y = x - 300$

Store 1 has a better deal if the price of the camera is over \$2000.



3.1 Mixed Review (p. 145)

66. $4x + 11 = 39$

$$4x = 28$$

$$x = 7$$

67. $\frac{1}{2}x - 10 = 8$

$$\frac{1}{2}x = 18$$

$$x = 36$$

68. $6x - 8 = 3x + 16$

$$3x = 24$$

$$x = 8$$

69. $-9x - 2 = x + 1$

$$-10x = 3$$

$$x = -0.3$$

70. $2(3x - 5) = 7(x + 2)$

$$6x - 10 = 7x + 14$$

$$-x = 24$$

$$x = -24$$

71. $10(x + 1) = \frac{1}{2}(x - 18)$

$$10x + 10 = \frac{1}{2}x - 9$$

$$\frac{19}{2}x = -19$$

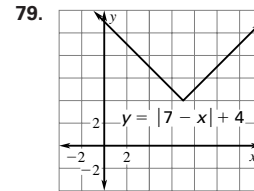
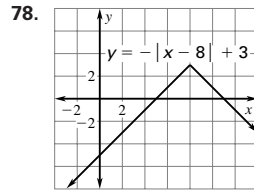
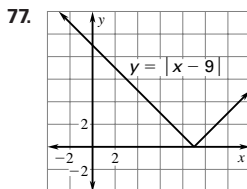
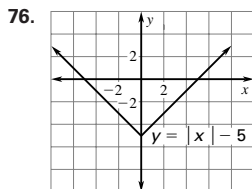
$$x = -2$$

72. no; yes

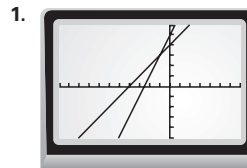
73. no; no

74. yes; yes

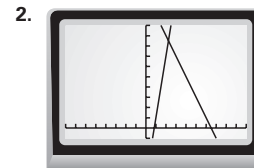
75. no; no



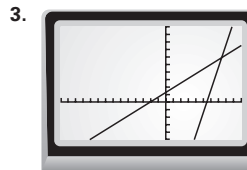
Technology Activity 3.1 (p. 146)



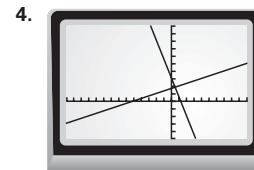
$(-1, 3)$



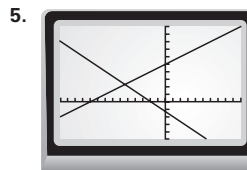
$(2.25, 8.5)$



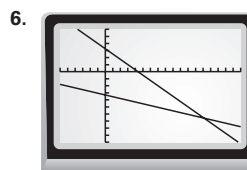
$(\frac{141}{19}, \frac{119}{19}) \approx (7.42, 6.26)$



$(\frac{8}{17}, \frac{31}{17}) \approx (0.47, 1.82)$



$(-\frac{116}{21}, \frac{47}{21}) \approx (-5.52, 2.24)$

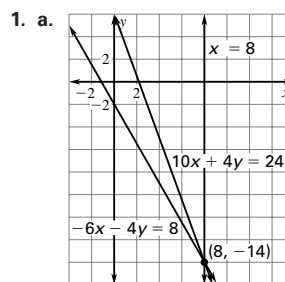


$(\frac{105}{4}, -\frac{211}{16}) \approx (26.25, -13.19)$

Lesson 3.2

Developing Concepts Activity 3.2 (p. 147)

Drawing Conclusions



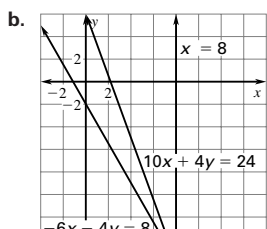
$$10x + 4y = 24$$

$$-6x - 4y = 8$$

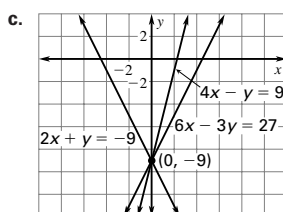
$$4x = 32$$

$$x = 8$$

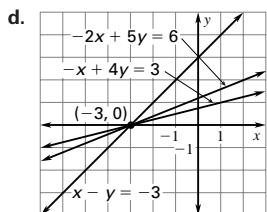
Chapter 3 continued



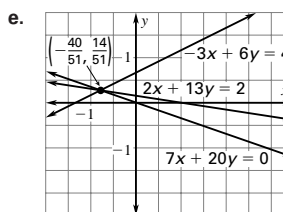
$$\begin{array}{r} x - 2y = 2 \\ -x + 4y = -20 \\ \hline 2y = -18 \\ y = -9 \end{array}$$



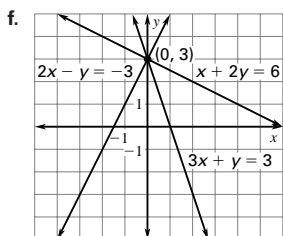
$$\begin{array}{r} 6x - 3y = 27 \\ 2x + y = -9 \\ \hline 8x - 2y = 18 \\ 4x - y = 9 \end{array}$$



$$\begin{array}{r} x - y = -3 \\ -2x + 5y = 6 \\ \hline -x + 4y = 3 \end{array}$$



$$\begin{array}{r} 7x + 20y = 0 \\ -3x + 6y = 4 \\ \hline 4x + 26y = 4 \\ 2x + 13y = 2 \end{array}$$



$$\begin{array}{r} 2x - y = -3 \\ x + 2y = 6 \\ \hline 3x + y = 3 \end{array}$$

- The sum of the equations is a line whose graph contains the point of intersection.
- Sample answer: The sum of the two equations is $(A + D)x + (B + E)y = C + F$. Since (p, q) is a solution of the system of equations, $Ap + Bq = C$ and $Dp + Eq = F$. At the point (p, q) , the left-hand side of the sum equation is $(A + D)p + (B + E)q = (Ap + Dp) + (Bq + Eq) = C + F$. So the point (p, q) is a solution of the sum equation as well.

3.2 Guided Practice (p. 152)

- substitution

2. Sample answer: Because the revised equation is already solved for the other variable, it is the most direct way to find the value.

3. There is no solution if you come up with an equation that is never true, like $1 = -2$. There are infinitely many solutions if you come up with an equation that is always true, like $4 = 4$.

4. $-4(-3y - 2) - 5y = 8$
 $12y + 8 - 5y = 8$
 $7y = 0$
 $y = 0$
 $x + 3(0) = -2$
 $x = -2$
 $(-2, 0)$

5. $3x + 2(2x - 9) = 10$
 $3x + 4x - 18 = 10$
 $7x = 28$
 $x = 4$
 $2(4) - y = 9$
 $y = -1$
 $(4, -1)$

6. $5x - 2(-7 + 3x) = 12$
 $5x + 14 - 6x = 12$
 $-x = -2$
 $x = 2$
 $-3(2) + y = -7$
 $y = -1$
 $(2, -1)$

7. $-3x + 2y = -6$
 $5x - 2y = 18$
 $2x = 12$
 $x = 6$
 $5(6) - 2y = 18$
 $-2y = -12$
 $y = 6$
 $(6, 6)$

8. $-20x + 8y = -48$
 $-9x - 8y = 19$
 $-29x = -29$
 $x = 1$
 $5(1) - 2y = 12$
 $-2y = 7$
 $y = -\frac{7}{2}$
 $(1, -\frac{7}{2})$

9. $20x - 15y = 0$
 $-20x + 14y = -4$
 $-y = -4$
 $y = 4$
 $4x - 3(4) = 0$
 $4x = 12$
 $x = 3$
 $(3, 4)$

10. $2s + 2.5d = 565$
 $s + d = 250$
 $2(250 - d) + 2.5d = 565$
 $500 - 2d + 2.5d = 565$
 $0.5d = 65$
 $d = 130$
 $s = 250 - 130$
 $s = 120$
 120 single-scoop and 130 double-scoop cones

Chapter 3 continued

3.2 Practice and Applications (pp. 152–154)

11. $2(9 + 5y) + 3y = 5$

$$18 + 10y + 3y = 5$$

$$13y = -13$$

$$y = -1$$

$$x = 9 + 5(-1)$$

$$x = 4$$

$$(4, -1)$$

13. $4(2y - 3) - 5y = -3$

$$8y - 12 - 5y = -3$$

$$3y = 9$$

$$y = 3$$

$$x = 2(3) - 3$$

$$x = 3$$

$$(3, 3)$$

12. $4x - 2(6 + 2x) = 5$

$$4x - 12 - 4x = 5$$

$$-12 \neq 5$$

no solution

14. $5x + 3(16 - 5x) = 4$

$$5x + 48 - 15x = 4$$

$$-10x = -44$$

$$x = \frac{22}{5}$$

$$5\left(\frac{22}{5}\right) + y = 16$$

$$y = -6$$

$$\left(\frac{22}{5}, -6\right)$$

15. $4(2y - 5) + 6y = 15$

$$8y - 20 + 6y = 15$$

$$14y = 35$$

$$y = \frac{5}{2}$$

$$x = 2\left(\frac{5}{2}\right) - 5$$

$$x = 0$$

$$\left(0, \frac{5}{2}\right)$$

16. $5x + 3(3x - 4) = 9$

$$5x + 9x - 12 = 9$$

$$14x = 21$$

$$x = \frac{3}{2}$$

$$y = 3\left(\frac{3}{2}\right) - 4$$

$$y = \frac{1}{2}$$

$$\left(\frac{3}{2}, \frac{1}{2}\right)$$

17. $7x + 4\left(9 - \frac{1}{2}x\right) = 24$

$$7x + 36 - 2x = 24$$

$$5x = -12$$

$$x = -\frac{12}{5}$$

$$y = 9 - \frac{1}{2}\left(-\frac{12}{5}\right)$$

$$y = \frac{51}{5}$$

$$\left(-\frac{12}{5}, \frac{51}{5}\right) \text{ or } (-2.4, 10.2)$$

18. $8x - 15(2 + 3x) = 7$

$$8x - 30 - 45x = 7$$

$$-37x = 37$$

$$x = -1$$

$$y = 2 + 3(-1)$$

$$y = -1$$

$$(-1, -1)$$

19. $5\left(8 + \frac{1}{2}y\right) + 6y = -45$

$$40 + \frac{5}{2}y + 6y = -45$$

$$\frac{17}{2}y = -85$$

$$y = -10$$

$$8 + \frac{1}{2}(-10) = x$$

$$3 = x$$

$$(3, -10)$$

20. $-x - 4(15 - 2x) = -3$

$$-x - 60 + 8x = -3$$

$$7x = 57$$

$$x = \frac{57}{7}$$

$$y = 15 - 2\left(\frac{57}{7}\right)$$

$$y = \frac{105}{7} - \frac{114}{7}$$

$$y = -\frac{9}{7}$$

$$\left(\frac{57}{7}, -\frac{9}{7}\right)$$

21. $7(2 - 2y) - 3y = -20$

$$14 - 14y - 3y = -20$$

$$-17y = -34$$

$$y = 2$$

$$x = 2 - 2(2)$$

$$x = -2$$

$$(-2, 2)$$

22. $-9x + 3(3x - 4) = -12$

$$-9x + 9x - 12 = -12$$

$$0 = 0$$

infinitely many solutions

23. $6x + 10y = -32$

$$15x - 10y = -45$$

$$21x = -77$$

$$x = -\frac{11}{3}$$

$$3\left(-\frac{11}{3}\right) + 5y = -16$$

$$5y = -5$$

$$y = -1$$

$$\left(-\frac{11}{3}, -1\right)$$

24. $6x + 4y = 12$

$$-6x - 3y = -6$$

$$y = 6$$

$$6x + 4(6) = 12$$

$$6x = -12$$

$$x = -2$$

$$(-2, 6)$$

25. $-12x + 10y = 8$

$$7x - 10y = -8$$

$$-5x = 0$$

$$x = 0$$

$$-6(0) + 5y = 4$$

$$y = \frac{4}{5}$$

$$\left(0, \frac{4}{5}\right)$$

26. $35x - 20y = -15$

$$8x + 20y = -28$$

$$43x = -43$$

$$x = -1$$

$$35(-1) - 20y = -15$$

$$-20y = 20$$

$$y = -1$$

$$(-1, -1)$$

27. $-72x + 48y = 0$

$$72x - 48y = 0$$

$$0 = 0$$

infinitely many solutions

Chapter 3 continued

- 28.** $-10x - 12y = 32$
 $\frac{10x + 50y = 25}{38y = 57}$
 $y = \frac{3}{2}$
 $2x = 5 - 10\left(\frac{3}{2}\right)$
 $2x = -10$
 $x = -5$
 $\left(-5, \frac{3}{2}\right)$
- 29.** $105x - 40y = -5$
 $72x + 40y = 64$
 $177x = 59$
 $x = \frac{1}{3}$
 $9\left(\frac{1}{3}\right) + 5y = 8$
 $5y = 5$
 $y = 1$
 $\left(\frac{1}{3}, 1\right)$
- 30.** $-45x - 6y = -93$
 $4x + 6y = 11$
 $-41x = -82$
 $x = 2$
 $4(2) + 6y = 11$
 $6y = 3$
 $y = \frac{1}{2}$
 $\left(2, \frac{1}{2}\right)$
- 31.** $4x + 80y = 592$
 $-4x + 2y = 13$
 $82y = 605$
 $y = \frac{605}{82}$
 $-4x + 2\left(\frac{605}{82}\right) = 13$
 $-4x = \frac{533}{41} - \frac{605}{41}$
 $-4x = \frac{-72}{41}$
 $x = \frac{18}{41}$
 $\left(\frac{18}{41}, \frac{605}{82}\right)$ or $(0.439, 7.378)$
- 32.** $14x + 4y = -6$
 $-14x - 4y = 6$
 $0 = 0$
 infinitely many solutions
- 33.** $18x - 3y = -6$
 $-18y + 3y = 4$
 $0 \neq -2$
 no solution
- 34.** $-15x + 6y = -30$
 $\frac{3x - 6y = -18}{-12x = -48}$
 $x = 4$
 $3(4) - 6y = -18$
 $-6y = -30$
 $y = 5$
 $(4, 5)$
- 35.** $5x - 7y = -11$
 $\frac{-5x + 3y = 19}{-4y = 8}$
 $y = -2$
 $-5x + 7(-2) = 11$
 $-5x = 25$
 $x = -5$
 $(-5, -2)$
- 36.** $-2(3 + y) + 2y = -6$
 $-6 - 2y + 2y = -6$
 $0 = 0$
 infinitely many solutions
- 37.** $6x - 15y = 30$
 $\frac{-6x + 8y = -30}{-7y = 0}$
 $y = 0$
 $2x - 5(0) = 10$
 $2x = 10$
 $x = 5$
 $(5, 0)$
- 38.** $-6x + 2y = 22$
 $5x - 2y = -16$
 $-x = 6$
 $x = -6$
 $5(-6) - 2y = -16$
 $-2y = 14$
 $y = -7$
 $(-6, -7)$
- 39.** $-12x - 18y = 33$
 $\frac{12x + 18y = -9}{0 \neq 24}$
 no solution
- 40.** $-3(4y - 2) + 8y = -1$
 $-12y + 6 + 8y = -1$
 $-4y = -7$
 $y = \frac{7}{4}$
 $x = 4\left(\frac{7}{4}\right) - 2$
 $x = 5$
 $\left(5, \frac{7}{4}\right)$
- 41.** $10x + 25y = 85$
 $\frac{-10x - 14y = -20}{11y = 65}$
 $y = \frac{65}{11}$
 $-5x - 7\left(\frac{65}{11}\right) = -10$
 $-5x = -10 + \frac{455}{11}$
 $-5x = \frac{345}{11}$
 $x = -\frac{69}{11}$
 $\left(-\frac{69}{11}, \frac{65}{11}\right)$

Chapter 3 continued

$$\begin{aligned}
 42. \quad -3x + 7(5x - 10) &= 6 \\
 -3x + 35x - 70 &= 6 \\
 32x &= 76 \\
 x &= \frac{19}{8}
 \end{aligned}$$

$$y = 5\left(\frac{19}{8}\right) - 10$$

$$y = \frac{95}{8} - \frac{80}{8}$$

$$y = \frac{15}{8}$$

$$\left(\frac{19}{8}, \frac{15}{8}\right)$$

$$43. \quad -4x + 6y = 40$$

$$\frac{4x + 4y = -15}{10y = 25}$$

$$10y = 25$$

$$y = \frac{5}{2}$$

$$4x + 4\left(\frac{5}{2}\right) = -15$$

$$4x = -25$$

$$x = -\frac{25}{4}$$

$$\left(-\frac{25}{4}, \frac{5}{2}\right)$$

$$45. \quad \frac{1}{2}(17 + y) - 3y = 1$$

$$\frac{17}{2} + \frac{1}{2}y - \frac{6}{2}y = 1$$

$$-\frac{5}{2}y = -\frac{15}{2}$$

$$y = 3$$

$$x = 17 + 3$$

$$x = 20$$

$$(20, 3)$$

$$47. \quad 36x + 9y = 48$$

$$\frac{-36x - 9y = 32}{0 \neq 80}$$

$$0 \neq 80$$

no solution

$$44. \quad 33x - 77y = 220$$

$$\frac{-33x + 30y = 15}{-47y = 235}$$

$$-47y = 235$$

$$y = -5$$

$$3x - 7(-5) = 20$$

$$3x = -15$$

$$x = -5$$

$$(-5, -5)$$

$$46. \quad 8x + 18y = -20$$

$$\frac{-8x - 12y = 8}{6y = -12}$$

$$6y = -12$$

$$y = -2$$

$$4x + 9(-2) = -10$$

$$4x = 8$$

$$x = 2$$

$$(2, -2)$$

$$48. \quad -2x + 10y = 34$$

$$\frac{2x - 10y = -34}{0 = 0}$$

$$0 = 0$$

infinitely many solutions

$$49. \quad -2x + 2\left(9 - \frac{1}{3}x\right) = -6$$

$$-2x + 18 - \frac{2}{3}x = -6$$

$$-\frac{8}{3}x = -24$$

$$x = 9$$

$$y = 9 - \frac{1}{3}(9)$$

$$y = 6$$

$$(9, 6)$$

50. a. Sample answer: The second equation is equal to -2 times the first, so there are infinitely many solutions.

b. Sample answer: The left-hand side of the second equation is equal to 3 times the left-hand side of the first equation, but $12 \neq 3 \cdot 8$, so there are no solutions.

$$51. \quad y = \frac{3}{2}x \quad \text{eq. 1}$$

$$y - 5 = \frac{5 + 3}{1 - 5}(x - 1)$$

$$y - 5 = -2(x - 1)$$

$$y = 2x + 7 \quad \text{eq. 2}$$

$$-2x + 7 = \frac{3}{2}x$$

$$7 = \frac{7}{2}x$$

$$2 = x$$

$$y = \frac{3}{2}(2)$$

$$y = 3$$

$$(2, 3)$$

$$52. \quad y - 6 = \frac{6 - 1}{6 - 1}(x - 6)$$

$$y - 6 = x - 6$$

$$y = x \quad \text{eq. 1}$$

$$y - 4 = \frac{4 - 2}{0 - 6}(x)$$

$$y = -\frac{1}{3}x + 4 \quad \text{eq. 2}$$

$$x = -\frac{1}{3}x + 4$$

$$\frac{4}{3}x = 4$$

$$x = 3$$

$$y = 3$$

$$(3, 3)$$

Chapter 3 continued

$$53. y - 5 = \frac{5 + 1}{1 - 3}(x - 1)$$

$$y - 5 = -3(x - 1)$$

$$y = -3x + 8 \quad \text{eq. 1}$$

$$y - 3 = \frac{3 - 0}{4 + 2}(x - 4)$$

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

$$y = \frac{1}{2}x + 1 \quad \text{eq. 2}$$

$$-3x + 8 = \frac{1}{2}x + 1$$

$$-\frac{7}{2}x = -7$$

$$x = 2$$

$$y = -3(2) + 8 = 2$$

$$(2, 2)$$

$$54. 36 + 3.5b = 5b$$

$$36 = 1.5b$$

$$24 = b$$

$$5(24) = \$120$$

$$24 \text{ boxes; } \$120$$

$$55. 15.5 = 2y + 6x$$

$$-10.25 = -2y - 3x$$

$$5.25 = 3x$$

$$1.75 = x$$

$$15.5 = 2y + 6(1.75)$$

$$5 = 2y$$

$$2.5 = y$$

$$56. 2C + 6H = 30.07$$

$$3C + 8H = 44.097$$

$$-6C - 18H = -90.21$$

$$\frac{6C + 16H = 88.194}{-2H = -2.016}$$

$$H = 1.008 \text{ u}$$

$$2C + 6(1.008) = 30.07$$

$$2C = 30.07 - 6.048$$

$$2C = 24.022$$

$$C = 12.011 \text{ u}$$

Sample answer: Let x = the cost per foot of cable and y = cost per connector. Then $6x + 2y = 15.50$ and $3x + 2y = 10.25$. Subtracting the second equation from the first, find $x = 1.75$. Then a 4-ft cable with connectors will cost $7 + 5 = \$12$.

$$57. 380 = 8s + 12w$$

$$40 = s + w$$

$$380 = 8(40 - w) + 12w$$

$$380 = 320 - 8w + 12w$$

$$60 = 4w$$

$$15 = w$$

$$s = 40 - 15 = 25$$

swim: 15 minutes

skate: 25 minutes

$$58. 3.25x + 3.25y = 975$$

$$x = y + 60$$

$$3.25(y + 60) + 3.25y = 975$$

$$6.5y = 780$$

$$y = 120$$

$$x = 120 + 60$$

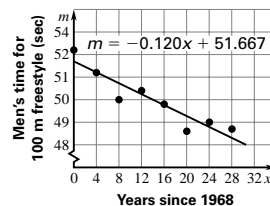
$$x = 180$$

$$(180, 120)$$

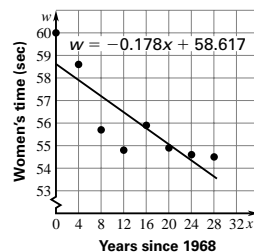
The smaller bedroom is 120 ft^2 ; the larger one is 180 ft^2 .

59.

Olympic Times for
Men's 100 m Freestyle



Olympic Times for
Women's 100 m Freestyle



$$60. m = -0.12x + 51.667$$

$$w = -0.178x + 58.617$$

61. (119.83, 37.288); about 120 years after the 1968 olympics, in the year 2088 summer olympics, the men's and women's times in the 100 meter freestyle will both be about 37.3 seconds.

Chapter 3 continued

62. Sample answer: Athletic performance cannot be expected to improve at the same linear rate indefinitely. First of all, there is some limit to what the human body can accomplish, and eventually the graph of performance times would tend to become tangent to the horizontal line at this value. Further, a line would have an x-intercept, implying some future time at which the race would be won in 0 seconds, which is impossible.

63. C

64. B

65. a. Sample answers:

$$r = 6, s = 10, t = 5$$

b. Sample answers:

$$r = 6, s = 10, t = -18$$

c. Sample answers:

$$r = 2, s = 1, t = 1$$

3.2 Mixed Review (p. 155)

66. $6x = 12$ or $6x = -12$

$$x = 2 \quad x = -2$$

67. $x + 5 = 3$ or $x + 5 = -3$

$$x = -2 \quad x = -8$$

68. $2x - 1 = 7$ or $2x - 1 = -7$

$$2x = 8 \quad 2x = -6$$

$$x = 4 \quad x = -3$$

69. $4x + 1 = 5$ or $4x + 1 = -5$

$$4x = 4 \quad 4x = -6$$

$$x = 1 \quad x = -\frac{3}{2}$$

70. $3x - 2 = 8$ or $3x - 2 = -8$

$$3x = 10 \quad 3x = -6$$

$$x = \frac{10}{3} \quad x = -2$$

71. $-x + 10 = 14$ or $-x + 10 = -14$

$$-x = 4 \quad -x = -24$$

$$x = -4 \quad x = 24$$

72. $y - 3 = \frac{3+2}{-2-1}(x+2)$ 73. $y - 3 = \frac{3+3}{3+0}(x-3)$

$$y - 3 = -\frac{5}{3}(x+2) \quad y - 3 = 2(x-3)$$

$$y = -\frac{5}{3}x - \frac{10}{3} + \frac{9}{3} \quad y - 3 = 2x - 6$$

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

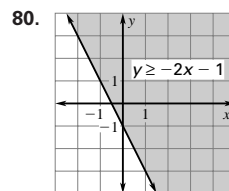
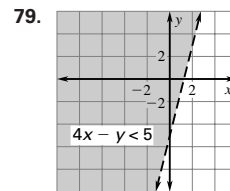
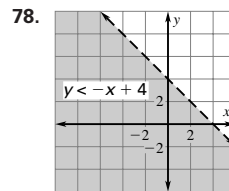
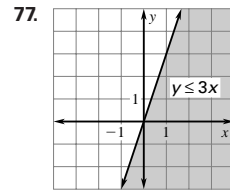
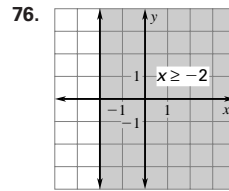
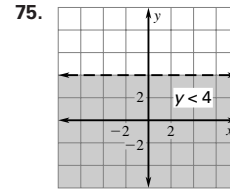
$$y = 2x - 3$$

74. $y - 2 = \frac{1-2}{3+2}(x+2)$

$$y - 2 = -\frac{1}{5}(x+2)$$

$$y = -\frac{1}{5}x - \frac{2}{5} + \frac{10}{5}$$

$$y = -\frac{1}{5}x + \frac{8}{5}$$

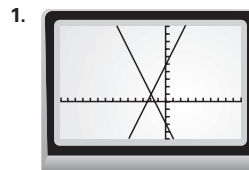


81. $12x + 25 \leq 60$

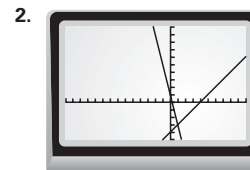
$$12x \leq 35$$

$$x \leq \frac{35}{12}$$

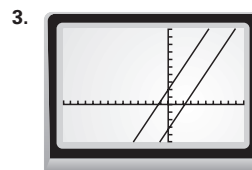
3.2 Quiz 1 (pg. 155)



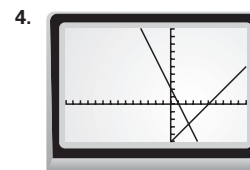
$(-2, 1)$



$(1, -3)$

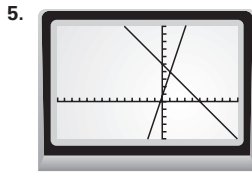


no solution

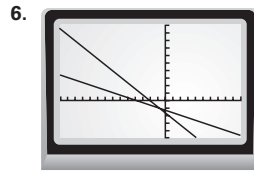


$(\frac{7}{3}, -\frac{8}{3})$

Chapter 3 continued



(1, 4)



(-1, -1)

7. infinitely many solutions 8. 1 9. no solution 10. 1
11. 1 12. infinitely many solutions

13. $-2(-5 - y) + 2y = -5$ 14. $-3x + 2y = -6$

$$10 + 2y + 2y = -5$$

$$4y = -15$$

$$y = -\frac{15}{4}$$

$$x = -5 + \frac{15}{4}$$

$$x = -\frac{5}{4}$$

$$\left(-\frac{5}{4}, -\frac{15}{4}\right)$$

15. $-12x - 3y = -3$

$$\frac{12x + 3y = 3}{0 = 0}$$

$$0 = 0$$

infinitely many solutions

16. $-3(3 - 2y) - 4y = -2$

$$-9 + 6y - 4y = -2$$

$$2y = 7$$

$$y = \frac{7}{2}$$

$$x = 3 - 2\left(\frac{7}{2}\right)$$

$$x = -4$$

$$\left(-4, \frac{7}{2}\right)$$

17. $6x - 16y = 22$

$$\frac{-6x + 16y = -5}{0 \neq 17}$$

$$0 \neq 17$$

no solution

18. $15x - 40y = -35$

$$\frac{-15x - 18y = 9}{-58y = -26}$$

$$-58y = -26$$

$$y = \frac{13}{29}$$

$$3x - 8\left(\frac{13}{29}\right) = -7$$

$$3x = -\frac{99}{29}$$

$$x = -\frac{33}{29}$$

$$\left(-\frac{33}{29}, \frac{13}{29}\right)$$

19. $3s + 5n = 3943$

$$s + n = 937$$

$$3(937 - n) + 5n = 3943$$

$$2811 - 3n + 5n = 3943$$

$$2n = 1132$$

$$n = 566$$

$$s = 937 - 566$$

$$s = 371$$

371 tickets sold to students

566 tickets sold to non-students

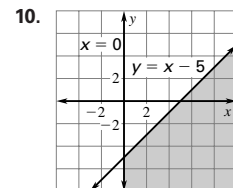
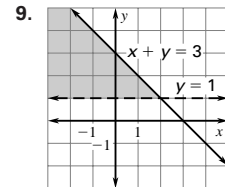
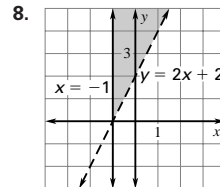
Lesson 3.3

Activity (p. 156)

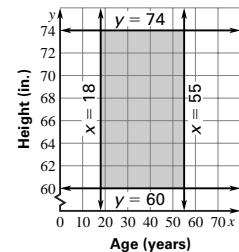
- Region 1
- Region 3
- Region 4
- Region 2

3.3 Guided Practice (p. 159)

- It must satisfy every inequality in the system.
- It is not a solution because it does not satisfy inequality 1; $-5 \not\geq 2$.
- The line $y = 3$ should be solid, and the region above the line $x + y = 5$ should be shaded, not the region below.
- $-1 \geq -1$; $2 > -2 + 2$; yes 5. $0 \geq -1$; $0 \not\geq 0 + 2$; no
6. $1 \geq -1$; $4 \not\geq 2 + 2$; no 7. $2 \geq -1$; $7 > 2(2) + 2$; yes

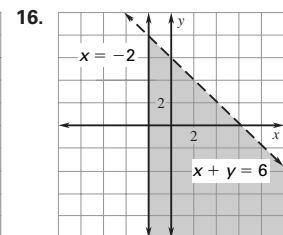
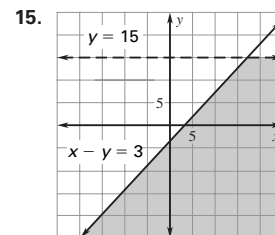


11. $18 \leq x \leq 55$
 $60 \leq y \leq 74$



3.3 Practice and Applications (pp. 159-162)

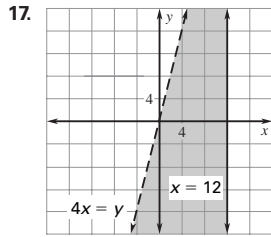
12. yes 13. no 14. yes



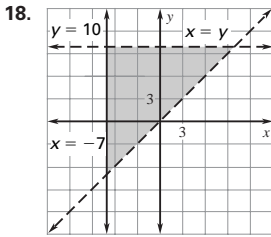
Sample answer: (13, 10)

Sample answer: (0, 0)

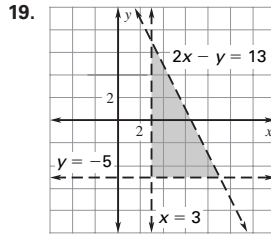
Chapter 3 continued



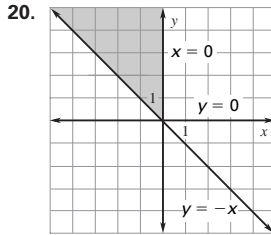
Sample answer: $(-2, -10)$



Sample answer: $(0, 2)$



Sample answer: $(4, 2)$



Sample answer: $(-3, 5)$

21. C

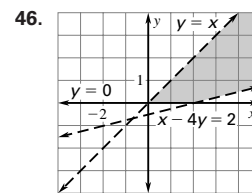
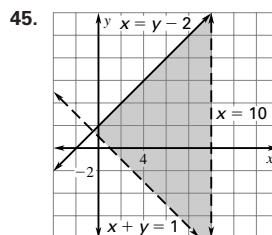
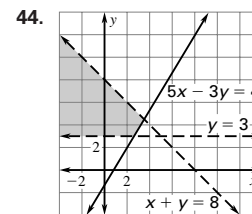
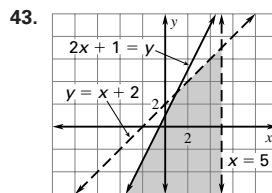
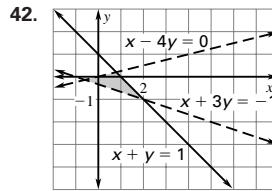
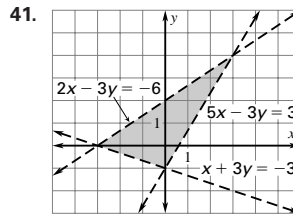
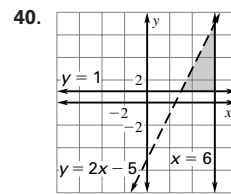
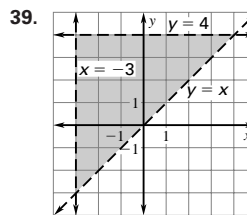
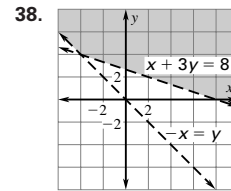
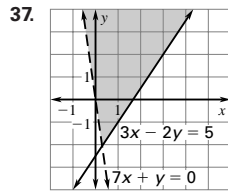
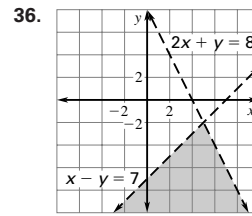
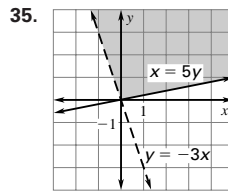
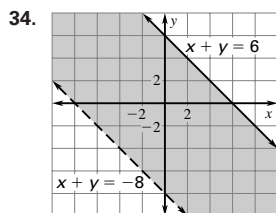
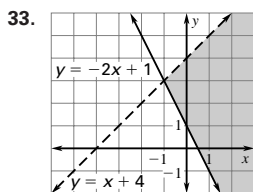
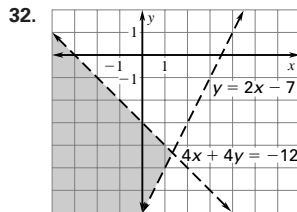
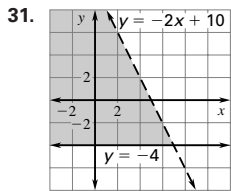
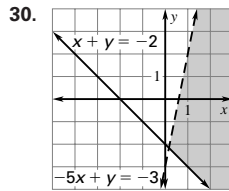
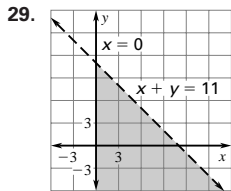
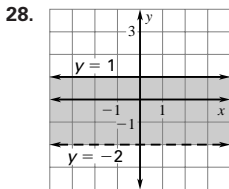
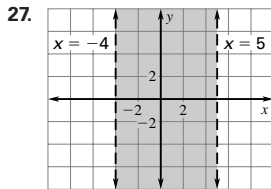
22. B

23. F

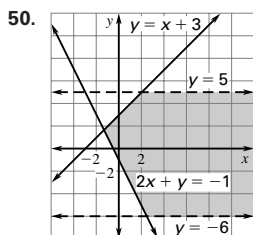
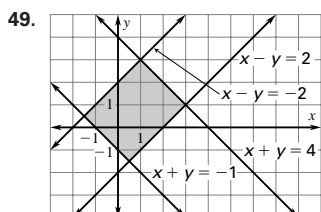
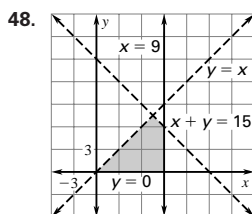
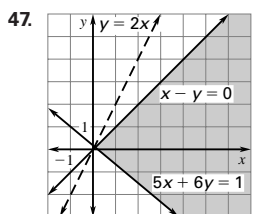
24. E

25. A

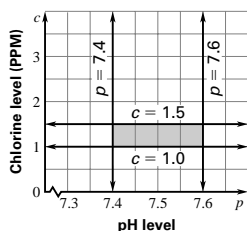
26. D



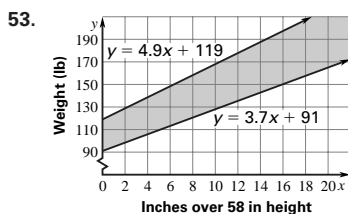
Chapter 3 continued



51. $7.4 \leq p \leq 7.6$
 $1.0 \leq c \leq 1.5$

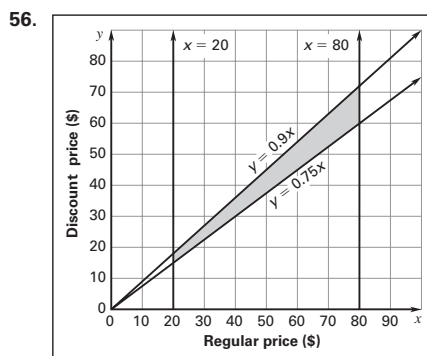


52. $y \geq 3.7x + 91$
 $y \leq 4.9x + 119$

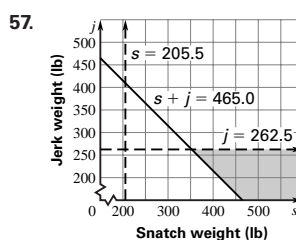


54. $y \geq 3.7(14) + 91$ $y \leq 4.9(14) + 119$
 $y \geq 142.8 \text{ lbs.}$ $y \leq 187.6 \text{ lbs.}$

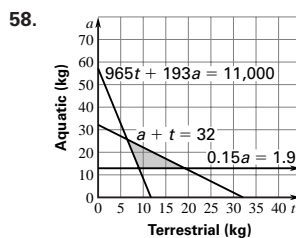
55. $20 \leq x \leq 80$; $y \leq 0.9x$ or $0.75x \leq y$



\$48.75 to \$58.50



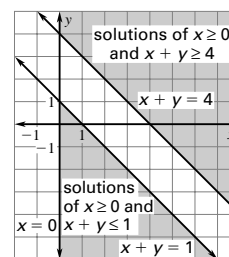
$s > 205.5$; $j \leq 262.5$;
 $s + j > 465.0$



$0.15a \geq 1.9$;
 $965t + 193a \geq 11,000$;
 $a + t \leq 32$

59. Sample answer:

$x + y \leq 1$
 $x + y \geq 4$
 $x \geq 0$



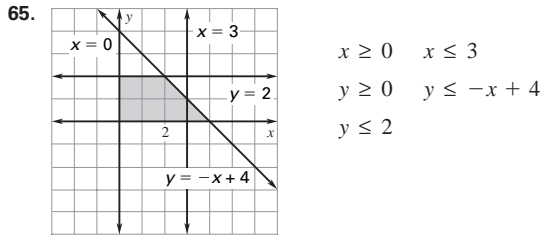
60. A

61. C

62. $x \geq 1$; $x \leq 8$ 63. $y \leq x + 3$ 64. $y \leq 4x + 27$;
 $y \geq -5$; $y \leq 3$ $y \leq 3$ $y \leq -x + 12$

$y \geq x - 6$;
 $y \geq -1$ $y \geq \frac{2}{3}x + 7$

Chapter 3 continued



3.3 Mixed Review (p. 162)

66. $2(5) + 7(-3) = 10 - 21 = -11$

67. $-4(-6) - 3(-1) = 24 + 3 = 27$

68. $10(-4) - 3(2) = -40 - 6 = -46$

69. $-(-3) + 8(-2) = 3 - 16 = -13$

70. positive correlation 71. relatively no correlation

72. negative correlation

73. $13(10 + 4y) + 5y = 2$

$$130 + 52y + 5y = 2$$

$$57y = -128$$

$$y = -\frac{128}{57}$$

$$x = \frac{570}{57} + 4\left(-\frac{128}{57}\right)$$

$$x = \frac{58}{57}$$

$$\left(\frac{58}{57}, -\frac{128}{57}\right)$$

74. $-2(3y - 3) + 7y = 10$

$$-6y + 6 + 7y = 10$$

$$y = 4$$

$$x = 3(4) - 3$$

$$x = 9$$

$$(9, 4)$$

75. $-10x - 12y = 24$

$$10x + 12y = 24$$

$$0 \neq 48$$

no solution

76. $-14x + 10y = 0$

$$14x - 8y = 2$$

$$2y = 2$$

$$y = 1$$

$$14x - 8(1) = 2$$

$$14x = 10$$

$$x = \frac{5}{7}$$

$$\left(\frac{5}{7}, 1\right)$$

77. $-4(2 - 5y) - 10y = 12$

$$-8 + 20y - 10y = 12$$

$$10y = 20$$

$$y = 2$$

$$x = 2 - 5(2)$$

$$x = -8$$

$$(-8, 2)$$

78. $6x - 8y = -18$

$$-6x + 8y = 18$$

$$0 = 0$$

infinitely many solutions

Lesson 3.4

Activity (p. 163)

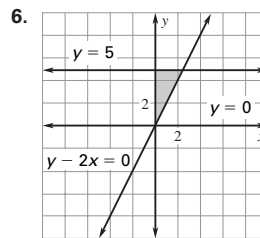
- at O , $C = 0$;
at P , $C = 20$;
at R , $C = 30$;
at S , $C = 18$;
at T , $C = 8$;
at U , $C = 18$;
at V , $C = 12$;

2. R ; O

3. 30 ; 0 ; can't be done

3.4 Guided Practice (p. 166)

- Linear programming is the process of optimizing a linear objective function subject to a set of linear inequalities known as constraints.
- The value of the objective function is tested at various points of the feasible region to determine where it is a maximum and/or minimum; the system of constraints define the feasible region.
- If the feasible region is bounded, the maximum and minimum values of the objective function must occur at a vertex, so the value of the objective function is checked at each vertex.
- $(0, 0)$, $(0, 3)$, $(2, 4)$, $(4, 0)$
- minimum $C = 5(0) + 7(0) = 0$
maximum $C = 5(2) + 7(4) = 38$

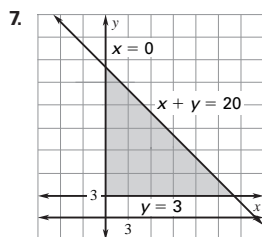


At $(0, 0)$: $C = 0 + 0 = 0$ ← minimum

At $(0, 5)$: $C = 0 + 5 = 5$

At $\left(\frac{5}{2}, 5\right)$: $C = \frac{5}{2} + 5 = \frac{15}{2}$ ← maximum

Chapter 3 continued



At $(0, 3)$: $C = 2(0) - (3) = -3$

At $(17, 3)$: $C = 2(17) - (3) = 31$ ← maximum

At $(0, 20)$: $C = 2(0) - (20) = -20$ ← minimum

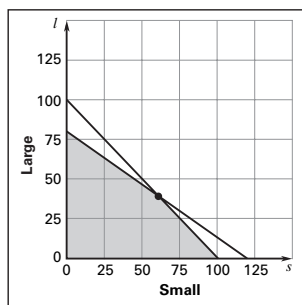
8. $s + l \leq 100$

$10s + 15l \leq 1200$

$C = 6s + 10l$

At $(0, 80) = 6(0) + 10(80)$

Buy 80 large baskets and sell them for a profit of \$800.00.



3.4 Practice and Applications (pp. 166-167)

9. $(0, 40)$: $C = 0 - 40 = -40$ ← minimum

$(30, 30)$: $C = 30 - 30 = 0$

$(40, 0)$: $C = 40 - 0 = 40$ ← maximum

$(0, 0)$: $C = 0 - 0 = 0$

10. $(-6, -3)$: $C = 2(-6) + 5(-3) = -27$

$(-2, -6)$: $C = 2(-2) + 5(-6) = -34$ ← minimum

$(6, -6)$: $C = 2(6) + 5(-6) = -18$

$(1, 5)$: $C = 2(1) + 5(5) = 27$ ← maximum

$(8, 1)$: $C = 2(8) + 5(1) = 21$

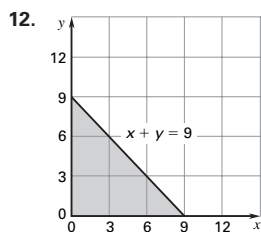
11. $(3, 5)$: $C = 4(3) + 2(5) = 22$

$(1, 4)$: $C = 4(1) + 2(4) = 12$

$(2, 1)$: $C = 4(2) + 2(1) = 10$ ← minimum

$(4, 0)$: $C = 4(4) + 2(0) = 16$

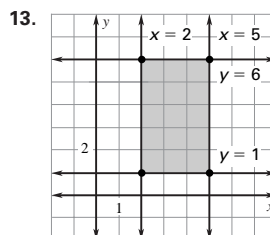
no maximum; feasible region unbounded



$(0, 0)$: $C = 2(0) + 3(0) = 0$ ← minimum

$(9, 0)$: $C = 2(9) + 3(0) = 18$

$(0, 9)$: $C = 2(0) + 3(9) = 27$ ← maximum

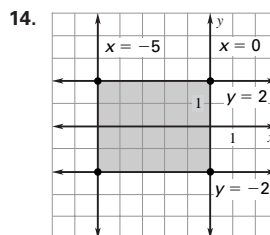


$(2, 1)$: $C = 2 + 4(1) = 6$ ← minimum

$(5, 1)$: $C = 5 + 4(1) = 9$

$(2, 6)$: $C = 2 + 4(6) = 26$

$(5, 6)$: $C = 5 + 4(6) = 29$ ← maximum

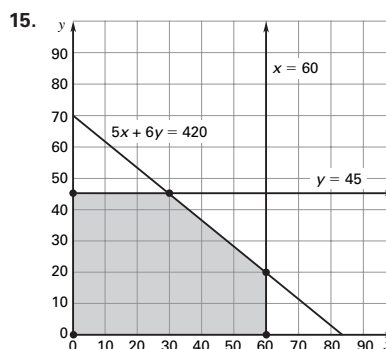


$(0, 2)$: $C = 2(0) + (2) = 2$ ← maximum

$(0, -2)$: $C = 2(0) + (-2) = -2$

$(-5, 2)$: $C = 2(-5) + (2) = -8$

$(-5, -2)$: $C = 2(-5) + (-2) = -12$ ← minimum



$(0, 0)$: $C = 10(0) + 7(0) = 0$ ← minimum

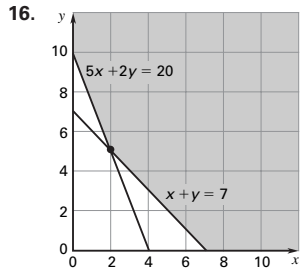
$(0, 45)$: $C = 10(0) + 7(45) = 315$

$(30, 45)$: $C = 10(30) + 7(45) = 615$

$(60, 20)$: $C = 10(60) + 7(20) = 740$ ← maximum

$(60, 0)$: $C = 10(60) + 7(0) = 600$

Chapter 3 continued

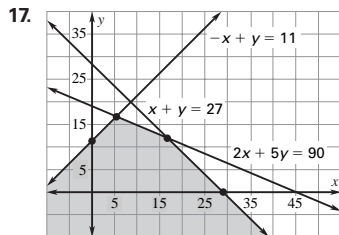


$$(0, 10): C = -2(0) + 10 = 10$$

$$(2, 5): C = -2(2) + 5 = 1$$

$$(7, 0): C = -2(7) + 0 = -14$$

no minimum or maximum; feasible region is unbounded



$$(-11, 0): C = 4(-11) + 6(0) = -44$$

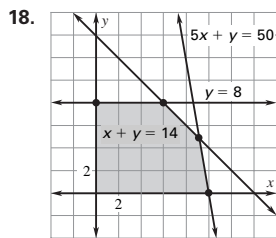
$$(0, 11): C = 4(0) + 6(11) = 66$$

$$(5, 16): C = 4(5) + 6(16) = 116$$

$$(15, 12): C = 4(15) + 6(12) = 132 \leftarrow \text{maximum}$$

$$(27, 0): C = 4(27) + 6(0) = 108$$

no minimum; feasible region is unbounded



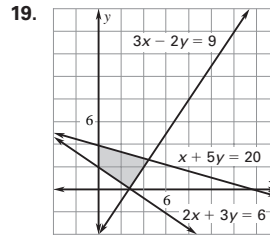
$$(0, 0): C = 5(0) + 4(0) = 0 \leftarrow \text{minimum}$$

$$(0, 8): C = 5(0) + 4(8) = 32$$

$$(6, 8): C = 5(6) + 4(8) = 62$$

$$(9, 5): C = 5(9) + 4(5) = 65 \leftarrow \text{maximum}$$

$$(10, 0): C = 5(10) + 4(0) = 50$$

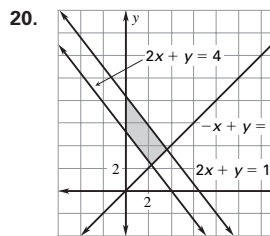


$$(0, 4): C = 4(0) + 3(4) = 12$$

$$(0, 2): C = 4(0) + 3(2) = 6 \leftarrow \text{minimum}$$

$$(5, 3): C = 4(5) + 3(3) = 29 \leftarrow \text{maximum}$$

$$(3, 0): C = 4(3) + 3(0) = 12$$



$$(0, 13): C = 10(0) + 3(13) = 39$$

$$(0, 4): C = 10(0) + 3(4) = 12 \leftarrow \text{minimum}$$

$$\left(\frac{4}{3}, \frac{4}{3}\right): C = 10\left(\frac{4}{3}\right) + 3\left(\frac{4}{3}\right) = 17\frac{1}{3}$$

$$\left(\frac{13}{3}, \frac{13}{3}\right): C = 10\left(\frac{13}{3}\right) + 3\left(\frac{13}{3}\right) = 56\frac{1}{3} \leftarrow \text{maximum}$$

21. $C = 0.5O + 0.4B$

$$2.5O + B \leq 500 \text{ (1 gal = 4 quarts)}$$

$$1.5O + 3B \leq 600$$

$$B \geq 0$$

$$O \geq 0$$

$$(0, 200): C = 0.5(0) + 0.4(200) = 80$$

$$(150, 125): C = 0.5(150) + 0.4(125) = 125 \leftarrow \text{maximum}$$

$$(200, 0): C = 0.5(200) + 0.4(0) = 100$$

$$(0, 0): C = 0.5(0) + 0.4(0) = 0$$

150 gal of Orangeade and 125 gal of Berry-fruity for a profit of \$125

22. $C = 12x + 18y$

$$75x + 50y \leq 600$$

$$3x + 6y \leq 60$$

$$x \geq 0$$

$$y \geq 0$$

$$(0, 10): C = 12(0) + 18(10) = 180$$

$$(2, 9): C = 12(2) + 18(9) = 186 \leftarrow \text{maximum}$$

$$(8, 0): C = 12(8) + 18(0) = 96$$

$$(0, 0): C = 12(0) + 18(0) = 0$$

Purchase 2 of type A and 9 of type B for a total storage capacity of 186 ft³.

Chapter 3 continued

23. $C = \$2t + \$1.50s$

$$10t + 5s \leq 180$$

$$t + 0.25s \leq 15$$

$$t \geq 3s$$

$$t \geq 0$$

$$s \geq 0$$

$$(0, 0): C = \$2(0) + \$1.5(0) = 0$$

$$(14, 4): C = \$2(14) + \$1.5(4) = \$34 \leftarrow \text{maximum}$$

$$(15, 0): C = \$2(15) + \$1.5(0) = 30$$

Make 14 jars of tomato sauce and 4 jars of salsa for a profit of \$34.

24. $C = 0.57p + 0.78b$

$$265p + 230b \geq 500$$

$$15p + 5b \geq 20$$

$$3p + 10b \leq 30$$

$$p + b \leq 8$$

$$(8, 0): C = 0.57(8) + 0.78(0) = 4.56$$

$$\left(\frac{100}{53}, 0\right): C = 0.57\left(\frac{100}{53}\right) + 0.78(0) \approx 1.08$$

$$\left(\frac{84}{85}, \frac{88}{85}\right): C = 0.57\left(\frac{84}{85}\right) + 0.78\left(\frac{88}{85}\right) \approx 1.37$$

$$\left(\frac{10}{27}, \frac{26}{9}\right): C = 0.57\left(\frac{10}{27}\right) + 0.78\left(\frac{26}{9}\right) \approx 2.46$$

$$\left(\frac{50}{7}, \frac{6}{7}\right): C = 0.57\left(\frac{50}{7}\right) + 0.78\left(\frac{6}{7}\right) = 4.74$$

Eat about 1.887 cups of pinto beans and no rice for a total cost of \$1.08.

25. $C = 2(0) + 6(46) = 276$

26. $C = -2(0) - (8)$

D

A

27. a. $C = 2x + 2y$

vertices

$$(5, 1); 2(5) + 2(1) = 12 \leftarrow \text{maximum}$$

$$(2, 4); 2(2) + 2(4) = 12 \leftarrow \text{maximum}$$

$$(5, 0); 2(5) + 2(0) = 10$$

$$(0, 4); 2(0) + 2(4) = 8$$

$$(0, 0); 2(0) + 2(0) = 0$$

two points

$$(3, 3); 2(3) + 2(3) = 12$$

$$(4, 2); 2(3) + 2(3) = 12$$

If the objective function has a certain value at two vertices, it has that same value at each point of the edge connecting them.

b. $C = 5x - y$

vertices

$$(-1, -1); C = 5(-1) - (-1) = -4$$

$$(3, 19); C = 5(3) - 19 = -4$$

$$(3, -1); C = 5(3) - (-1) = 16 \leftarrow \text{maximum}$$

two points

$$(3, 15); C = 5(3) - 15 = 0$$

$$(3, 0); C = 5(3) - 0 = 15$$

$$(2, -1); C = 5(2) - 1 = 11$$

$$(0, -1); C = 5(0) - 1 = -1$$

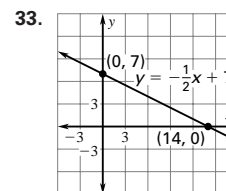
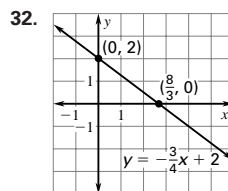
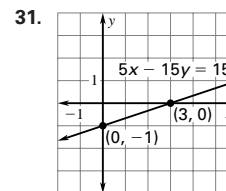
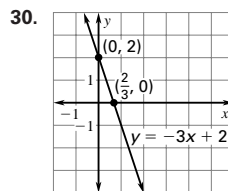
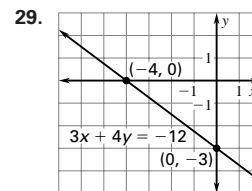
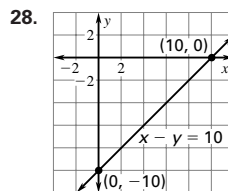
$$(0, 4); C = 5(0) - 4 = -4$$

$$(2, 14); C = 5(2) - 14 = -4$$

The closer to the point $(3, -1)$ on the line segment, the closer the maximum value.

If an edge is parallel to the objective function, the value of C is constant all along that edge. The value of the objective function at points along an edge is between the values at the vertices at its endpoints.

3.4 Mixed Review (p. 168)



34. $f(0) = 0 - 5 = -5$

35. $f(-2) = -2 - 5 = -7$

36. $f(-10) = 3(-10) - 1 = -31$

37. $f(-1) = -1 - 5 = -6$

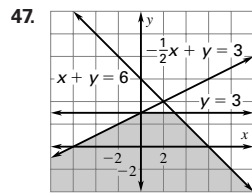
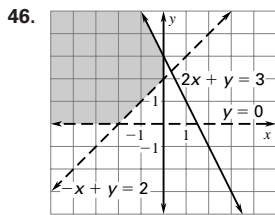
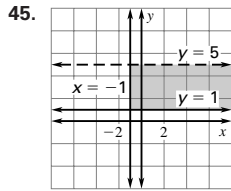
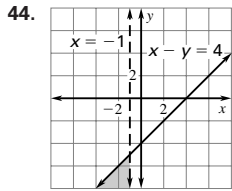
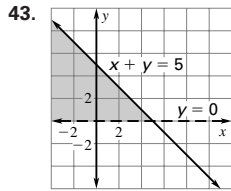
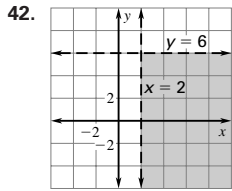
38. $g(1) = 2(1) + 1 = 3$

39. $g(-5) = -7(-5) = 35$

40. $g(-1) = -7(-1) = 7$

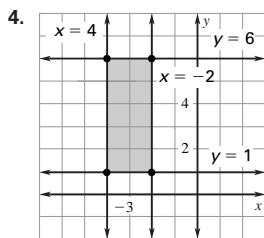
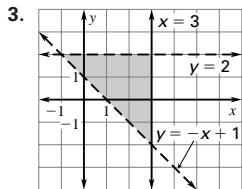
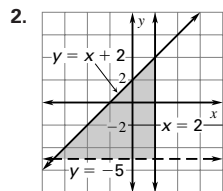
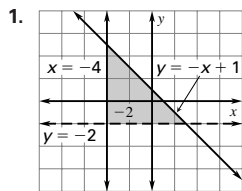
41. $g(7) = 2(7) + 1 = 15$

Chapter 3 continued



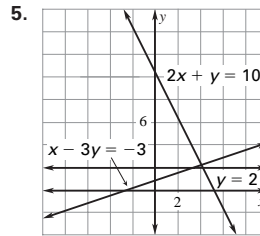
48. $30 = 3v + 2p$
 $v = p$
 $30 = 5p$
 $6 = p$
 $6 = v$; Play 6 games of each.

Quiz 2 (p. 169)

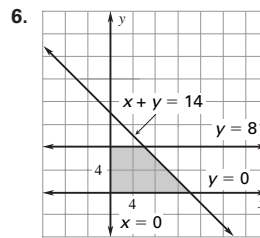


- $(-4, 6): C = 5(-4) + 2(6) = -8$
 $(-2, 6): C = 5(-2) + 2(6) = 2 \leftarrow$ maximum

- $(-4, 1): C = 5(-4) + 2(1) = -18 \leftarrow$ minimum
 $(-2, 1): C = 5(-2) + 2(1) = -8$



- $(3, 2): C = 5(3) + 2(2) = 19 \leftarrow$ minimum
 $(4, 2): C = 5(4) + 2(2) = 24 \leftarrow$ maximum
 $(\frac{27}{7}, \frac{16}{7}): C = 5(\frac{27}{7}) + 2(\frac{16}{7}) = 23\frac{6}{7}$



- $(0, 8): C = 5(0) + 2(8) = 16$
 $(6, 8): C = 5(6) + 2(8) = 46$
 $(14, 0): C = 5(14) + 2(0) = 70 \leftarrow$ maximum
 $(0, 0): C = 5(0) + 2(0) = 0 \leftarrow$ minimum

7. $C = 10S + 20L$

- vertices
 $2S + 3L \leq 30$ $(12, 0); 10(12) + 20(0) = 120$
 $S + L \geq 12$ $(6, 6); 10(6) + 20(6) = 180$
 $S \geq 0$ $(15, 0); 10(15) + 20(0) = 150$
 $L \geq 0$ 6 small boxes and 6 large boxes

Math and History (p. 169)

1. $\frac{500 \text{ ton}}{25 \text{ ton}} = 20$ tanks 2. $33 + 27 = 60$ trucks

3. $C = r + t$

$581 \geq 3r + 25t$

$60 \geq r$

$20 \geq t$

$r \geq 3t$

$r \geq 0$

$t \geq 0$

$(0, 60): C = 0 + 60 = 60$

$(16, 60): C = 16 + 60 = 76 \leftarrow$ maximum

$(17, 51): C = 17 + 51 = 68$

$(0, 0): C = 0 + 0 = 0$

16 tanks, 60 trucks

Chapter 3 continued

Lesson 3.5

3.5 Guided Practice (p. 173)

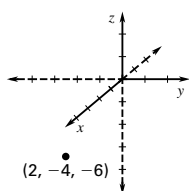
1. $ax + by + cz = d$; the solution of such an equation is a plane in three-dimensional space; to graph it, find the three intercepts and shade the triangular region lying in one octant.

2. false

3. *Sample answer:* Octants and quadrants are both distinct regions bounded by the axes, and defined by the signs of the x -, y - and z -coordinates.

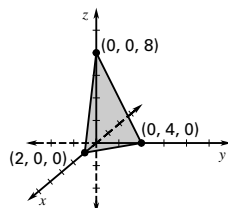
4. To graph a linear equation in three variables, find the three intercepts and shade the triangular region lying in one octant.

5.



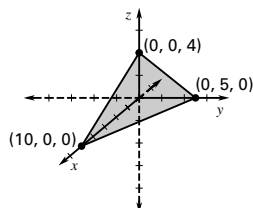
6. $A = (2, 0, 4)$
 $B = (2, 3, 0)$
 $C = (0, 3, 4)$
 $D = (0, 0, 4)$

7.



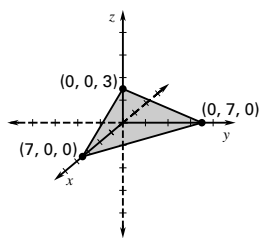
$$8x + 4y + 2z = 16$$

8.



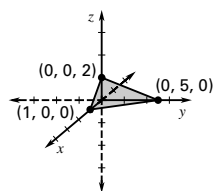
$$2x + 4y + 5z = 20$$

9.



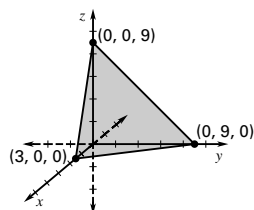
$$3x + 3y + 7z = 21$$

10.



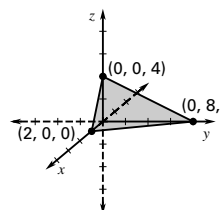
$$10x + 2y + 5z = 10$$

11.



$$9x + 3y + 3z = 27$$

12.



$$4x + y + 2z = 8$$

13. $3z = 9 - 6x - 6y$

$$z = 3 - 2x - 2y$$

$$f(x, y) = 3 - 2x - 2y$$

$$f(1, 2) = 3 - 2(1) - 2(2)$$

$$f(1, 2) = -3$$

14. $z = 7 + 2x + y$

$$f(x, y) = 7 + 2x + y$$

$$f(-3, 2) = 7 + 2(-3) + 2$$

$$f(-3, 2) = 3$$

15. $4z = -16 - 8x - 2y$

$$z = -4 - 2x - \frac{1}{2}y$$

$$f(x, y) = -4 - 2x - \frac{1}{2}y$$

$$f(5, 6) = -4 - 2(5) - \frac{1}{2}(6)$$

$$f(5, 6) = -4 - 10 - 3$$

$$f(5, 6) = -17$$

16. $-5z = 15 - 5x + 10y$

$$z = -3 + x - 2y$$

$$f(x, y) = -3 + x - 2y$$

$$f(2, 2) = -3 + 2 - 2(2)$$

$$f(2, 2) = -3 + 2 - 4$$

$$f(2, 2) = -5$$

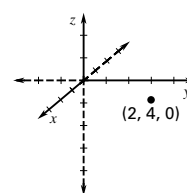
17. $C = 2.25r + 2.95p + 2.65$

$$C = 2.25(5) + 2.95(8) + 2.65$$

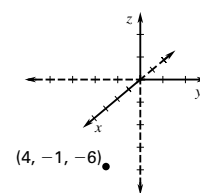
$$C = 11.25 + 23.60 + 2.65$$

$$C = \$37.50$$

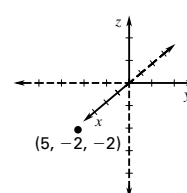
18.



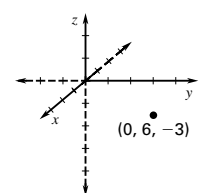
19.



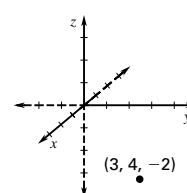
20.



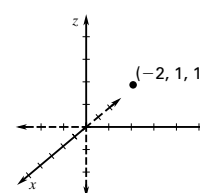
21.



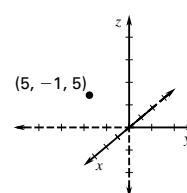
22.



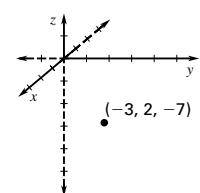
23.



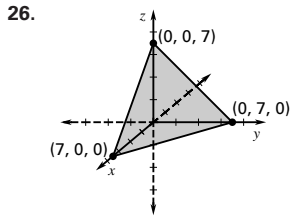
24.



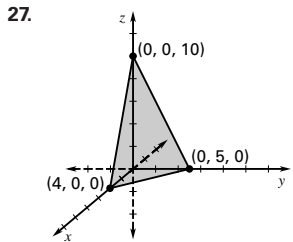
25.



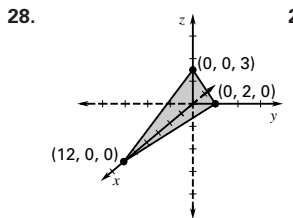
Chapter 3 continued



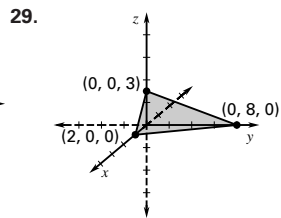
$$x + y + z = 7$$



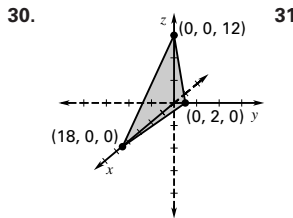
$$5x + 4y + 2z = 20$$



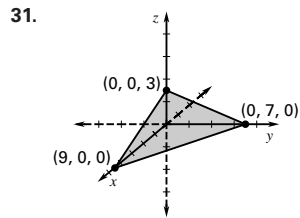
$$x + 6y + 4z = 12$$



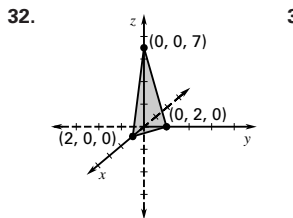
$$12x + 3y + 8z = 24$$



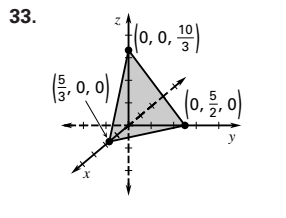
$$2x + 18y + 3z = 36$$



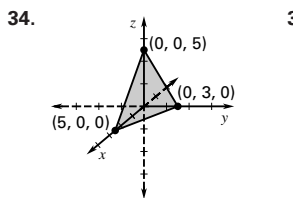
$$7x + 9y + 21z = 63$$



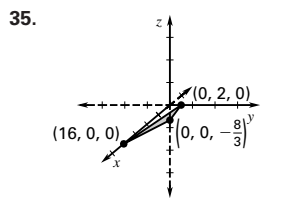
$$7x + 7y + 2z = 14$$



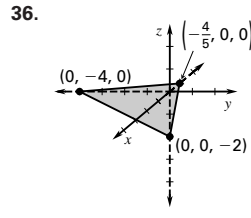
$$6x + 4y + 3z = 10$$



$$3x + 5y + 3z = 15$$



$$\frac{1}{2}x + 4y - 3z = 8$$



$$5x + y + 2z = -4$$

38. $3z = 18 - 6x - 2y$

$$z = 6 - 2x - \frac{2}{3}y$$

$$f(x, y) = 6 - 2x - \frac{2}{3}y$$

$$f(2, 1) = 6 - 2(2) - \frac{2}{3}(1)$$

$$f(2, 1) = \frac{4}{3}$$

39. $5z = 15 + 2x + 5y$

$$z = 3 + \frac{2}{5}x + y$$

$$f(x, y) = 3 + \frac{2}{5}x + y$$

$$f\left(\frac{3}{2}, -2\right) = 3 + \left(\frac{2}{5}\right)\left(\frac{3}{2}\right) + (-2)$$

$$f\left(\frac{3}{2}, -2\right) = 1 + \frac{3}{5}$$

$$f\left(\frac{3}{2}, -2\right) = \frac{8}{5}$$

40. $z = 10 - x - 6y$

$$f(x, y) = 10 - x - 6y$$

$$f(-4, -1) = 10 - (-4) - 6(-1)$$

$$f(-4, -1) = 10 + 4 + 6$$

$$f(-4, -1) = 20$$

41. $\frac{5}{2}z = 9 - 3x + \frac{3}{4}y$

$$z = \frac{18}{5} - \frac{6}{5}x + \frac{3}{10}y$$

$$f(x, y) = \frac{18}{5} - \frac{6}{5}x + \frac{3}{10}y$$

$$f(-3, 16) = \frac{18}{5} + \frac{18}{5} + \frac{48}{10}$$

$$f(-3, 16) = 12$$

42. $-7z = 14 + x + 2y$

$$z = -2 - \frac{1}{7}x - \frac{2}{7}y$$

$$f(x, y) = -2 - \frac{1}{7}x - \frac{2}{7}y$$

$$f(-5, -10) = -2 + \frac{5}{7} + \frac{20}{7}$$

$$f(-5, -10) = \frac{11}{7}$$

43. $60z = 12 - 10x - 15y$

$$z = \frac{1}{5} - \frac{1}{6}x - \frac{1}{4}y$$

$$f(x, y) = \frac{1}{5} - \frac{1}{6}x - \frac{1}{4}y$$

$$f\left(-3, \frac{4}{5}\right) = \frac{1}{5} + \frac{1}{2} - \frac{1}{5}$$

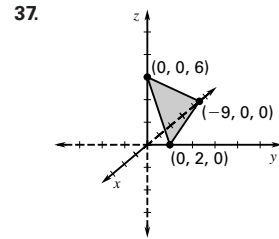
$$f\left(-3, \frac{4}{5}\right) = \frac{1}{2}$$

44. $z = x - 5y - 14$

$$f(x, y) = x - 5y - 14$$

$$f(3, 6) = 3 - 5(6) - 14$$

$$f(3, 6) = -41$$



$$-2x + 9y + 3z = 18$$

Chapter 3 continued

45. $9z = -x + 6y - 12$

$$z = -\frac{1}{9}x + \frac{2}{3}y - \frac{4}{3}$$

$$f(x, y) = -\frac{1}{9}x + \frac{2}{3}y - \frac{4}{3}$$

$$f\left(-\frac{1}{2}, 12\right) = \frac{1}{18} + 8 - \frac{4}{3}$$

$$f\left(-\frac{1}{2}, 12\right) = 6\frac{13}{18}$$

46. $V = (\ell)(w)(h)$

$$V = (7)(4)(2)$$

$$V = 56 \text{ cubic units}$$

48. $C = 0.4g + 4a + 6s$

Sample answers:

a	g	C
1	10	\$73
2	20	\$81

50. $C = 0.7t + 0.3c + 20$

Sample answers:

t	c	C
6	6	\$18
12	12	\$24

52. $S = 8l + 6b + 10$

Sample answers:

l	b	S
3	6	\$70
6	3	\$76

53. a. $C = 100x + 350y + 500$

b. Sample answers:

x	y	C
2	4	\$2100
4	2	\$1600

c. Sample answer: 8 of each kind of spot costs \$4100, so you don't have enough money. I would spend \$3950 on 10 off-peak spots and 7 peak ones. This way your commercial gets 17 airings rather than 16 and you are \$50 under budget.

54. $x - 2y + z = 4$

55. $8x + y + 2z = 12$

56. $27x - 18y - 12z = 108$

Sample explanation: I found the least common multiple of the given intercepts and divided each one into the LCM to find the coefficients of the variables.

47. $V = \ell \times w \times h$

$$V = 6 \times 5 \times 2$$

$$V = 60 \text{ cubic units}$$

49. $C = 1.5n + p + 16$

Sample answers:

n	p	C
5	4	\$27.50
10	8	\$39

51. $C = 0.9e + 0.25s + 20$

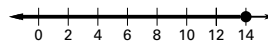
Sample answers:

e	s	C
8	10	\$29.70
10	5	\$30.25
20	10	\$40.50

3.5 Mixed Review (p. 175)

57. $3 + x \leq 17$

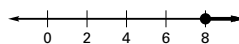
$$x \leq 14$$



58. $2x + 5 \geq 21$

$$2x \geq 16$$

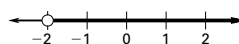
$$x \geq 8$$



59. $-x + 3 < 3x + 11$

$$-4x < 8$$

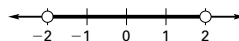
$$x > -2$$



60. $-13 < 6x - 1 < 11$

$$-12 < 6x < 12$$

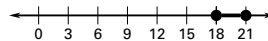
$$-2 < x < 2$$



61. $24 \leq 2x - 12 \leq 30$

$$36 \leq 2x \leq 42$$

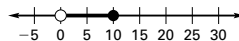
$$18 \leq x \leq 21$$



62. $-3 < 2x - 3 \leq 17$

$$0 < 2x \leq 20$$

$$0 < x \leq 10$$



63. $m_1 = \frac{7 + 5}{1 + 3} = \frac{12}{4} = 3$

$$m_2 = \frac{20 - 2}{-6 + 0} = \frac{18}{-6} = -3$$

neither

64. $m_1 = \frac{1 + 4}{-16 - 4} = \frac{5}{-20} = -\frac{1}{4}$

$$m_2 = \frac{21 - 5}{5 - 1} = \frac{16}{4} = 4$$

perpendicular

65. $m_1 = \frac{1 - 3}{-2 - 0} = \frac{-2}{-2} = 1$

$$m_2 = \frac{1 + 1}{2 - 0} = \frac{2}{2} = 1$$

parallel

66. $m_1 = \frac{6 + 2}{0 - 5} = \frac{8}{-5} = -\frac{8}{5}$

$$m_2 = \frac{-1 - 4}{-1 - 7} = \frac{-5}{-8} = \frac{5}{8}$$

perpendicular

Chapter 3 continued

67. $3.95r + 3.1p = 48.5$

$$r + p = 14$$

buy 6 red oak boards and 8 poplar boards

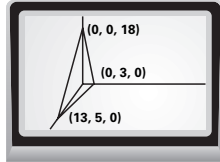
Activity 3.5 (p. 176)

1. $3z = 54 - 4x - 18y$

$$z = 18 - \frac{4}{3}x - 6y$$

$$f(x, y) = 18 - \frac{4}{3}x - 6y$$

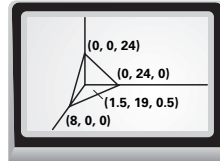
$$f(6, 4) = -14$$



2. $z = 24 - 3x - y$

$$f(x, y) = 24 - 3x - y$$

$$f(1.5, 19) = 0.5$$

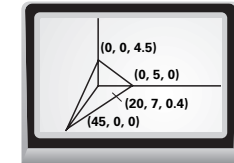


3. $10z = 45 - x - 3y$

$$z = 4.5 - 0.1x - 0.3y$$

$$f(x, y) = 4.5 - 0.1x - 0.3y$$

$$f(20, 7) = 0.4$$

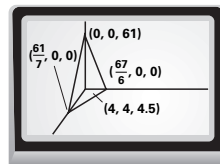


4. $2z = 61 - 7x - 6y$

$$z = 30.5 - 3.5x - 3y$$

$$f(x, y) = 30.5 - 3.5x - 3y$$

$$f(4, 4) = 4.5$$

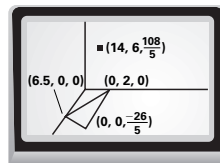


5. $-5z = 26 - 4x - 13y$

$$z = -\frac{26}{5} + \frac{4}{5}x + \frac{13}{5}y$$

$$f(x, y) = -\frac{26}{5} + \frac{4}{5}x + \frac{13}{5}y$$

$$f(14, 6) = 21.6$$

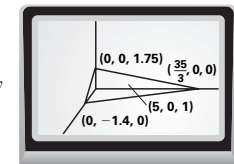


6. $20z = 35 - 3x + 25y$

$$z = 1.75 - 0.15x + 1.25y$$

$$f(x, y) = 1.75 - 0.15x + 1.25y$$

$$f(5, 0) = 1$$



Lesson 3.6

3.6 Guided Practice (p. 181)

1. *Sample answers:*

$$x + y + z = 3$$

$$4x + 2y - \frac{1}{2}z = 7$$

$$3x + 11y - 4z = 20$$

2. When you come up with an impossible solution such as $0 = 3$, that tells you that the original system of equations is inconsistent. If there are many solutions, you would obtain an identity, such as $0 = 0$.

3. Two or more of the planes could coincide.

4. Solve one of the equations for one variable in terms of the other two, and then substitute this expression into each of the other two equations, obtaining a system of two equations in two variables.

5. $-2(1) - (4) + 5(2) \neq 12$

$$3(1) + 2(4) - 2 \neq -7$$

$$-5(1) + 4(4) + 2(2) \neq -17$$

no

6. $-4(7) + 6(-1) - 0 = -34$

$$-2(7) - 5(-1) + 0 = -9$$

$$5(7) + 2(-1) + 0 = 33$$

yes

7. $5(-2) - 2(3) + 3 = -13$

$$-2 + 4(3) + 3(3) = 19$$

$$-3(-2) + 3 + 6(3) \neq 15$$

no

8. $2x + 10y - 2z = 32$

$$\underline{3x - 3y + 2z = 12}$$

$$5x + 7y = 44 \text{ Equation 1}$$

$$3x - 3y + 2z = 12$$

$$\underline{-4x - 8y - 2z = -40}$$

$$-x - 11y = -28 \text{ Equation 2}$$

$$5x + 7y = 44$$

$$\underline{-5x - 55y = -140}$$

$$-48y = -96$$

$$y = 2$$

$$5x + 7(2) = 44$$

$$5x = 30$$

$$x = 6$$

$$6 + 5(2) - z = 16$$

$$16 - z = 16$$

$$-z = 0$$

$$z = 0$$

$$(6, 2, 0)$$

Chapter 3 continued

$$9. -2(4 - 2y - z) + y + 3z = -8$$

$$3(4 - 2y - z) + 4y - 2z = 9$$

$$-8 + 4y + 2z + y + 3z = -8$$

$$12 - 6y - 3z + 4y - 2z = 9$$

$$5y + 5z = 0$$

$$5(-1) + 5(z) = 0$$

$$-2y - 5z = -3$$

$$5z = 5$$

$$z = 1$$

$$5y + (-2y + 3) = 0$$

$$5y - 2y = -3$$

$$x = 4 - 2(-1) - (1)$$

$$3y = -3$$

$$x = 4 + 2 - 1$$

$$y = -1$$

$$x = 5$$

$$(5, -1, 1)$$

$$10. x = 2 + y - 2z$$

$$9(2 + y - 2z) + 5y - z = -11$$

$$18 + 9y - 18z + 5y - z = -11$$

$$14y - 19z = -29$$

$$6(2 + y - 2z) + 4y + 2z = 2$$

$$12 + 6y - 12z + 4y + 2z = 2$$

$$10y - 10z = -10$$

$$y - z = -1$$

$$y = z - 1$$

$$14(z - 1) - 19z = -29$$

$$y = 3 - 1$$

$$14z - 14 - 19z = -29$$

$$y = 2$$

$$-5z = -15$$

$$x = 2 + y - 2z$$

$$z = 3$$

$$x = 2 + 2 - 2(3)$$

$$x = -2$$

$$(-2, 2, 3)$$

$$11. 0.02s + 0.05c + 0.06b = 1000$$

$$s + c + b = 20,000$$

$$c = 2b$$

$$s + 2b + b = 20,000$$

$$0.02s + 0.1b + 0.06b = 1000$$

$$0.02s + 0.16b = 1000$$

$$0.02(20,000 - 3b) + 0.16b = 1000$$

$$400 - 0.06b + 0.16b = 1000$$

$$0.10b = 600$$

$$b = \$6,000$$

$$c = \$12,000$$

$$s + 12,000 + 6000 = 20,000$$

$$s = 2000$$

She should invest \$2,000 in savings,
\$6,000 in bonds, and \$12,000 in CDs.

3.6 Practice and Applications (pp. 181–183)

$$12. 3x + 2y - z = 8$$

$$-3x + 4y + 5z = -14$$

$$6y + 4z = -6$$

$$-3x + 4y + 5z = -14$$

$$3x - 9y + 12z = -42$$

$$-5y + 17z = -56$$

$$30y + 20z = -30$$

$$-30y + 102z = -336$$

$$122z = -366$$

$$z = -3$$

$$6y + 4(-3) = -6$$

$$6y = 6$$

$$y = 1$$

$$x = -14 + 3(1) - 4(-3)$$

$$x = -14 + 3 + 12$$

$$x = 1$$

$$(1, 1, -3)$$

$$14. 3x + 2y - 3z = -2$$

$$7x - 2y + 5z = -14$$

$$10x + 2z = -16$$

$$14x - 4y + 10z = -28$$

$$2x + 4y + z = 6$$

$$16x + 11z = -22$$

$$-110x - 22z = 176$$

$$32x + 22z = -44$$

$$-78x = 132$$

$$x = -\frac{22}{13}$$

$$16\left(-\frac{22}{13}\right) + 11z = -22$$

$$11z = \frac{66}{13}$$

$$z = \frac{6}{13}$$

$$3\left(-\frac{22}{13}\right) + 2y - 3\left(\frac{6}{13}\right) = -2$$

$$2y = \frac{58}{13}$$

$$y = \frac{29}{13}$$

$$\left(-\frac{22}{13}, \frac{29}{13}, \frac{6}{13}\right)$$

$$13. x + 2y + 5z = -1$$

$$4x - 2y + 2z = 4$$

$$5x + 7z = 3$$

$$8x - 4y + 4z = 8$$

$$3x + 4y - 4z = 14$$

$$11x = 22$$

$$x = 2$$

$$5(2) + 7z = 3$$

$$7z = -7$$

$$z = -1$$

$$2(2) - y - 1 = 2$$

$$-y = -1$$

$$y = 1$$

$$(2, 1, -1)$$

$$15. 5x - 4y + 4z = 18$$

$$-2x + 6y - 4z = 0$$

$$3x + 2y = 18$$

$$-7x + 21y - 14z = 0$$

$$8x - 4y + 14z = 6$$

$$x + 17y = 6$$

$$3x + 2y = 18$$

$$-3x - 51y = -18$$

$$-49y = 0$$

$$y = 0$$

$$x = 6$$

$$-6 + 3(0) - 2z = 0$$

$$-2z = 6$$

$$z = -3$$

$$(6, 0, -3)$$

Chapter 3 continued

$$\begin{array}{r}
 16. \quad x + y - 2z = 5 \\
 \underline{-x - 2y - z = -8} \\
 -y - 3z = -3 \\
 \\
 -2x - 2y + 4z = -10 \\
 \underline{2x + 3y - z = 13} \\
 y + 3z = 3 \\
 \\
 -y - 3z = -3 \\
 \underline{y + 3z = 3} \\
 0 = 0 \\
 y = 3 - 3z \\
 -3x - 3y + 6z = -15 \\
 \underline{2x + 3y - z = 13} \\
 -x + 5z = -2 \\
 x = 5z + 2 \\
 \text{infinitely many solutions} \\
 (5z + 2, -3z + 3, z)
 \end{array}
 \qquad
 \begin{array}{r}
 17. \quad -10x + 6y + 2z = -30 \\
 \underline{10x + 2y + 8z = 18} \\
 8y + 10z = -12 \\
 \\
 -15x + 9y + 3z = -45 \\
 \underline{15x + 5y + 7z = 9} \\
 14y + 10z = -36 \\
 \\
 -8y - 10z = 12 \\
 \underline{14y + 10z = -36} \\
 6y = -24 \\
 y = -4 \\
 \\
 14(-4) + 10z = -36 \\
 10z = 20 \\
 z = 2 \\
 \\
 -5x + 3(-4) + 2 = -15 \\
 -5x - 12 + 2 = -15 \\
 -5x = -5 \\
 x = 1 \\
 \\
 (1, -4, 2)
 \end{array}$$

$$\begin{array}{r}
 18. \quad 3x + 2(1 - 6z + 2x) + 5z = 16 \\
 3x + 2 - 12z + 4x + 5z = 16 \\
 7x - 7z = 14 \\
 x - z = 2 \\
 \\
 7x + 3(1 - 6z + 2x) - 4z = 11 \\
 7x + 3 - 18z + 6x - 4z = 11 \\
 13x - 22z = 8 \\
 13(2 + z) - 22z = 8 \\
 26 + 13z - 22z = 8 \\
 -9z = -18 \\
 z = 2 \\
 \\
 x - 2 = 2 \\
 x = 4 \\
 \\
 -2(4) + y + 6(2) = 1 \\
 y = 1 - 12 + 8 \\
 y = -3 \\
 \\
 (4, -3, 2)
 \end{array}$$

$$\begin{array}{r}
 19. \quad -(-8 + 6y + 2z) + 5y + 3z = 2 \\
 8 - 6y - 2z + 5y + 3z = 2 \\
 -y + z = -6 \\
 \\
 3(-8 + 6y + 2z) - 2y - 4z = 18 \\
 -24 + 18y + 6z - 2y - 4z = 18 \\
 16y + 2z = 42 \\
 8y + z = 21 \\
 8y + y - 6 = 21 \\
 9y = 27 \\
 y = 3 \\
 \\
 -3 + z = -6 \\
 z = -3 \\
 \\
 x = -8 + 6(3) + 2(-3) \\
 x = -8 + 18 - 6 \\
 x = 4 \\
 (4, 3, -3)
 \end{array}$$

$$\begin{array}{r}
 20. \quad 5(4 - y - z) + 5y - 5z = 12 \\
 20 - 5y - 5z + 5y + 5z = 12 \\
 0 = -8 \\
 \text{no solution}
 \end{array}$$

$$\begin{array}{r}
 21. \quad 3(21 + 3y - 6z) + 2y - 5z = -30 \\
 63 + 9y - 18z + 2y - 5z = -30 \\
 11y - 23z = -93 \\
 \\
 2(21 + 3y - 6z) - 5y + 2z = -6 \\
 42 + 6y - 12z - 5y + 2z = -6 \\
 y - 10z = -48 \\
 \\
 11(-48 + 10z) - 23z = -93 \\
 -528 + 110z - 23z = -93 \\
 87z = 435 \\
 z = 5 \\
 \\
 y = -48 + 10(5) \\
 y = 2 \\
 \\
 x = 21 + 3(2) - 6(5) \\
 x = -3 \\
 \\
 (-3, 2, 5)
 \end{array}$$

$$\begin{array}{r}
 22. \quad 5 - y + 2z + 2y + z = 8 \\
 y + 3z = 3 \\
 \\
 2(5 - y + 2z) + 3y - z = 1 \\
 10 - 2y + 4z + 3y - z = 1 \\
 y + 3z = -9 \\
 \\
 3 - 3z + 3z = -9 \\
 3 \neq -9 \\
 \text{no solution}
 \end{array}$$

Chapter 3 continued

23. $y + 2(5) = 13$

$$y = 3$$

$$2x - 3(3) + 5 = 10$$

$$2x = 14$$

$$x = 7$$

$$(7, 3, 5)$$

24. $2x - 2y + 5y + 31 = 3$

$$2x + 3y = -28$$

$$x + 3y + 2(5y + 31) = -21$$

$$x + 3y + 10y = -83$$

$$x + 13y = -83$$

$$2(-83 - 13y) + 3y = -28$$

$$-166 - 26y + 3y = -28$$

$$-23y = 138$$

$$y = -6$$

$$x + 13(-6) = -83$$

$$x = -5$$

$$2(-5) - 2(-6) + z = 3$$

$$-10 + 12 + z = 3$$

$$z = 1$$

$$(-5, -6, 1)$$

25. $17x - (8 + 4z - x) + 2z = -9$

$$17x + x - 4z + 2z = -1$$

$$18x - 2z = -1$$

$$3x - 2(8 + 4z - x) - 12z = 24$$

$$3x - 16 - 8z + 2x - 12z = 24$$

$$5x - 20z = 40$$

$$x - 4z = 8$$

$$18(8 + 4z) - 2z = -1$$

$$144 + 72z - 2z = -1$$

$$70z = -145$$

$$z = -\frac{29}{14}$$

$$x - 4\left(-\frac{29}{14}\right) = 8$$

$$x = 8 - \frac{58}{7}$$

$$x = -\frac{2}{7}$$

$$y = 8 + 4\left(-\frac{29}{14}\right) + \frac{2}{7}$$

$$y = 0$$

$$\left(-\frac{2}{7}, 0, -\frac{29}{14}\right)$$

26. $5x + 3y + 3z = 71$

$$4x - 2y - 3z = 1$$

$$9x + y = 72$$

$$4x - 2y - 3z = 1$$

$$-6x + 3y + 3z = -6$$

$$-2x + y = -5$$

$$-9x - y = -72$$

$$-2x + y = -5$$

$$-11x = -77$$

$$x = 7$$

$$-14 + y = -5$$

$$y = 9$$

$$5(7) + 3(9) + 3(z) = 71$$

$$3z = 9$$

$$z = 3$$

$$(7, 9, 3)$$

27. $x - 9y + 4z = 1$

$$2x + y - 4z = -3$$

$$3x - 8y = -2$$

$$2x - 18y + 8z = 2$$

$$-4x + 18y - 8z = -6$$

$$-2x = -4$$

$$x = 2$$

$$6 - 8y = -2$$

$$-8y = -8$$

$$y = 1$$

$$2 - 9(1) + 4z = 1$$

$$4z = 8$$

$$z = 2$$

$$(2, 1, 2)$$

Chapter 3 continued

28. $2x + y + 2z = 7$

$$\frac{2x - y + 2z = 1}{4x + 4z = 8}$$

$$4x + 4z = 8$$

$$x + z = 2$$

$$2x - y + 2z = 1$$

$$\frac{5x + y + 5z = 13}{7x + 7z = 14}$$

$$7x + 7z = 14$$

$$2x + y + 2z = 7$$

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

$$2y = 6$$

$$y = 3$$

infinitely many solutions

$$(2 - z, 3, z)$$

29. $42x - 18y + 24z = -84$

$$\frac{8x + 2y - 24z = 18}{50x - 16y = -66}$$

$$50x - 16y = -66$$

$$25x - 8y = -33$$

$$8x + 2y - 24z = 18$$

$$\frac{18x - 30y + 24z = -72}{26x - 28y = -54}$$

$$26x - 28y = -54$$

$$13x - 14y = -27$$

$$175x - 56y = -231$$

$$\frac{-52x + 56y = 108}{123x = -123}$$

$$123x = -123$$

$$x = -1$$

$$13(-1) - 14y = -27$$

$$-14y = -14$$

$$y = 1$$

$$7(-1) - 3(1) + 4z = -14$$

$$4z = -4$$

$$z = -1$$

$$(-1, 1, -1)$$

30. $12(-10 - y) + 6y + 7z = -35$

$$-120 - 12y + 6y + 7z = -35$$

$$-6y + 7z = 85$$

$$7(-10 - y) - 5y - 6z = 200$$

$$-70 - 7y - 5y - 6z = 200$$

$$-12y - 6z = 270$$

$$y = \frac{270 + 6z}{-12}$$

$$-6\left(\frac{270 + 6z}{-12}\right) + 7z = 85$$

$$135 + 3z + 7z = 85$$

$$10z = -50$$

$$z = -5$$

$$y = \frac{270 + 6(-5)}{-12}$$

$$y = -20$$

$$x = -10 + 20$$

$$x = 10$$

$$(10, -20, -5)$$

31. $7x - 10y + 8z = -50$

$$\frac{-6x - 8y - 8z = -52}{x - 18y = -102}$$

$$x - 18y = -102$$

$$-2x - 5y + 12z = -90$$

$$\frac{-9x - 12y - 12z = -78}{-11x - 17y = -168}$$

$$-11x - 17y = -168$$

$$-11(-102 + 18y) - 17y = -168$$

$$1122 - 198y - 17y = -168$$

$$-215y = -1290$$

$$y = 6$$

$$x = (-102 + 108) \quad 3(6) + 4(6) + 4z = 26$$

$$x = 6$$

$$4z = -16$$

$$z = -4$$

$$(6, 6, -4)$$

Chapter 3 continued

$$32. x = \frac{-26 + 3y + 6z}{-2}$$

$$5\left(13 - \frac{3}{2}y - 3z\right) + 5y + 4z = 24$$

$$65 - \frac{15}{2}y - 15z + 5y + 4z = 24$$

$$-\frac{5}{2}y - 11z = -41$$

$$-5y - 22z = -82$$

$$3\left(13 - \frac{3}{2}y - 3z\right) + 4y - 5z = -40$$

$$39 - \frac{9}{2}y - 9z + 4y - 5z = -40$$

$$-\frac{1}{2}y - 14z = -79$$

$$y = 158 - 28z$$

$$-5(158 - 28z) - 22z = -82$$

$$-790 + 140z - 22z = -82$$

$$118z = 708$$

$$z = 6$$

$$y = 158 - 28(6)$$

$$y = -10$$

$$-2x = -26 + 3(-10) + 6(6)$$

$$x = 10$$

$$(10, -10, 6)$$

$$33. 6x + 6y + 2z = 60$$

$$-6x + 7y + 3z = -49$$

$$13y + 5z = 11$$

$$30x + 30y + 10z = 300$$

$$-30x + 9y + 21z = -51$$

$$39y + 31z = 249$$

$$39y + 31z = 249$$

$$-39y - 15z = -33$$

$$16z = 216$$

$$z = \frac{27}{2}$$

$$39y = 249 - 31\left(\frac{27}{2}\right)$$

$$y = -\frac{113}{26}$$

$$3x = 60 - 6\left(-\frac{113}{26}\right) - 2\left(\frac{27}{2}\right)$$

$$3x = \frac{384}{13}$$

$$x = \frac{128}{13}$$

$$\left(\frac{128}{13}, -\frac{113}{26}, \frac{27}{2}\right)$$

$$34. n + \frac{1}{2}g + \frac{1}{2}d = 5.97$$

$$\frac{4}{3}n + \frac{1}{4}g + \frac{3}{2}d = 9.22$$

$$\frac{1}{3}n + \frac{3}{2}g + 2d = 10.96$$

$$-\frac{1}{3}n - \frac{1}{6}g - \frac{1}{6}d = -1.99$$

$$\frac{1}{3}n + \frac{9}{6}g + \frac{12}{6}d = 10.96$$

$$\frac{4}{3}g + \frac{11}{6}d = 8.97$$

$$\frac{4}{3}n + \frac{1}{4}g + \frac{3}{2}d = 9.22$$

$$-\frac{4}{3}n - \frac{24}{4}g - \frac{16}{2}d = -43.84$$

$$-\frac{23}{4}g - \frac{13}{2}d = -34.62$$

$$\frac{26}{3}g + \frac{143}{12}d = 58.305$$

$$-\frac{253}{24}g - \frac{143}{12}d = -63.47$$

$$-\frac{15}{8}g = -5.165$$

$$g = \$2.75$$

$$\frac{4}{3}(2.75) + \frac{11}{6}d = 8.97$$

$$\frac{11}{6}d = 5.30$$

$$d = 2.89$$

$$n + 1.38 + 1.44 = 5.97$$

$$n = \$3.15$$

A pound of mixed nuts costs \$3.15, a pound of granola costs \$2.75, and dried fruit costs \$2.89 a pound.

$$35. f + s + t = 20$$

$$5f + 3s + t = 68$$

$$s = f + t$$

$$f + f + t + t = 20$$

$$2f + 2t = 20$$

$$f + t = 10$$

$$s = 10$$

$$5f + 3(10) + t = 68$$

$$5f + t = 38$$

$$5f + 10 - f = 38$$

$$4f = 28$$

$$f = 7$$

$$10 = 7 + t$$

$$3 = t$$

There were 7 first place finishers, 10 second place finishers, and 3 third place finishers.

Chapter 3 continued

36. $2f + c = 5$

$$1f + c + b = 5.25$$

$$2c + b = 5.75$$

$$f + c + 5.75 - 2c = 5.25$$

$$f - c = -0.50$$

$$2(-0.50 + c) + c = 5$$

$$-1 + 2c + c = 5$$

$$3c = 6$$

$$c = 2$$

Chicken chow mein is \$2 per portion.

37. $s + l = 1300$

$$s + 2c = 1400$$

$$s + l + c = 1600$$

38. $1300 + c = 1600$

$$c = \$300$$

$$s + 2(300) = 1400$$

$$s = \$800$$

$$800 + l = 1300$$

$$l = \$500$$

sofa: \$800

love seat: \$500

chair: \$300

39. $0.2D + 0.15R + 0.2O = 18$

$$0.3D + 0.35R + 0.25O = 31.5$$

$$D + R + O = 100$$

$$-0.05R = -2$$

$$0.05R - 0.05O = 1.5$$

$$-0.05O = -0.5$$

$$O = 10$$

$$0.05R = 1.5 + 0.5$$

$$R = 40$$

$$D = 50$$

Democrat: 50 million

Republican: 40 million

Other parties: 10 million

40. $-1 + 2(2) - 3(-3) = 12 = a$

$$1 - 2 + (-3) = -4 = b$$

$$2(-1) + 3(2) - 2(-3) = 10 = c$$

41. a. Sample answer:

$$x + y + z = 3$$

$$2x - 2y + 5z = 23$$

$$4x - 3z = 1$$

b. Sample answer:

$$x + y + z = 3$$

$$2x - 2y + 5z = 23$$

$$4x - 4y + 10z = 11$$

c. Sample answer:

$$x + y + z = 3$$

$$2x - 2y + 5z = 23$$

$$3x - y + 6z = 26$$

42. a. $e + r + g = 21$

$$1.4e + 1.1r + 1.3g = 25$$

$$r = 2(e + g)$$

b. $e + 2e + 2g + g = 21$

$$3e + 3g = 21$$

$$e + g = 7$$

$$1.4e + 2.2e + 2.2g + 1.3g = 25$$

$$3.6e + 3.5g = 25$$

$$3.6(7 - g) + 3.5g = 25$$

$$25.2 - 3.6g + 3.5g = 25$$

$$-0.1g = -0.2$$

$$g = 2$$

$$e = 5$$

$$r = 14$$

5 lb empire apples; 2 lb golden delicious;

14 lb red delicious

c. Sample answer: You need 4 pounds of berries to make berry tarts for a party. Strawberries cost \$1.50 per pound, raspberries cost \$4.00 per pound and blueberries cost \$2.00 per pound. You have \$8 to spend, and plan to use as many pounds of strawberries as of blueberries and raspberries combined.

$$s + r + b = 4$$

$$s = r + b$$

$$1.5s + 4r + 2b = 8$$

Buy 2 lb of strawberries, $\frac{1}{2}$ lb of raspberries and 1.5 lb of blueberries.

43. $w = -\frac{2}{19}$

$$x = \frac{123}{38}$$

$$y = \frac{65}{38}$$

$$z = \frac{22}{19}$$

44. $w = 2$

$$x = -12$$

$$y = -4$$

$$z = 1$$

3.6 Mixed Review (p. 184)

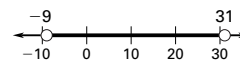
45. 11 46. 16 47. 84 48. 18 49. -16 50. 48

51. $\frac{3}{10}$ 52. $\frac{2}{21}$ 53. $-\frac{9}{4}$

54. $-20 < 11 - x < 20$

$$-31 < -x < 9$$

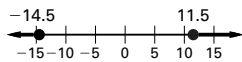
$$-9 < x < 31$$



Chapter 3 continued

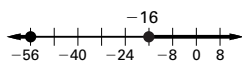
55. $2x + 3 \geq 26$ or $2x + 3 \leq -26$

$$\begin{aligned} 2x &\geq 23 & 2x &\leq -29 \\ x &\geq \frac{23}{2} & x &\leq -\frac{29}{2} \end{aligned}$$



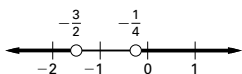
56. $18 + \frac{x}{2} \geq 10$ or $18 + \frac{x}{2} \leq -10$

$$\begin{aligned} \frac{x}{2} &\geq -8 & \frac{x}{2} &\leq -28 \\ x &\geq -16 & x &\leq -56 \end{aligned}$$

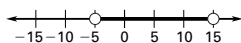


57. $7 + 8x < -5$ or $7 + 8x > 5$

$$\begin{aligned} 8x &< -12 & 8x &> -2 \\ x &< -\frac{3}{2} & x &> -\frac{1}{4} \end{aligned}$$

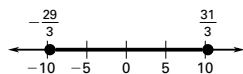


58. $-10 < 5 - x < 10$
 $-15 < -x < 5$
 $-5 < x < 15$



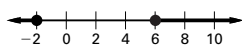
59. $-30 \leq 3x - 1 \leq 30$

$$\begin{aligned} -29 &\leq 3x \leq 31 \\ -\frac{29}{3} &\leq x \leq \frac{31}{3} \end{aligned}$$



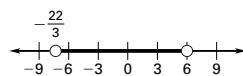
60. $-12 \geq -3x + 6$ or $-3x + 6 \geq 12$

$$\begin{aligned} -18 &\geq -3x & -3x &\geq 6 \\ 6 &\leq x & x &\leq -2 \end{aligned}$$



61. $-40 < 6x + 4 < 40$

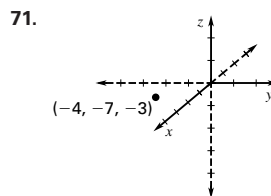
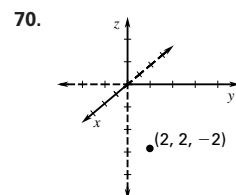
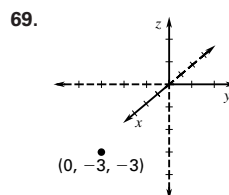
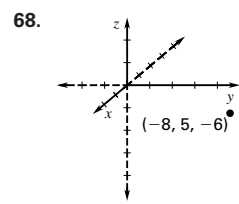
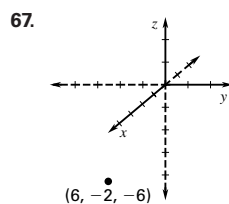
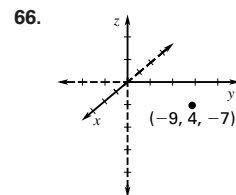
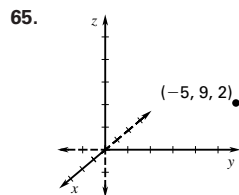
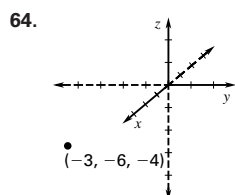
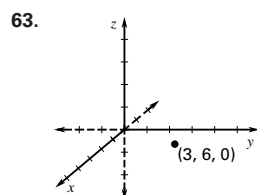
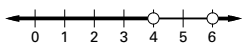
$$\begin{aligned} -44 &< 6x < 36 \\ -\frac{22}{3} &< x < 6 \end{aligned}$$



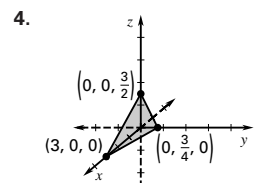
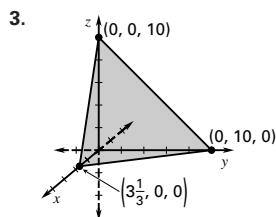
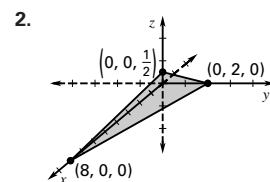
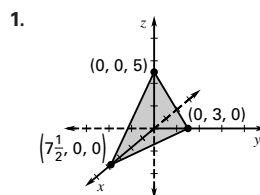
$$15 - 3x < -3 \quad 15 - 3x > 3$$

62. $-3x < -18$ or $-3x > -12$

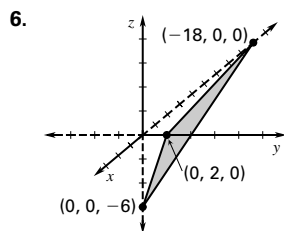
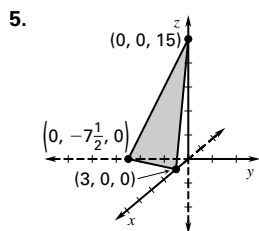
$$x > 6 \quad x < 4$$



Quiz 3 (p. 184)



Chapter 3 continued



7. $3z = 18 + x - \frac{1}{2}y$

$$z = 6 + \frac{x}{3} - \frac{1}{6}y$$

$$f(2, 0) = 6 + \frac{2}{3}$$

$$f(2, 0) = \frac{20}{3}$$

9. $z = 20x - 3y - 15$

$$f(x, y) = 20x - 3y - 15$$

$$f(3, -7) = 60 + 21 - 15$$

$$f(3, -7) = 66$$

8. $-8z = -16 - 8y - 4x$

$$z = 2 + y + \frac{x}{2}$$

$$f(-4, 4) = 2 + 4 - 2$$

$$f(-4, 4) = 4$$

10. $6z = 24 + 2x - y$

$$z = 4 + \frac{x}{3} - \frac{y}{6}$$

$$f(12, 7) = 4 + 4 - \frac{7}{6}$$

$$f(12, 7) = \frac{41}{6}$$

11. $6x - 2y + 12z = 30$

$$5x + 2y - z = 25$$

$$11x + 11z = 55$$

$$x + z = 5$$

$$2x + 4y + 3z = 10$$

$$-10x - 4y + 2z = -50$$

$$-8x + 5z = -40$$

$$-8(5 - z) + 5z = -40$$

$$-40 + 8z + 5z = -40$$

$$13z = 0$$

$$z = 0$$

$$x = 5$$

$$2(5) + 4y + 0 = 10$$

$$4y = 0$$

$$y = 0$$

$$(5, 0, 0)$$

12. $8x + z = 15$

$$7x - 4z = 18$$

$$7x - 4(15 - 8x) = 18$$

$$7x - 60 + 32x = 18$$

$$39x = 78$$

$$x = 2$$

$$16 + z = 15$$

$$z = -1$$

$$-2 + y - 1 = -7$$

$$y = -4$$

$$(2, -4, -1)$$

13. $3x - 6y + 9z = -27$

$$-3x + 6y - 9z = -12$$

$$0 \neq -39$$

no solution

14. $w = 2(s + p)$

$$w + s + p = 15$$

$$s = 3$$

$$15 - s - p = 2s + 2p$$

$$15 = 3s + 3p$$

$$5 = s + p$$

$$5 = 3 + p$$

$$2 = p$$

$$w = 2(3 + 2)$$

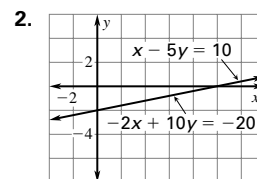
$$w = 10$$

3 string players,

10 winds, and

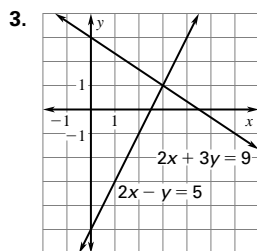
2 percussionists

Chapter 3 Review (pp. 186–188)

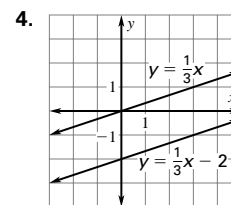


infinitely many solutions

one solution; $(-4, 6)$



one solution; $(3, 1)$



no solution

5. $9(12 - 2y) - 5y = -30$

$$108 - 23y = -30$$

$$-23y = -138$$

$$y = 6$$

$$x = 12 - 12$$

$$x = 0$$

$$(0, 6)$$

7. $4x + 6y = -14$

$$-4x - 5y = 13$$

$$y = -1$$

$$2x - 3 = -7$$

$$2x = -4$$

$$x = -2$$

$$(-2, -1)$$

6. $2 - y + 3y = -2$

$$2y = -4$$

$$y = -2$$

$$x = 2 + 2$$

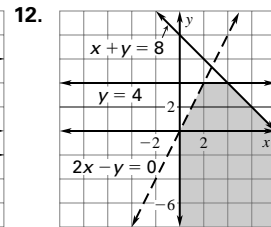
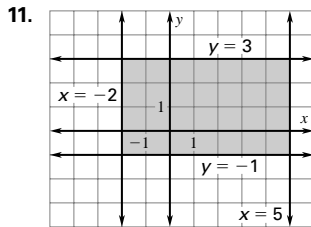
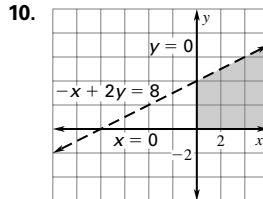
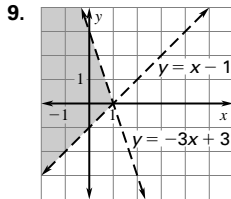
$$x = 4$$

$$(4, -2)$$

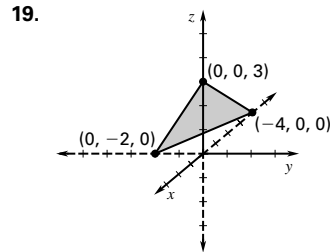
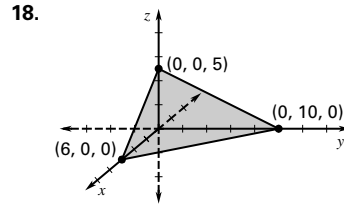
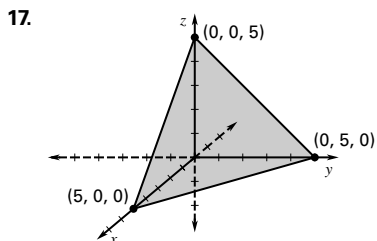
Chapter 3 continued

$$\begin{aligned}
 8. \quad & -6x - 6y = 0 \\
 & \underline{-2x - 6y = -24} \\
 & -8x = -24 \\
 & x = 3 \\
 & 3(3) + 3(y) = 0 \\
 & 3y = -9 \\
 & y = -3
 \end{aligned}$$

(3, -3)



13. (0, 10): $C = 5(0) + 2(10) = 20$
 (10, 0): $C = 5(10) + 2(0) = 50$ max
 (0, 0): $C = 5(0) + 2(0) = 0$ min
14. (0, 4): $C = 5(0) + 2(4) = 8$
 (5, 0): $C = 5(5) + 2(0) = 25$ max
 (0, 0): $C = 5(0) + 2(0) = 0$ min
15. (1, 0): $C = 5(1) + 2(0) = 5$ min
 (1, 9): $C = 5(1) + 2(9) = 23$
 (4, 0): $C = 5(4) + 2(0) = 20$
 (4, 9): $C = 5(4) + 2(9) = 38$ max
16. (0, 0): $C = 5(0) + 2(0) = 0$ min
 (0, 6): $C = 5(0) + 2(6) = 12$
 (4, 6): $C = 5(4) + 2(6) = 32$
 (5, 5): $C = 5(5) + 2(5) = 35$ max



20.
$$\begin{aligned}
 x + 2y - z &= 3 \\
 -x + y + 3z &= -5 \\
 \hline
 3y + 2z &= -2 \\
 -3x + 3y + 9z &= -15 \\
 \hline
 3x + y + 2z &= 4 \\
 4y + 11z &= -11 \\
 -12y - 8z &= 8 \\
 \hline
 12y + 33z &= -33 \\
 25z &= -25 \\
 z &= -1 \\
 4y - 11 &= -11 & x = 3 - 1 - 2(0) \\
 4y &= 0 & x = 2 \\
 y &= 0
 \end{aligned}$$

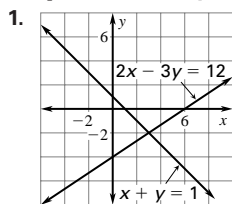
(2, 0, -1)

21.
$$\begin{aligned}
 2x - 4y + 3z &= 1 \\
 -2x + 5y - 2z &= 2 \\
 \hline
 y + z &= 3 \\
 6x + 2y + 10z &= 19 \\
 -6x + 15y - 6z &= 6 \\
 \hline
 17y + 4z &= 25 \\
 -17y - 17z &= -51 \\
 \hline
 17y + 4z &= 25 \\
 -13z &= -26 \\
 z &= 2 \\
 y + 2 &= 3 \\
 y &= 1 \\
 2x = 1 + 4 - 6 \\
 2x &= -1 \\
 x &= -\frac{1}{2} \\
 \left(-\frac{1}{2}, 1, 2\right)
 \end{aligned}$$

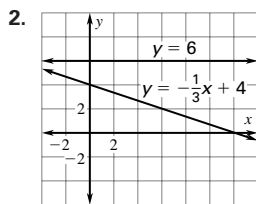
22.
$$\begin{aligned}
 x + y + z &= 3 \\
 x + y - z &= 3 \\
 \hline
 2x + 2y &= 6 \\
 x + y - z &= 3 \\
 2x + 2y + z &= 6 \\
 \hline
 3x + 3y &= 9 \\
 2y &= 6 - 2x \\
 y &= 3 - x \\
 x + 3 - x + z &= 3 \\
 z &= 0 \\
 (x, 3 - x, 0)
 \end{aligned}$$

Chapter 3 continued

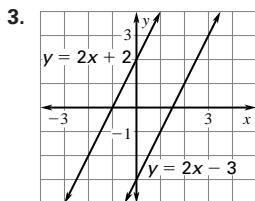
Chapter 3 Test (p. 189)



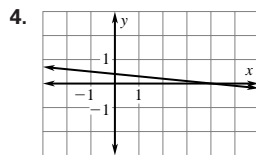
one solution; $(3, -2)$



one solution; $(-6, 6)$



no solution



infinitely many solutions

5. $3(-3 - 2y) + 6y = -9$

$$-9 - 6y + 6y = -9$$

infinitely many solutions

6. $2x = 6$

$$x = 3$$

$$y = 11 - 3$$

$$y = 8$$

$$(3, 8)$$

7. $3x - 10(-17 - 7x) = 24$

$$3x + 170 + 70x = 24$$

$$73x = -146$$

$$x = -2$$

$$y = (-17 + 14)$$

$$y = -3$$

$$(-2, -3)$$

8. $8x + 3(-3 + 5x) = -2$

$$8x - 9 + 15x = -2$$

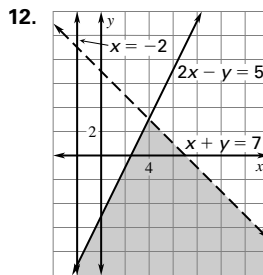
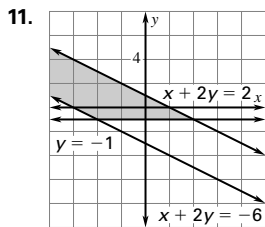
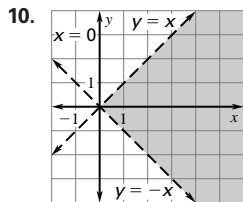
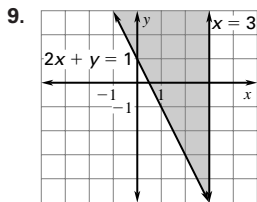
$$23x = 7$$

$$x = \frac{7}{23}$$

$$y = -3 + \frac{35}{23}$$

$$y = -\frac{34}{23}$$

$$\left(\frac{7}{23}, -\frac{34}{23}\right)$$



13. $(0, 0): C = 7(0) + 4(0) = 0$ min

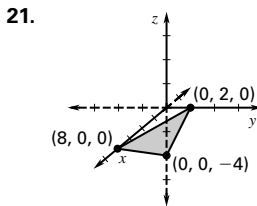
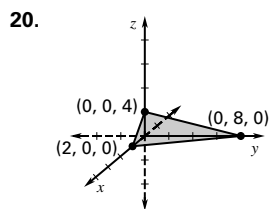
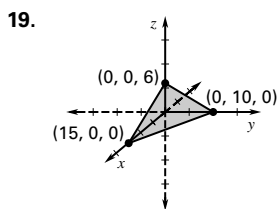
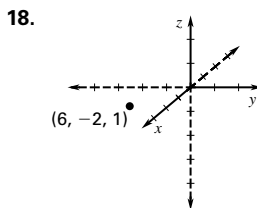
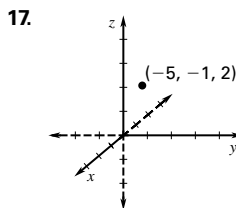
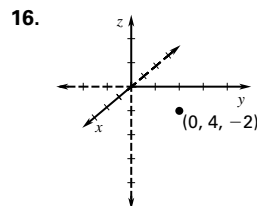
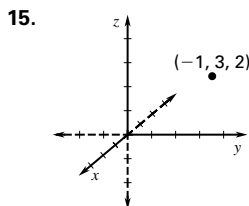
$$(0, 8): C = 7(0) + 4(8) = 32$$

$$(6, 0): C = 7(6) + 4(0) = 42$$
 max

14. $(4, 6): C = 3(4) + 4(6) = 36$ max

$$(2, 7): C = 3(2) + 4(7) = 34$$

No min—feasible region is unbounded.



22. $z = 9 - 2x + 5y$
 $f(x, y) = 9 - 2x + 5y$
 $f(10, 3) = 9 - 20 + 15$
 $f(10, 3) = 4$

Chapter 3 continued

$$\begin{array}{r}
 23. \quad -x - 2y + 6z = -23 \\
 \quad \quad x + 3y + z = 4 \\
 \quad \quad \quad y + 7z = -19 \\
 -2x - 6y - 2z = -8 \\
 \quad \quad 2x + 5y - 4z = 24 \\
 \quad \quad \quad -y - 6z = 16 \\
 \quad \quad \quad \quad y + 7z = -19 \\
 \quad \quad \quad \quad -y - 6z = 16 \\
 \quad \quad \quad \quad \quad z = -3 \\
 -y - 6(-3) = 16 \\
 \quad \quad \quad y = 2 \\
 x + 6 - 3 = 4 \\
 \quad \quad \quad x = 1 \\
 \\
 (1, 2, -3)
 \end{array}$$

$$\begin{array}{r}
 25. \quad -4(1 - 3y + z) - 2y + 5z = 16 \\
 \quad -4 + 12y - 4z - 2y + 5z = 16 \\
 \quad \quad \quad 10y + z = 20 \\
 7(1 - 3y + z) + 10y + 6z = -15 \\
 7 - 21y + 7z + 10y + 6z = -15 \\
 \quad \quad -11y + 13z = -22 \\
 -11y + 13(20 - 10y) = -22 \\
 -11y + 260 - 130y = -22 \\
 \quad -141y = -282 \\
 \quad \quad \quad y = 2 \\
 \\
 z = 20 - 20 \\
 z = 0 \\
 x = 1 - 6 + 0 \\
 x = -5 \\
 \\
 (-5, 2, 0)
 \end{array}$$

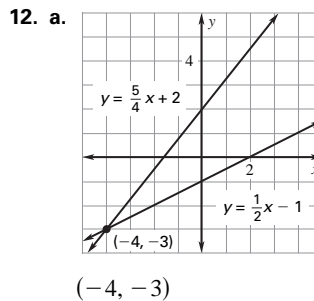
$$\begin{array}{r}
 26. \quad 10d + 25p = 150 \\
 \quad \quad 0.5d + 0.75p = 5.5 \\
 \quad \quad \text{Buy 4 packs of plain} \\
 \quad \quad \text{beads and 5 packs of} \\
 \quad \quad \text{decorative beads.} \\
 \\
 27. \quad C = 250c + 400u \\
 \quad \quad 40c + 60u \geq 4800 \\
 \quad \quad \quad c + u \geq 100 \\
 \quad \quad \quad c \geq 0 \\
 \quad \quad \quad u \geq 0 \\
 \quad \quad \text{Order 120 chest freezers.} \\
 \quad \quad \text{This will give a profit of} \\
 \quad \quad \text{\$4800 at a cost of \$30,000.}
 \end{array}$$

Chapter 3 Standardized Test (p. 190)

1. C
 $-2 - 10 = -12$
 $1 + 8 = 9$
 2. E 3. A 4. C 5. C 6. D 7. E

$$\begin{array}{r}
 8. \quad A \\
 2(7) + 5(1) + 3(-3) = 10 \\
 3(7) - (1) + 4(-3) = 8 \\
 5(7) - 2(1) + 7(-3) = 12
 \end{array}$$

9. B 10. B 11. B



$$\begin{array}{r}
 \text{b. } x = 2 + 2y \\
 5(2 + 2y) - 4y = -8 \\
 10 + 10y - 4y = -8 \\
 6y = -18 \\
 y = -3 \\
 \\
 x = 2 - 6 \\
 x = -4 \\
 \\
 (-4, -3)
 \end{array}$$

$$\begin{array}{r}
 \text{c. } -5x + 10y = -10 \\
 \quad \quad 5x - 4y = -8 \\
 \quad \quad \quad 6y = -18 \\
 \quad \quad \quad \quad y = -3 \\
 5x - 4(-3) = -8 \\
 \quad \quad 5x = -20 \\
 \quad \quad \quad x = -4
 \end{array}$$

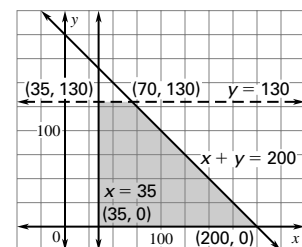
d. The linear form took the least time.

$$(-4, -3)$$

13. Sample answers: a. $x + 4y = 5$ b. $4x - 6y = 5$
 c. $4x - 6y = -24$

d. In part a, I used a different slope and a point on the given line. In part b, I used the same slope but not the same intercept. Therefore, the lines are parallel. In part c, I used a multiple of the same line. That way the lines coincide.

14. a. $0 \leq y < 130$
 $x \geq 35$
 $x + y \leq 200$

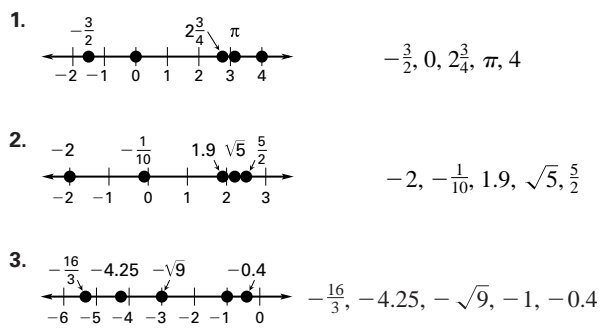


c. not within recommended levels

- d. Sample answer: LDL: 135 mg/dL
 HDL: 40 mg/dL
 Total: 175 mg/dL
 $y \geq 130$
 $x \geq 35$
 $x + y \leq 200$
- e. Sample answer: One solution is LDL = 135 mg/dL, HDL = 50. Then total/HDL = $3.7 < 4$.

Chapter 3 continued

Chapter 3 Cumulative Practice (pp. 192–193)



4. inverse property of multiplication
 5. distributive property
 6. associative property of multiplication 7. -22 8. 40

9. 16 10. 4.6 11. $16a + 11$ 12. $11x - 3y$

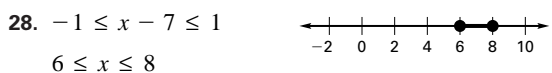
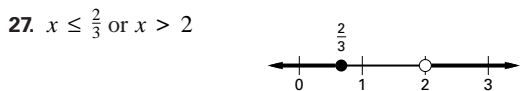
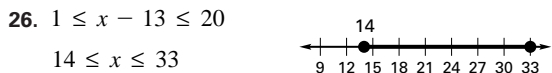
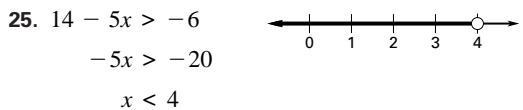
13. $n^2 + 2n$ 14. $\frac{5}{8}x = 30$ 15. $-72 = 9x$
 $x = 48$ $-8 = x$

16. $8x = -16$ 17. $-24 = 6x$ 18. $x = -9$ or $x = 9$
 $x = -2$ $-4 = x$

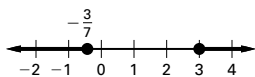
19. $4x + 1 = 39$ or $4x + 1 = -39$
 $4x = 38$ $4x = -40$
 $x = \frac{19}{2}$ $x = -10$

20. $7 - 2x = 15$ or $7 - 2x = -15$
 $-2x = 8$ $-2x = -22$
 $x = -4$ $x = 11$

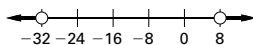
21. $x = 10$ 22. $r = \frac{d}{t}$ 23. $h = \frac{V}{\pi r^2}$ 24. $h = \frac{2A}{b_1 + b_2}$



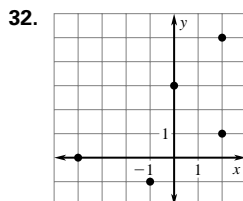
29. $-12 \geq 7x - 9$ or $12 \leq 7x - 9$
 $-3 \geq 7x$ $21 \leq 7x$
 $-\frac{3}{7} \geq x$ $3 \leq x$



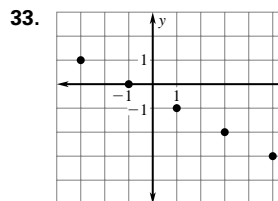
30. $x + 12 < -20$ or $x + 12 > 20$
 $x < -32$ $x > 8$



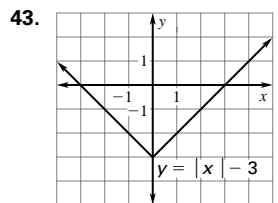
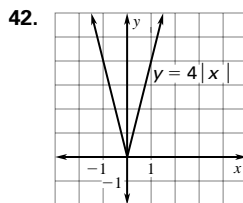
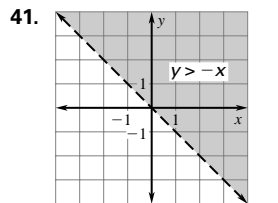
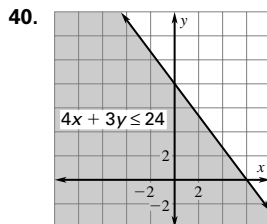
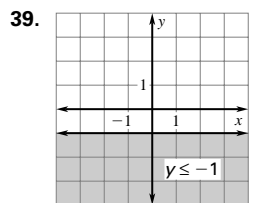
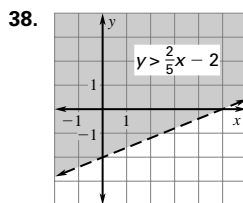
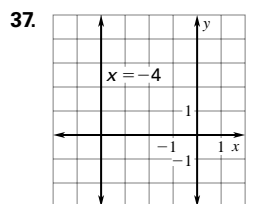
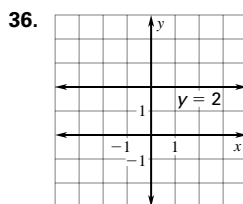
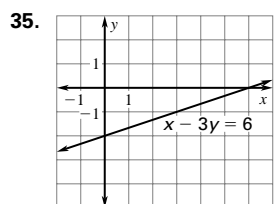
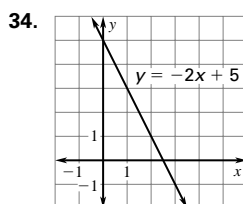
31. $-10 < -5x < 10$ $2 > x > -2$



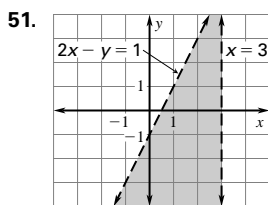
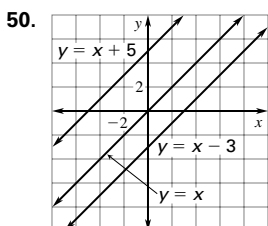
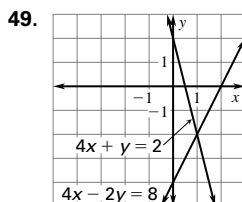
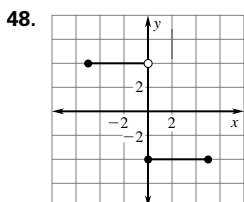
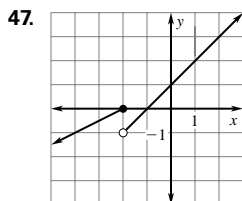
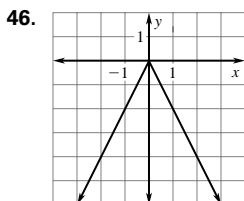
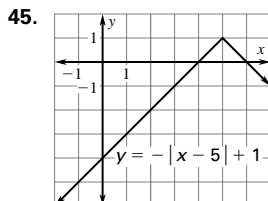
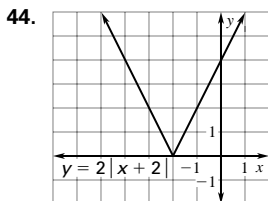
no



yes

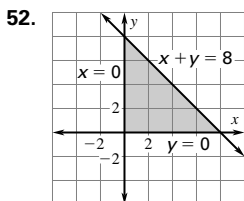


Chapter 3 continued



no solution

all points in shaded region



53. $m_1 = \frac{7 - 6}{0 - 3} = -\frac{1}{3}$
 $m_2 = \frac{-9 + 3}{-2 + 0} = \frac{-6}{-2} = 3$
 perpendicular

all points in shaded region

54. $m_1 = \frac{-3 - 1}{-6 + 0} = \frac{-4}{-6} = \frac{2}{3}$

55. $y = -3x + 7$

$m_2 = \frac{-5 + 2}{0 - 4} = \frac{-3}{-4} = \frac{3}{4}$

neither

56. $x = 2$ 57. $y = \frac{1}{2}x + 1$

58. $f(-3) = 5(-3) - 17 = -32$

59. $f(2) = 4 - 4 + 11 = 11$

60. $f(-2) = -2 - 4 = -6$

61. $f(1) = -|12 - 8| = -4$

62. $f(3, -2) = 24 + 10 = 34$

63. $f(-1, 0) = 2(1 + 0) = 2$

64. $3x - 15y = -24$
 $-3x + 15y = 24$
 $0 = 0$
 infinitely many solutions

65. $x - 3(7 - 2x) = 7$
 $x - 21 + 6x = 7$
 $7x = 28$
 $x = 4$

$y = 7 - (2 \cdot 4) = -1$

(4, -1)

66. $3y + z = 10$
 $-3x + 6y + 6z = 9$
 $\frac{3x - y - z = 1}{5y + 5z = 10}$

67. $2x + y + z = 4$
 $-2x + y - z = -6$
 $2y = -2$
 $y = -1$

$5y + 5(10 - 3y) = 10$
 $5y + 50 - 15y = 10$
 $-10y = -40$
 $y = 4$

$-2x + 2y + 4z = 18$
 $\frac{2x - y + z = 6}{y + 5z = 24}$
 $-1 + 5z = 24$
 $5z = 25$
 $z = 5$

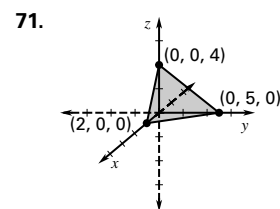
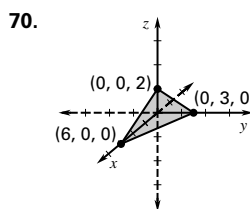
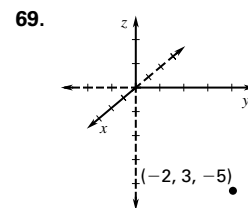
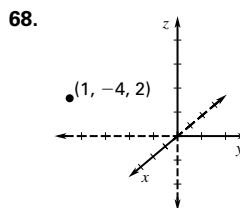
$z = 10 - 12 = -2$

$x + 4 + 2 = 7$
 $x = 1$

$2x - 1 + 5 = 4$
 $2x = 0$
 $x = 0$

(1, 4, -2)

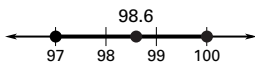
(0, -1, 5)



72. $R \times 0.7 = 38.50$
 $R = \$55$
 $55 - 38.50 = \$16.50$

Chapter 3 *continued*

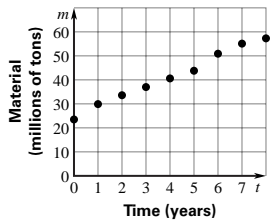
73. $97^\circ \leq T \leq 100^\circ$



74. $d = 60t; 60$

speed in mph

75.

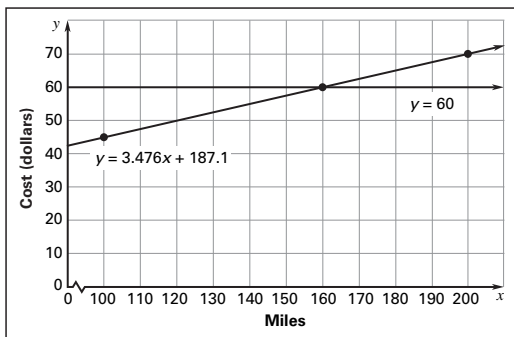


Sample answer:

$$y = 4.2x + 24.5$$

$$4.2(14) + 24.5 = 83.3 \text{ million tons}$$

76.



160 mi

77. $C = 1.39v + 1.79b$

$$v \geq 0, b \geq 0$$

$$v \leq 2b$$

$$v + b = 150$$

$$(50, 100): C = 1.39(100) + 1.79(50) = \$228.50$$

50 pounds of beef and 100 pounds of vegetables will minimize the cost. Total cost: \$228.50

