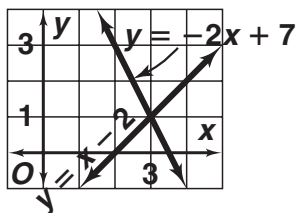
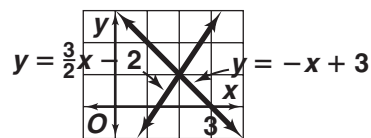


Answers for Lesson 3-1 Exercises

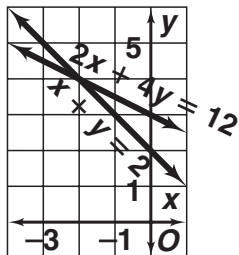
1. (3, 1)



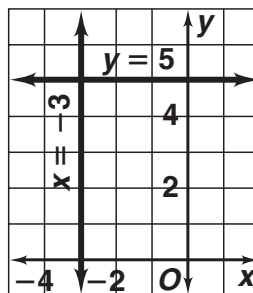
2. (2, 1)



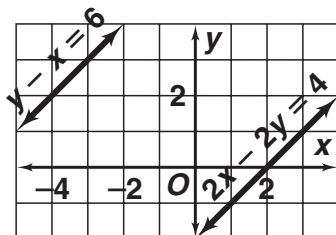
3. (-2, 4)



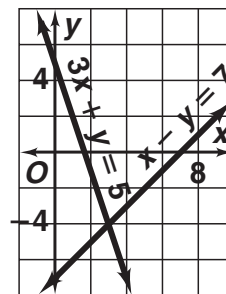
4. (-3, 5)



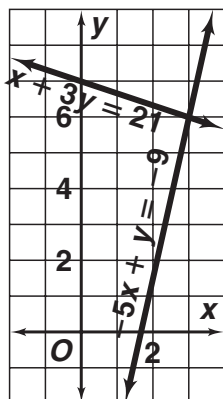
5. no solution



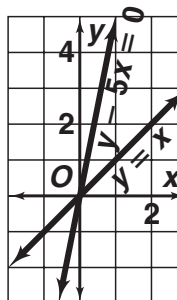
6. (3, -4)



7. (3, 6)

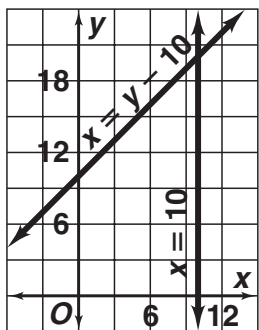


8. (0, 0)



Answers for Lesson 3-1 Exercises (cont.)

9. (10, 20)



10. Use 0 for 1980.

$$\begin{cases} y = 0.232x + 1.328 \\ y = 0.145x + 3.673 \end{cases}$$

about 2007

11. Use 0 for 1970.

$$\begin{cases} y = 0.22x + 67.5 \\ y = 0.15x + 75.507 \end{cases}$$

about 2085

12. a.
$$\begin{cases} y = 3000x + 5200 \\ y = -900x + 35,700 \end{cases}$$

b. If Feb = 1, the revenue will equal expenses in the 7.82 month, or late August.

13. dependent

14. inconsistent

15. inconsistent

16. independent

17. inconsistent

18. inconsistent

19. dependent

20. independent

21. dependent

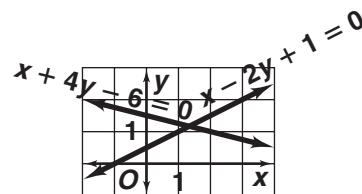
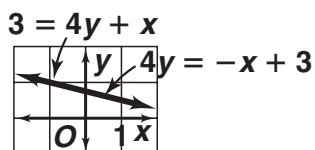
22. inconsistent

23. independent

24. inconsistent

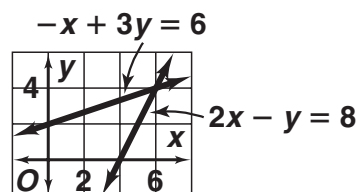
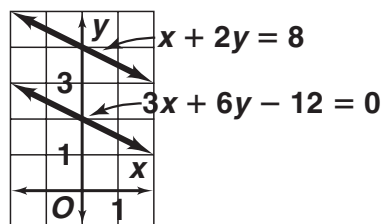
25. infinite solutions

26. $\left(\frac{4}{3}, \frac{7}{6}\right) \approx (1.5, 1)$



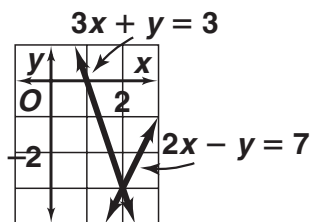
27. no solution

28. (6, 4)

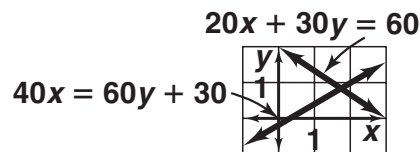


Answers for Lesson 3-1 Exercises (cont.)

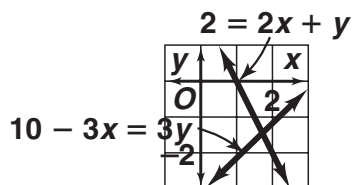
29. $(2, -3)$



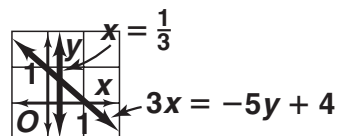
30. $(1.875, 0.75) \approx (2, 1)$



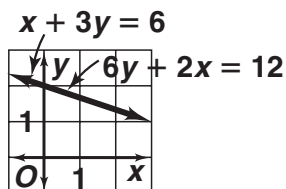
31. $(\frac{16}{9}, -\frac{14}{9}) \approx (1.5, -1.5)$



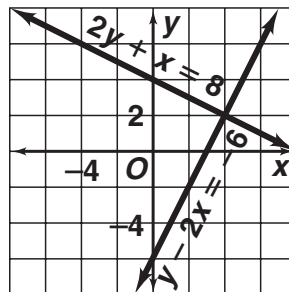
32. $(\frac{1}{3}, \frac{3}{5})$



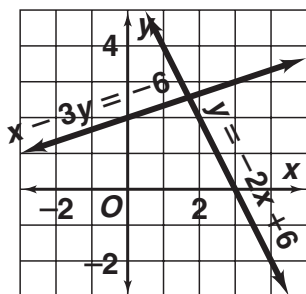
33. infinite solutions



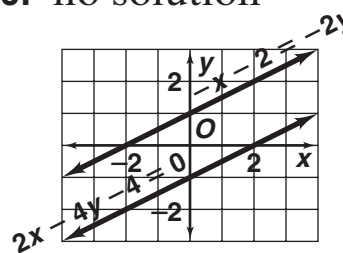
34. $(4, 2)$



35. $(\frac{12}{7}, \frac{18}{7}) \approx (1.7, 2.6)$

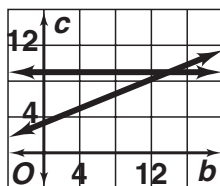


36. no solution



Answers for Lesson 3-1 Exercises (cont.)

37. a.
$$\begin{cases} c = 3 + 0.40b \\ c = 9.00 \end{cases}$$



- b. (15, 9); the point represents where the cost of using the bank or online service would be the same.
 c. The local bank would be cheaper if you only have 12 bills to pay per month.

38. inconsistent 39. dependent 40. independent

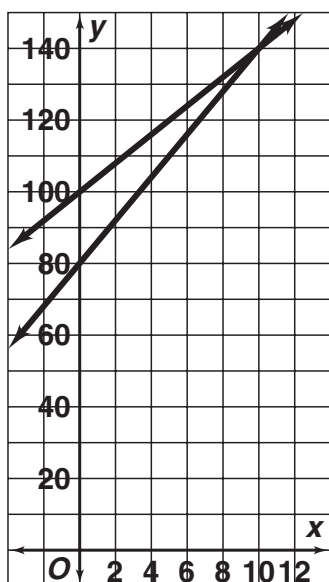
41. inconsistent 42. inconsistent 43. dependent

44. a.
$$\begin{cases} c = 20d + 30 \\ c = 25d \end{cases}$$

- b. The cost would be the same for a 6-day stay.
 c. The Pooch Pad would be cheaper for a 7-day stay.

45. $x = \text{minutes}, y = \text{flyers};$

$$\begin{cases} y = 6x + 80 \\ y = 4x + 100 \end{cases}$$



After 10 minutes the numbers of flyers will be equal.

46. Answers may vary. Sample: $y = x + 3$

47. Answers may vary. Sample: $y = -4x + 8$

Answers for Lesson 3-1 Exercises (cont.)

48. Answers may vary. Sample: $y = 2x + \frac{7}{3}$
49. No; they would be the same line, and the system would be dependent and consistent.
50. An independent system has one solution. The slopes are different, but the y -intercepts could be the same. An inconsistent system has no solution. The slopes are the same, and the y -intercepts are different. A dependent system has an infinite number of solutions. The slopes and y -intercepts are the same.
51. Answers may vary. Sample: $3x + 4y = 12$
52. Answers may vary. Sample: $y = -\frac{5x}{2} + 7$
53. Answers may vary. Sample:
$$\begin{cases} -10x + 2y = 4 \\ 5x - y = -2 \end{cases}$$
54. They are the same equation written in different forms.
55. a. p : independent, n : dependent
b. $n = -1600p + 14,800$
c. $n = -6000 + 32,000$
d. About $(3.91, 8545)$; profits are maximized if about 8545 widgets are sold for about \$3.91 each.

Answers for Lesson 3-2 Exercises

1. $(0.5, 2.5)$
2. $(c, d) = (-2, 4)$
3. $(20, 4)$
4. $(p, q) = (0.75, 2.5)$
5. $(10, -1)$
6. $(8, -1)$
7. $(a, b) = (0, 3)$
8. $(r, t) = (-6, -9)$
9. $(-2, -5)$
10. $(m, n) = (-3, 4)$
11. $(6, 4)$
12. $(r, s) = (-6, -6)$
13. a. $\begin{cases} d = 0.50m \\ d = 15 \end{cases}$
b. 30 miles
14. 3 vans and 2 sedans, or 4 vans and 1 sedan, or 5 vans and 0 sedans
15. a. $\begin{cases} p = 28 \\ p = 8 + 0.35d \end{cases}$
b. 58
16. 2 mi/h, 6 mi/h
17. $20^\circ, 70^\circ, 90^\circ$
18. $(7, 5)$
19. $(2, 4)$
20. $(a, b) = (-1, 3)$
21. $(2, -2)$
22. $(w, y) = (-2, -4)$
23. $(u, v) = (4, 1)$
24. $(2, 3)$
25. $(6, 0)$
26. $(8, 6)$
27. $(0, 3)$
28. $(1, 1)$
29. $(r, s) = (2, -1)$
30. $\{(x, y) \mid -2x + 3y = 13\}$
31. $\{(a, d) \mid -3a + d = -1\}$
32. $(a, b) = (3, 2)$
33. no solution
34. $(5, 4)$
35. no solution
36. $(\frac{20}{17}, \frac{19}{17})$
37. $(-3, 2)$

Answers for Lesson 3-2 Exercises (cont.)

38. $(r, s) = (4, 1)$

39. $(1, 3)$

40. no solution

41. $(m, n) = (1, -4)$

42. 2875 votes

43. In determining whether to use substitution or elimination to solve an equation, look at the equations to determine if one is solved or can be easily solved for a particular variable. If that is the case, substitution can easily be used. Otherwise, elimination might be easier.

44. $(-6, 30)$

45. $(m, n) = (4, -3)$

46. $(-1, -\frac{1}{2})$

47. $(t, v) = (50, 750)$

48. $(0.5, 0.75)$

49. $(\frac{3}{11}, -\frac{2}{11})$

50. $(300, 150)$

51. $(a, b) = (-235, -5.8)$

52. $(0.5, 0.25)$

53. A

54. Elimination; substitution would be difficult since no coefficient is 1.

55. Substitution; the first equation is solved for y .

56. Substitution; the second equation is easily solved for n .

57. Substitution; the second equation is solved for y .

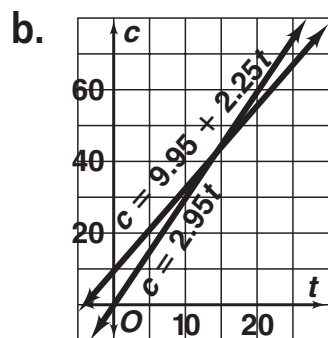
58. Elimination; $2x$ would be eliminated from the system if the equations were subtracted.

59. Elimination; substitution would be difficult since no coefficient is 1.

60. Answers may vary. Sample: $\begin{cases} -3x + 4y = 12 \\ 5x - 3y = 13 \end{cases} (8, 9)$

Answers for Lesson 3-2 Exercises (cont.)

61. a. $c = 9.95 + 2.25t$, $c = 2.95t$



c. about 14.2 h; it is where the graphs intersect.

d. Answers may vary. Sample: Internet Action, because it would cost \$4.05 less per month

62. 46 performances

63. yes; for -40 degrees

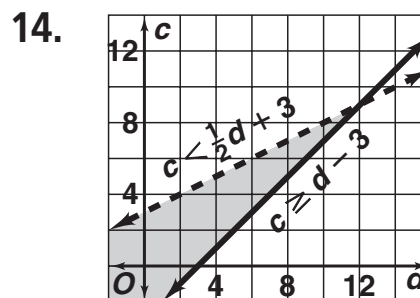
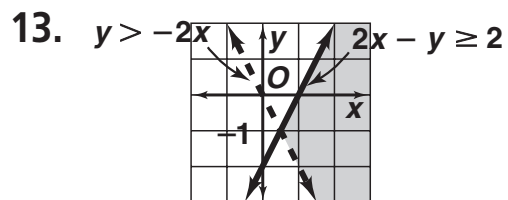
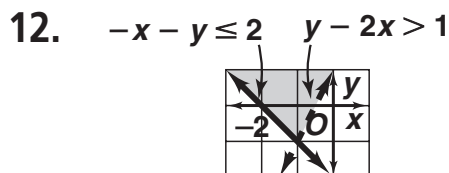
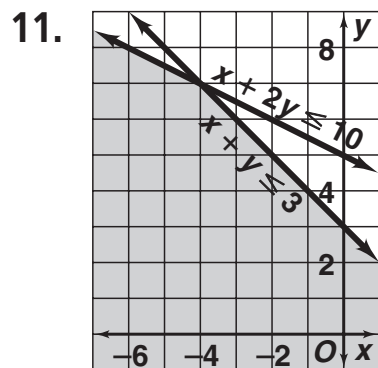
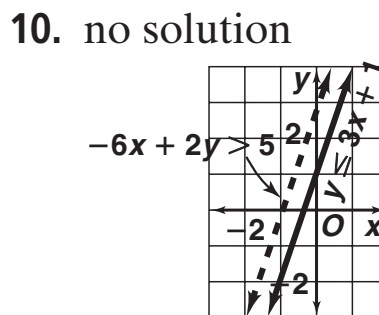
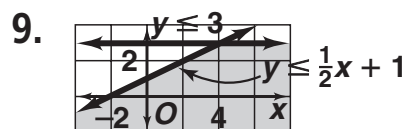
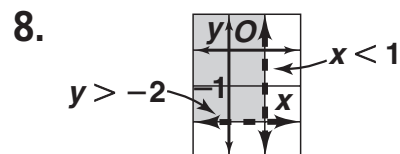
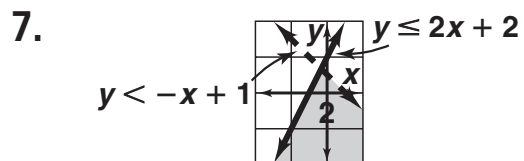
64. -2

65. 0

66. 8

Answers for Lesson 3-3 Exercises

1. (0, 4), (0, 5), (0, 6), (0, 7), (0, 8)
2. (3, 0), (4, 1), (5, 2), (6, 3), (7, 4)
3. (0, 7), (0, 6), (0, 5), (0, 4), (0, 3), (0, 2), (0, 1), (0, 0), (1, 6), (1, 5), (1, 4), (1, 3), (1, 2), (1, 1), (1, 0), (2, 5), (2, 4), (2, 3), (2, 2), (2, 1), (2, 0), (3, 4), (3, 3)
4. yes
5. no
6. yes

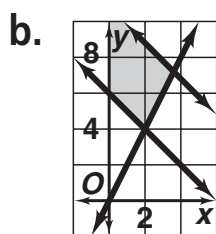


Answers for Lesson 3-3 Exercises (cont.)

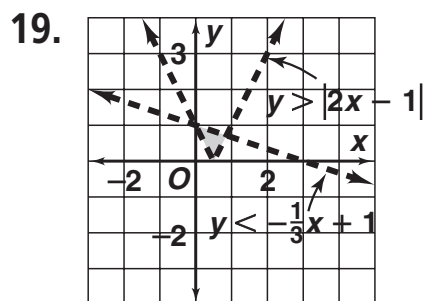
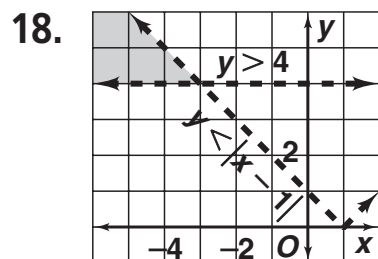
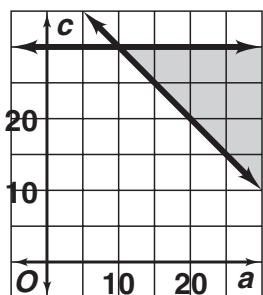
15. $2x + y < 1$ $-y + 3x < 1$



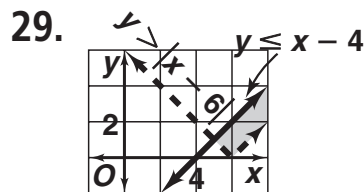
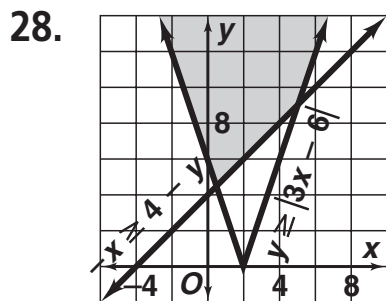
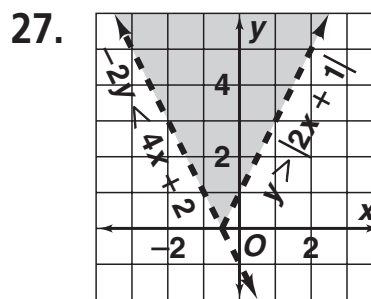
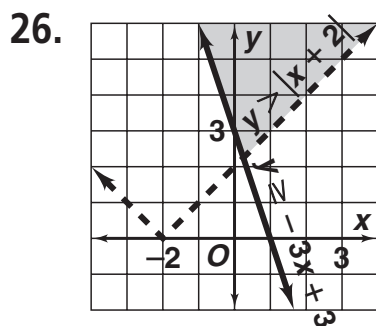
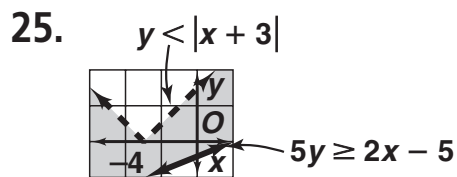
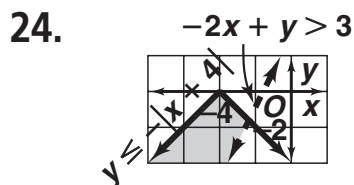
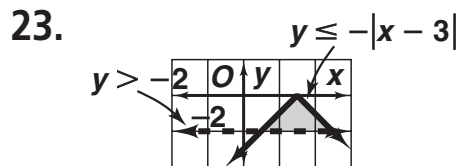
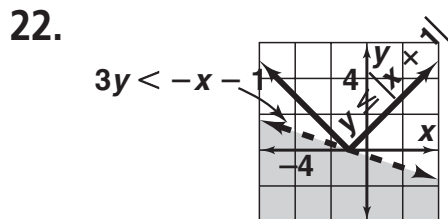
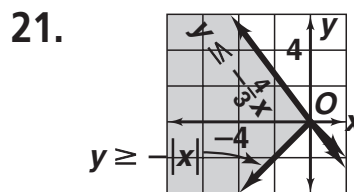
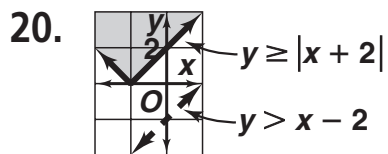
16. a.
$$\begin{cases} x + y \geq 6 \\ x + y \leq 11 \\ y \geq 2x \\ y \geq 0 \\ x \geq 0 \end{cases}$$



17.
$$\begin{cases} a + c \geq 40 \\ c \leq 30 \end{cases}$$



Answers for Lesson 3-3 Exercises (cont.)



30. A, C

31. A, B

32. A, C

33. A, B

34. A, C

35. B, C

36. A, B, C

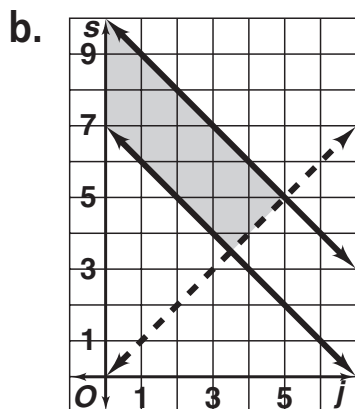
37. A

38. B, C

39. A

Answers for Lesson 3-3 Exercises (cont.)

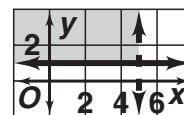
40. a.
$$\begin{cases} j + s \geq 7 \\ j + s \leq 10 \\ s > j \\ j \geq 0 \\ s \geq 0 \end{cases}$$



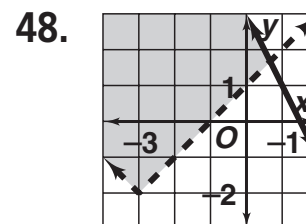
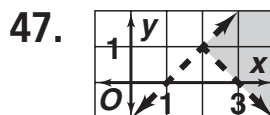
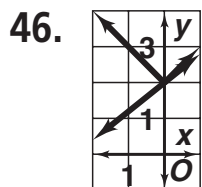
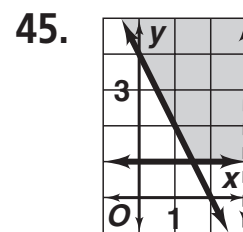
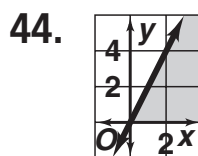
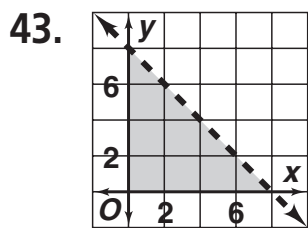
(0, 7) (0, 8) (0, 9) (0, 10) (1, 6) (1, 7)
 (1, 8) (1, 9) (2, 5) (2, 6) (2, 7) (2, 8)
 (3, 4) (3, 5) (3, 6) (3, 7) (4, 5) (4, 6)

c. Only whole numbers of juniors and seniors make sense.

41. Answers may vary. Sample:
$$\begin{cases} x < 5 \\ y \geq 1 \end{cases}$$



42. Answers may vary. Sample: If the isolated variable is greater than the remaining expression, the half-plane above the boundary line is shaded. If the variable is less than the remaining expression, then the half-plane below the line is shaded.



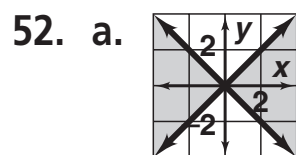
49.
$$\begin{cases} y \geq |x| - 2 \\ y \leq -|x| + 2 \end{cases}$$

Answers for Lesson 3-3 Exercises (cont.)

$$49. \begin{cases} y \geq |x| - 2 \\ y \leq -|x| + 2 \end{cases}$$

$$50. \begin{cases} y \leq 3 \\ y \geq 0 \\ y \leq 3x + 9 \\ y \leq -3x + 9 \end{cases}$$

$$51. \begin{cases} y \leq 4 \\ y \geq 0 \\ y \leq 2x \\ y \geq 2x - 8 \end{cases}$$

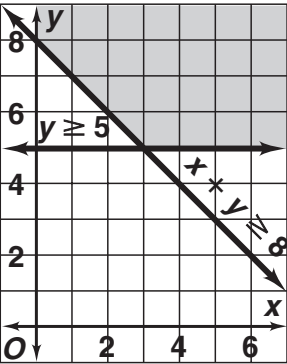


b. Answers may vary. Sample: $|y| \leq \frac{1}{2}|x|$
 $|x| \leq 2$

Answers for Lesson 3-4 Exercises

- When $x = 4$ and $y = 2$, P is maximized at 16.
- When $x = 600$ and $y = 0$, P is maximized at 4200.
- When $x = 6$ and $y = 8$, C is minimized at 36.

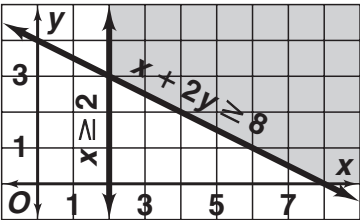
4.  vertices: $(0, 0)$, $(5, 0)$, $(5, 4)$, $(0, 4)$;
maximized at $(5, 4)$

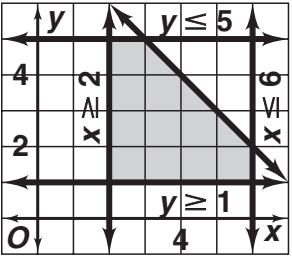
5.  vertices: $(3, 5)$, $(0, 8)$; minimized at $(0, 8)$

6.  vertices: $(0, 0)$, $(5, 0)$, $(2, 6)$, $(0, 8)$;
maximized at $(5, 0)$

7.  vertices: $(1, 5)$, $(8, 5)$, $(8, -2)$;
minimized at $(8, -2)$

Answers for Lesson 3-4 Exercises (cont.)

8.  vertices: (8, 0), (2, 3);
minimized at (8, 0)

9.  vertices: (2, 1), (6, 1), (6, 2), (2, 5), (3, 5);
maximized at (6, 2)

10. a.
$$\begin{cases} 2x + y \leq 30 \\ 2y \leq 16 \\ x \geq 0, y \geq 0 \end{cases}$$

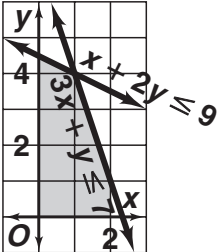
$$P = 500x + 200y$$

- b. 15 experienced teams, 0 training teams; none; 7500 trees
c. 11 experienced teams; 8 training teams; 7100 trees

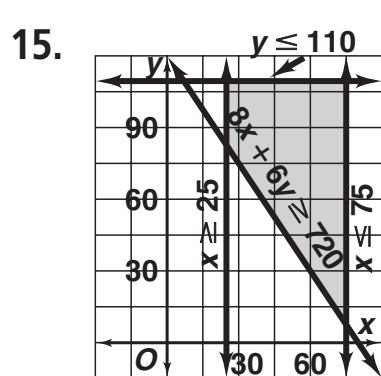
11. 70 spruce; 0 maple

12. Solving a system of linear equations is a necessary skill used to locate the vertex points.

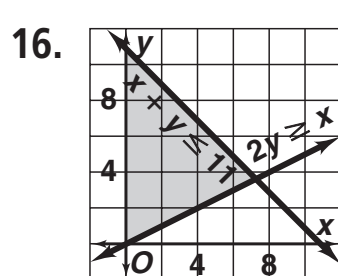
13. A

14.  vertices: (0, 0), (1, 4), (0, 4.5), $(\frac{7}{3}, 0)$;
maximized when $P = 6$ at (1, 4)

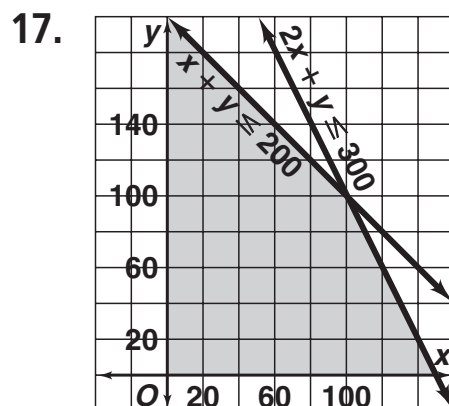
Answers for Lesson 3-4 Exercises (cont.)



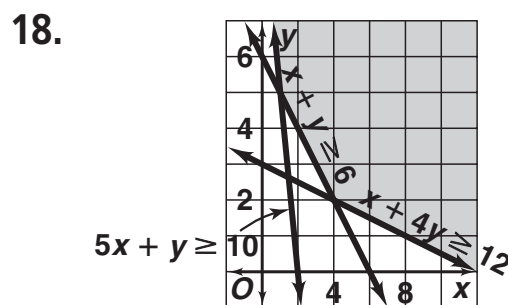
vertices: $(75, 20)$, $(75, 110)$, $(25, 86\frac{2}{3})$,
 $(25, 110)$; minimized when $C = 633\frac{1}{3}$
 at $(25, 86\frac{2}{3})$



vertices: $(0, 0)$, $(7\frac{1}{3}, 3\frac{2}{3})$, $(0, 11)$; maximized
 when $P = 29\frac{1}{3}$ at $(7\frac{1}{3}, 3\frac{2}{3})$



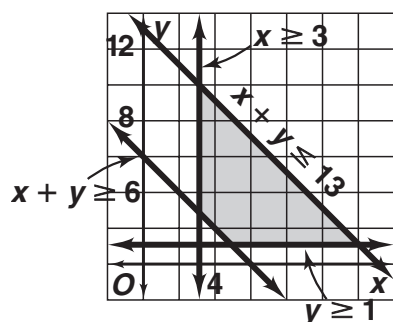
vertices: $(0, 0)$, $(150, 0)$, $(100, 100)$,
 $(0, 200)$; maximized when $P = 400$
 at $(0, 200)$



vertices: $(12, 0)$, $(0, 10)$, $(4, 2)$,
 $(1, 5)$; minimized when $C = 80,000$
 at $(4, 2)$

Answers for Lesson 3-4 Exercises (cont.)

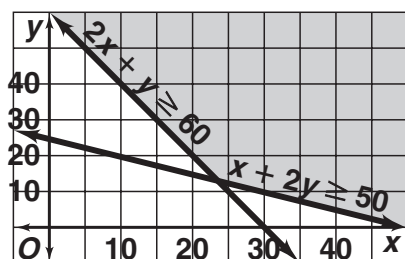
19.



vertices: (3, 3), (3, 10), (5, 1), (12, 1);
maximized when $P = 51$ at (12, 1)

20. 3 trays of corn muffins and 2 trays of bran muffins

21.



vertices: $(0, 60)$, $(23\frac{1}{3}, 13\frac{1}{3})$, $(50, 0)$,
minimized when $x = 23\frac{1}{3}$ and $y = 13\frac{1}{3}$
Round to (23, 14) and (24, 13);
(24, 13) gives you a minimum C
of 261.

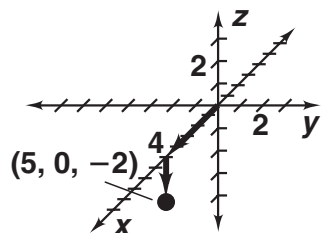
22. Check students' work.

23. Answers may vary. Sample: (4, 6), (6, 5), (9, 3.5), (10, 3)

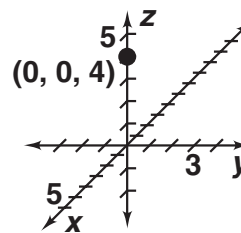
Answers for Lesson 3-5 Exercises

1. 1 unit back, 5 units right
2. 3 units forward, 3 units left, 4 units up
3. 2 units forward, 5 units up
4. 4 units back, 7 units left, 1 unit down

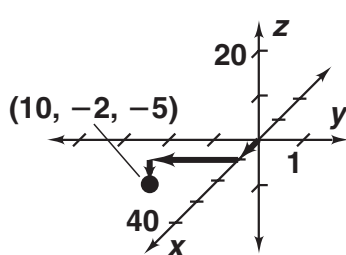
5.



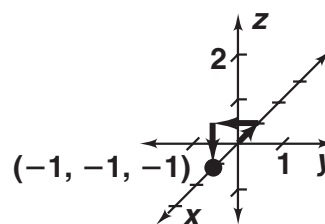
6.



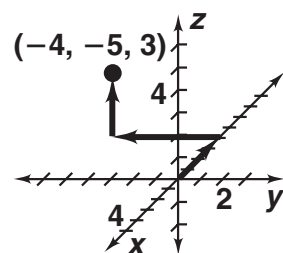
7.



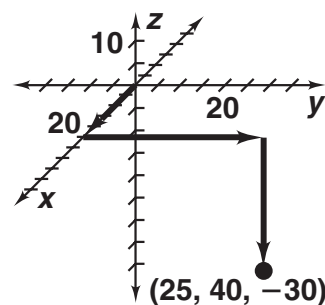
8.



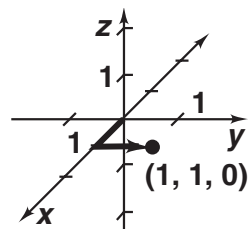
9.



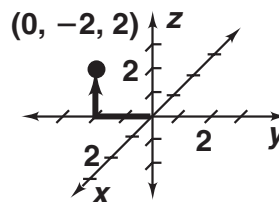
10.



11.



12.



13. $(0, 0, 0)$

14. $(0, 0, 50)$

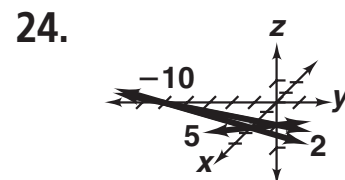
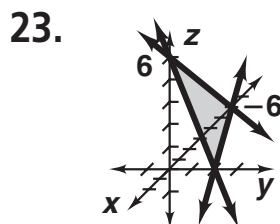
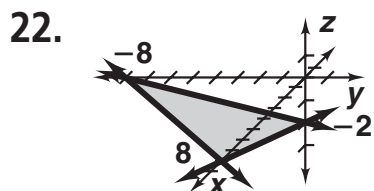
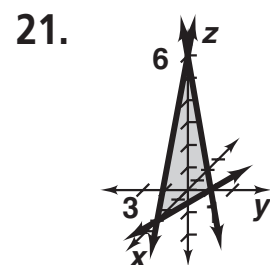
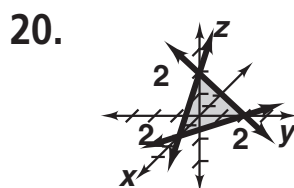
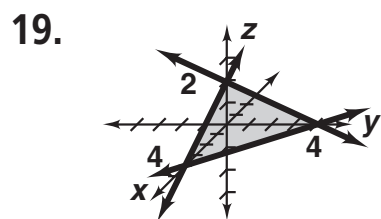
15. $(0, 40, 0)$

16. $(60, 0, 50)$

17. $(0, 80, 100)$

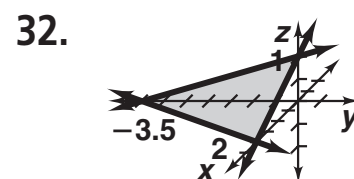
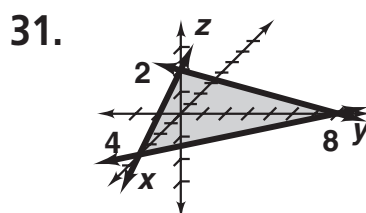
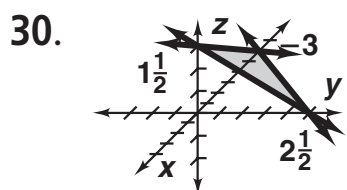
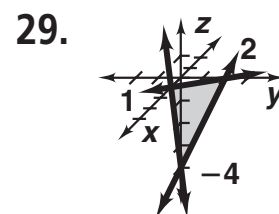
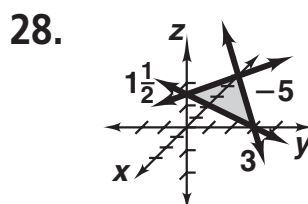
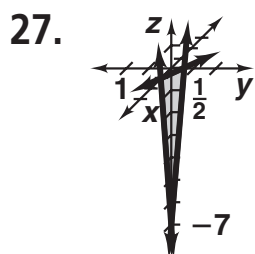
18. $(60, 30, 100)$

Answers for Lesson 3-5 Exercises (cont.)

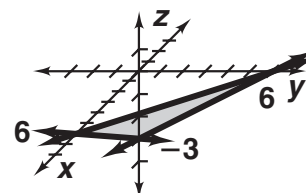


25. Answers may vary. Sample: Balcony represents vertical direction, row is backward or forward, and seat is left or right.

26. C

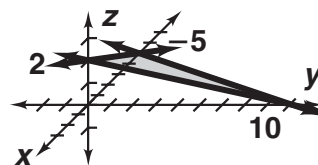


33. xy -trace: $x + y = 6$
 xz -trace: $x - 2z = 6$
 yz -trace: $y - 2z = 6$

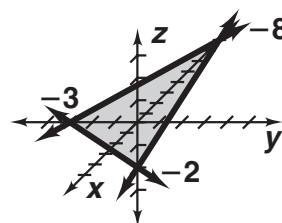


Answers for Lesson 3-5 Exercises (cont.)

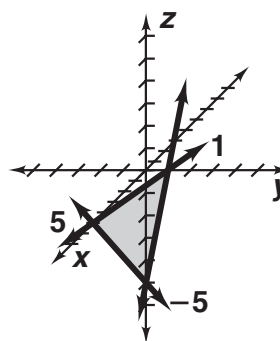
34. xy -trace: $-2x + y = 10$
 xz -trace: $-2x + 5z = 10$
 yz -trace: $y + 5z = 10$



35. xy -trace: $-3x - 8y = 24$
 xz -trace: $-x - 4z = 8$
 yz -trace: $-2y - 3z = 6$



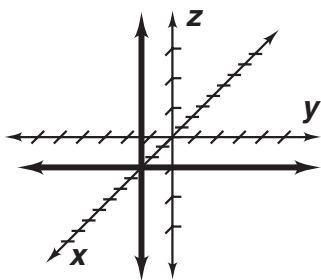
36. xy -trace: $x + 5y = 5$
 xz -trace: $x - z = 5$
 yz -trace: $5y - z = 5$



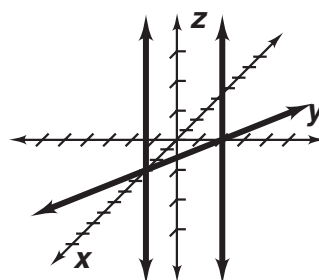
- | | |
|------------------------|--------------------|
| 37. Mt. Kilimanjaro | 38. Mt. Tahat |
| 39. Valdivia Seamount | 40. Cape Verde |
| 41. Qattara Depression | 42. Lake Chad |
| 43. Jabal Toubkal | 44. Victoria Falls |
| 45. Aswan High Dam | 46. Lake Victoria |
47. The student is actually finding the equation of the yz -trace. If the student wants the x -intercept, the student should substitute 0 for both y and z in the equation of the plane.
48. a. $\sqrt{29}$ b. $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$
49. a. No, a plane that is parallel to two of the axes (and is therefore perpendicular to the third axis) has only two traces, which are perpendicular.
- b. No, a plane that intersects two of the axes and is parallel to the third axis has three traces, two of which are parallel.

Answers for Lesson 3-5 Exercises (cont.)

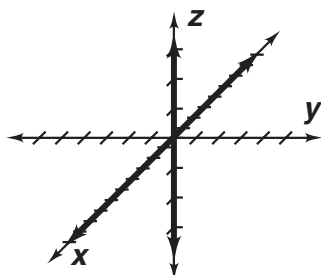
50.



51.



52.



Answers for Lesson 3-6 Exercises

1. $(4, 2, -3)$
2. $(0, 2, -3)$
3. $(2, 1, -5)$
4. $(a, b, c) = (-3, 1, -1)$
5. $(q, r, s) = (\frac{1}{2}, -3, 1)$
6. $(0, 3, -2)$
7. $(1, -4, 3)$
8. $(1, 1, 1)$
9. $(4, -1, 2)$
10. $(8, -4, 2)$
11. $(a, b, c) = (2, 3, -2)$
12. $(r, s, t) = (-2, -1, -3)$
13. $(5, 2, 2)$
14. $(0, 1, 7)$
15. $(4, 1, 6)$
16. $(5, -2, 0)$
17. $(1, -1, 2)$
18. $(1, 3, 2)$
19. \$220,000 was placed in short-term notes.
\$440,000 was placed in government bonds.
\$340,000 was placed in utility bonds.
20. Section A has 24,500 seats.
Section B has 14,400 seats.
Section C has 10,100 seats.
21. 50 nickels, 10 dimes, and 15 quarters
22. infinitely many solutions
23. one solution
24. no solution
25. $(8, 1, 3)$
26. $(3, 2, -3)$
27. $(\frac{1}{2}, 2, -3)$
28. $(A, U, I) = (-2, -1, 12)$
29. no solution
30. $(\ell, w, h) = (21.6, 7.2, 14.4)$
31. $(6, 1.5, 3.2)$
32. $(-\frac{122}{11}, \frac{72}{11}, \frac{71}{11})$
33. $(-\frac{10}{13}, -\frac{2}{13}, \frac{4}{13})$
34. $(2, 4, 6)$
35. $(-1, 2, 0)$
36. $(4, 6, -4)$
37. $(2, \frac{10}{3}, \frac{5}{3})$
38. $(0, 2, -3)$
39. 75 apples; 25 pears
40. 72 pounds

Answers for Lesson 3-6 Exercises (cont.)

41. Answers may vary. Sample: When one of the equations can easily be solved for one variable, it is easier to use substitution.
42. Answers may vary. Sample: The student is thinking that 0 means that there is no solution. The point $(0, 0, 0)$ is the solution.
43. $x + 2y = 180$
 $y + z = 180$
 $5z = 540$
 $x = 36, y = 72, z = 108$
44. Answers may vary. Sample: Solution is $(1, 2, 3)$
 $x + y + z = 6$
 $2x - y + 2z = 6$
 $3x + 3y + z = 12$
45. Let E , F , and V represent the numbers of edges, faces, and vertices, respectively. From the statement, “Every face has five edges, and the number of edges is 5 times the number of faces: $E = 5F$.” But since each edge is part of two faces, this counts each edge twice. So $E = \frac{5}{2}F$. Since every face has five vertices and every vertex is shared by three faces, $3V = 5F$ or $V = \frac{5}{3}F$. Euler’s formula: $V + F = E + 2$. Solving this system of three equations yields $E = 30$, $F = 12$, and $V = 20$.