Algebra 2
Lesson 12-1 - Practice and Problem-Solving Exercises Answers

7. $\begin{bmatrix} 6 & 5 & 4 \\ 2 & -1 & 7 \end{bmatrix}$

8. $\begin{bmatrix} 0 & -2 & 0 \\ -2 & 0 & -2 \end{bmatrix}$

9. $\begin{bmatrix} 3.9 & -2.3 \\ -0.6 & 9.1 \end{bmatrix}$

10. $\begin{bmatrix} -6.8 & 1.3 \\ -2.1 & -1 \end{bmatrix}$

11. $\begin{bmatrix} 4 & -8 \\ -1 & -1 \\ 11 & 1 \end{bmatrix}$

12. $\begin{bmatrix} -9 & -2 & 12 \\ -15 & 11 & -7 \end{bmatrix}$

13. $\begin{bmatrix} 6 & 2 \\ -1 & 3 \end{bmatrix}$

14. $\begin{bmatrix} -4 & -1 \\ -1 & -2 \end{bmatrix}$

15. $\begin{bmatrix} 2 & -3 & 4 \\ 5 & 6 & -7 \end{bmatrix}$

16. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

17. $x = -2, y = 3, z = 1$

18. $x = 2$
$t = \frac{1}{10}$

19. $\begin{bmatrix} 0 & 5 \\ 8 & -6 \\ 0 & 5 \end{bmatrix}$

20. B and D cannot be added because they do not have the same dimensions.

21. $\begin{bmatrix} 6 & 3 \\ -3 & 3 \end{bmatrix}$

22. $\begin{bmatrix} -6 & -3 \\ -4 & -2 \\ -2 & 5 \end{bmatrix}$

23. $\begin{bmatrix} -4 & 1 \\ -3 & -1 \end{bmatrix}$

24. You know that Plant 1 has two shifts per day and Plant 2 has 3 shifts per day. To find the total daily production for Plant 1, multiply the number of beach balls by 2. To find the total daily production for Plant 2, multiply the number of beach balls by 3.

Let A = Plant 1 daily production
Let B = Plant 2 daily production

$$A = \begin{bmatrix} 2(500) & 2(700) \\ 2(1300) & 2(1900) \end{bmatrix}$$

$$B = \begin{bmatrix} 3(400) & 3(1200) \\ 3(600) & 3(1600) \end{bmatrix}$$

Use the matrix equation $X = A - B$ to find the difference between daily production totals at the two plants.

$$X = \begin{bmatrix} 2(500) & 2(700) \\ 2(1300) & 2(1900) \end{bmatrix} - \begin{bmatrix} 3(400) & 3(1200) \\ 3(600) & 3(1600) \end{bmatrix}$$

$$= \begin{bmatrix} 1000 & 1400 \\ 2600 & 3800 \end{bmatrix} - \begin{bmatrix} 1200 & 3600 \\ 1800 & 4800 \end{bmatrix}$$

$$= \begin{bmatrix} 1000-1200 & 1400-3600 \\ 2600-1800 & 3800-4800 \end{bmatrix}$$

$$= \begin{bmatrix} -200 & -2200 \\ 800 & -1000 \end{bmatrix}$$, where the top row represents 1-color balls and the bottom represents 3-color balls.

25a. For Anita Allen:

$\begin{bmatrix} 952 \\ 720 \\ 1108 \\ 1172 \\ 1044 \end{bmatrix}$

For Mary Beth Iagorashvili:

$\begin{bmatrix} 760 \\ 832 \\ 1252 \\ 1144 \\ 1064 \end{bmatrix}$

25b. Allen: 4996; Iagorashvili: 5052

26a. $\begin{bmatrix} 124.6 \\ 113.3 \\ 71.6 \\ 87.2 \end{bmatrix}$

26b. $\begin{bmatrix} -6.2 \\ -4.7 \\ 9.4 \\ 3.6 \end{bmatrix}$

26c. Yes; order matters because subtraction is not commutative.

27. Matrix B would have the same dimensions as A. Its elements would be the opposites of the corresponding elements in A.

28. $a = 2, b = \frac{9}{4}, c = -1, d = 0, f = \frac{1}{2}, g = -4$

29. $c = \frac{5}{2}, d = \frac{2}{5}, f = 7, g = 5, h = -1$

30. $\begin{bmatrix} 5 \\ 4 \\ 2 \end{bmatrix}$

31. Consider any two 2×2 matrices, $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $B = \begin{bmatrix} w & x \\ y & z \end{bmatrix}$. By the definition of matrix addition and the Commutative Property of Addition,

$$\begin{aligned} A+B &= \begin{bmatrix} a & b \\ c & d \end{bmatrix} + \begin{bmatrix} w & x \\ y & z \end{bmatrix} \\ &= \begin{bmatrix} a+w & b+x \\ c+y & d+z \end{bmatrix} \\ &= \begin{bmatrix} w+a & x+b \\ y+c & z+d \end{bmatrix} \\ &= B+A \end{aligned}$$

32. Consider any three 2×2 matrices, $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, $B = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$, and $C = \begin{bmatrix} w & x \\ y & z \end{bmatrix}$. By the definition of matrix addition and the Associative Property of Addition,

$$\begin{aligned} A+(B+C) &= \begin{bmatrix} a & b \\ c & d \end{bmatrix} + \left(\begin{bmatrix} e & f \\ g & h \end{bmatrix} + \begin{bmatrix} w & x \\ y & z \end{bmatrix} \right) \\ &= \begin{bmatrix} a & b \\ c & d \end{bmatrix} + \left(\begin{bmatrix} e+w & f+x \\ g+y & h+z \end{bmatrix} \right) \\ &= \begin{bmatrix} a+(e+w) & b+(f+x) \\ c+(g+y) & d+(h+z) \end{bmatrix} \\ &= \begin{bmatrix} (a+e)+w & (b+f)+x \\ (c+g)+y & (d+h)+z \end{bmatrix} \\ &= \begin{bmatrix} (a+e) & (b+f) \\ (c+g) & (d+h) \end{bmatrix} + \begin{bmatrix} w & x \\ y & z \end{bmatrix} \\ &= (A+B)+C \end{aligned}$$

33. B

34. I

35. B

36. 440 pieces of luggage, since 3 standard deviations is $3\cdot 20 = 60$ pieces of luggage, 3 standard deviations above the mean is $380 + 60 = 440$ pieces of luggage.

37. 68%

38. 97.35%

39. 47.5%

40. 2, -6

41. $\frac{2}{3}$, 2

42. $-\frac{1}{2}, -6$

43. 5, 0

44. $\begin{bmatrix} 9 & 15 \\ 6 & 24 \end{bmatrix}$

45. $\begin{bmatrix} -20 \\ 35 \end{bmatrix}$

Algebra 2
Lesson 12-2 - Practice and Problem-Solving Exercises Answers

7. $\begin{bmatrix} 9 & 12 \\ 18 & -6 \\ 3 & 0 \end{bmatrix}$

8. $\begin{bmatrix} -12 & 4 \\ 8 & -16 \\ -4 & 20 \end{bmatrix}$

9. $\begin{bmatrix} -3 & -6 \\ 9 & -3 \end{bmatrix}$

10. $\begin{bmatrix} -5 & -1 \\ 0 & -2 \end{bmatrix}$

11. $\begin{bmatrix} 9 & 2 \\ 2 & 6 \\ 3 & -10 \end{bmatrix}$

12. $\begin{bmatrix} 3 & 14 \\ 22 & -14 \\ 1 & 10 \end{bmatrix}$

13. $\begin{bmatrix} 19 & 11 \\ -12 & 10 \end{bmatrix}$

14. $\begin{bmatrix} 21 & 3 \\ 2 & 16 \\ 7 & -25 \end{bmatrix}$

15. $\begin{bmatrix} 8 & -2.5 \\ -1.5 & -1 \end{bmatrix}$

16. $\begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}$

17. $\begin{bmatrix} -4 & 8 \\ -22 & 2 \end{bmatrix}$

18. $\begin{bmatrix} 0.34 & -0.46 \\ -1.18 & 0.9 \end{bmatrix}$

19. $\begin{bmatrix} 5 & -12 \\ 9 & -6 \end{bmatrix}$

20. $\begin{bmatrix} -3 & 4 \\ -21 & 2 \end{bmatrix}$

21. $\begin{bmatrix} -8 & 0 \\ 0 & -8 \end{bmatrix}$

22. $\begin{bmatrix} 34 \end{bmatrix}$

23. $\begin{bmatrix} 34 & 0 \end{bmatrix}$

24. $\begin{bmatrix} 0 & 34 \end{bmatrix}$

25. $\begin{bmatrix} -15 & 0 \\ 25 & 0 \end{bmatrix}$

26. $\begin{bmatrix} -1 & 0 \\ 1 & 5 \\ 0 & -3 \end{bmatrix}$

27. $\begin{bmatrix} -2 \\ 5 \end{bmatrix}$

28a.

	Lilies	Carnations	Daisies
Arrangement 1	3	0	0
Arrangement 2	3	4	0
Arrangement 3	0	3	4

28b.

	Cost
Lilies	$2.15
Carnations	$0.90
Daisies	$1.30

28c.

	Cost
Arrangement 1	$6.45
Arrangement 2	$10.05
Arrangement 3	$7.90

29. yes

30. yes

31. yes

32. no

33. yes

34. $115

35a. River's Edge: 99 points. West River: 97 points.

35b. West River: 92 points. River's Edge: 90 points. 92 > 90. West River would win.

36. $\begin{bmatrix} 1 & -6 & -5 \\ 6 & 1 & -5 \\ -3 & -12 & 0 \end{bmatrix}$

37. $\begin{bmatrix} 9 & -6 \\ 15 & -3 \\ -6 & -12 \end{bmatrix}$

38. $\begin{bmatrix} 17 & -24 \\ -33 & -7 \\ 69 & -18 \end{bmatrix}$

39. $\begin{bmatrix} 17 & -24 \\ -33 & -7 \\ 69 & -18 \end{bmatrix}$

40. $\begin{bmatrix} -3 & 12 & -1 \\ -2 & 3 & 5 \\ -4 & -3 & -4 \end{bmatrix}$

41. $\begin{bmatrix} 34 & -1 \\ 6 & -13 \\ -7 & 16 \end{bmatrix}$

42. $\begin{bmatrix} 16 & 8 & -15 \\ 15 & -9 & -15 \\ 2 & 11 & -5 \end{bmatrix}$

43. $\begin{bmatrix} -90 & 0 \\ -78 & 42 \\ -30 & -30 \end{bmatrix}$

44. No; AB will be a 2×2 matrix and BA will be a 3×3 matrix, and equal matrices must have the same dimensions.
Answers may vary. Sample:
Let A be the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \end{bmatrix}$ and let B be the matrix $\begin{bmatrix} 1 & 0 \\ 2 & 4 \\ 3 & 1 \end{bmatrix}$. Then $AB = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 2 & 4 \\ 3 & 1 \end{bmatrix}$
$= \begin{bmatrix} 0+2+6 & 0+4+2 \\ 3+0+0 & 0+0+0 \end{bmatrix} = \begin{bmatrix} 8 & 6 \\ 3 & 0 \end{bmatrix}$, and
$BA = \begin{bmatrix} 1 & 0 \\ 2 & 4 \\ 3 & 1 \end{bmatrix}\begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0+0 & 1+0 & 2+0 \\ 0+12 & 2+0 & 4+0 \\ 0+3 & 3+0 & 6+0 \end{bmatrix}$
$= \begin{bmatrix} 0 & 1 & 2 \\ 12 & 2 & 4 \\ 3 & 3 & 6 \end{bmatrix}$, so $AB \neq BA$.

45. yes

46. yes

47. yes

48. yes

49. B

50. F

51. C

52. F

53. Since the center is at the origin, the vertices are $\left(\pm\frac{50}{2}, 0\right)$ and the co-vertices are $\left(0, \pm\frac{40}{2}\right)$. Using $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, $a=\pm25$ and $b=\pm20$, so $\frac{x^2}{625}+\frac{y^2}{400}=1$.

54. $\begin{bmatrix} -33 & -12 \\ -6 & 27 \end{bmatrix}$

55. $\begin{bmatrix} 9 & -6 & 12 \\ 2 & 20 & 12 \end{bmatrix}$

56a. 12

56b. 12

56c. 0

57a. −12

57b. −12

57c. 0

Algebra 2
Lesson 12-3 - Practice and Problem-Solving Exercises Answers

7. yes

8. yes

9. yes

10. yes

11. no

12. −21

13. 0

14. −0.75

15. $-\frac{11}{40}$

16. −17

17. 11

18. −3

19. −6

20. 20

21. −5

22. −14

23. 106

24. 1

25. 6

26. −7314.14

27. 467,500 mi²

28. yes; $\begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$

29. yes; $\begin{bmatrix} -1 & 3 \\ 1 & -2 \end{bmatrix}$

30. yes; $\begin{bmatrix} 2 & -1.5 \\ -1 & 1 \end{bmatrix}$

31. yes; $\begin{bmatrix} 0 & \frac{1}{2} \\ \frac{1}{3} & -\frac{1}{6} \end{bmatrix}$

32. no

33. yes; $\begin{bmatrix} -\frac{1}{8} & -\frac{1}{2} \\ \frac{3}{16} & \frac{1}{4} \end{bmatrix}$

34. yes; $\begin{bmatrix} \frac{2}{27} & \frac{4}{9} \\ \frac{10}{27} & \frac{2}{9} \end{bmatrix}$

35. yes; $\begin{bmatrix} 0 & \frac{1}{3} \\ -\frac{1}{2} & \frac{1}{6} \end{bmatrix}$

36. The student found the inverse of each individual element of the matrix and NOT the inverse of the entire matrix.
So, the inverse of $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$.

37. The coded phone number is 2, 10, 10, 6, 9, 55, 15, 15, 9, 20.

38. 36

39. −120

40. 0

41. 9

42. −30

43. −3

44. 25

45. 1

46. 44 units^2

47. Answers may vary. Sample:
Form a new matrix by switching the element in row 1, column 1 with the element in row 2, column 2. Then replace the other two elements with their opposites. Finally divide each element by the determinant of the original matrix.

48. D

49. 36 units^2

50. yes; $\begin{bmatrix} -3 & 4 \\ 1 & -1 \end{bmatrix}$

51. yes; $\begin{bmatrix} -5 & 7 \\ 3 & -4 \end{bmatrix}$

52. yes; $\begin{bmatrix} 7 & 11 \\ 2 & 3 \end{bmatrix}$

53. yes; $\begin{bmatrix} 0.5 & 0 \\ 0 & 0.5 \end{bmatrix}$

54. yes; $\begin{bmatrix} -4 & -3.5 & 2 \\ -5 & -5 & 3 \\ 2 & 2 & -1 \end{bmatrix}$

55. yes; $\begin{bmatrix} 0.4 & 0.4 & 0.2 \\ -0.6 & -0.6 & 0.2 \\ -0.2 & 0.8 & 0.4 \end{bmatrix}$

56. yes; $\begin{bmatrix} 0 & \frac{1}{7} & \frac{2}{7} \\ \frac{1}{4} & \frac{3}{14} & -\frac{1}{14} \\ \frac{1}{2} & 0 & 0 \end{bmatrix}$

57. No inverse exists because the determinant equals zero.

58a. 0

58b. 0

58c. 0

58d. 0
Answers may vary. Sample:
When the top row and bottom row are identical and the middle row has the same numbers as both rows, then the determinant is zero.

59. 6

60. Answers may vary. Sample:
when $ad - bc = -1$ and $a = -d$

61. $\det M = ad - bc$ and $\det N = eh - fg$.
Next, $MN = \begin{bmatrix} ae + bg & af + bh \\ ce + dg & cf + dh \end{bmatrix}$, and
$\det MN = (ae + bg)(cf + dh) - (af + bh)(ce + dg) =$
$acef + adeh + bcfg + bdgh - acef - adfg - bceh - bdgh =$
$adeh - bceh + bcfg - adfg$. But $\det M \cdot \det N = (ad - bc)(eh - fg) =$
$adeh - bceh - adfg + bcfg$. So, $\det M \cdot \det N = \det MN$.

62. 15

63. $\frac{1}{2}$

64. $\frac{1}{56}$

65. 15

66. 4

67. $\begin{bmatrix} 2 & 5 \\ 1 & 1 \end{bmatrix}$

68. $\begin{bmatrix} -10 & 19 \\ -20 & 7 \end{bmatrix}$

69. 720

70. 362,880

71. $1.08972864 \times 10^{10}$

72. 110,880

73. no solution

74. $(6, 0, -3)$

75. $(3, -3, 9)$

76. $(-2, -1, -3)$

Algebra 2
Lesson 12-4 - Practice and Problem-Solving Exercises Answers

7. $\begin{bmatrix} -15 & -17 \\ 26 & 29 \end{bmatrix}$

8. No solutions, the determinant of $\begin{bmatrix} 0 & -4 \\ 0 & -1 \end{bmatrix}$ is 0.

9. $\begin{bmatrix} \frac{29}{31} \\ -\frac{66}{217} \\ \frac{34}{217} \end{bmatrix}$

10. $\begin{bmatrix} \frac{2487}{253} \\ \frac{1192}{253} \\ -\frac{430}{253} \end{bmatrix}$

11. $\begin{bmatrix} 1 & 1 \\ 1 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -4 \end{bmatrix}$

coefficient matrix: $\begin{bmatrix} 1 & 1 \\ 1 & -2 \end{bmatrix}$

variable matrix: $\begin{bmatrix} x \\ y \end{bmatrix}$

constant matrix: $\begin{bmatrix} 5 \\ -4 \end{bmatrix}$

12. $\begin{bmatrix} -3 & 1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -7 \\ 2 \end{bmatrix}$

coefficient matrix: $\begin{bmatrix} -3 & 1 \\ 1 & 0 \end{bmatrix}$

variable matrix: $\begin{bmatrix} x \\ y \end{bmatrix}$

constant matrix: $\begin{bmatrix} -7 \\ 2 \end{bmatrix}$

13. $\begin{bmatrix} 3 & 5 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$

coefficient matrix: $\begin{bmatrix} 3 & 5 \\ 1 & 1 \end{bmatrix}$

variable matrix: $\begin{bmatrix} a \\ b \end{bmatrix}$

constant matrix: $\begin{bmatrix} 0 \\ 2 \end{bmatrix}$

14. $\begin{bmatrix} 1 & 3 & -1 \\ 1 & 0 & 2 \\ 0 & 2 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 8 \\ 1 \end{bmatrix}$

coefficient matrix: $\begin{bmatrix} 1 & 3 & -1 \\ 1 & 0 & 2 \\ 0 & 2 & -1 \end{bmatrix}$

variable matrix: $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$

constant matrix: $\begin{bmatrix} 2 \\ 8 \\ 1 \end{bmatrix}$

15. $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 0 & 1 \\ 0 & 1 & 3 \end{bmatrix}\begin{bmatrix} r \\ s \\ t \end{bmatrix} = \begin{bmatrix} 150 \\ 425 \\ 0 \end{bmatrix}$

coefficient matrix: $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 0 & 1 \\ 0 & 1 & 3 \end{bmatrix}$

variable matrix: $\begin{bmatrix} r \\ s \\ t \end{bmatrix}$

constant matrix: $\begin{bmatrix} 150 \\ 425 \\ 0 \end{bmatrix}$

16. $\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 11 \\ 18 \end{bmatrix}$

coefficient matrix: $\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$

variable matrix: $\begin{bmatrix} x \\ y \end{bmatrix}$

constant matrix: $\begin{bmatrix} 11 \\ 18 \end{bmatrix}$

17. $(2, 1)$

18. $(-1, 0)$

19. $\left(\frac{1}{2}, 20\right)$

20. $(1, -1)$

21. $(3, 2)$

22. $(-8, 7)$

23. $(2,\ -1,\ 3)$

24. $(-3,\ -2,\ 18)$

25. $(1,\ 2,\ -2)$

26. He should bicycle for about 22 min at 11 mph and about 38 min at 15 mph.

27. If you spend exactly $15, you should buy 2.5 lb of almonds, 3.5 lb of peanuts, and 3 lb of raisins.

28. If you spent $4.45, you bought 1 lb of almonds, 1 lb of peanuts, and 1 lb of raisins.

29. $(-2,\ -1)$

30. $(2,\ 4)$

31. $(-1,\ 0)$

32. $(4,\ 1,\ 3)$

33. $(5,\ 0,\ 1)$

34. $(-19,\ 22,\ 13)$

35. $(1,\ 0,\ 3)$

36. $(2,\ -1,\ 3)$

37. $(1,\ 1,\ 1,\ 1)$

38. $(2,\ 0,\ 2,\ 0)$

39. $(6,\ 2)$

40. no unique solution

41. $(16,\ -22)$

42. yes; (2, 40)

43. yes; $\left(\frac{27}{5}, \frac{37}{5}\right)$

44. yes; $\left(\frac{25}{2}, \frac{2375}{2}\right)$

45. yes; $(6,\ 1)$

46. no

47. yes; $(2,\ -1,\ 4)$

48. $(2,\ 3)$

49. length = 280 ft, width = 140 ft

50. $6x + 5y = 7$
There are 2 equations in the system: $5 = -3m + b$ and $-1 = 2m + b$, where m = slope and b = y-intercept. Solving the system, the equation of the line is $y = -1.2x + 1.4$ or, in standard form, $6x + 5y = 7$.

51. $\begin{bmatrix} -3 & 2 \\ -5 & 8 \end{bmatrix}$

52. $\begin{bmatrix} -1 & -1 \\ 0 & 0 \end{bmatrix}$

53. $\begin{bmatrix} 10 \\ 3 \\ -2 \end{bmatrix}$

54. $\begin{bmatrix} -1 & 2 & 6 \\ 0 & 0 & 5 \\ 8 & -1 & 0 \end{bmatrix}$

55. 14

56. Answers may vary. Sample:
$y + z = 0$
$z = 0$

57. Answers may vary. Sample:
$y + z = 0$
$y + z = 1$

58a. Let c = lb of chicken, r = lb of rice, and s = lb of shellfish.
① $c + r + s = 18$
② $1.50c + 0.40r + 6.00s = 29.50$
③ $100c + 20r + 50s = 850$

58b. $(5,\ 10,\ 3)$
She used 5 lb of chicken, 10 lb of rice, and 3 lb of shellfish.

59. B

60. H

61. A

62. First write each equation in standard form. Then place the coefficients in a matrix, with the coefficients of x in the first column, the coefficients of y in the second column, and the coefficients of z in the third column:
$\begin{bmatrix} 2 & -3 & 1 \\ 1 & 4 & -2 \\ -3 & -2 & 3 \end{bmatrix}$. Finally, put this in an equation with the variable matrix $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and the constant matrix $\begin{bmatrix} -10 \\ 11 \\ -7 \end{bmatrix}$,
to get $\begin{bmatrix} 2 & -3 & 1 \\ 1 & 4 & -2 \\ -3 & -2 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -10 \\ 11 \\ -7 \end{bmatrix}$

63. −44

64. 4913

65. −218

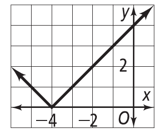
66. $\bar{x} = 34.\overline{4}$
$\sigma^2 = 30.9$
$\sigma = 5.56$

67. $\bar{x} = 4.17$
$\sigma^2 = 1.32$
$\sigma = 1.15$

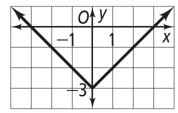
68. $\bar{x} = 19.\overline{6}$ m
$\sigma^2 = 22.\overline{2}$ m^2
$\sigma = 4.7$ m

69. $\bar{x} = 57.4$ mi
$\sigma^2 = 345.44$ mi^2
$\sigma = 18.6$ m

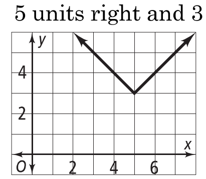
70. $f(x) = |x + 4|$ is a horizontal translation of $f(x) = |x|$, 4 units left.



71. $f(x) = |x| - 3$ is a vertical translation of $f(x) = |x|$, 3 units down.

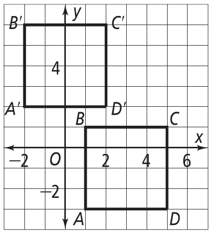


72. $f(x) = |x - 5| + 3$ is a combined translation of $f(x) = |x|$, 5 units right and 3 units up.

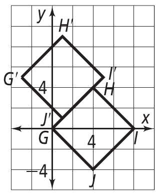


Algebra 2
Lesson 12-5 - Practice and Problem-Solving Exercises Answers

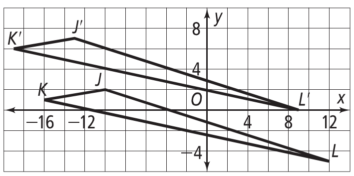
7. $(-2,\ 2),\ (-2,\ 6),\ (2,\ 6),\ (2,\ 2)$



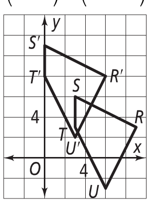
8. $(-3,\ 5),\ (1,\ 9),\ (5,\ 5),\ (1,\ 1)$



9. $(-13,\ 7),\ (-19,\ 6),\ (9,\ 0)$



10. $(6,\ 8),\ (0,\ 11),\ (0,\ 8),\ (3,\ 2)$

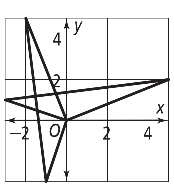


11. $(0,\ 0),\ (4,\ 8),\ (10,\ 10),\ (16,\ 2)$

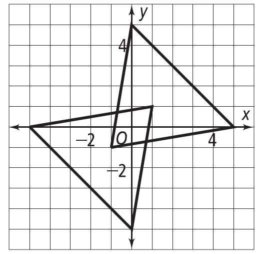
12. $(-3.5,\ -2.5),\ (-1.5,\ 2),\ (2,\ 0)$

13. $(-12,\ 9),\ (3,\ 6),\ (4.5,\ 0),\ (1.5,\ -6),\ (-3,\ 0)$

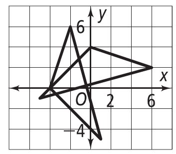
14.



15.



16.

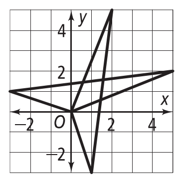


17. (–3, –3), (3, –6), (3, –3), (–3, –6)

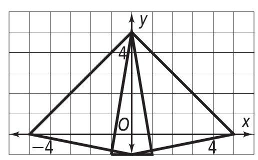
18. (0, 0), (4, 4), (8, 4), (6, 2)

19. (–1, –3), (–2, –2), (–3, –2), (–4, –3), (–2.5, –5)

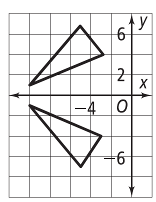
20.



21.



22.



23. (3, –3), (–3, –6), (–3, –3), (3, –6)

24. (0, 0), (4, –4), (8, –4), 6, –2)

25. (3, 1), (2, 2), (2, 3), (3, 4), (5, 2.5)

26. $\begin{bmatrix} -8 & -8 & -3 & -3 \\ -1 & -3 & -1 & -3 \end{bmatrix}$

27. $\begin{bmatrix} -8 & -5 & -2 & -5 \\ -8 & -5 & -8 & -11 \end{bmatrix}$

28. $\begin{bmatrix} -5 & -4 & -9 \\ 1 & 4 & 6 \end{bmatrix}$

29. $\begin{bmatrix} -5 & -1 & -3 \\ -2 & -1 & 1 \end{bmatrix}$

30. $\begin{bmatrix} -1.5 & 0.5 & -0.5 \\ 0.5 & 1 & 2 \end{bmatrix}$

31. $\begin{bmatrix} 3 & -1 & 1 \\ -1 & -2 & -4 \end{bmatrix}$

32. $\begin{bmatrix} -3 & 1 & -1 \\ -1 & -2 & -4 \end{bmatrix}$

33. Apply a 90° rotation matrix $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ three times to determine the image matrix for each frame. The fourth application of the 90° rotation matrix would show the gymnast at the starting position of Frame 1.

34. Apply a 90° rotation matrix $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ seven times.

35. Check students' work.

36. $f: \begin{bmatrix} -5 & -3 & -2 & -1 & 1 & -1 & -2 & -3 \\ 2 & 1 & -1 & 1 & 2 & 3 & 5 & 3 \end{bmatrix}$,
$g: \begin{bmatrix} -3 & -1 & 0 & 1 & 3 & 1 & 0 & -1 \\ -2 & -3 & -5 & -3 & -2 & -1 & 1 & -1 \end{bmatrix}$
translation

37. $f: \begin{bmatrix} -5 & -2 & 1 \\ 3 & 0 & 3 \end{bmatrix}$, $g: \begin{bmatrix} -1 & 2 & 5 \\ 1 & -2 & 1 \end{bmatrix}$
translation

38. $f: \begin{bmatrix} 0 & 4 & 4 \\ 0 & 2 & 4 \end{bmatrix}$, $g: \begin{bmatrix} 0 & -4 & -4 \\ 0 & -2 & -4 \end{bmatrix}$
rotation

39. $\begin{bmatrix} -1.5 & 0.25 & -2.5 \\ 0 & 1.5 & 1.5 \end{bmatrix}$

40. $\begin{bmatrix} 3 & 1.5 & 2 & 4 \\ -3 & -4.5 & -5 & -3.5 \end{bmatrix}$

41. Check students' work.

x	y
1	5
2	6
3	7
4	8

$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \end{bmatrix} = \begin{bmatrix} 5 & 6 & 7 & 8 \\ 1 & 2 & 3 & 4 \end{bmatrix}$

The reflection of a matrix of points from a function table across the line $y = x$ interchanges the values of y and x in the function table. Finding the inverse of the matrix points of a function from a function table also results in the interchanging of the values of y and x.

42. B

43. H

44. D

45. G

46. 514 – 401 = 113, or one standard deviation. Assuming a normal distribution, 34% of the data points fall between the mean and one standard deviation below the mean. So, the probability that a student chosen at random got between 401 and 514 is 34% = $\frac{34}{100} = 0.34$.

47. $(3, -2)$

48. $(1, -1, 2)$

49. $(0, 1, -2)$

50. $\begin{bmatrix} 16 \\ 12 \end{bmatrix}$

51. $\begin{bmatrix} 12 \end{bmatrix}$

52. $\begin{bmatrix} 22 \end{bmatrix}$

Algebra 2
Lesson 12-6 - Practice and Problem-Solving Exercises Answers

7. $\langle 4, 1 \rangle$

8. $\langle -3, 5 \rangle$

9. $\langle 4, -2 \rangle$

10. $\langle 6, -2 \rangle$

11. $\langle 0, 2 \rangle$

12. $\langle -5, 0 \rangle$

13. $\langle -1, 5 \rangle$

14. $\langle 4, -3 \rangle$

15. $\langle 2, 0 \rangle$

16. $\langle 11, 4 \rangle$

17. $\langle 3, 0 \rangle$

18. $\langle 5, 4 \rangle$

19. $\langle 3, -4 \rangle$

20. $\langle 1, 7 \rangle$

21. $\langle 4, -1 \rangle$

22. $\langle -3, -1 \rangle$

23. $\langle -3, 8 \rangle$

24. $\langle -2, 6 \rangle$

25. $\langle -8, 20 \rangle$

26. $\langle 3, 6 \rangle$

27. $\langle -6, -12 \rangle$

28. normal

29. not normal

30. not normal

31. normal

32. $\langle 2, -3 \rangle$

33. $\langle 0, -14 \rangle$

34. $\langle 3, -5 \rangle$

35. $\langle 18, -13 \rangle$

36. about 26 mi/h

37. about 304.14 mi/h

38. 229 miles

39. $\overrightarrow{AB} = \left(5-2,\ 3-2\right) = \langle 3, 1 \rangle$
$\overrightarrow{BC} = \left(3-5,\ 6-3\right) = \langle -2, 3 \rangle$
$\overrightarrow{CA} = \left(2-3,\ 2-6\right) = \langle -1, -4 \rangle$

40. $\langle -10, 4 \rangle$

41. $\langle 6, -3 \rangle$

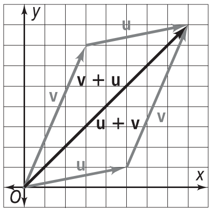
42. $\langle 4, 2 \rangle$

43. $\langle -4, -2 \rangle$

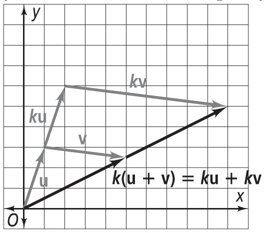
44. 6.75 hours

45. $\mathbf{v} - \mathbf{v} = \langle 0, 0 \rangle$; $\langle 0, 0 \rangle$, the zero vector, is the additive identity for the set of all vectors and $-\mathbf{v}$ is the additive inverse of any given vector $\mathbf{v}$; in other words, $\mathbf{v} + \langle 0, 0 \rangle = \mathbf{v}$ and $\mathbf{v} + (-\mathbf{v}) = \langle 0, 0 \rangle$

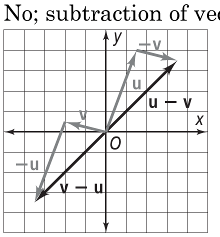
46. yes; Commutative Property of Addition



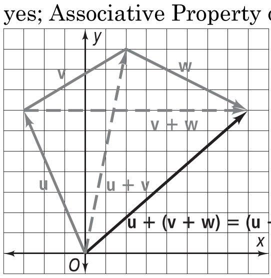
47. yes; Distributive Property



48. No; subtraction of vectors is not commutative.



49. yes; Associative Property of Addition



50. Yes; the vector addition of $\langle 10,\ 10\rangle$, $\langle 5,\ -4\rangle$, and $\langle -3,\ 5\rangle$ is commutative and associative.

51. **a** and **b** are perpendicular; **b** and **d** are perpendicular; **a** and **d** are parallel

52. $w = \langle 2,\ 5\rangle$

53. 30 pounds

54. about 6.08

55. -3

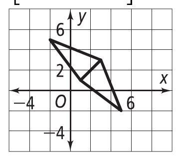
56. $\dfrac{3}{40}$

57. $\dfrac{1}{2}$

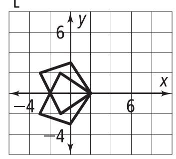
58. 90

59. 5

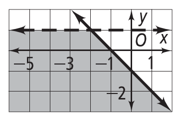
60. $\begin{bmatrix} 1 & -2 & 3 \\ 1 & 5 & 3 \end{bmatrix}$



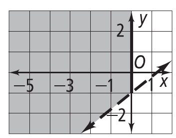
61. $\begin{bmatrix} -3 & 0 & 2 & -1 \\ -2 & -3 & 0 & 2 \end{bmatrix}$



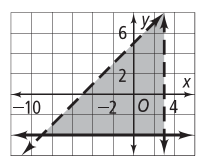
62.



63.



64.



65. $y - 1 = -3x$ or $y + 5 = -3(x - 2)$

66. $y + 4 = -\dfrac{7}{5}(x + 4)$ or $y - 3 = -\dfrac{7}{5}(x + 9)$

67. $y - 2 = -(x - 7)$ or $y - 8 = -(x - 1)$

68. yes

69. no

70. yes

71. no