58. $-2(6 - 3z) + 3y + z = -11$

$-12 + 6z + 3y + z = -11$

$7z + 3y = 1$ Eq 1

$3(6 - 3z) - y + 2z = 13$

$18 - 9z - y + 2z = 13$

$-7z - y = -5$ Eq 2

$7z + 3y = 1$

$-7z - y = -5$

$2y = -4$

$y = -2$

$-7z + 2 = -5$

$-7z = -7$

$z = 1$

$x = 6 - 3(1)$

$x = 3$

$(3, -2, 1)$

59. $4x - 3y + 8z = -8$

$-4x + 14y - 24z = 48$

$11y - 16z = 40$ Eq 1

$2x + y - 4z = 4$

$-2x + 7y - 12z = 24$

$8y - 16z = 28$ Eq 2

$11y - 16z = 40$

$-8y + 16z = -28$

$3y = 12$

$y = 4$

$8(4) - 16z = 28$ $\quad 2x = 4 + 4\left(\frac{1}{4}\right) - 4$

$-16z = -4$ $\quad 2x = 1$

$z = \frac{1}{4}$ $\quad x = \frac{1}{2}$

$\left(\frac{1}{2}, 4, \frac{1}{4}\right)$

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

61. Not possible; the matrices have different dimensions.

62. $\begin{bmatrix} 8 & -24 & -32 \\ -8 & -64 & 0 \end{bmatrix}$ **63.** $\begin{bmatrix} 17 & -3 & -1 \\ 0 & 25 & 31 \end{bmatrix}$

64. $\begin{bmatrix} 9 & 2 & -2 \\ -5 & 13 & -5 \end{bmatrix}$ **65.** $\begin{bmatrix} 2 & 5 & 1 \\ 3 & 4 & 8 \end{bmatrix}$

66. $6x + 8y = 1000$

$x + y = 150$

$6(150 - y) + 8y = 1000$

$2y = 100$

$y = 50$

$x = 150 - 50$

$x = 100$

100 vegetarian, 50 chicken

Lesson 4.5

Activity (p. 230)

1. $\begin{bmatrix} 5x - 4y \\ x + 2y \end{bmatrix} = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$ **2.** $\begin{bmatrix} 2 & -1 \\ -4 & 9 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -4 \\ 1 \end{bmatrix}$

$5x - 4y = 8$

$x + 2y = 6$

a linear system

4.5 Guided Practice (p. 233)

1. *Sample answer:* A matrix of variables is a column matrix containing only the variables of the equations in a linear system. A constant matrix is a column matrix containing only the constant terms of the equations in a linear system. To solve a linear system that has been written as a matrix equation, solve for the matrix of variables by multiplying (on the left) the matrix of constants by the inverse of the coefficient matrix.

2. $X = A^{-1}B$

3. *Sample answer:* Because matrix multiplication is not commutative, $A \times A^{-1}$ cannot be simplified to $AA^{-1}X = X$; Therefore, the matrix equation cannot be solved by multiplying both sides by A^{-1} on the right.

4. $\begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$ **5.** $\begin{bmatrix} 1 & 3 \\ 4 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 9 \\ -2 \end{bmatrix}$

6. $\begin{bmatrix} 1 & 1 & 1 \\ 5 & -1 & 0 \\ 3 & 4 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 10 \\ 1 \\ 8 \end{bmatrix}$

7. $A = \begin{bmatrix} 1 & 1 \\ 7 & 8 \end{bmatrix}$ $A^{-1} = \frac{1}{1}\begin{bmatrix} 8 & -1 \\ -7 & 1 \end{bmatrix} = \begin{bmatrix} 8 & -1 \\ -7 & 1 \end{bmatrix}$

$x = \begin{bmatrix} 8 & -1 \\ -7 & 1 \end{bmatrix}\begin{bmatrix} 2 \\ 21 \end{bmatrix} = \begin{bmatrix} -5 \\ 7 \end{bmatrix}$

$(-5, 7)$

8. $A = \begin{bmatrix} -1 & -2 \\ 2 & 8 \end{bmatrix}$

$A^{-1} = \frac{1}{-4}\begin{bmatrix} 8 & 2 \\ -2 & -1 \end{bmatrix} = \begin{bmatrix} -2 & -\frac{1}{2} \\ \frac{1}{2} & \frac{1}{4} \end{bmatrix}$

$x = \begin{bmatrix} -2 & -\frac{1}{2} \\ \frac{1}{2} & \frac{1}{4} \end{bmatrix}\begin{bmatrix} 3 \\ 1 \end{bmatrix} = \begin{bmatrix} -\frac{13}{2} \\ \frac{7}{4} \end{bmatrix}$

$\left(-\frac{13}{2}, \frac{7}{4}\right)$

9. $A = \begin{bmatrix} 4 & 3 \\ 6 & -2 \end{bmatrix}$ $A^{-1} = \frac{1}{-26}\begin{bmatrix} -2 & -3 \\ -6 & 4 \end{bmatrix} = \begin{bmatrix} \frac{1}{13} & \frac{3}{26} \\ \frac{3}{13} & -\frac{2}{13} \end{bmatrix}$

$x = \begin{bmatrix} \frac{1}{13} & \frac{3}{26} \\ \frac{3}{13} & -\frac{2}{13} \end{bmatrix}\begin{bmatrix} 6 \\ 10 \end{bmatrix} = \begin{bmatrix} \frac{21}{13} \\ -\frac{2}{13} \end{bmatrix}$

$\left(\frac{21}{13}, -\frac{2}{13}\right)$

10. $s + b + m = 60{,}000$

$0.12s + 0.8b + 0.5m = 5400$

$s = b + m$

$A = \begin{bmatrix} 1 & 1 & 1 \\ 0.12 & 0.8 & 0.5 \\ 1 & -1 & -1 \end{bmatrix}$

$A^{-1} = \begin{bmatrix} 0.5 & 0 & 0.5 \\ -2.8 & 33.3 & -1.17 \\ 3.3 & -33.3 & 0.67 \end{bmatrix}$

$x = \begin{bmatrix} 0.5 & 0 & 0.5 \\ -2.8 & 33.3 & -1.7 \\ 3.3 & -33.3 & 0.7 \end{bmatrix}\begin{bmatrix} 60{,}000 \\ 5{,}400 \\ 0 \end{bmatrix} = \begin{bmatrix} 30{,}000 \\ 10{,}000 \\ 20{,}000 \end{bmatrix}$

Stock mutual fund: \$30,000

Bond mutual fund: \$10,000

Money market fund: \$20,000

4.5 Practice and Applications (pp. 233-235)

11. $\begin{bmatrix} 1 & 1 \\ 3 & -4 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 8 \end{bmatrix}$ **12.** $\begin{bmatrix} 1 & 2 \\ 4 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ 5 \end{bmatrix}$

13. $\begin{bmatrix} 5 & -3 \\ -4 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 9 \\ 10 \end{bmatrix}$ **14.** $\begin{bmatrix} 2 & -5 \\ -3 & 7 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -11 \\ 15 \end{bmatrix}$

15. $\begin{bmatrix} 1 & 8 \\ 4 & -5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ -11 \end{bmatrix}$ **16.** $\begin{bmatrix} 2 & -5 \\ 1 & -3 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$

17. $\begin{bmatrix} 1 & -4 & 5 \\ 2 & 1 & -7 \\ -4 & 5 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -4 \\ -23 \\ 38 \end{bmatrix}$

18. $\begin{bmatrix} 3 & -1 & 4 \\ 2 & 4 & -1 \\ 1 & -1 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 16 \\ 10 \\ 31 \end{bmatrix}$

19. $\begin{bmatrix} 0.5 & 3.1 & -0.2 \\ 1.2 & -2.5 & 0.7 \\ 0.3 & 4.8 & -4.3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5.9 \\ 2.2 \\ 4.8 \end{bmatrix}$

20. $\begin{bmatrix} 1 & 0 & 1 \\ -1 & -1 & 2 \\ 2 & 7 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 9 \\ 6 \\ -4 \end{bmatrix}$

21. $\begin{bmatrix} 0 & 8 & -10 \\ 0 & 6 & -12 \\ -9 & 0 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -23 \\ 14 \\ 0 \end{bmatrix}$

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

23. $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$

$x = \begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}\begin{bmatrix} 8 \\ 11 \end{bmatrix} = \begin{bmatrix} 5 \\ -7 \end{bmatrix}$

$(5, -7)$

24. $A = \begin{bmatrix} 1 & 1 \\ 11 & 12 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 12 & -1 \\ -11 & 1 \end{bmatrix}$

$x = \begin{bmatrix} 12 & -1 \\ -11 & 1 \end{bmatrix}\begin{bmatrix} -1 \\ 8 \end{bmatrix} = \begin{bmatrix} -20 \\ 19 \end{bmatrix}$

$(-20, 19)$

25. $A = \begin{bmatrix} 2 & 7 \\ 1 & 3 \end{bmatrix}$ $A^{-1} = -\begin{bmatrix} 3 & -7 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} -3 & 7 \\ 1 & -2 \end{bmatrix}$

$x = \begin{bmatrix} -3 & 7 \\ 1 & -2 \end{bmatrix}\begin{bmatrix} -53 \\ -22 \end{bmatrix} = \begin{bmatrix} 5 \\ -9 \end{bmatrix}$

$(5, -9)$

26. $A = \begin{bmatrix} 7 & 5 \\ 4 & 3 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 3 & -5 \\ -4 & 7 \end{bmatrix}$

$x = \begin{bmatrix} 3 & -5 \\ -4 & 7 \end{bmatrix}\begin{bmatrix} 8 \\ 4 \end{bmatrix} = \begin{bmatrix} 4 \\ -4 \end{bmatrix}$

$(4, -4)$

27. $A = \begin{bmatrix} 5 & -7 \\ 2 & -4 \end{bmatrix}$ $A^{-1} = \frac{1}{-6}\begin{bmatrix} -4 & 7 \\ -2 & 5 \end{bmatrix} = \begin{bmatrix} \frac{2}{3} & -\frac{7}{6} \\ \frac{1}{3} & -\frac{5}{6} \end{bmatrix}$

$x = \begin{bmatrix} \frac{2}{3} & -\frac{7}{6} \\ \frac{1}{3} & -\frac{5}{6} \end{bmatrix}\begin{bmatrix} 54 \\ 30 \end{bmatrix} = \begin{bmatrix} 1 \\ -7 \end{bmatrix}$

$(1, -7)$

28. $A = \begin{bmatrix} -5 & -7 \\ 2 & 3 \end{bmatrix}$ $A^{-1} = -\begin{bmatrix} 3 & 7 \\ -2 & -5 \end{bmatrix} = \begin{bmatrix} -3 & -7 \\ 2 & 5 \end{bmatrix}$

$x = \begin{bmatrix} -3 & -7 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} -9 \\ 3 \end{bmatrix} = \begin{bmatrix} 6 \\ -3 \end{bmatrix}$

$(6, -3)$

29. $A = \begin{bmatrix} 1 & 2 \\ -2 & -3 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} -3 & -2 \\ 2 & 1 \end{bmatrix}$

$x = \begin{bmatrix} -3 & -2 \\ 2 & 1 \end{bmatrix}\begin{bmatrix} -9 \\ 14 \end{bmatrix} = \begin{bmatrix} -1 \\ -4 \end{bmatrix}$

$(-1, -4)$

30. $A = \begin{bmatrix} 2 & 4 \\ 2 & 5 \end{bmatrix}$ $A^{-1} = \frac{1}{2}\begin{bmatrix} 5 & -4 \\ -2 & 2 \end{bmatrix} = \begin{bmatrix} \frac{5}{2} & -2 \\ -1 & 1 \end{bmatrix}$

$x = \begin{bmatrix} \frac{5}{2} & -2 \\ -1 & 1 \end{bmatrix}\begin{bmatrix} -26 \\ -31 \end{bmatrix} = \begin{bmatrix} -3 \\ -5 \end{bmatrix}$

$(-3, -5)$

31. $A = \begin{bmatrix} 9 & -5 \\ -2 & 2 \end{bmatrix}$ $A^{-1} = \frac{1}{8}\begin{bmatrix} 2 & 5 \\ 2 & 9 \end{bmatrix} = \begin{bmatrix} \frac{1}{4} & \frac{5}{8} \\ \frac{1}{4} & \frac{9}{8} \end{bmatrix}$

$x = \begin{bmatrix} \frac{1}{4} & \frac{5}{8} \\ \frac{1}{4} & \frac{9}{8} \end{bmatrix}\begin{bmatrix} 43 \\ -22 \end{bmatrix} = \begin{bmatrix} -3 \\ -14 \end{bmatrix}$

$(-3, -14)$

32. $x = \begin{bmatrix} -1 & -11 & 8 \\ 1 & 7 & -5 \\ 1 & 14 & -10 \end{bmatrix}\begin{bmatrix} -2 \\ 4 \\ -5 \end{bmatrix} = \begin{bmatrix} -82 \\ 51 \\ 104 \end{bmatrix}$

$(-82, 51, 104)$

33. $x = \begin{bmatrix} 1 & 3 & 5 \\ -3 & -9 & -16 \\ 1 & 4 & 7 \end{bmatrix}\begin{bmatrix} 9 \\ -30 \\ 4 \end{bmatrix} = \begin{bmatrix} -61 \\ 179 \\ -83 \end{bmatrix}$

$(-61, 179, -83)$

34. $A = \begin{bmatrix} 3 & 2 & 0 \\ 3 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 5 & -6 & 2 \\ -7 & 9 & -3 \\ -1 & 1 & 0 \end{bmatrix}$

$\begin{bmatrix} 5 & -6 & 2 \\ -7 & 9 & -3 \\ -1 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 13 \\ 13 \\ 9 \end{bmatrix} = \begin{bmatrix} 5 \\ -1 \\ 0 \end{bmatrix}$ $(5, -1, 0)$

35. $A = \begin{bmatrix} -1 & 1 & -3 \\ 3 & -2 & 8 \\ 2 & -2 & 5 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 6 & 1 & 2 \\ 1 & 1 & -1 \\ -2 & 0 & -1 \end{bmatrix}$

$\begin{bmatrix} 6 & 1 & 2 \\ 1 & 1 & -1 \\ -2 & 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} -4 \\ 14 \\ 7 \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \\ 1 \end{bmatrix}$ $(4, 3, 1)$

36. $A = \begin{bmatrix} 3 & 5 & -5 \\ -4 & 8 & -5 \\ 2 & -5 & 6 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 0.19 & -0.04 & 0.13 \\ 0.12 & 0.24 & 0.29 \\ 0.03 & 0.21 & 0.37 \end{bmatrix}$

$\begin{bmatrix} 0.19 & -0.04 & 0.13 \\ 0.12 & 0.24 & 0.29 \\ 0.03 & 0.21 & 0.37 \end{bmatrix} \cdot \begin{bmatrix} 21 \\ 1 \\ -16 \end{bmatrix} = \begin{bmatrix} 2 \\ -2 \\ -5 \end{bmatrix}$ $(2, -2, -5)$

37. $A = \begin{bmatrix} 2 & 0 & 1 \\ 5 & -1 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} -4 & 2 & 1 \\ -11 & 5 & 3 \\ 9 & -4 & -2 \end{bmatrix}$

$\begin{bmatrix} -4 & 2 & 1 \\ -11 & 5 & 3 \\ 9 & -4 & -2 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ 5 \\ 0 \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \\ -2 \end{bmatrix}$ $(2, 3, -2)$

38. $A = \begin{bmatrix} 4 & 3 & 1 \\ 6 & 1 & 0 \\ 3 & 5 & 3 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} -0.2 & 0.27 & 0.07 \\ 1.2 & -0.6 & -0.4 \\ -1.8 & 0.73 & 0.93 \end{bmatrix}$

$\begin{bmatrix} -0.2 & 0.27 & 0.07 \\ 1.2 & -0.6 & -0.4 \\ -1.8 & 0.73 & 0.93 \end{bmatrix} \cdot \begin{bmatrix} 14 \\ 9 \\ 21 \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix}$ $(1, 3, 1)$

39. $A = \begin{bmatrix} 1 & 1 & -3 \\ 2 & 0 & 1 \\ -7 & -2 & 1 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 0.4 & 1 & 0.2 \\ -1.8 & -4 & -1.4 \\ -0.8 & -1 & -0.4 \end{bmatrix}$

$\begin{bmatrix} 0.4 & 1 & 0.2 \\ -1.8 & -4 & -1.4 \\ -0.8 & -1 & -0.4 \end{bmatrix} \cdot \begin{bmatrix} -17 \\ 12 \\ -11 \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \\ 6 \end{bmatrix}$ $(3, -2, 6)$

40. $A = \begin{bmatrix} 1 & 1 \\ 3.5 & 2.25 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} -1.8 & 0.8 \\ 2.8 & -0.8 \end{bmatrix}$

$\begin{bmatrix} -1.8 & 0.8 \\ 2.8 & -0.8 \end{bmatrix} \cdot \begin{bmatrix} 20 \\ 50 \end{bmatrix} = \begin{bmatrix} 4 \\ 16 \end{bmatrix}$

4 adults and 16 children

41. $A = \begin{bmatrix} 0.7 & 0.72 & 0.73 \\ 0.26 & 0.25 & 0.27 \\ 0.04 & 0.03 & 0 \end{bmatrix}$

$A^{-1} = \begin{bmatrix} -16.2 & 43.8 & 23.8 \\ 21.6 & -58.4 & 1.6 \\ -4.4 & 15.6 & -24.4 \end{bmatrix}$

$\begin{bmatrix} -16.2 & 43.8 & 23.8 \\ 21.6 & -58.4 & 1.6 \\ -4.4 & 15.6 & -24.4 \end{bmatrix} \cdot \begin{bmatrix} 5483 \\ 2009 \\ 129 \end{bmatrix} = \begin{bmatrix} 2239.8 \\ 1313.6 \\ 4067.6 \end{bmatrix}$

2239.8 g of A 1313.6 g of B 4067.6 g of C

42. $B = \begin{bmatrix} 0.75 & 0.75 & 0.75 \\ 1 & -1 & -1 \\ 6.5 & 4.5 & 5.5 \end{bmatrix}$ $B^{-1} = \begin{bmatrix} 0.667 & 0.5 & 0 \\ 8 & 0.5 & -1 \\ -7.333 & -1 & 1 \end{bmatrix}$

$\begin{bmatrix} 0.667 & 0.5 & 0 \\ 8 & 0.5 & -1 \\ -7.333 & -1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 6 \\ 0 \\ 45 \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \\ 1 \end{bmatrix}$

4 sheets of iridescent, 3 sheets of red, and 1 sheet of blue

43. $T + 25W + 5L = 20$

$T + 50W + 15L = 35$

$T + 100W + 20L = 50$

$A = \begin{bmatrix} 1 & 25 & 5 \\ 1 & 50 & 15 \\ 1 & 100 & 20 \end{bmatrix}$

$A^{-1} = \begin{bmatrix} 1.333 & 0 & -0.333 \\ 0.013 & -0.04 & 0.027 \\ -0.133 & 0.2 & -0.067 \end{bmatrix}$

$\begin{bmatrix} 1.333 & 0 & -0.333 \\ 0.013 & -0.04 & 0.027 \\ -0.133 & 0.2 & -0.067 \end{bmatrix} \cdot \begin{bmatrix} 20 \\ 35 \\ 50 \end{bmatrix} = \begin{bmatrix} 10 \\ 0.2 \\ 1 \end{bmatrix}$

Transformers are \$10.00, the wire cost \$0.20 per foot, and the light cost \$1.00.

44. $S + E + G = 200{,}000$

$S = 5E$

$0.1(S + E) = G$

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -5 & 0 \\ 0.1 & 0.1 & -1 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 0.758 & 0.167 & 0.758 \\ 0.152 & -0.167 & 0.152 \\ 0.091 & 0 & -0.909 \end{bmatrix}$$

$$\begin{bmatrix} 0.758 & 0.167 & 0.758 \\ 0.152 & -0.167 & 0.152 \\ 0.091 & 0 & -0.909 \end{bmatrix} \cdot \begin{bmatrix} 200{,}000 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 151{,}515 \\ 30{,}303 \\ 18{,}182 \end{bmatrix}$$

Salaries: \$151,515

Equipment Maintence: \$30,303

General Expenses: \$18,182

45. a. $2C + 3M = \$15$

$3C + 5M = \$24$

$7C + 10M = \$50$

$$A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix} \quad A^{-1} = \begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix} \cdot \begin{bmatrix} 15 \\ 24 \end{bmatrix} = \begin{bmatrix} 3 \\ 3 \end{bmatrix}$$ The average unit price for each choice of meat and cheese is \$3.

b. $$B = \begin{bmatrix} 3 & 5 \\ 7 & 10 \end{bmatrix} \quad B^{-1} = \begin{bmatrix} -2 & 1 \\ 1.4 & -0.6 \end{bmatrix}$$

$$\begin{bmatrix} -2 & 1 \\ 1.4 & -0.6 \end{bmatrix} \cdot \begin{bmatrix} 24 \\ 50 \end{bmatrix} = \begin{bmatrix} 2 \\ 3.6 \end{bmatrix}$$ The average unit price for each choice of cheese is \$2 and for each choice of meat is \$3.60.

c. *Sample answer:* The average unit price for the cheese and for the meat is different in parts (a) and (b); perhaps the super basket has a more expensive assortment of meat and a less expensive assortment of cheese than the other baskets.

46. $$A^{-1} = \begin{bmatrix} 40 & -3 & -33 & 9 \\ 1 & 0 & -1 & 0 \\ -39 & 3 & 33 & -8 \\ -24 & 2 & 20 & -5 \end{bmatrix}$$

$$\begin{bmatrix} 40 & -3 & -33 & 9 \\ 1 & 0 & -1 & 0 \\ -39 & 3 & 33 & -8 \\ -24 & 2 & 20 & -5 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ 5 \\ 3 \\ 6 \end{bmatrix} = \begin{bmatrix} 20 \\ -1 \\ -12 \\ -8 \end{bmatrix}$$

$(20, -1, -12, -8)$

4.5 Mixed Review (p. 235)

47. $f(8) = \frac{3}{4}(8) - 8 = -2$ **48.** $f(11) = -11 + 6 = -5$

49. $f(-2) = \frac{3}{4}(-2) - 8 = -\frac{19}{2}$

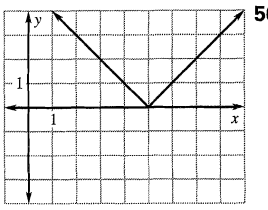
50. $f(0) = \frac{3}{4}(0) - 8 = -8$ **51.** $g(3) = 2(3) - 1 = 5$

52. $g(0) = 2(0) - 1 = -1$

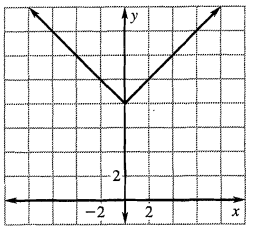
53. $g(-1) = 2(-1) - 1 = -3$

54. $g(-3) = \frac{1}{8}(-3) - 8 = \frac{61}{8}$

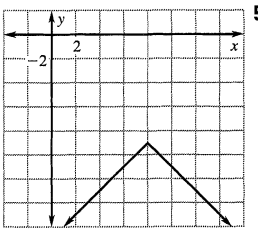
55.



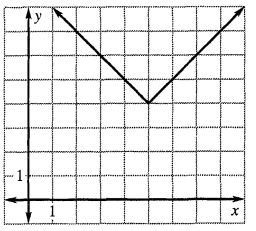
56.



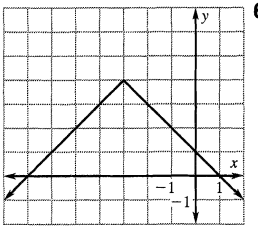
57.



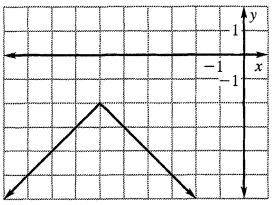
58.



59.



60.



61. $A^{-1} = \frac{1}{1}\begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix}$

62. $A^{-1} = \frac{1}{1}\begin{bmatrix} 1 & -2 \\ -2 & 5 \end{bmatrix} = \begin{bmatrix} 1 & -2 \\ -2 & 5 \end{bmatrix}$

63. $A^{-1} = \frac{1}{1}\begin{bmatrix} -2 & -17 \\ 1 & 8 \end{bmatrix} = \begin{bmatrix} -2 & -17 \\ 1 & 8 \end{bmatrix}$

64. $A^{-1} = \frac{1}{4}\begin{bmatrix} -1 & 5 \\ -3 & 11 \end{bmatrix} = \begin{bmatrix} -\frac{1}{4} & \frac{5}{4} \\ -\frac{3}{4} & \frac{11}{4} \end{bmatrix}$

65. $A^{-1} = \frac{1}{2}\begin{bmatrix} 2 & -4 \\ -3 & 7 \end{bmatrix} = \begin{bmatrix} 1 & -2 \\ -\frac{3}{2} & \frac{7}{2} \end{bmatrix}$

66. $A^{-1} = \frac{1}{2}\begin{bmatrix} -2 & 2 \\ -7 & 6 \end{bmatrix} = \begin{bmatrix} -1 & 1 \\ -\frac{7}{2} & 3 \end{bmatrix}$

Quiz 2 (p. 236)

1. $A^{-1} = \frac{1}{1}\begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix}$

2. $A^{-1} = \frac{1}{1}\begin{bmatrix} -3 & -5 \\ -4 & -7 \end{bmatrix} = \begin{bmatrix} -3 & -5 \\ -4 & -7 \end{bmatrix}$

3. $A^{-1} = \frac{1}{9}\begin{bmatrix} -3 & -1 \\ -9 & -6 \end{bmatrix} = \begin{bmatrix} -\frac{1}{3} & -\frac{1}{9} \\ -1 & -\frac{2}{3} \end{bmatrix}$

4. $A^{-1} = \frac{1}{2}\begin{bmatrix} 7 & -5 \\ -8 & 6 \end{bmatrix} = \begin{bmatrix} \frac{7}{2} & -\frac{5}{2} \\ -4 & 3 \end{bmatrix}$

5. $A = \begin{bmatrix} 4 & 7 \\ 1 & 2 \end{bmatrix} \quad A^{-1} = \begin{bmatrix} 2 & -7 \\ -1 & 4 \end{bmatrix}$

$$\begin{bmatrix} 2 & -7 \\ -1 & 4 \end{bmatrix}\begin{bmatrix} 4 & 7 \\ 1 & 2 \end{bmatrix}x = \begin{bmatrix} 2 & -7 \\ -1 & 4 \end{bmatrix}\begin{bmatrix} 24 \\ 7 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}x = \begin{bmatrix} -1 \\ 4 \end{bmatrix}$$

$$x = \begin{bmatrix} -1 \\ 4 \end{bmatrix}$$

6. $A = \begin{bmatrix} -9 & 13 \\ 2 & -3 \end{bmatrix} \quad A^{-1} = \begin{bmatrix} -3 & -13 \\ -2 & -9 \end{bmatrix}$

$$\begin{bmatrix} -3 & -13 \\ -2 & -9 \end{bmatrix}\begin{bmatrix} -9 & 13 \\ 2 & -3 \end{bmatrix}x = \begin{bmatrix} -3 & -13 \\ -2 & -9 \end{bmatrix}\begin{bmatrix} 3 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}x = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$$

$$x = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$$

7. $A = \begin{bmatrix} 8 & 7 \\ -2 & -2 \end{bmatrix}$

$$A^{-1} = \frac{1}{-2}\begin{bmatrix} -2 & -7 \\ 2 & 8 \end{bmatrix} = \begin{bmatrix} 1 & \frac{7}{2} \\ -1 & -4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & \frac{7}{2} \\ -1 & -4 \end{bmatrix}\begin{bmatrix} 8 & 7 \\ -2 & -2 \end{bmatrix}x = \begin{bmatrix} 1 & \frac{7}{2} \\ -1 & -4 \end{bmatrix}\begin{bmatrix} 3 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}x = \begin{bmatrix} 3 \\ -3 \end{bmatrix}$$

$$x = \begin{bmatrix} 3 \\ -3 \end{bmatrix}$$

8. $4s = 142$

$8s + x = 351$

$s = 35.5$ A place setting costs \$35.50.

$8(35.5) + x = 351$

$x = 67$ A serving set costs \$67.00.

***Math and History* (p. 236)**

1. $\begin{bmatrix} 3 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 2 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 39 \\ 34 \\ 26 \end{bmatrix}$

$detA = (27 + 2 + 4) - (3 + 6 + 12) = 33 - 21 = 12$

$$x = \frac{\begin{vmatrix} 39 & 2 & 1 \\ 34 & 3 & 1 \\ 26 & 2 & 3 \end{vmatrix}}{12} = \frac{(351 + 52 + 68) - (78 + 78 + 204)}{12}$$

$$= \frac{471 - 360}{12} = \frac{111}{12} = 9.25$$

—CONTINUED—

1. —CONTINUED—

$$y = \frac{\begin{vmatrix} 3 & 39 & 1 \\ 2 & 34 & 1 \\ 1 & 26 & 3 \end{vmatrix}}{12} = \frac{(306 + 39 + 52) - (34 + 78 + 23-}{12}$$

$$= \frac{397 - 346}{12} = \frac{51}{12} = 4.25$$

$$z = \frac{\begin{vmatrix} 3 & 2 & 39 \\ 2 & 3 & 34 \\ 1 & 2 & 26 \end{vmatrix}}{12} = \frac{(234 + 68 + 156) - (117 + 204 -}{12}$$

$$= \frac{458 - 425}{12} = \frac{33}{12} = 2.75$$

(9.25, 4.25, 2.75)

9.25 dou in a bundle of top-grade rice

4.25 dou in a bundle of medium-grade rice

2.75 dou in a bundle of low-grade rice

2. The arrangement is alike in that it looks like a coef matrix laid on its side. It is arranged in rows and c the modern matrix.

It is different in the fact that it is not set with a var matrix so that the exact amount could be found.

Chapter 4 Extension ***(p. 238)***

1. $\left[\begin{array}{ccc} 6 & 4 & 8 \\ 3 & 3 & 9 \end{array}\right]$

$\left[\begin{array}{ccc} 6 & 4 & 8 \\ 0 & 1 & 5 \end{array}\right] \quad -\frac{1}{2}R_1 + R_2 \rightarrow R_2$

$y = 5$

$6x + 4(5) = 8$

$6x = -12$

$x = -2$

$(-2, 5)$

2. $\left[\begin{array}{ccc} 1 & 1 & 2 \\ 7 & 8 & 21 \end{array}\right]$

$\left[\begin{array}{ccc} 1 & 1 & 2 \\ 0 & 1 & 7 \end{array}\right] \quad (-7)R_1 + R_2 \rightarrow R_2$

$y = 7$

$x + 7 = 2$

$x = -5$

$(-5, 7)$