Chapter 2: Linear Systems

MULTIPLE CHOICE

1. The solution to the system of equations

$$3x + 4y = -6$$
$$x - 5y = 17$$

is:

a. $(10, 6)$
b. $(-3, -4)$
c. $(-2, 0)$
d. $(2, -3)$

ANS: D PTS: 1 OBJ: 2.1

2. The solution to the system of equations

$$x + 3y = 12$$
$$4x - y = -17$$

is:

a. $(3, 3)$
b. $(12, -17)$
c. $(-3, 5)$
d. $(5, 3)$

ANS: C PTS: 1 OBJ: 2.1

3. The system

$$3x + 2y - z = 6$$
$$x - y + 2z = 1$$
$$2x + 3y - 3z = 5$$

has _____ solution(s).

a. no
b. one
c. three
d. infinite

ANS: D PTS: 1 OBJ: 2.1

4. The system

$$2x - y + 4z = -5$$
$$x + 2y - z = 6$$
$$x + y + z = 1$$

has _____ solution(s).

a. no
b. one
c. three
d. infinite

ANS: B PTS: 1 OBJ: 2.1

5. The system

$$3x - 2y = 7$$
$$-6x + 4y = -10$$

has:

a. no solution
b. a unique solution
c. an infinite number of solutions

ANS: A PTS: 1 OBJ: 2.1

6. The system

$$6x + 10y = 12$$
$$9x + 15y = 7$$

has:

a. no solution
b. a unique solution
c. an infinite number of solutions

ANS: A PTS: 1 OBJ: 2.1

7. The system

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

has:

a. no solution
b. a unique solution
c. an infinite number of solutions

ANS: B PTS: 1 OBJ: 2.1

8. The system

$$x - y = -1$$

$$2x + y = 4$$

has:

a. no solution
b. a unique solution
c. an infinite number of solutions

ANS: B PTS: 1 OBJ: 2.1

9. The system

$$4x - 6y = 8$$

$$6x - 9y = 12$$

has:

a. no solution
b. a unique solution
c. an infinite number of solutions

ANS: C PTS: 1 OBJ: 2.1

10. The system

$$2.1x - 1.5y = 2.7$$

$$-1.4x + y = -1.8$$

has:

a. no solution
b. a unique solution
c. an infinite number of solutions

ANS: C PTS: 1 OBJ: 2.1

11. The augmented matrix for the system of equations

$$3x - 2y = 5$$

$$4x + 7y = 2$$

is:

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

b. $\begin{bmatrix} 3 & -2 \\ 4 & 7 \end{bmatrix}$

c. $\left[\begin{array}{cc|c} 3 & -2 & 5 \\ 4 & 7 & 2 \end{array}\right]$

d. $\left[\begin{array}{cc|c} 3 & 2 & 1 \\ 4 & -7 & 3 \end{array}\right]$

ANS: C PTS: 1 OBJ: 2.2

12. The solution to the system of equations

$$x + 2y - z = -3$$
$$2x - y + 3z = 14$$
$$x + 4y - 2z = -8$$

is:

a. $(1, 1, 6)$

b. $(1, 3, 5)$

c. $(4, -1, 4)$

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

ANS: D PTS: 1 OBJ: 2.2

13. The augmented matrix

$$\left[\begin{array}{ccc|c} 1 & 3 & 2 & 4 \\ 2 & -1 & 5 & -2 \\ -3 & 1 & 6 & 1 \end{array}\right]$$

represents the system of equations:

a. $x_1 + 3x_2 + 2x_3 + 4x_4 = 0$
$2x_1 - x_2 + 5x_3 - 2x_4 = 0$
$-3x_1 + x_2 + 6x_3 + x_4 = 0$

b. $x_1 + 3x_2 + 2x_3 = 4$

$2x_1 - x_2 + 5x_3 = -2$

$-3x_1 + x_2 + 6x_3 = 1$

c. $x_1 + 2x_2 - 3x_3 = 4$

$3x_1 - x_2 + x_3 = -2$

$2x_1 + 5x_2 + 6x_3 = 1$

d. $x_1 + 3x_2 + 2x_3 = 0$

$2x_1 - x_2 + 5x_3 = 0$

$-3x_1 + x_2 + 6x_3 = 0$

ANS: B PTS: 1 OBJ: 2.2

14. The augmented matrix of a system of equations has been reduced to

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 5 \end{array}\right]$$

The system of equations has the solution:

a. $(1, 1, 1)$
b. $(-3, 2, -5)$
c. $(3, -2, 5)$
d. None of the above

ANS: C PTS: 1 OBJ: 2.2

15. The augmented matrix of a system of equations has been reduced to

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{array}\right]$$

The system of equations has the solution:

a. $(1, 1, 2)$
b. $(1, 2, 0)$
c. $(2, 1, 0)$
d. $(0, 1, 2)$

ANS: D PTS: 1 OBJ: 2.2

16. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 0 & 4 \end{array}\right]$$

The system of equations has the solution:

a. $(2, 3, 4)$
b. $(2, 3, 0)$
c. $(1, 1, 0)$
d. No solution

ANS: D PTS: 1 OBJ: 2.2

17. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 0 \end{array}\right]$$

The number of solution(s) to the system is:

a. none
b. one
c. infinite

ANS: C PTS: 1 OBJ: 2.2

18. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 5 \end{array}\right]$$

The number of solution(s) to the system is:

a. none
b. one
c. infinite

ANS: B PTS: 1 OBJ: 2.2

19. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & -5 & 7 \\ 0 & 1 & -2 & 0 & 4 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

The system has ____ solution(s).

a. one
b. two
c. infinite
d. no

ANS: C PTS: 1 OBJ: 2.3

20. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{cccc|c} 1 & 0 & -2 & 4 & -2 \\ 0 & 1 & 3 & 2 & 4 \\ 0 & 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

The system has ____ solution(s).

a. one
b. two
c. infinite
d. no

ANS: D PTS: 1 OBJ: 2.3

21. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -1 \end{array}\right]$$

The number of solution(s) of the system is:

a. none
b. one
c. infinite

ANS: B PTS: 1 OBJ: 2.3

22. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 3 & 2 \\ 0 & 1 & 1 & 4 \end{array}\right]$$

The number of solution(s) of the system is:

a. none
b. one
c. infinite

ANS: C PTS: 1 OBJ: 2.3

23. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & 5 \\ 0 & 1 & 1 & -3 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

The number of solution(s) of the system is:

a. none
b. one
c. infinite

ANS: C PTS: 1 OBJ: 2.3

24. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{cccc|c} 1 & 0 & 1 & 2 & -1 \\ 0 & 1 & 2 & 3 & -7 \\ 0 & 0 & 0 & 0 & 1 \end{array}\right]$$

The number of solution(s) of the system is:

a. none
b. one
c. infinite

ANS: A PTS: 1 OBJ: 2.3

25. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 3 & 6 \\ 0 & 1 & 0 & 5 & 4 \\ 0 & 0 & 0 & 0 & -2 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

The number of solution(s) of the system is:

a. none
b. one
c. infinite

ANS: A PTS: 1 OBJ: 2.3

26. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 4 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 12 \\ 0 & 0 & 0 & 0 & 2 \end{array}\right]$$

The number of solution(s) of the system is:

a. none
b. one
c. infinite

ANS: A PTS: 1 OBJ: 2.3

27. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 2 & 3 \\ 0 & 1 & 0 & 1 & 5 \\ 0 & 0 & 1 & 3 & 6 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

The number of solution(s) of the system is:

a. none
b. one
c. infinite

ANS: C PTS: 1 OBJ: 2.3

28. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 3 & 2 \\ 0 & 1 & -1 & 4 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

The solution to the system is:

a. $(2, 4, 0)$
b. $(2 - 3k, 4 + k, k)$
c. $(3, 2, 4)$
d. no solution

ANS: B PTS: 1 OBJ: 2.3

29. The following matrix is obtained from the augmented matrix of a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 3 & 20 \\ 0 & 1 & 2 & -2 \\ 0 & 0 & 1 & 4 \end{array}\right]$$

The solution to the system is:

a. no solution
b. $(20, -2, 4)$
c. $(3, 2, 1)$
d. $(8, -10, 4)$

ANS: D PTS: 1 OBJ: 2.3

30. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & -5 & 4 \\ 0 & 1 & 2 & -2 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

The solution to the system is:

a. $(4 + 5k, -2 - 2k, k)$
b. $(4, -2, 0)$
c. $(-5, 4, -2)$
d. no solution

ANS: A PTS: 1 OBJ: 2.3

31. The following matrix is a reduced augmented matrix obtained from a system of equations.

$$\left[\begin{array}{ccc|c} 1 & 0 & 6 & 5 \\ 0 & 1 & -4 & 3 \\ 0 & 0 & 2 & -6 \end{array}\right]$$

The solution to the system is:

a. no solution
b. $(23, -9, -3)$
c. $(5, 3, -6)$
d. $(3 + 4k, 5 - 6k, k)$

ANS: B PTS: 1 OBJ: 2.3

32. $\begin{bmatrix} 3 & 2 & 1 \\ 4 & 0 & 1 \end{bmatrix} + \begin{bmatrix} 2 & -3 & 5 \\ 1 & 7 & 6 \end{bmatrix} =$

a. $\begin{bmatrix} 5 & 5 & 6 \\ 5 & 7 & 5 \end{bmatrix}$
b. $\begin{bmatrix} 1 & 5 & -4 \\ 3 & -7 & -5 \end{bmatrix}$
c. $\begin{bmatrix} 5 & -1 & 6 \\ 5 & 7 & 7 \end{bmatrix}$
d. not defined

ANS: C PTS: 1 OBJ: 2.4

33. $A = \begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}, B = \begin{bmatrix} 4 & -2 \\ 5 & -1 \end{bmatrix}$. Find $3A - B$.

a. $\begin{bmatrix} 2 & -1 \\ 4 & 1 \end{bmatrix}$
b. $\begin{bmatrix} -6 & 3 \\ -6 & 3 \end{bmatrix}$
c. $\begin{bmatrix} 6 & -3 \\ 9 & 0 \end{bmatrix}$
d. $\begin{bmatrix} 10 & -5 \\ 14 & -1 \end{bmatrix}$

ANS: A PTS: 1 OBJ: 2.4

34. $\begin{bmatrix} 3 & 5 \\ 4 & 1 \\ 2 & 2 \end{bmatrix} + \begin{bmatrix} -1 & 2 \\ 0 & 1 \\ 4 & 4 \end{bmatrix} =$

a. $\begin{bmatrix} 2 & 7 \\ 4 & 2 \\ 6 & 6 \end{bmatrix}$

b. $\begin{bmatrix} 4 & 3 \\ 4 & 0 \\ 2 & 2 \end{bmatrix}$

c. $\begin{bmatrix} 2 & 3 \\ 4 & 0 \\ -2 & -2 \end{bmatrix}$

d. not defined

ANS: A PTS: 1 OBJ: 2.4

35. $A = \begin{bmatrix} 5 & 1 \\ 3 & 2 \end{bmatrix}, B = \begin{bmatrix} -1 & 3 \\ 4 & 1 \end{bmatrix}$. Find $A - 2B$.

a. $\begin{bmatrix} 3 & 11 \\ 11 & 4 \end{bmatrix}$

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

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

d. $\begin{bmatrix} 7 & -5 \\ -5 & 0 \end{bmatrix}$

ANS: D PTS: 1 OBJ: 2.4

36. $A = \begin{bmatrix} 4 & 3x \\ 5 & -1 \end{bmatrix}, B = \begin{bmatrix} 4 & 9 \\ 5 & -1 \end{bmatrix}$

These matrices are equal when $x =$ _____.

a. 9

b. 6

c. 3
d. 0

ANS: C PTS: 1 OBJ: 2.4

37. $A = \begin{bmatrix} 2x-1 & 5 \\ 0 & 7 \end{bmatrix}, B = \begin{bmatrix} 3x+4 & 5 \\ 0 & -1 \end{bmatrix}$

These matrices are equal when $x =$ _____.

a. -5
b. $\frac{2}{3}$
c. 4
d. There are no values which make them equal.

ANS: A PTS: 1 OBJ: 2.4

38. The size of the matrix $\begin{bmatrix} 1 & 3 & 5 \\ 2 & 0 & 1 \end{bmatrix}$ is:

a. 6
b. 2×3
c. 3×2
d. 3×3

ANS: B PTS: 1 OBJ: 2.4

39. The size of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 2 & 0 & 2 \\ 1 & 1 & 1 \\ -2 & 4 & 3 \end{bmatrix}$ is:

a. 3×4
b. 4×4
c. 4×3
d. 3×3

ANS: C PTS: 1 OBJ: 2.4

40. The dot product of $\begin{bmatrix} 3 & 1 & 4 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ -1 \\ 5 \end{bmatrix}$ is:

a. 14
b. 25
c. 48

d. 21

ANS: B PTS: 1 OBJ: 2.5

41. The dot product of $\begin{bmatrix} 5 & 3 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 4 \end{bmatrix}$ is:

a. 40
b. 32
c. 17
d. 34

ANS: C PTS: 1 OBJ: 2.5

42. $\begin{bmatrix} 3 & 5 \\ -1 & 4 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix} =$

a. $\begin{bmatrix} 3 & 10 \\ -3 & 4 \end{bmatrix}$
b. $\begin{bmatrix} 18 & 11 \\ 11 & 2 \end{bmatrix}$
c. $\begin{bmatrix} 13 & 7 \\ 14 & 1 \end{bmatrix}$
d. $\begin{bmatrix} 3 & -2 \\ 15 & 4 \end{bmatrix}$

ANS: B PTS: 1 OBJ: 2.5

43. For the matrices $A = \begin{bmatrix} 4 & 1 & 2 \\ 6 & -1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 5 \\ 4 & 1 \\ 6 & -7 \end{bmatrix}$ which products are possible?

a. *AB* only
b. *BA* only
c. *AB* and *BA*
d. No product is possible

ANS: C PTS: 1 OBJ: 2.5

44. For the matrices $A = \begin{bmatrix} 3 & 1 & 4 \\ 6 & 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 5 & 0 \\ 2 & 1 & 1 \\ 3 & -1 & 6 \end{bmatrix}$ which products are possible?

a. *AB* only
b. *BA* only
c. *AB* and *BA*
d. No product is possible

ANS: A PTS: 1 OBJ: 2.5

45. $\begin{bmatrix} 1 & 5 \\ -2 & 3 \end{bmatrix}\begin{bmatrix} 4 & -2 \\ 0 & 1 \end{bmatrix} =$

a. $\begin{bmatrix} 20 & 7 \\ 8 & 7 \end{bmatrix}$
b. $\begin{bmatrix} 4 & -10 \\ 0 & 3 \end{bmatrix}$
c. $\begin{bmatrix} 5 & 3 \\ -2 & 4 \end{bmatrix}$
d. $\begin{bmatrix} 4 & 3 \\ -8 & 7 \end{bmatrix}$

ANS: D PTS: 1 OBJ: 2.5

46. The inverse of $\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & -1 \end{bmatrix}$ is:

a. $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & 0 \\ 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 0 & -\frac{1}{2} \end{bmatrix}$
b. $\begin{bmatrix} -1 & 1 & 0 \\ 0 & -1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \end{bmatrix}$

d. $\begin{bmatrix} 1 & 1 & 1 \\ -1 & 1 & 1 \\ 1 & 1 & -1 \end{bmatrix}$

ANS: C PTS: 1 OBJ: 2.6

47. The inverse of $\begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & -2 \end{bmatrix}$ is:

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

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

c. $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & \frac{1}{2} & -1 \end{bmatrix}$

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

ANS: B PTS: 1 OBJ: 2.6

48. For the input-output matrix *A*, and the output matrix *X*, of three industries, find the amounts consumed internally by the production process.

$$A = \begin{bmatrix} 0.10 & 0.15 & 0.10 \\ 0.20 & 0.05 & 0.08 \\ 0.04 & 0.06 & 0.02 \end{bmatrix}, X = \begin{bmatrix} 500 \\ 800 \\ 400 \end{bmatrix}$$

a. $\begin{bmatrix} 210 \\ 172 \\ 760 \end{bmatrix}$

b. $\begin{bmatrix} 200 \\ 150 \\ 75 \end{bmatrix}$

c. $\begin{bmatrix} 210 \\ 172 \\ 76 \end{bmatrix}$

d. $\begin{bmatrix} 220 \\ 190 \\ 100 \end{bmatrix}$

ANS: C PTS: 1 OBJ: 2.7

49. For the input-output matrix *A*, and the output matrix *X*, of three industries, find the amounts consumed internally by the production process.

$$A = \begin{bmatrix} 0.15 & 0.25 & 0.10 \\ 0.05 & 0.05 & 0.12 \\ 0.12 & 0.16 & 0.08 \end{bmatrix}, X = \begin{bmatrix} 1000 \\ 2000 \\ 2500 \end{bmatrix}$$

a. $\begin{bmatrix} 950 \\ 440 \\ 600 \end{bmatrix}$

b. $\begin{bmatrix} 900 \\ 450 \\ 640 \end{bmatrix}$

c. $\begin{bmatrix} 640 \\ 450 \\ 900 \end{bmatrix}$

d. $\begin{bmatrix} 900 \\ 1800 \\ 2200 \end{bmatrix}$

ANS: B PTS: 1 OBJ: 2.7

50. For the input-output matrix *A*, find the output required to meet the demand *D*.

$$A = \begin{bmatrix} 0.4 & 0.2 \\ 0.1 & 0.3 \end{bmatrix}, D = \begin{bmatrix} 3000 \\ 4000 \end{bmatrix}$$

a. $\begin{bmatrix} 2000 \\ 1500 \end{bmatrix}$

b. $\begin{bmatrix} 4200 \\ 6450 \end{bmatrix}$

c. $\begin{bmatrix} 2750 \\ 6750 \end{bmatrix}$

d. $\begin{bmatrix} 7250 \\ 6750 \end{bmatrix}$

ANS: D PTS: 1 OBJ: 2.7

51. For the input-output matrix *A*, find the output required to meet the demand *D*.

$$A = \begin{bmatrix} 0.2 & 0.4 \\ 0.3 & 0.6 \end{bmatrix}, D = \begin{bmatrix} 700 \\ 400 \end{bmatrix}$$

a. $\begin{bmatrix} 200 \\ 150 \end{bmatrix}$

b. $\begin{bmatrix} 2200 \\ 2650 \end{bmatrix}$

c. $\begin{bmatrix} 300 \\ 450 \end{bmatrix}$

d. $\begin{bmatrix} 1250 \\ 3750 \end{bmatrix}$

ANS: B PTS: 1 OBJ: 2.7

SHORT ANSWER

1. Solve the system by substitution.

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

ANS:
$(5, -6)$

PTS: 1 DIF: Level 1 OBJ: 2.1

2. Solve the system by substitution.

$$x - 3y = -9$$
$$4x + 5y = -2$$

ANS:
$(-3, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.1

3. Solve the system by substitution.

$$7x + 2y = 20$$
$$x + y = 5$$

ANS:
$(2, 3)$

PTS: 1 DIF: Level 1 OBJ: 2.1

4. Solve the system by substitution.

$$2x + 4y = -2$$
$$5x - 3y = -31$$

ANS:
$(-5, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.1

5. Solve the system by elimination.

$$3x - y = 4$$
$$9x + 4y = 26$$

ANS:
$(2, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.1

6. Solve the system by elimination.

$3x - y = 6$

$2x + 5y = 38$

ANS:
$(4, 6)$

PTS: 1 DIF: Level 1 OBJ: 2.1

7. Solve the system by elimination.

$2x + 5y = 39$

$3x + 2y = -2$

ANS:
$(-8, 11)$

PTS: 1 DIF: Level 1 OBJ: 2.1

8. Solve the system by elimination.

$6x - 5y = 7$

$9x - 2y = -17$

ANS:
$(-3, -5)$

PTS: 1 DIF: Level 1 OBJ: 2.1

9. Solve the system by elimination.

$0.5x + 1.5y = -1.5$

$2x - 9y = 24$

ANS:
$(3, -2)$

PTS: 1 DIF: Level 1 OBJ: 2.1

10. Solve the system by elimination.

$2x + 3y = 22$

$4x - y = 16$

ANS:
$(5, 4)$

PTS: 1 DIF: Level 1 OBJ: 2.1

11. Solve the system by elimination.

$7x + 3y = -1$

$3x + 4y = 5$

ANS:
$(-1, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.1

12. Solve the system by elimination.

$11x + 3y = 15$

$2x - 2y = -10$

ANS:
$(0, 5)$

PTS: 1 DIF: Level 1 OBJ: 2.1

13. Solve the system by elimination.

$x + 4y = -1$

$3x - 5y = 14$

ANS:
$(3, -1)$

PTS: 1 DIF: Level 1 OBJ: 2.1

14. Solve the system.

$4x + 9y = 5$

$2x - 6y = -1$

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

PTS: 1 DIF: Level 1 OBJ: 2.1

15. Solve the system.

$6x - 2y = 7$

$3x - y = 4$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.1

16. Solve the system.

$$5x - 4y = 8$$
$$7.5x - 6y = 15$$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.1

17. Solve the system.

$$4x - 6y = 10$$
$$6x - 9y = 15$$

ANS:
$(1.5k + 2.5, k)$

PTS: 1 DIF: Level 1 OBJ: 2.1

18. Solve the system.

$$x - 3y = 3$$
$$-4x + 12y = -12$$

ANS:
$(3k + 3, k)$

PTS: 1 DIF: Level 1 OBJ: 2.1

19. Find the solution(s), if any, to the system.

$$4x - 6y = 12$$
$$6x - 9y = 15$$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.1

20. Find the solution(s), if any, to the system.

$$4x - 6y = 12$$
$$6x - 9y = 18$$

ANS:

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

PTS: 1 DIF: Level 1 OBJ: 2.1

21. Find the solution(s), if any, to the system.

$2.5x + 4.5y = 11$

$1.5x + 2.7y = 5.4$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.1

22. Find the solution(s), if any, to the system.

$3x + 9y = 6$

$5x + 15y = 10$

ANS:
$\left(2-3k, k\right)$

PTS: 1 DIF: Level 1 OBJ: 2.1

23. Solve the system of equations, if possible.

$x + 3y = -1$

$3x + y = 13$

$x + 5y = -5$

ANS:
$\left(5, -2\right)$

PTS: 1 DIF: Level 2 OBJ: 2.1

24. Solve the system of equations, if possible.

$x + y = 5$

$x - y = 3$

$2x + 3y = 11$

ANS:
$\left(4, 1\right)$

PTS: 1 DIF: Level 2 OBJ: 2.1

25. Solve the system of equations, if possible.

$$2x + y = 10$$
$$3x - 2y = -6$$
$$x + 4y = 21$$

ANS:
No solution

PTS: 1 DIF: Level 2 OBJ: 2.1

26. Solve the system of equations, if possible.

$$x + 3y = 4$$
$$5x - y = 4$$
$$2x + 2y = 4$$

ANS:
$(1, 1)$

PTS: 1 DIF: Level 2 OBJ: 2.1

27. Solve the system of equations, if possible.

$$2x + 4y = 16$$
$$3x + 6y = 24$$
$$0.5x + y = 4$$

ANS:
$(8 - 2k, k)$

PTS: 1 DIF: Level 2 OBJ: 2.1

28. Solve the system of equations, if possible.

$$x + 3y = 4$$
$$3x + 11y = 7$$
$$x + 5y = -5$$

ANS:
No solution

PTS: 1 DIF: Level 2 OBJ: 2.1

29. Find the solutions of the following systems of equations, if they exist.

(a) $3x + 5y = 11$
$x - 3y = 13$

(b) $x + 2y - 3z = -16$

$2x + 3y + z = 2$

$3x - y + 2z = 0$

(c) $x + 2y - z = 7$

$2x - y + 3z = 3$

$3x + y + 2z = 10$

(d) $x + y - 2z = 7$

$3x - y + z = 3$

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

ANS:
(a) $(7, -2)$

(b) $(-3, 1, 5)$

(c) Infinite number of solutions: $x = \left(\frac{13}{5}\right) - z, \quad y = \left(\frac{11}{5}\right) + z$

(d) No solution

PTS: 1 DIF: Level 2 OBJ: 2.1

30. The demand equation is $y = -4x + 1224$ and the supply equation is $y = 3x - 204$. Find the equilibrium solution.

ANS:
$(204, 408)$

PTS: 1 DIF: Level 2 OBJ: 2.1

31. Find the equilibrium solution for the demand equation $y = -4x + 161$ and the supply equation $y = 3x + 98$.

ANS:
Demand = 9, price = 125

PTS: 1 DIF: Level 2 OBJ: 2.1

32. Find the equilibrium solution for the demand equation $y = -2.4x + 846$ and the supply equation $y = 1.8x + 237$.

ANS:
Demand = 145, price = 498

PTS: 1 DIF: Level 2 OBJ: 2.1

33. The demand equation for VCR sets is $y = -4.5x + 248$ where *x* is the demand in thousands. The supply equation is $y = 6.3x + 86$. Find the equilibrium demand.

ANS:
15

PTS: 1 DIF: Level 2 OBJ: 2.1

34. Roy and Brett use money from savings to attend medical school. When they start Roy has $14,300 in savings and Brett has $11,500. Roy withdraws $335 per month for expenses and Brett withdraws $265 each month.
(a) Find when they have the same amount left.
(b) Find when Brett has $210 more than Roy.

ANS:
(a) 40 months
(b) 43 months

PTS: 1 DIF: Level 2 OBJ: 2.1

35. The campus food service sold 182 box lunches for the Geology field trip and received a total of $1071. The diet lunches cost $5.40 each and the regular lunches sold for $6.10. How many of each sold?

ANS:
56 diet, 126 regular

PTS: 1 DIF: Level 3 OBJ: 2.1

36. Joe bought 100 sandwiches for the club picnic. He paid $1.25 each for the ham sandwiches and $0.85 each for the peanut butter and jelly sandwiches. The total bill was $109.80. How many of each kind did he buy?

ANS:
62 ham and 38 peanut butter

PTS: 1 DIF: Level 3 OBJ: 2.1

37. A club sold fruitcakes for a fund raising project. The two-pound cakes sold for $5 each and the five-pound cakes sold for $11 each. The club sold 323 pounds of cakes and received $749. How many of each did they sell?

ANS:
64 2-lb and 39 5-lb cakes

PTS: 1 DIF: Level 3 OBJ: 2.1

38. A toy store bought toy trucks for $9 each and dolls for $8 each for a total cost of $1772. They sold all the trucks for $15 each and all the dolls for $12 each and received a total of $2796. How many of each were purchased?

ANS:

92 trucks and 118 dolls

PTS: 1 DIF: Level 3 OBJ: 2.1

39. One day the Department Store sold 22 gadgets and 18 widgets for a total of $70.80. The next day they sold 11 gadgets and 35 widgets for a total of $90. What was the price of each?

ANS:
$1.50 for gadgets, $2.10 for widgets

PTS: 1 DIF: Level 3 OBJ: 2.1

40. A family invests a total of $40,000 in two securities, one which pays 7% and one which pays 9%. How much should be invested in each to obtain an annual total return of 7.5%?

ANS:
Invest $30,000 at 7% and $10,000 at 9%

PTS: 1 DIF: Level 3 OBJ: 2.1

41. The annual suicide rate (number per 100,000) of 15-24 year olds is estimated by the linear equation $y = 0.13x + 9.95$ where *x* is the number of years since 1970 and *y* is the annual suicide rate (number per 100,000). For those in the 25-34 year old group the linear equation is $y = 0.01x + 14.87$. Find when the annual suicide rate for these two groups will be equal and find the suicide rate at that time.

ANS:
In the year 2011. The rate = 15.28 per 100,000.

PTS: 1 DIF: Level 3 OBJ: 2.1

42. For the matrix $\begin{bmatrix} 3 & -1 & 2 & 4 \\ 5 & -3 & 6 & 1 \\ 0 & -2 & 9 & 8 \end{bmatrix}$ find:

(a) the $(1,1)$ element
(b) a_{32}
(c) the location of 9

ANS:
(a) 3
(b) -2
(c) $(3,3)$

PTS: 1 DIF: Level 1 OBJ: 2.2

43. For the matrix $\begin{bmatrix} 8 & 2 & 15 \\ 5 & 4 & 9 \\ -2 & 6 & -6 \\ -1 & 11 & 7 \end{bmatrix}$ find:

(a) the $(1, 3)$ element
(b) a_{42}
(c) the location of -1

ANS:
(a) 15
(b) 11
(c) $(4, 1)$

PTS: 1 DIF: Level 1 OBJ: 2.2

44. Write the augmented matrix of the system.

$$8x_1 + 3x_2 + 4x_3 = -1$$
$$x_1 + 2x_2 - 7x_3 = 13$$
$$-3x_1 - x_2 + 5x_3 = 2$$

ANS:
$$\left[\begin{array}{ccc|c} 8 & 3 & 4 & -1 \\ 1 & 2 & -7 & 13 \\ -3 & -1 & 5 & 2 \end{array}\right]$$

PTS: 1 DIF: Level 1 OBJ: 2.2

45. Write the augmented matrix of the system.

$$x_1 - 3x_3 = 5$$
$$2x_1 + 7x_2 + x_3 = 4$$
$$8x_1 - 5x_2 + 7x_3 = 29$$

ANS:
$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & 5 \\ 2 & 7 & 1 & 4 \\ 8 & -5 & 7 & 29 \end{array}\right]$$

PTS: 1 DIF: Level 1 OBJ: 2.2

46. Write the augmented matrix of the system.

$$\begin{aligned} 5x - 2y + 3z &= 17 \\ 2x + 3y - z &= 2 \\ x + y + 7z &= -5 \end{aligned}$$

ANS:

$$\left[\begin{array}{ccc|c} 5 & -2 & 3 & 17 \\ 2 & 3 & -1 & 2 \\ 1 & 1 & 7 & -5 \end{array}\right]$$

PTS: 1 DIF: Level 1 OBJ: 2.2

47. Write the augmented matrix of the system.

$$\begin{aligned} -x_1 + 5x_2 + 4x_3 &= 0 \\ 9x_1 + 4x_2 + x_3 &= 15 \\ 3x_1 + 2x_2 - 6x_3 &= 22 \end{aligned}$$

ANS:

$$\left[\begin{array}{ccc|c} -1 & 5 & 4 & 0 \\ 9 & 4 & 1 & 15 \\ 3 & 2 & -6 & 22 \end{array}\right]$$

PTS: 1 DIF: Level 1 OBJ: 2.2

48. Write the system of equations represented by the augmented matrix.

$$\left[\begin{array}{cc|c} 3 & 5 & 2 \\ 1 & -7 & 6 \end{array}\right]$$

ANS:

$$\begin{aligned} 3x_1 + 5x_2 &= 2 \\ x_1 - 7x_2 &= 6 \end{aligned}$$

PTS: 1 DIF: Level 1 OBJ: 2.2

49. Write the system of equations represented by the augmented matrix.

$$\left[\begin{array}{ccc|c} 1 & 0 & 3 & -4 \\ 2 & 1 & 5 & 7 \\ 1 & 1 & 1 & -5 \end{array}\right]$$

ANS:

$$x_1 + 3x_3 = -4$$
$$2x_1 + x_2 + 5x_3 = 7$$
$$x_1 + x_2 + x_3 = -5$$

PTS: 1 DIF: Level 1 OBJ: 2.2

50. Write the system of equations represented by the augmented matrix.

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 0 \\ 3 & 4 & -2 & 6 \\ -1 & 5 & 8 & 17 \end{array}\right]$$

ANS:

$$x_1 - x_2 + 2x_3 = 0$$
$$3x_1 + 4x_2 - 2x_3 = 6$$
$$-x_1 + 5x_2 + 8x_3 = 17$$

PTS: 1 DIF: Level 1 OBJ: 2.2

51. Perform the row operations indicated and write the resulting matrix.

$$\left[\begin{array}{cc|c} 1 & 5 & 8 \\ 1 & -6 & 14 \end{array}\right] \frac{1}{2}R_2 \to R_2$$

ANS:

$$\left[\begin{array}{cc|c} 1 & 5 & 8 \\ 1 & -3 & 7 \end{array}\right]$$

PTS: 1 DIF: Level 1 OBJ: 2.2

52. Perform the row operations indicated and write the resulting matrix.

$$\left[\begin{array}{ccc|c} 1 & 3 & -1 & 2 \\ 2 & 5 & 2 & 3 \\ -3 & -4 & 6 & 0 \end{array}\right] \begin{array}{l} -2R_1 + R_2 \to R_2 \\ 3R_1 + R_3 \to R_3 \end{array}$$

ANS:

$$\left[\begin{array}{ccc|c} 1 & 3 & -1 & 2 \\ 0 & -1 & 4 & -1 \\ 0 & 5 & 3 & 6 \end{array}\right]$$

PTS: 1 DIF: Level 1 OBJ: 2.2

53. Perform the row operations indicated and write the resulting matrix.

$$\left[\begin{array}{ccc|c} 5 & 6 & 2 & -1 \\ 3 & 1 & -1 & 2 \\ 1 & -1 & 2 & 7 \end{array}\right] \begin{array}{l} -6R_2 + R_1 \to R_1 \\ R_2 + R_3 \to R_3 \end{array}$$

ANS:

$$\left[\begin{array}{ccc|c} -13 & 0 & 8 & -13 \\ 3 & 1 & -1 & 2 \\ 4 & 0 & 1 & 9 \end{array}\right]$$

PTS: 1 DIF: Level 1 OBJ: 2.2

54. The following matrix was obtained by reducing the augmented matrix of a system of equations. From the matrix determine the solution to the system.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 5 \end{array}\right]$$

ANS:

$(-2, 3, 5)$

PTS: 1 DIF: Level 1 OBJ: 2.2

55. The following matrix was obtained by reducing the augmented matrix of a system of equations. From the matrix determine the solution to the system.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \end{array}\right]$$

ANS:

$(5, 0, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.2

56. The following matrix was obtained by reducing the augmented matrix of a system of equations. From the matrix determine the solution to the system.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ 0 & 1 & 0 & \frac{2}{3} \\ 0 & 0 & 1 & -\frac{1}{9} \end{array}\right]$$

ANS:
$\left(-7, \frac{2}{3}, -\frac{1}{9}\right)$

PTS: 1 DIF: Level 1 OBJ: 2.2

57. Solve the system.

$$x_1 - 2x_2 = -8$$
$$2x_1 - 3x_2 = -11$$

ANS:
$(2, 5)$

PTS: 1 DIF: Level 1 OBJ: 2.2

58. Solve the system.

$$2x_1 + 2x_2 = 4$$
$$3x_1 + 2x_2 = 3$$

ANS:
$(-1, 3)$

PTS: 1 DIF: Level 1 OBJ: 2.2

59. Solve the system.

$$3x - y = 0$$
$$5x + 3y = 7$$

ANS:

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

PTS: 1 DIF: Level 1 OBJ: 2.2

60. Solve the system.

$$\begin{aligned} x_1 + 2x_2 + x_3 &= 1 \\ x_2 + 2x_3 &= 5 \\ 2x_1 - x_2 + 3x_3 &= -1 \end{aligned}$$

ANS:
$(-3, 1, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.2

61. Solve the system.

$$\begin{aligned} x_1 - 3x_2 + 2x_3 &= 2 \\ -2x_1 + 5x_2 + 2x_3 &= 3 \\ 3x_2 - 10x_3 &= -5 \end{aligned}$$

ANS:
$(13, 5, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.2

62. Solve the system.

$$\begin{aligned} x_1 + 4x_2 - 2x_3 &= 25 \\ 3x_1 + 6x_2 - 3x_3 &= 39 \\ 2x_1 + 4x_2 + x_3 &= 20 \end{aligned}$$

ANS:
$(1, 5, -2)$

PTS: 1 DIF: Level 1 OBJ: 2.2

63. Solve the system.

$$\begin{aligned} 2x_1 + 3x_2 + x_3 &= 1 \\ x_1 - x_2 + 4x_3 &= 12 \\ 3x_1 + 2x_2 - x_3 &= -11 \end{aligned}$$

ANS:

$(-3, 1, 4)$

PTS: 1 DIF: Level 1 OBJ: 2.2

64. Solve the system.

$$\begin{aligned} x_1 - 2x_3 &= -17 \\ 3x_1 + x_2 + x_3 &= 10 \\ -2x_2 + x_3 &= -17 \end{aligned}$$

ANS:
$(-3, 12, 7)$

PTS: 1 DIF: Level 1 OBJ: 2.2

65. Solve the system.

$$\begin{aligned} x_1 - x_2 + 3x_3 &= 10 \\ 2x_1 + x_2 - 4x_3 &= -3 \\ x_2 + 5x_3 &= 9 \end{aligned}$$

ANS:
$(3, -1, 2)$

PTS: 1 DIF: Level 1 OBJ: 2.2

66. Solve the system.

$$\begin{aligned} x + 2y - 2z &= 9 \\ 2x - y + z &= 3 \\ 2x - 2y + z &= 2 \end{aligned}$$

ANS:
$(3, 1, -2)$

PTS: 1 DIF: Level 1 OBJ: 2.2

67. Solve the system.

$$\begin{aligned} 3x + 5y - 2z &= 3 \\ 2x + 2y &= 6 \\ 5x + 8y - 7z &= -10 \end{aligned}$$

ANS:
$(2, 1, 4)$

PTS: 1 DIF: Level 1 OBJ: 2.2

68. Solve the system.

$$\begin{aligned} 3x_1 + 6x_2 - 3x_4 &= 3 \\ x_1 + 3x_2 - x_3 - 4x_4 &= -12 \\ -x_1 - x_2 + x_3 + 2x_4 &= 8 \\ 2x_1 + 3x_2 &= 8 \end{aligned}$$

ANS:
$(1, 2, 3, 4)$

PTS: 1 DIF: Level 2 OBJ: 2.2

69. Solve the system.

$$\begin{aligned} x_2 + 2x_3 + 6x_4 &= 21 \\ -x_1 + x_2 + x_3 + 5x_4 &= 12 \\ x_1 - x_2 - x_3 - 4x_4 &= -9 \\ 3x_1 - 2x_1 - 6x_4 &= -4 \end{aligned}$$

ANS:
$(4, -1, 2, 3)$

PTS: 1 DIF: Level 2 OBJ: 2.2

70. The following matrix was obtained by reducing the augmented matrix of a system of equations. From the matrix determine the solution to the system.

$$\left[\begin{array}{ccc|c} 1 & 2 & 1 & 5 \\ 0 & 1 & 3 & -2 \\ 0 & 0 & 1 & 4 \end{array}\right]$$

ANS:
$(29, -14, 4)$

PTS: 1 DIF: Level 2 OBJ: 2.2

71. The following matrix was obtained by reducing the augmented matrix of a system of equations. From the matrix determine the solution to the system.

$$\left[\begin{array}{ccc|c} 1 & 1 & -2 & 6 \\ 0 & 0 & 1 & 3 \\ 0 & 1 & 1 & 7 \end{array}\right]$$

ANS:
$(8,4,3)$

PTS: 1 DIF: Level 2 OBJ: 2.2

72. The following matrix was obtained by reducing the augmented matrix of a system of equations. From the matrix determine the solution to the system.

$$\left[\begin{array}{ccc|c} 1 & 2 & -2 & 5 \\ 0 & 1 & 0 & -2 \\ 0 & -2 & 1 & 6 \end{array}\right]$$

ANS:
$(13,-2,2)$

PTS: 1 DIF: Level 2 OBJ: 2.2

73. Set up the system of equations for the following problem. **Do not solve.**

An electronics firm has three production facilities I, II, III. Each one produces radios, stereos, and TV sets. Their production capacities are

Plant I: 18 radios, 17 stereos, and 5 TV sets per hour
Plant II: 9 radios, 12 stereos and 10 TV sets per hour
Plant III: 20 radios, 6 stereos, and 9 TV sets per hour

The firm receives an order for 1500 radios, 1250 stereos, and 1900 TV sets. How many hours should each plant be scheduled in order to produce these items?

ANS:
$18x_1 + 9x_2 + 20x_3 = 1500$

$17x_1 + 12x_2 + 6x_3 = 1250$

$5x_1 + 10x_2 + 9x_3 = 1900$

PTS: 1 DIF: Level 3 OBJ: 2.2

74. A car dealer bought some pickups, vans, sedans. He paid \$9,000 for each pickup, \$16,000 for each van, and \$11,000 for each sedan. He bought a total of 16 vehicles at a total cost of \$181,000. The number of sedans equaled the total number of vans and pickups. Set up the system of equations used to find the number of each type vehicle. **Do not solve.**

ANS:

$$x_1 + x_2 + x_3 = 16$$

$$9000x_1 + 16000x_2 + 11000x_3 = 181,000$$

$$x_3 = x_1 + x_2$$

PTS: 1 DIF: Level 3 OBJ: 2.2

75. An appliance dealer is offered an excellent price on washers and dryers. He pays $280 each for the washers, $100 each for the dryers, and paid a total of $18,040. The number of washers and dryers totaled 85. How many of each did he buy?

ANS:
53 washers and 32 dryers

PTS: 1 DIF: Level 3 OBJ: 2.2

76. Three groups of students went to the Burger Barn for a study break and snack. The first group ordered 4 Burgers, 5 fries, and 7 soft drinks for a total of $25.60. The second group ordered 8 Burgers, 5 fries, and 6 soft drinks for a total of $37.90. The third group ordered 12 Burgers, 10 fries, and 11 soft drinks for a total of $61.30. Find the cost of a Burger, an order of fries, and a soft drink.

ANS:
Burger $3.35, fries $0.90, and soft drink $1.10.

PTS: 1 DIF: Level 3 OBJ: 2.2

77. The campus chapter of Habitat for Humanity spent several Saturdays building a house for a low income family. The Alpha, Beta, and Gamma club members volunteered. On the first Saturday the Alpha Club members worked 4 hours each, the Beta Club members worked 6 hours each, and the Gamma Club members worked 8 hours each. The combined person-hours of the three clubs totaled 232 hours. On the second Saturday the Alpha Club members worked 6 hours each, the Beta Club members worked 8 hours each, and the Gamma Club members worked 10 hours each. The combined person-hours of the three clubs totaled 306 hours. On the third Saturday the Alpha Club members worked 8 hours each, the Beta Club members worked 9 hours each, and the Gamma Club members worked 5 hours each. The combined person-hours of the three clubs totaled 263 hours. Each club had the same number of volunteers working each Saturday. Find the number of members each club had working.

ANS:
Alpha Club-10 members, Beta Club-12 members, and the Gamma Club-15 members

PTS: 1 DIF: Level 3 OBJ: 2.2

78. A child has 25 coins consisting of nickels, dimes, and quarters. He has twice as many dimes as quarters. The total value is $3.05. How many of each coin does he have?

ANS:
7 nickels, 12 dimes, and 6 quarters

PTS: 1 DIF: Level 3 OBJ: 2.2

79. Find the reduced echelon form of $\left[\begin{array}{cc|c} 1 & 2 & 4 \\ 0 & 3 & 6 \\ 0 & 2 & 4 \end{array}\right]$.

ANS:
$\left[\begin{array}{cc|c} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{array}\right]$

PTS: 1 DIF: Level 1 OBJ: 2.3

80. Find the reduced echelon form of $\left[\begin{array}{cc|c} 1 & 2 & 4 \\ 0 & 3 & 6 \\ 1 & 4 & 2 \end{array}\right]$.

ANS:
$\left[\begin{array}{cc|c} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array}\right]$

PTS: 1 DIF: Level 1 OBJ: 2.3

81. Find the reduced echelon form of $\left[\begin{array}{ccc|c} 1 & 2 & 3 & -1 \\ 2 & 5 & 8 & 3 \\ -3 & 4 & 1 & -2 \\ 1 & -9 & -9 & -1 \end{array}\right]$.

ANS:
$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -\frac{11}{2} \\ 0 & 1 & 0 & -6 \\ 0 & 0 & 1 & \frac{11}{2} \\ 0 & 0 & 0 & 0 \end{array}\right]$

PTS: 1 DIF: Level 1 OBJ: 2.3

82. Find the reduced echelon form of $\left[\begin{array}{cccc|c} 1 & 2 & 0 & 0 & 5 \\ 3 & 7 & 0 & 5 & 10 \\ 2 & 0 & -1 & 2 & 2 \end{array}\right]$.

ANS:
$\left[\begin{array}{cccc|c} 1 & 0 & 0 & -10 & 15 \\ 0 & 1 & 0 & 5 & -5 \\ 2 & 0 & 1 & -22 & 28 \end{array}\right]$

PTS: 1 DIF: Level 1 OBJ: 2.3

83. Find the reduced echelon form of $\left[\begin{array}{cccc|c} 1 & 0 & 4 & 2 & 6 \\ 1 & 1 & 6 & 5 & 10 \\ 0 & 2 & 4 & 7 & 10 \\ 2 & 3 & 14 & 14 & 26 \end{array}\right]$.

ANS:
$\left[\begin{array}{cccc|c} 1 & 0 & 4 & 0 & 2 \\ 0 & 1 & 2 & 0 & -2 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$

PTS: 1 DIF: Level 1 OBJ: 2.3

84. The matrix given is a reduced matrix for a system of equations. From the matrix give the solution of the system.

$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 2 & 3 \\ 0 & 1 & 0 & 4 & -1 \\ 0 & 0 & 1 & 2 & 5 \end{array}\right]$

ANS:
$(3-2k, -1-4k, 5-2k, k)$

PTS: 1 DIF: Level 1 OBJ: 2.3

85. The matrix given is a reduced matrix for a system of equations. From the matrix give the solution of the system.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 4 \end{array}\right]$$

ANS:
$(5, 2, 4)$

PTS: 1 DIF: Level 1 OBJ: 2.3

86. The matrix given is a reduced matrix for a system of equations. From the matrix give the solution of the system.

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 4 & 3 \\ 0 & 1 & 0 & 3 & -2 \\ 0 & 0 & 1 & 6 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

ANS:
$(3 - 4k, -2 - 3k, 1 - 6k, k)$

PTS: 1 DIF: Level 1 OBJ: 2.3

87. The matrix given is a reduced matrix for a system of equations. From the matrix give the solution of the system.

$$\left[\begin{array}{ccccc|c} 1 & 0 & 0 & -1 & 2 & 4 \\ 0 & 1 & 0 & 3 & 5 & -2 \\ 0 & 0 & 1 & 1 & 7 & 3 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

ANS:
$(4 + r - 2s, -2 - 3r - 5s, 3 - r - 7s, r, s)$

PTS: 1 DIF: Level 1 OBJ: 2.3

88. The matrix given is a reduced matrix for a system of equations. From the matrix give the solution of the system.

$$\left[\begin{array}{ccc|c} 2 & 1 & 3 & 6 \\ 0 & 0 & 0 & -1 \\ 0 & 0 & 8 & 9 \end{array}\right]$$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

89. The matrix given is a reduced matrix for a system of equations. From the matrix give the solution of the system.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

90. Find the solutions of the system.

$$x_1 + 2x_2 - x_3 = 3$$
$$x_1 + 3x_2 - x_3 = 4$$
$$x_1 + x_2 - x_3 = 2$$

ANS:
$x_1 = 1 + x_3,\ x_2 = 1$

PTS: 1 DIF: Level 1 OBJ: 2.3

91. Find the solutions of the system.

$$x_1 + x_2 + 2x_3 = 5$$
$$3x_1 + 2x_2 = 4$$
$$2x_1 + x_2 - 2x_3 = -1$$

ANS:
$x_1 = -6 + 4x_3,\ x_2 = 11 - 6x_3$

PTS: 1 DIF: Level 1 OBJ: 2.3

92. Find the solutions of the system.

$$x_1 + 2x_3 = 5$$
$$x_1 - 2x_2 + 4x_3 = 10$$
$$3x_1 - 2x_2 + 8x_3 = 20$$

ANS:
$x_1 = 5 - 2x_3,\ x_2 = -\frac{5}{2} + x_3$

PTS: 1 DIF: Level 1 OBJ: 2.3

93. Find the solutions to the system.

$$x_1 + 5x_2 - x_3 = 1$$
$$-3x_1 + x_2 + 3x_3 = -3$$
$$-x_1 + x_2 + x_3 = -1$$

ANS:
$x_1 = 1 + x_3,\ x_2 = 0$

PTS: 1 DIF: Level 1 OBJ: 2.3

94. Find the solutions to the system.

$$x_1 + 2x_2 - x_3 = -1$$
$$2x_1 - 3x_2 + 2x_3 = 15$$
$$x_1 - 5x_2 + 3x_3 = 16$$

ANS:
$x_1 = \frac{27}{7} - \frac{1}{7}x_3,\ x_2 = -\frac{17}{7} + \frac{4}{7}x_3$

PTS: 1 DIF: Level 1 OBJ: 2.3

95. Find the solutions to the system.

$$x_1 - x_2 + x_3 = 0$$
$$x_1 + 2x_2 - 3x_3 = 0$$
$$3x_1 - x_3 = 0$$

ANS:
$x_1 = \frac{1}{3}x_3,\ x_2 = \frac{4}{3}x_3$

PTS: 1 DIF: Level 1 OBJ: 2.3

96. Find the solutions to the system.

$$2x_1 + 4x_2 + 2x_3 = 6$$
$$x_1 + x_2 + 2x_3 = 9$$
$$2x_1 + 3x_2 + 3x_3 = 12$$

ANS:
$x_1 = 15 - 3x_3,\ x_2 = -6 + x_3$

PTS: 1 DIF: Level 1 OBJ: 2.3

97. Find the solutions to the system.

$$x_1 + x_2 + x_3 + x_4 = 4$$
$$x_1 + 2x_2 - x_3 - x_4 = 7$$
$$2x_1 + 3x_2 = 11$$
$$3x_1 + 4x_2 + x_3 + x_4 = 15$$

ANS:
$x_1 = 1 - 3x_3 - 3x_4,\ x_2 = 3 + 2x_3 + 2x_4$

PTS: 1 DIF: Level 1 OBJ: 2.3

98. Find the solutions, if any, to the system.

$$x_1 + 2x_2 - 3x_3 = -6$$
$$x_1 - 3x_2 - 7x_3 = 10$$
$$2x_1 - x_2 - 10x_3 = 8$$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

99. Find the solutions, if any, to the system.

$$x_1 + x_2 + 2x_3 + x_4 = 3$$
$$x_1 + 2x_2 + x_3 + x_4 = 2$$
$$3x_1 + 4x_2 + 5x_3 + 3x_4 = 5$$
$$x_1 + 3x_3 + x_4 = 4$$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

100. Find the solutions, if any, to the system.

$x_1 + 3x_2 + 2x_3 = 15$

$3x_1 + 2x_2 + x_3 = 14$

$2x_1 - x_2 - x_3 = 0$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

101. Find the solutions, if any, to the system.

$x_1 + 2x_2 + x_3 = 6$

$x_1 - x_3 = 0$

$2x_1 + x_2 - x_3 = 5$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

102. Find the solutions, if any, to the system.

$2x_1 + x_2 - 4x_3 + 5x_4 = 9$

$4x_1 + 3x_2 + 6x_3 + x_4 = 7$

$3x_1 + 2x_2 + x_3 + 3x_4 = 10$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

103. Find the solutions, if any, to the system.

$3x_1 - x_2 = 4$

$6x_1 + 5x_2 - x_3 = 4$

$3x_1 - 8x_2 + x_3 = 6$

ANS:
No solution

PTS: 1 DIF: Level 1 OBJ: 2.3

104. The following matrices represent the reduced echelon form of a system of equations. Find the solution given by these reduced matrices.

(a) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & -5 \\ 0 & 0 & 1 & 4 \end{array}\right]$

(b) $\left[\begin{array}{cccc|c} 1 & 0 & 1 & 0 & 7 \\ 0 & 1 & 2 & 0 & 3 \\ 0 & 0 & 0 & 1 & -6 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$

(c) $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & 4 & 0 \\ 0 & 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{array}\right]$

ANS:
(a) $x_1 = 3,\ x_2 = -5,\ x_3 = 4$

(b) $x_1 = 7 - x_3,\ x_2 = 3 - 2x_3,\ x_4 = -6$

(c) No solution

PTS: 1 DIF: Level 2 OBJ: 2.3

105. Solve the system.

$$\begin{aligned} 2x_1 + x_2 - 3x_3 + 2x_4 &= 4 \\ x_1 - 2x_3 + 2x_4 &= 4 \\ x_1 + 2x_2 - x_3 - x_4 &= -1 \\ 3x_1 + x_2 + x_4 &= 1 \end{aligned}$$

ANS:
$(-2, 3, 1, 4)$

PTS: 1 DIF: Level 2 OBJ: 2.3

106. Solve the system of equations, if possible.

$$\begin{aligned} x_1 + 2x_2 - x_3 &= 13 \\ 3x_1 + 5x_2 - x_3 &= 35 \\ 2x_1 + 3x_2 &= 22 \end{aligned}$$

ANS:
$(5-3k, 4+2k, k)$

PTS: 1 DIF: Level 2 OBJ: 2.3

107. Solve the system of equations, if possible.

$$x_1 + x_2 + 6x_3 = 2$$
$$x_1 - 2x_2 - 6x_3 = -7$$
$$2x_1 + x_2 + 8x_3 = 3$$

ANS:
No solution

PTS: 1 DIF: Level 2 OBJ: 2.3

108. Find the solutions to the system.

$$2x_1 - 4x_2 - 14x_3 = 6$$
$$x_1 - x_2 - 5x_3 = 4$$
$$2x_1 - 4x_2 - 17x_3 = 9$$
$$-x_1 + 3x_2 + 10x_3 = -3$$
$$2x_2 + 2x_3 = 4$$

ANS:
$(2, 3, -1)$

PTS: 1 DIF: Level 2 OBJ: 2.3

109. Find the solutions to the system.

$$x_1 + 2x_2 - x_3 - x_4 = 0$$
$$x_1 + 2x_2 + x_4 = 4$$
$$-x_1 - 2x_2 + 2x_3 + 4x_4 = 5$$
$$-x_1 - x_2 - x_3 = 1$$

ANS:
$(-9, 6, 2, 1)$

PTS: 1 DIF: Level 2 OBJ: 2.3

110. Find the solutions to the system.

$$x_1 + x_2 + x_3 - x_4 = -3$$
$$2x_1 + 3x_2 + x_3 - 5x_4 = -9$$
$$x_1 + 3x_2 - x_3 - 6x_4 = 7$$

ANS:
$(-32 - 2r, 45 + r, r, 16)$

PTS: 1 DIF: Level 2 OBJ: 2.3

111. A craftsman makes jewelry boxes, miniature, regular and large sizes. He spends 1, 1.5, and 1.75 hours each, respectively, in making the boxes. He spends .5, 1, and 2 hours each, respectively, in finishing the boxes. For one crafts show, he made 62 boxes, spent 89.5 hours making them, and 72 hours finishing them. How many did he make of each kind?

ANS:
16 miniature, 28 regular, 18 large

PTS: 1 DIF: Level 3 OBJ: 2.3

112. Bill and Bob's Burgers ran a special in which they sold Burgers for $1.00 each, Big Burgers for $1.50 each, and Cheese Burgers for $1.75 each. They sold a total of 1240 burgers. The number of Cheese Burgers equaled the total number of Burgers and Big Burgers. The total receipts were $1895. How many of each did they sell?

ANS:
240 Burgers, 380 Big Burgers, 620 Cheese Burgers

PTS: 1 DIF: Level 3 OBJ: 2.3

113. A portfolio contains three stocks, *A*, *B*, and *C*. At the end of each week the price of each stock and the value of the portfolio are recorded. For three weeks the records show the following.

	Week 1	Week 2	Week 3
Price of *A*	40	48	44
Price of *B*	50	48	49
Price of *C*	60	64	62
Total Value	5400	5600	5500

Find the number of shares of each stock.

ANS:
Stock $A = \frac{130}{3} - \frac{2}{3}(\text{No. of } C)$,
Stock $B = \frac{220}{3} - \frac{2}{3}(\text{No. of } C)$

PTS: 1 DIF: Level 3 OBJ: 2.3

114. Find the value of *x* that makes these matrices equal.

$$\begin{bmatrix} 1 & 3x+2 & 17 \\ 4 & 3 & -1 \\ 2 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & x+6 & 17 \\ 4 & 3 & -1 \\ 2 & 0 & 1 \end{bmatrix}$$

ANS:
$x = 2$

PTS: 1 DIF: Level 1 OBJ: 2.4

115. Find the value of *x* that makes the matrices equal.

$$\begin{bmatrix} 2 & 2x+1 \\ -14 & 21 \end{bmatrix} = \begin{bmatrix} 2 & 5x+6 \\ -14 & 21 \end{bmatrix}$$

ANS:
$x = -\frac{5}{3}$

PTS: 1 DIF: Level 1 OBJ: 2.4

116. Find the value of *x* that makes these matrices equal.

$$\begin{bmatrix} 4 & 6x-2 \\ 3 & 9 \end{bmatrix} = \begin{bmatrix} 4 & 3x+5 \\ 3 & 9 \end{bmatrix}$$

ANS:
$x = \frac{7}{3}$

PTS: 1 DIF: Level 1 OBJ: 2.4

117. If possible, add the matrices.

$$\begin{bmatrix} 3 & 2 \\ 1 & 0 \end{bmatrix} + \begin{bmatrix} -2 & 4 \\ 1 & 1 \end{bmatrix}$$

ANS:
$$\begin{bmatrix} 1 & 6 \\ 2 & 1 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.4

118. If possible, add the matrices.

$$\begin{bmatrix} 3 & 2 & 1 & 4 \end{bmatrix} + \begin{bmatrix} 6 & -1 & 2 & 5 \end{bmatrix}$$

ANS:
$\begin{bmatrix} 9 & 1 & 3 & 9 \end{bmatrix}$

PTS: 1 DIF: Level 1 OBJ: 2.4

119. If possible, add the matrices.

$$\begin{bmatrix} 3 & 1 & 5 \\ 2 & 4 & 6 \end{bmatrix} + \begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix}$$

ANS:
Not possible

PTS: 1 DIF: Level 1 OBJ: 2.4

120. If possible, add the matrices.

$$\begin{bmatrix} 1 & 3 & 5 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \\ 4 \end{bmatrix}$$

ANS:
Not possible

PTS: 1 DIF: Level 1 OBJ: 2.4

121. If possible, add the matrices.

$$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 1 & 2 \\ 1 & 0 & 0 \end{bmatrix} + \begin{bmatrix} 4 & -1 & 0 \\ 5 & 2 & 2 \\ -1 & 0 & 0 \end{bmatrix}$$

ANS:
$\begin{bmatrix} 5 & 2 & 5 \\ 7 & 3 & 4 \\ 0 & 0 & 0 \end{bmatrix}$

PTS: 1 DIF: Level 1 OBJ: 2.4

122. Perform the scalar multiplication.

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

ANS:

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

PTS: 1 DIF: Level 1 OBJ: 2.4

123. Perform the scalar multiplication.

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

ANS:

$$\begin{bmatrix} -2 & -8 & -2 \\ -6 & 4 & -4 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.4

124. Perform the scalar multiplication.

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

ANS:

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

PTS: 1 DIF: Level 1 OBJ: 2.4

125. Perform the following matrix operations.

(a) $\begin{bmatrix} 2 & 1 & 4 \\ 3 & -2 & 1 \end{bmatrix} + \begin{bmatrix} 1 & -3 & 1 \\ 5 & 7 & 2 \end{bmatrix}$

(b) $3\begin{bmatrix} 4 & 2 \\ -1 & 5 \end{bmatrix}$

ANS:

(a) $\begin{bmatrix} 3 & -2 & 5 \\ 8 & 5 & 3 \end{bmatrix}$

(b) $\begin{bmatrix} 12 & 6 \\ -3 & 15 \end{bmatrix}$

PTS: 1 DIF: Level 1 OBJ: 2.4

126. $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \\ -5 & 0 \end{bmatrix}, B = \begin{bmatrix} 8 & 1 \\ -2 & 2 \\ 7 & 3 \end{bmatrix}$. Find $2A + 3B$.

ANS:
$\begin{bmatrix} 28 & 5 \\ 0 & 14 \\ 11 & 9 \end{bmatrix}$

PTS: 1 DIF: Level 1 OBJ: 2.4

127. $A = \begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}, B = \begin{bmatrix} 3 & 5 \\ 0 & 4 \end{bmatrix}, C = \begin{bmatrix} -2 & 2 \\ 3 & -3 \end{bmatrix}$. Find $A + 2B - C$.

ANS:
$\begin{bmatrix} 10 & 9 \\ -7 & 14 \end{bmatrix}$

PTS: 1 DIF: Level 1 OBJ: 2.4

128. Summarize the following information in matrix form.

A survey of three campus departments found the following information on the number of people working in the departments.

English: 48 faculty, 4 office staff, and 15 student workers
Mathematics: 25 faculty, 2 office staff, and 11 student workers
Philosophy: 5 faculty, 1 office staff, and 4 student workers

ANS:

	E	M	P
Faculty	48	25	5
Staff	4	2	1
Student	15	11	4

PTS: 1 DIF: Level 2 OBJ: 2.4

129. A paperbook bookstore has three locations, the mall, downtown, and campus. The average monthly sales of western, romance, and mystery paperbacks are summarized by the matrix.

	Mall	D-town	Campus
Western	475	300	125
Romance	350	240	560
Mystery	620	400	230

Based on this, find the annual sales by each category.

ANS:

	Mall	D-town	Campus
Western	5700	3600	1500
Romance	4200	2880	6720
Mystery	7440	4800	2760

PTS: 1 DIF: Level 2 OBJ: 2.4

130. The campus food service recorded the number of students eating in Penland Cafeteria on three days. Summarize their findings in matrix form.

On Thursday 256 ate breakfast, 352 ate lunch, and 297 ate dinner.
On Friday 283 ate breakfast, 407 ate lunch, and 268 ate dinner.
On Saturday 38 ate breakfast, 229 ate lunch and 116 ate dinner.

ANS:

	Thu	Fri	Sat
Breakfast	256	283	38
Lunch	352	407	229
Dinner	297	268	116

PTS: 1 DIF: Level 2 OBJ: 2.4

131. Summarize the following information in matrix form.

In the fall semester of 2000 Math 1301 had 69 students, Math 1315 had 46 students, and Math 1321 had 114 students.
In the spring semester of 2001 Math 1301 had 78 students, Math 1315 had 33 students, and Math 1321 had 59 students.
In the summer session of 2001 Math 1301 had 22 students, Math 1315 had 17 students, and Math 1321 had 28 students.

ANS:

$$\begin{array}{c} \\ \text{Fall} \\ \text{Spring} \\ \text{Summer} \end{array} \begin{array}{c} \begin{array}{ccc} 1301 & 1315 & 1321 \end{array} \\ \begin{bmatrix} 69 & 46 & 114 \\ 78 & 33 & 59 \\ 22 & 17 & 28 \end{bmatrix} \end{array}$$

PTS: 1 DIF: Level 2 OBJ: 2.4

132. Find the dot product.

$$\begin{bmatrix} 2 & 0 & 7 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$

ANS:
9

PTS: 1 DIF: Level 1 OBJ: 2.5

133. Find the dot product.

$$\begin{bmatrix} 2 & -1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 4 \\ 5 \\ -2 \end{bmatrix}$$

ANS:
-3

PTS: 1 DIF: Level 1 OBJ: 2.5

134. Find the dot product.

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

ANS:
13

PTS: 1 DIF: Level 1 OBJ: 2.5

135. Find the matrix product.

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

ANS:
$$\begin{bmatrix} 6 & 17 \\ 10 & -2 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

136. Find the matrix product.

$$\begin{bmatrix} 1 & 4 \\ 9 & 2 \end{bmatrix}\begin{bmatrix} 6 \\ 2 \end{bmatrix}$$

ANS:
$$\begin{bmatrix} 14 \\ 58 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

137. Find the matrix product.

$$\begin{bmatrix} 2 & 0 & 3 \\ 1 & 5 & -1 \\ 4 & 1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 3 & 1 \\ 1 & 2 & 5 \\ 0 & 4 & 2 \end{bmatrix}$$

ANS:
$$\begin{bmatrix} 2 & 18 & 8 \\ 6 & 9 & 24 \\ 5 & 18 & 11 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

138. Find the matrix product.

$$\begin{bmatrix} 2 & 1 & 0 \\ 3 & 2 & 2 \end{bmatrix}\begin{bmatrix} 4 & -1 & 6 \\ 2 & 1 & 1 \\ 3 & 2 & 3 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 10 & -1 & 13 \\ 22 & 3 & 26 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

139. Find the matrix product.

$$\begin{bmatrix} 3 & 1 & 2 & 4 \\ 1 & -1 & 2 & 2 \\ 3 & 1 & 5 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 3x_1 + x_2 + 2x_3 + 4x_4 \\ x_1 - x_2 + 2x_3 + 2x_4 \\ 3x_1 + x_2 + 5x_3 + 4x_4 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

140. $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & 6 \\ -1 & 1 \end{bmatrix}$. Find *AB* and *BA*, if possible.

ANS:

$$AB = \begin{bmatrix} 0 & 9 \\ 5 & 13 \end{bmatrix}, BA = \begin{bmatrix} 15 & 15 \\ 1 & -2 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

141. $A = \begin{bmatrix} 2 & 3 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$. Find *AB* and *BA*, if possible.

ANS:

$AB = \begin{bmatrix} 21 \\ 11 \end{bmatrix}$, BA not possible.

PTS: 1 DIF: Level 1 OBJ: 2.5

142. $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ -1 & 5 \\ 2 & -2 \end{bmatrix}$. Find *AB* and *BA* if possible.

ANS:

$AB = \begin{bmatrix} 1 & 19 \\ 5 & -1 \end{bmatrix}$, $BA = \begin{bmatrix} 5 & 3 & 7 \\ 3 & -3 & 9 \\ 2 & 6 & -2 \end{bmatrix}$

PTS: 1 DIF: Level 1 OBJ: 2.5

143. Perform the matrix multiplication.

$$\begin{bmatrix} 3 & -1 & 0 \\ 2 & 4 & 6 \\ 1 & 7 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 3 & -1 & 0 \\ 2 & 4 & 6 \\ 1 & 7 & 1 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

144. Perform the matrix multiplication.

$$\begin{bmatrix} 5 & 2 & 1 \\ 0 & -2 & 2 \\ 3 & 4 & 1 \end{bmatrix} \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 1 & 2 & 5 \\ 2 & -2 & 0 \\ 1 & 4 & 3 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

145. Three farmers each grow wheat, oats, and corn. The matrix summarizes the number of bushels (in thousands that each one produced).

$$\begin{array}{r} \\ \\ A \\ \text{Farmer } B \\ C \end{array} \begin{array}{c} \text{Bushels produced} \\ \begin{array}{ccc} \text{wheat} & \text{oats} & \text{corn} \end{array} \\ \begin{bmatrix} 15 & 8 & 22 \\ 12 & 9 & 14 \\ 30 & 5 & 12 \end{bmatrix} \end{array}$$

Use matrix multiplication to find the total income of each farmer if the price per bushel are: Wheat, \$3.20; oats, \$1.40; and corn \$2.60.

ANS:

$$\begin{array}{r} \\ A \\ \text{Farmer } B \\ C \end{array} \begin{array}{c} \text{Total Income} \\ \text{(Thousands)} \\ \begin{bmatrix} \$116.4 \\ \$87.4 \\ \$134.2 \end{bmatrix} \end{array}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

146. A plant has three production lines I, II, and III. All three produce small, medium, and large sizes of laundry detergent. The number produced per hour is given by the matrix.

$$\begin{array}{r} \\ \text{small} \\ \text{medium} \\ \text{large} \end{array} \begin{array}{c} \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 140 & 110 & 85 \\ 120 & 130 & 140 \\ 80 & 65 & 90 \end{bmatrix} \end{array}$$

Find the number of each size that is produced if Line I operates 8 hours, Line II, 7 hours, and Line III, 10 hours.

ANS:

$$\begin{bmatrix} 140 & 110 & 85 \\ 120 & 130 & 140 \\ 80 & 65 & 90 \end{bmatrix} \begin{bmatrix} 8 \\ 7 \\ 10 \end{bmatrix} = \begin{bmatrix} 2740 \\ 3270 \\ 1995 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.5

147. The Snack Shop makes 3 mixes of nuts in the following proportions.

Mix I: 6 pounds of peanuts, 2 pounds of cashews, and 2 pounds of pecans
Mix II: 5 pounds of peanuts, 3 pounds of cashews, and 2 pounds of pecans
Mix III: 3 pounds of peanuts, 4 pounds of cashews, and 3 pounds of pecans

They received an order for 25 of Mix I, 18 of Mix II, and 35 of Mix III. Write the matrices A and B for which AB gives the total number of pounds of each nut required to fill the order.

ANS:

$$\begin{array}{c} \\ \text{Peanuts} \\ \text{Cashews} \\ \text{Pecans} \end{array}\begin{array}{c} \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 6 & 5 & 3 \\ 2 & 3 & 4 \\ 2 & 3 & 3 \end{bmatrix} \end{array} = A \qquad \begin{array}{c} \\ \text{I} \\ \text{II} \\ \text{III} \end{array}\begin{bmatrix} 25 \\ 18 \\ 35 \end{bmatrix} = B$$

$$A = \begin{array}{c} \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 25 & 18 & 35 \end{bmatrix} \end{array} \qquad \begin{array}{c} \\ \text{I} \\ \text{II} \\ \text{III} \end{array}\begin{array}{c} \begin{array}{ccc} \text{Peanut} & \text{Cashew} & \text{Pecan} \end{array} \\ \begin{bmatrix} 6 & 2 & 2 \\ 5 & 3 & 2 \\ 3 & 4 & 3 \end{bmatrix} \end{array} = B$$

PTS: 1 DIF: Level 1 OBJ: 2.5

148. The Humidor blends regular coffee, high mountain coffee, and chocolate to obtain three kinds of coffee: Early Riser, After Dinner, and Deluxe. The Early Riser blend is 80% regular and 20% high mountain coffee. The After Dinner blend is 75% regular, 20% high mountain, and 5% chocolate. The Deluxe is 50% regular, 40% high mountain, and 10% chocolate. They receive an order for 65 pounds of Early Riser, 80 pounds of After Dinner, and 40 pounds Deluxe.

Write the matrices *A* and *B* for which *AB* gives the amount of regular, high mountain coffee, and chocolate required to fill the order.

ANS:

$$\begin{array}{c} \\ \text{Reg} \\ \text{H.M.} \\ \text{Choc.} \end{array}\begin{array}{c} \begin{array}{ccc} \text{E.R.} & \text{A.D.} & \text{D.} \end{array} \\ \begin{bmatrix} 0.80 & 0.75 & 0.50 \\ 0.20 & 0.20 & 0.40 \\ 0 & 0.05 & 0.10 \end{bmatrix} \end{array} = A$$

$$\begin{array}{c} \\ \text{E.R.} \\ \text{A.D.} \\ \text{D.} \end{array}\begin{bmatrix} 65 \\ 80 \\ 40 \end{bmatrix} = B$$

PTS: 1 DIF: Level 1 OBJ: 2.5

149. Determine if *B* is the inverse of *A*.

$$A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}, B = \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$$

ANS:
Yes, because $AB = I$

PTS: 1 DIF: Level 1 OBJ: 2.6

150. Determine if *B* is the inverse of *A*.

$$A = \begin{bmatrix} 3 & 5 \\ 2 & 3 \end{bmatrix}, B = \begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix}$$

ANS:
No, because $AB \neq I$

PTS: 1 DIF: Level 1 OBJ: 2.6

151. Determine if *B* is the inverse of *A*.

$$A = \begin{bmatrix} 2 & 4 \\ 2 & 5 \end{bmatrix}, B = \begin{bmatrix} \frac{5}{2} & -2 \\ -1 & 1 \end{bmatrix}$$

ANS:
Yes, because $AB = I$

PTS: 1 DIF: Level 1 OBJ: 2.6

152. Find the inverse of this matrix, if possible.

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

ANS:
No inverse

PTS: 1 DIF: Level 1 OBJ: 2.6

153. Find the inverse of this matrix, if possible.

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

ANS:
No inverse

PTS: 1 DIF: Level 1 OBJ: 2.6

154. Find the inverse of this matrix, if possible.

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

ANS:
No inverse

PTS: 1 DIF: Level 1 OBJ: 2.6

155. Find the inverse of this matrix, if possible.

$$\begin{bmatrix} 3 & 5 \\ 4 & 7 \end{bmatrix}$$

ANS:
$$\begin{bmatrix} 7 & -5 \\ -4 & 3 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

156. Find the inverse of this matrix, if possible.

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

ANS:
$$\begin{bmatrix} -4 & 5 & -1 \\ 1 & -1 & 0 \\ 1 & -1 & \frac{1}{2} \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

157. Find the inverse of this matrix, if possible.

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 1 & 2 & 4 \end{bmatrix}$$

ANS:

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

PTS: 1 DIF: Level 1 OBJ: 2.6

158. Find the inverse of this matrix, if possible.

$$\begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$$

ANS:
$$\begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

159. Find the inverse of this matrix, if possible.

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 3 & 1 \end{bmatrix}$$

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

PTS: 1 DIF: Level 1 OBJ: 2.6

160. Find the inverse of this matrix, if possible.

$$\begin{bmatrix} 1 & 2 & 2 \\ 0 & 1 & 2 \\ 4 & 5 & 3 \end{bmatrix}$$

ANS:
$$\begin{bmatrix} -7 & 4 & 2 \\ 8 & -5 & -2 \\ -4 & 3 & 1 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

161. Write the system of equations in the matrix form $AX = B$.

$$3x_1 + 5x_2 = 4$$
$$x_1 - 2x_2 = 7$$

ANS:
$$\begin{bmatrix} 3 & 5 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 4 \\ 7 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

162. Write the system of equations in the matrix form $AX = B$.

$$x_1 + 2x_2 + 3x_3 = 4$$
$$5x_1 + 6x_2 + 7x_3 = 8$$
$$9x_1 - x_2 - 2x_3 = -3$$

ANS:
$$\begin{bmatrix} 1 & 2 & 3 \\ 5 & 6 & 7 \\ 9 & -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 4 \\ 8 \\ -3 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

163. Write the system of equations in the matrix form $AX = B$.

$$x_1 + x_2 - x_3 + x_4 = 7$$
$$2x_1 + 7x_2 - 2x_3 + 5x_4 = -6$$
$$-3x_1 - x_2 + 4x_3 + 2x_4 = 17$$

ANS:
$$\begin{bmatrix} 1 & 1 & -1 & 1 \\ 2 & 7 & -2 & 5 \\ -3 & -1 & 4 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 7 \\ -6 \\ 17 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

164. Write the system of equations in the matrix form $AX = B$.

$3x - 2y - 5 = 0$

$x + 5y + 4 = 0$

ANS:

$$\begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -4 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

165. Write the system of equations in the matrix form $AX = B$.

$$x_1 + 2x_2 - x_3 + 3x_4 = 0$$

$$3x_1 + 5x_2 + 2x_3 - x_4 = 0$$

$$-2x_1 + x_2 - 6x_3 + 9x_4 = 0$$

$$5x_1 - 3x_2 + x_3 - 2x_4 = 0$$

ANS:

$$\begin{bmatrix} 1 & 2 & -1 & 3 \\ 3 & 5 & 2 & -1 \\ -2 & 1 & -6 & 9 \\ 5 & -3 & 1 & -2 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.6

166. The inverse of $\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$ is $\begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix}$.

Use this to find the solution of the system.

$x + 3y = 3$

$2x + 5y = -1$

ANS:

The system can be written $\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$.

so $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix}\begin{bmatrix} 3 \\ -1 \end{bmatrix} = \begin{bmatrix} -18 \\ 7 \end{bmatrix}$

The solution is $(-18, 7)$.

PTS: 1 DIF: Level 1 OBJ: 2.6

167. The inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ is $\begin{bmatrix} 2 & -2 & -1 \\ 1 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$. Use this to find the solution of the system

$$x_1 + 2x_2 + 3x_3 = 3$$
$$x_2 + x_3 = -1$$
$$x_1 + 2x_2 + 4x_3 = 2$$

ANS:

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 2 & -2 & -1 \\ 1 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ -1 \\ 2 \end{bmatrix} = \begin{bmatrix} 6 \\ 0 \\ -1 \end{bmatrix}$$

Solution: $(6, 0, -1)$

PTS: 1 DIF: Level 2 OBJ: 2.6

168. The inverse of $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & -4 & 7 \\ 1 & -3 & 3 \end{bmatrix}$ is $\begin{bmatrix} 9 & -3 & 1 \\ -2 & 1 & -1 \\ -5 & 2 & -1 \end{bmatrix}$.

Use this information to solve the system.

$$x - y + 2z = 3$$
$$3x - 4y + 7z = 6$$
$$x - 3y + 3z = -4$$

ANS:

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

PTS: 1 DIF: Level 2 OBJ: 2.6

169. Find the inverse of each matrix, if possible.

(a) $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 2 & 2 \\ 1 & 0 & 1 \\ 2 & 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 3 & 1 \\ 2 & -5 & 2 \\ 5 & 4 & 5 \end{bmatrix}$

ANS:

(a) $\begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & -1 & 1 \\ \frac{1}{2} & -\frac{3}{2} & \frac{1}{2} \\ 0 & 2 & -1 \end{bmatrix}$

(c) No inverse

PTS: 1 DIF: Level 2 OBJ: 2.6

170. The following input-output matrix defines the interdependency of five industries. Each entry gives the dollar value of the row industry's output required to produce one dollar's worth of output of the column industry.

	1	2	3	4	5
1. Auto	0.03	0.15	0.05	0.05	0.10
2. Steel	0.40	0.20	0.10	0.10	0.10
3. Electricity	0.10	0.25	0.20	0.10	0.20
4. Coal	0.10	0.20	0.30	0.15	0.10
5. Chemical	0.05	0.10	0.05	0.02	0.05

Determine the
(a) amount of electricity consumed in producing $1 worth of steel.
(b) amount of steel consumed in producing $1 worth in the auto industry.
(c) industry that requires the largest amount of coal per $1 output.
(d) industry that requires the largest amount of electricity per $1 output.
(e) industry on which the auto industry is most dependent.

ANS:
(a) $0.25
(b) $0.40
(c) Electricity
(d) Steel
(e) Steel

PTS: 1 DIF: Level 1 OBJ: 2.7

171. A is an input-output matrix of an industry and X is the output. Find the amount consumed internally by the production process.

$$A = \begin{bmatrix} 0.20 & 0.15 \\ 0.22 & 0.08 \end{bmatrix}, X = \begin{bmatrix} 40 \\ 32 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 12.8 \\ 11.36 \end{bmatrix}$$

PTS: 1 DIF: Level 2 OBJ: 2.7

172. A is an input-output matrix of an industry and X is the output. Find the amount consumed internally by the production process.

$$A = \begin{bmatrix} 0.30 & 0.25 \\ 0.10 & 0.06 \end{bmatrix}, X = \begin{bmatrix} 20 \\ 30 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 13.5 \\ 3.8 \end{bmatrix}$$

PTS: 1 DIF: Level 2 OBJ: 2.7

173. A is an input-output matrix of an industry and X is the output. Find the amount consumed internally by the production process.

$$A = \begin{bmatrix} 0.10 & 0.12 & 0.08 \\ 0.14 & 0.15 & 0.06 \\ 0.12 & 0.10 & 0.10 \end{bmatrix}, X = \begin{bmatrix} 30 \\ 50 \\ 40 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 12.2 \\ 14.1 \\ 12.6 \end{bmatrix}$$

PTS: 1 DIF: Level 2 OBJ: 2.7

174. A is an input-output matrix of an industry and X is the output. Find the amount consumed internally by the production process.

$$A = \begin{bmatrix} 0.08 & 0.05 & 0.04 \\ 0.10 & 0.09 & 0.03 \\ 0.06 & 0.10 & 0.05 \end{bmatrix}, X = \begin{bmatrix} 35 \\ 70 \\ 55 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 8.50 \\ 11.45 \\ 11.85 \end{bmatrix}$$

PTS: 1 DIF: Level 2 OBJ: 2.7

175. *A* is an input-output matrix of an industry and *D* is the demand matrix. Find the amount of each product that must be produced in order to meet the demand.

$$A = \begin{bmatrix} 0.20 & 0.20 \\ 0.20 & 0.20 \end{bmatrix}, D = \begin{bmatrix} 150 \\ 210 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 270 \\ 330 \end{bmatrix}$$

PTS: 1 DIF: Level 2 OBJ: 2.7

176. *A* is an input-output matrix of an industry and *D* is the demand matrix. Find the amount of each product that must be produced in order to meet the demand.

$$A = \begin{bmatrix} 0.3 & 0.1 \\ 0.1 & 0.2 \end{bmatrix}, D = \begin{bmatrix} 220 \\ 330 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 380 \\ 460 \end{bmatrix}$$

PTS: 1 DIF: Level 2 OBJ: 2.7

177. *A* is an input-output matrix of an industry and *D* is the demand matrix. Find the amount of each product that must be produced in order to meet the demand.

$$A = \begin{bmatrix} 0 & 0.20 & 0.25 \\ 0.20 & 0 & 0.25 \\ 0.20 & 0 & 0 \end{bmatrix}, D = \begin{bmatrix} 1800 \\ 8100 \\ 2700 \end{bmatrix}$$

ANS:

$$\begin{bmatrix} 4700 \\ 9950 \\ 3640 \end{bmatrix}$$

PTS: 1 DIF: Level 3 OBJ: 2.7

178. Set up the system of equations used to find *m* and *b* of the linear regression line for the points $(2,8), (3,11), (5,15),$ and $(8,16)$. **Do not solve**.

ANS:

$$102m + 18b = 252$$
$$18m + 4b = 50$$

PTS: 1 DIF: Level 1 OBJ: 2.8

179. Set up the system of equations used to find *m* and *b* of the linear regression line for the points $(1,12), (3,10), (4,9), (7,6),$ and $(8,2)$. **Do not solve**.

ANS:

$$139m + 23b = 136$$
$$23m + 5b = 39$$

PTS: 1 DIF: Level 1 OBJ: 2.8

180. Find the matrices *A* and *B* such that *AB* gives the augmented matrix of the system of equations used to find *m* and *b* of the regression line for the points $(-1,-4), (1,3), (2,4), (4,7), (5,10),$ and $(8,11)$.

ANS:

$$A = \begin{bmatrix} -1 & 1 & 2 & 4 & 5 & 8 \\ 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix}, B = \begin{bmatrix} -1 & 1 & -4 \\ 1 & 1 & 3 \\ 2 & 1 & 4 \\ 4 & 1 & 7 \\ 5 & 1 & 10 \\ 8 & 1 & 11 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.8

181. Find the matrices *A* and *B* such that *AB* gives the augmented matrix of the system of equations used to find *m* and *b* of the regression line for the points $(10,22), (12,19), (15,15), (16,17),$ and $(19,13)$.

ANS:

$$A = \begin{bmatrix} 10 & 12 & 15 & 16 & 19 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 10 & 1 & 22 \\ 12 & 1 & 19 \\ 15 & 1 & 15 \\ 16 & 1 & 17 \\ 19 & 1 & 13 \end{bmatrix}$$

PTS: 1 DIF: Level 1 OBJ: 2.8

182. Find the linear regression line for the points $(2,6), (4,3), (6,2),$ and $(8,1)$.

ANS:
$y = -0.8x + 7$

PTS: 1 DIF: Level 2 OBJ: 2.8

183. Find the linear regression line for the points $(1,8), (3,6), (4,5), (5,4),$ and $(7,2)$.

ANS:
$y = -x + 9$

PTS: 1 DIF: Level 2 OBJ: 2.8

184. Find the linear regression line for the points $(0,3), (4,6), (6,9), (7,10),$ and $(8,12)$.

ANS:
$y = 1.1x + 2.5$

PTS: 1 DIF: Level 2 OBJ: 2.8