Finite Mathematics and Calculus with Applications 10th edition Lial Test Bank

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MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the echelon method to solve the system of two equations in two unknowns.

1) $x - 5y = 28$
$9x - 6y = 57$
A) (2, -4)
B) (3, -5)
C) (-3, -4)
D) No solution
Answer: B

2) $x + 8y = -40$
$7x + 9y = -45$
A) (0, –5)
B) (5, 0)
C) (1, –6)
D) No solution
Answer: A

3) $x + 7y = 8$
$8x + 8y = 64$
A) (–8, -1)
B) (9, 8)
C) (8, 0)
D) No solution
Answer: C

4) $6x + 6y = 0$
$4x + 4y = 0$
A) (–4, 4)
B) (–5, 5)
C) (–4, 5)
D) No solution
Answer: A

5) $6x + 8y = -16$
$-3x + 2y = -4$
A) (0, -1)
B) (0, -2)
C) (-1, -1)
D) No solution
Answer: B

6) $7x + 8y = -42$
$-5x - 2y = 30$
A) (-7, 1)
B) (-6, 1)
C) (-6, 0)
D) No solution
Answer: C

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7) $6x + 16 = -7y$
$3x - 4y = 22$
A) (1, -3)
B) (2, -4)
C) (2, -3)
D) No solution
Answer: B

8) $4x - 2y = 9$
$20x - 10y = 27$
A) $\left(\frac{1}{2}y + \frac{9}{4}, y\right)$
B) $\left(1, -\frac{5}{2}\right)$
C) (1, 0)
D) No solution
Answer: D

9) $6x + 5y = 2$
$24x + 20y = 8$
A) $\left(-\frac{5}{6}y + \frac{1}{3}, y\right)$
B) $\left(-\frac{1}{2}, 1\right)$
C) $\left(\frac{1}{3}, 0\right)$
D) No solution
Answer: A

Use the echelon method to solve the system.

10) $\frac{x}{3} + \frac{y}{3} = 1$
$x - y = -7$
A) (-2, 5)
B) (2, 6)
C) (-3, 6)
D) No solution
Answer: A

11) $\frac{x}{5} + \frac{y}{5} = 1$
$\frac{x}{5} - \frac{y}{5} = -\frac{7}{5}$
A) (-2, 7)
B) (1, 7)
C) (-1, 6)
D) No solution
Answer: C

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12) $\frac{3x}{8} - \frac{3y}{5} = \frac{33}{80}$

$\frac{4x}{7} + \frac{4y}{5} = \frac{23}{35}$

A) $\left(\frac{3}{2}, \frac{3}{4}\right)$

B) $\left(\frac{3}{4}, \frac{1}{2}\right)$

C) $\left(\frac{3}{2}, \frac{1}{4}\right)$

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

Answer: C

13) $\frac{3x}{2} - \frac{y}{3} = -18$

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

A) (0, –12)

B) (–12, 0)

C) (12, 0)

D) (0, 12)

Answer: B

14) $\frac{7x}{3} + \frac{5y}{4} = 4$

$\frac{5x}{6} - 2y = 21$

A) (6, 8)

B) (–6, –8)

C) (–6, 8)

D) (6, –8)

Answer: D

15) $3x - \frac{5y}{7} = 10$

$\frac{2x}{3} - \frac{9y}{7} = \frac{19}{5}$

A) $\left(3, -\frac{7}{5}\right)$

B) $\left(3, \frac{7}{9}\right)$

C) $\left(3, \frac{7}{5}\right)$

D) $\left(3, -\frac{7}{9}\right)$

Answer: A

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For the following systems of equations in echelon form, tell how many solutions there are in nonnegative integers.

16) $x - 5y + 8z = 60$
$2y + 5z = 44$
A) 5
B) 7
C) 6
D) 9

Answer: A

17) $x + 3y + 4z = 80$
$4y + 5z = 40$
A) 4
B) 5
C) 2
D) 3

Answer: D

18) $3x + 2y + 2z = 110$
$y - 4z = 10$
A) 4
B) 3
C) 9
D) 5

Answer: A

Solve the system of equations. Let z be the parameter.

19) $-7x + 4y - 2z = 14$
$3x + y - 7z = 10$
A) $\left(\frac{26}{19} + \frac{26}{19}z, 10 + 7z, z\right)$
B) $\left\{\frac{26}{19} + \frac{26}{19}z, \frac{112}{19} + \frac{55}{19}z, z\right\}$
C) $\left\{\frac{26}{19} + \frac{26}{19}z, 10 - 7z, z\right\}$
D) (-26 - 26z, -112 - 26z, z)

Answer: B

20) $-3x + y + 6z = -7$
$7x + 3y + 4z = -14$
A) (7 + 14z, -91 + 7z, z)
B) $\left\{\frac{7}{16} + \frac{7}{8}z, -7 + 6z, z\right\}$
C) $\left\{\frac{7}{16} + \frac{7}{8}z, -7 - 6z, z\right\}$
D) $\left\{\frac{7}{16} + \frac{7}{8}z, -\frac{91}{16} - \frac{27}{8}z, z\right\}$

Answer: D

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21) $7x + 3y + 5z = -20$
$3x + y + 2z = 2$
A) $\left(13 - \frac{1}{2}z, -37 - \frac{1}{2}z, z\right)$
B) $(-26 + z, 74 + z, z)$
C) $\left(13 - \frac{1}{2}z, 2 + 2z, z\right)$
D) $\left(13 - \frac{1}{2}z, 2 - 2z, z\right)$
Answer: A

22) $7x + 3y + 5z = 0$
$3x + y + 2z = 0$
A) (z, z, z)
B) $\left(-\frac{1}{2}z, -2z, z\right)$
C) $\left(-\frac{1}{2}z, -\frac{1}{2}z, z\right)$
D) $\left(-\frac{1}{2}z, 2z, z\right)$
Answer: C

Solve the problem.

23) Best Rentals charges a daily fee plus a mileage fee for renting its cars. Barney was charged $105 for 3 days and 300 miles, while Mary was charged $193 for 5 days and 600 miles. What does Best Rental charge per day and per mile?
A) $16 per day, 19¢ per mile
B) $18 per day, 19¢ per mile
C) $18 per day, 17¢ per mile
D) $17 per day, 18¢ per mile
Answer: D

24) There were 38,000 people at a ball game in Los Angeles. The day's receipts were $280,000. How many people paid $14 for reserved seats and how many paid $5 for general admission?
A) 22,500 paid $14; 15,500 paid $5.
B) 10,000 paid $14; 28,000 paid $5.
C) 15,500 paid $14; 22,500 paid $5.
D) 28,000 paid $14; 10,000 paid $5.
Answer: B

25) There were 340 people at a play. The admission price was $2 for adults and $1 for children. The admission receipts were $520. How many adults and how many children attended?
A) 130 adults, 210 children
B) 180 adults, 160 children
C) 80 adults, 260 children
D) 160 adults, 180 children
Answer: B

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26) A salesman sold $200 more than the rest of the sales staff. If the sales total for the day was $1600, then how much did the rest of the sales staff sell?
A) $800
B) $700
C) $1400
D) $900

Answer: B

27) A shopkeeper orders a total of 48 pounds of cashews and peanuts. If the amount of cashews he orders is 32 pounds less than the amount of peanuts, then how many pounds of peanuts does he order?
A) 16 pounds
B) 40 pounds
C) 24 pounds
D) 8 pounds

Answer: B

28) For their class play, Ron sold student tickets for $4.00 each and Kathy sold adult tickets for $6.50 each. If their total revenue for 29 tickets was $141.00, then how many tickets did Ron sell?
A) 19 tickets
B) 21 tickets
C) 10 tickets
D) 15 tickets

Answer: A

29) Carole's car averages 15.3 miles per gallon in city driving and 24.5 miles per gallon in highway driving. If she drove a total of 382.7 miles on 19 gallons of gas, then how many of the gallons were used for city driving?
A) 10 gallons
B) 11 gallons
C) 9 gallons
D) 15 gallons

Answer: C

30) Anne and Nancy use a metal alloy that is 25.75% copper to make jewelry. How many ounces of a 19% alloy must be mixed with a 28% alloy to form 92 ounces of the desired alloy?
A) 25 ounces
B) 74 ounces
C) 69 ounces
D) 23 ounces

Answer: D

31) Alan invests a total of $18,000 in three different ways. He invests one part in a mutual fund which in the first year has a return of 11%. He invests the second part in a government bond at 7% per year. The third part he puts in the bank at 5% per year. He invests twice as much in the mutual fund as in the bank. The first year Alan's investments bring a total return of $1440. How much did he invest in each way?
A) $6600 in mutual fund, $8100 in bond, and $3300 in bank
B) $6000 in mutual fund, $9000 in bond, and $3000 in bank
C) $5400 in mutual fund, $9900 in bond, and $2700 in bank
D) $6000 in mutual fund, $10,000 in bond, and $3000 in bank

Answer: B

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32) Julia is preparing a meal by combining three ingredients. One unit of each ingredient provides the following quantities (in grams) of carbohydrates, fat, and protein.

	Protein(g)	Carbohydrates(g)	Fat (g)
Ingredient A	3	3	1
Ingredient B	2	4	2
Ingredient C	4	5	1

Ideally the meal should contain 26 grams of protein, 34 grams of carbohydrates, and 12 grams of fat. How many units of each ingredient should Julia use?

A) 2 grams of ingredient A, 3 grams of ingredient B, 4 grams of ingredient C
B) 4 grams of ingredient A, 2 grams of ingredient B, 3 grams of ingredient C
C) 4 grams of ingredient A, 3 grams of ingredient B, 2 grams of ingredient C
D) 3 grams of ingredient A, 4 grams of ingredient B, 2 grams of ingredient C

Answer: C

Write the augmented matrix for the system. Do not solve.

33) $6x - 2y = 30$
$5x + 5y = 65$

A) $\left[\begin{array}{cc|c} 6 & 5 & 30 \\ -2 & 5 & 65 \end{array}\right]$
B) $\left[\begin{array}{cc|c} 30 & -2 & 6 \\ 65 & 5 & 5 \end{array}\right]$
C) $\left[\begin{array}{cc|c} 6 & -2 & 65 \\ 5 & 5 & 30 \end{array}\right]$
D) $\left[\begin{array}{cc|c} 6 & -2 & 30 \\ 5 & 5 & 65 \end{array}\right]$

Answer: D

34) $5x + 2y = 8$
$-2y = 2$

A) $\left[\begin{array}{cc|c} 8 & 2 & 5 \\ 2 & 0 & -2 \end{array}\right]$
B) $\left[\begin{array}{cc|c} -2 & 0 & 2 \\ 5 & 2 & 2 \end{array}\right]$
C) $\left[\begin{array}{cc|c} 5 & 2 & 8 \\ -2 & 2 & 0 \end{array}\right]$
D) $\left[\begin{array}{cc|c} 5 & 2 & 8 \\ 0 & -2 & 2 \end{array}\right]$

Answer: D

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35) $2x + 6y + 3z = 25$
$-2x + 4y + 6z = 6$
$8x + 7y + 7z = 37$

A) $\left[\begin{array}{ccc|c} 2 & 6 & 3 & 25 \\ -2 & 4 & 6 & 6 \\ 8 & 7 & 7 & 37 \end{array}\right]$

B) $\left[\begin{array}{ccc|c} 25 & 3 & 6 & 2 \\ 6 & 6 & 4 & -2 \\ 37 & 7 & 7 & 8 \end{array}\right]$

C) $\left[\begin{array}{ccc} 2 & 6 & 3 \\ -2 & 4 & 6 \\ 8 & 7 & 7 \end{array}\right]$

D) $\left[\begin{array}{ccc|c} 2 & -2 & 8 & 25 \\ 6 & 4 & 7 & 6 \\ 3 & 6 & 7 & 37 \end{array}\right]$

Answer: A

36) $9x + 3z = 75$
$2y + 9z = 59$
$-2x + 8y + 7z = 21$

A) $\left[\begin{array}{ccc|c} 9 & 0 & -2 & 75 \\ 0 & 2 & 8 & 59 \\ 3 & 9 & 7 & 21 \end{array}\right]$

B) $\left[\begin{array}{ccc} 9 & 0 & 3 \\ 0 & 2 & 9 \\ -2 & 8 & 7 \end{array}\right]$

C) $\left[\begin{array}{ccc|c} 9 & 0 & 3 & 75 \\ 0 & 2 & 9 & 59 \\ -2 & 8 & 7 & 21 \end{array}\right]$

D) $\left[\begin{array}{ccc|c} 9 & 3 & 0 & 75 \\ 2 & 9 & 0 & 59 \\ -2 & 8 & 7 & 21 \end{array}\right]$

Answer: C

Write the system of equations associated with the augmented matrix.

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

A) $x = 2$
$y = -3$

B) $x = 0$
$y = 0$

C) $x = -2$
$y = 3$

D) $x = 1$
$y = 1$

Answer: A

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38) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 6 \\ 0 & 1 & 0 & 10 \\ 0 & 0 & 1 & -3 \end{array}\right]$

A) x = 6
y = 10
z = –3

B) x = –6
y = –10
z = 3

C) x = 9
y = 13
z = 0

D) x = 0
y = 16
z = 3

Answer: A

Use the indicated row operation to change the matrix.

39) Replace R_2 by $R_1 + (-1)R_2$.

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

A) $\left[\begin{array}{cc|c} 1 & -3 & 2 \\ 2 & 3 & 1 \end{array}\right]$

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

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

D) $\left[\begin{array}{cc|c} 1 & -3 & 4 \\ -1 & -6 & 3 \end{array}\right]$

Answer: D

40) Replace R_2 by $R_1 + R_2$.

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

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

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

C) $\left[\begin{array}{cc|c} 0 & 1 & 5 \\ -1 & 1 & 3 \end{array}\right]$

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

Answer: B

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41) Replace R_2 by $\frac{1}{2}R_1 + \frac{1}{2}R_2$.

$$\left[\begin{array}{cc|c} 2 & 0 & 2 \\ -2 & 2 & 8 \end{array}\right]$$

A) $\left[\begin{array}{cc|c} 2 & 0 & 2 \\ 0 & 0 & 5 \end{array}\right]$

B) $\left[\begin{array}{cc|c} 2 & 0 & 2 \\ -1 & 1 & 4 \end{array}\right]$

C) $\left[\begin{array}{cc|c} 2 & 0 & 2 \\ 0 & 2 & 10 \end{array}\right]$

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

Answer: D

42) Replace R_3 by $\frac{1}{2}R_3$.

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

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

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

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

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

Answer: C

43) Replace R_2 by $\frac{1}{3}R_1 + \frac{1}{2}R_2$.

$$\left[\begin{array}{cc|c} 3 & 0 & 15 \\ -2 & 4 & 12 \end{array}\right]$$

A) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ 1 & 4 & 27 \end{array}\right]$

B) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ 0 & 0 & 11 \end{array}\right]$

C) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ -1 & 2 & 6 \end{array}\right]$

D) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ 0 & 2 & 11 \end{array}\right]$

Answer: D

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Use the Gauss–Jordan method to solve the system of equations.

44) $6x + 5y = 0$
$3x + 9y = 39$
A) (6, -5)
B) (-5, -6)
C) (-5, 6)
D) No solution
Answer: C

45) $5x + 5y = 10$
$2x = -4$
A) (-2, -4)
B) (-2, 4)
C) (4, -2)
D) No solution
Answer: B

46) $6x + y = 13$
$6x + 4y = -2$
A) (-5, 3)
B) (3, -5)
C) (-5, -3)
D) No solution
Answer: B

47) $5x - 3y = 6$
$25x - 15y = 9$
A) $\left(\frac{6}{5} + \frac{3}{5}y, y\right)$
B) (5, 5)
C) (6, 9)
D) No solution
Answer: D

48) $3x - 2y = -3$
$9x - 6y = -9$
A) $\left(-1 + \frac{2}{3}y, y\right)$
B) (1, 3)
C) $\left(-1 - \frac{2}{3}y, y\right)$
D) No solution
Answer: A

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49) $-2x - 8y = 6$
$-4x - 16y = 2$
A) (6, 2)
B) (2, 2)
C) $\left(-\frac{4}{3}x - \frac{1}{3}y, y\right)$
D) No solution
Answer: D

50) $x + y + z = -5$
$x - y + 2z = -6$
$2x + y + z = -3$
A) (2, –2, -5)
B) (-5, –2, 2)
C) (-5, 2, –2)
D) No solution
Answer: A

51) $x - y + 3z = 18$
$4x + z = 5$
$x + 5y + z = -10$
A) (0, –3, 5)
B) (5, 0, –3)
C) (5, –3, 0)
D) No solution
Answer: A

52) $x - y + z = 4$
$x + y + z = -2$
$x + y - z = -12$
A) (5, -4, -3)
B) (-4, -3, 5)
C) (-4, 5, -3)
D) No solution
Answer: B

53) $8x + 9y - z = 48$
$x - 4y + 7z = 65$
$2x + y + z = 22$
A) (6, 9, 1)
B) (6, 1, 9)
C) (-6, 1, 12)
D) No solution
Answer: B

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54) $4x - y - 5z = 3$
$5x + 3y + 3z = 45$
$-6x - 6y + z = -38$
A) (-6, 1, 12)
B) (6, 4, 1)
C) (6, 1, 4)
D) No solution
Answer: C

55) $8x - y - 9z = 19$
$-8x + 3z = -34$
$6y + z = 20$
A) (-5, 3, 10)
B) (5, 3, 2)
C) (5, 2, 3)
D) No solution
Answer: B

56) $x + y + z = 9$
$2x - 3y + 4z = 7$
$x - 4y + 3z = -2$
A) $\left(\frac{-7z + 34}{5}, \frac{2z + 11}{5}, z\right)$
B) $\left(\frac{7z + 34}{5}, \frac{2z - 11}{5}, z\right)$
C) $\left(\frac{7z + 34}{5}, \frac{2z + 11}{5}, z\right)$
D) $\left(\frac{-7z + 34}{5}, \frac{2z - 11}{5}, z\right)$
Answer: A

57) $3x + y + z = 5$
$4x + 5y - z = -8$
$10x + 7y + z = 2$
A) $\left(\frac{-6z + 33}{11}, \frac{-7z - 44}{11}, z\right)$
B) $\left(\frac{-6z + 33}{11}, \frac{7z - 44}{11}, z\right)$
C) $\left(\frac{6z + 33}{11}, \frac{7z - 44}{11}, z\right)$
D) $\left(\frac{6z + 33}{11}, \frac{7z + 44}{11}, z\right)$
Answer: B

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58) $2x - 5y + z = 11$
$3x + y - 6z = 1$
$5x - 4y - 5z = 12$

A) $\left\{\left(\frac{29z - 16}{17}, \frac{15z - 31}{17}, z\right)\right\}$

B) $\left\{\left(\frac{29z + 16}{17}, \frac{15z - 31}{17}, z\right)\right\}$

C) $\left\{\left(\frac{29z + 16}{17}, \frac{15z + 31}{17}, z\right)\right\}$

D) $\left\{\left(\frac{-29z + 16}{17}, \frac{15z - 31}{17}, z\right)\right\}$

Answer: B

59) $x + y - 2z = 8$
$3x + z = -6$
$2x - y + 3z = -14$

A) $\left\{\left(\frac{z - 6}{3}, \frac{7z + 30}{3}, z\right)\right\}$

B) $\left\{\left(\frac{-z + 6}{3}, \frac{7z - 30}{3}, z\right)\right\}$

C) $\left\{\left(\frac{-z - 6}{3}, \frac{7z - 30}{3}, z\right)\right\}$

D) $\left\{\left(\frac{-z - 6}{3}, \frac{7z + 30}{3}, z\right)\right\}$

Answer: D

60) $3x + 2y + z = 4$
$2x - 3y - z = 5$
$5x + 12y + 5z = 2$

A) $\left\{\left(\frac{-z + 22}{13}, \frac{-5z + 7}{13}, z\right)\right\}$

B) $\left\{\left(\frac{-z + 22}{13}, \frac{-5z - 7}{13}, z\right)\right\}$

C) $\left\{\left(\frac{z - 22}{13}, \frac{5z - 7}{13}, z\right)\right\}$

D) $\left\{\left(\frac{z + 22}{13}, \frac{-5z - 7}{13}, z\right)\right\}$

Answer: B

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61) $x + y + z = 7$
$x - y + 2z = 7$
$2x + 3z = 14$

A) $\left\{\left(\frac{3z+14}{2}, \frac{z}{2}, z\right)\right\}$

B) $\left\{\left(\frac{-3z+14}{2}, 2z, z\right)\right\}$

C) $\left\{\left(\frac{-3z+14}{2}, \frac{z}{2}, z\right)\right\}$

D) $\left\{\left(\frac{-3z-14}{2}, \frac{z}{2}, z\right)\right\}$

Answer: C

62) $5x - y + z = 8$
$7x + y + z = 6$
$12x + 2z = 14$

A) $\left\{\left(\frac{z-7}{6}, \frac{-z-13}{6}, z\right)\right\}$

B) $\left\{\left(\frac{z+7}{6}, \frac{-z-13}{6}, z\right)\right\}$

C) $\left\{\left(\frac{-z+7}{6}, \frac{z-13}{6}, z\right)\right\}$

D) $\left\{\left(\frac{-z+7}{6}, \frac{z+13}{6}, z\right)\right\}$

Answer: C

63) $x + 3y + 2z = 11$
$4y + 9z = -12$
$x + 7y + 11z = -1$

A) $\left\{\left(\frac{-19z+80}{4}, \frac{9z-12}{4}, z\right)\right\}$

B) $\left\{\left(\frac{19z+80}{4}, \frac{-9z-12}{4}, z\right)\right\}$

C) $\left\{\left(\frac{19z+80}{4}, \frac{9z-12}{4}, z\right)\right\}$

D) $\left\{\left(\frac{19z-80}{4}, \frac{-9z+12}{4}, z\right)\right\}$

Answer: B

64) $x + y + z = 7$
$x - y + 2z = 7$
$2x + 3z = 15$

A) (1, 2, 4)

B) (4, 2, 1)

C) (2, 1, 4)

D) No solution

Answer: D

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65) $x - y + 3z = -8$
$x + 5y + z = 40$
$5x + y + 13z = 10$
A) (8, 8, 0)
B) (8, 0, 8)
C) (0, 8, 0)
D) No solution
Answer: D

66) $x - y + z = 8$
$x + y + z = 6$
$3x + y + 3z = 10$
A) (−2, 1, 9)
B) (4, 0, 4)
C) (5, 3, 6)
D) No solution
Answer: D

67) $x + 3y + 2z = 11$
$4y + 9z = -12$
$x + 7y + 11z = -11$
A) (7, −1, −1)
B) (1, 6, −4)
C) (0, 3, 1)
D) No solution
Answer: D

68) $5x + 2y + z = -11$
$2x - 3y - z = 17$
$7x - y = 12$
A) (0, −6, 1)
B) (−2, 0, −1)
C) (1, −5, 0)
D) No solution
Answer: D

69) $x - y + 8z = -107$
$x + 2y = 21$
$2x + y + 8z = -80$
A) (5, 8, 7)
B) (5, 8, −13)
C) (5, 8, 0)
D) No solution
Answer: D

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70) $4x - y + 3z = 12$
$x + 4y + 6z = -32$
$-3x + 3y + 9z = 20$
A) $(-8, -7, 9)$
B) $(8, -7, -2)$
C) $(2, -7, -1)$
D) No solution

Answer: D

71) $x + 8y + 8z = 8$
$7x + 7y + z = 1$
$8x + 15y + 9z = -9$
A) $(-1, 0, 1)$
B) $(0, 0, 1)$
C) $(1, -1, 1)$
D) No solution

Answer: D

72) $9w + 8x - 6y - 4z = 15$
$8w + 6x - 9y - 4z = -6$
$9w - 8x + 7y + 5z = -31$
$-6w - 4x + 8y + 9z = 0$
A) $(-1, 5, 4, -2)$
B) $(1, 5, 4, 2)$
C) $(-1, 4, -5, 2)$
D) No solution

Answer: A

73) $8w + 8x - 6y - 2z = -30$
$7w + 6x - 9y - 2z = -38$
$8w + 8x + 7y + 3z = 17$
$-6w - 2x + 8y + 8z = 18$
A) $(2, 3, -4, -2)$
B) $(2, -3, 4, -1)$
C) $(-1, 4, -5, 2)$
D) No solution

Answer: B

74) $3w + 3x - 3y - 3z = -4$
$-w - 3x - 3y - z = -2$
$5w + 6x + 6y + 5z = -5$
$5w + 7x + 7y + 5z = 6$
A) $(-z, z, -z, z)$
B) $\left(\frac{3}{2}, -\frac{2}{3}, \frac{9}{2}, -5\right)$
C) $\left(-\frac{3}{2}z, \frac{2}{3}z, -\frac{9}{2}z, z\right)$
D) No solution

Answer: D

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Use a graphing calculator to solve the system of equations. Round your solution to one decimal place.

75) $2.8x + 1.8y - 3.8z = 3.4$
$5.3x - 5.1y + 0.3z = -3.0$
$2.3x + 4.1y + 3.2z = 11.1$
A) (2.0, 3.3, 1.3)
B) (4.0, 6.6, 2.5)
C) (0.5, 0.8, 0.3)
D) (1.0, 1.7, 0.6)

Answer: D

76) $2.7x - 0.2y - 5.0z = 2.6$
$5.6x + 4.6y - 0.5z = -4.1$
$3.4x - 1.3y + 1.6z = 10.5$
A) (8.6, -14.6, 2.6)
B) (3.4, -5.9, 1.1)
C) (1.7, -2.9, 0.5)
D) (6.9, -11.7, 2.1)

Answer: C

77) $1.5x - 0.4y + 1.6z = 2.4$
$4.5x - 7.0y - 0.4z = -4.0$
$3.8x + 2.4y + 2.0z = 8.6$
A) (0.5, 0.6, 0.4)
B) (0.8, 0.9, 0.6)
C) (1.1, 1.2, 0.8)
D) (0.3, 0.3, 0.2)

Answer: C

78) $1.4x - 1.2y - 3.6z = -2.1$
$5.5x - 7.0y + 1.4z = -5.0$
$4.9x - 1.8y - 4.8z = -6.1$
A) (–1.1, –0.1, 0.2)
B) (–2.2, –0.2, 0.4)
C) (–4.4, –0.4, 0.8)
D) (–8.8, –0.9, 1.5)

Answer: A

79) $1.6x + 5.6y + 2.7z = 3.5$
$4.3x - 7.0y - 1.4z = -4.3$
$2.1x + 17.8y - 1.7z = 11.8$
A) (0.0, 0.7, –0.1)
B) (0.1, 1.4, –0.2)
C) (0.0, 0.3, 0.0)
D) (0.0, 0.1, 0.0)

Answer: A

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80) $1.8x + 11.6y - 3.6z = 1.2$
$5.2x - 7.0y + 0.6z = -4.3$
$2.1x + 4.0y - 3.5z = 9.8$
A) (–1.9, –1.3, -5.4)
B) (–7.9, –5.2, -22.2)
C) (4.8, 3.2, 13.5)
D) (–2.9, –1.9, -8.1)

Answer: A

81)
$$\begin{aligned} 1.5x + 3.1y - 2.3z + 0.6w &= 2.7 \\ 6.1x - 0.5z - 3.4w &= 0.8 \\ 11.5y - 2.2w &= 0 \\ 4.0x + 3.0y - 2.1z &= 9 \end{aligned}$$
A) (3.2, 1.0, 3.7, 5.0)
B) (4.3, 1.3, 4.9, 6.7)
C) (3.6, 1.1, 4.1, 5.6)
D) (7.9, 2.4, 9.0, 12.3)

Answer: C

82)
$$\begin{aligned} 2.6x - 0.7y + 5.3z - 3.4w &= 12.9 \\ 6.5y + 0.7w &= -1.8 \\ 4.0z - 2.2w &= 1.5 \\ 4.9x + 0.6w &= 3.2 \end{aligned}$$
A) (2.2, -1.1, -6.4, 7.6)
B) (-2.2, 1.1, -6.4, 23.3)
C) (2.2, 1.1, 7.2, 12.4)
D) (2.2, 1.1, -6.4, -12.4)

Answer: D

Solve the problem.

83) Barges from ports X and Y went to cities A and B. X sent 30 barges and Y sent 8. City A received 22 barges and B received 16. Shipping costs $220 from X to A, $300 from X to B, $400 from Y to A, and $180 from Y to B. $8680 was spent. How many barges went where?
A) 22 from X to A, 8 from X to B, 0 from Y to A, and 8 from Y to B
B) 15 from X to A, 15 from X to B, 6 from Y to A, and 2 from Y to B
C) 18 from X to A, 18 from X to B, 4 from Y to A, and 4 from Y to B
D) 20 from X to A, 10 from X to B, 2 from Y to A, and 6 from Y to B

Answer: A

84) Factories A and B sent rice to stores 1 and 2. A sent 11 loads and B sent 22. Store 1 received 18 loads and store 2 received 15. It cost $200 to ship from A to 1, $350 from A to 2, $300 from B to 1, and $250 from B to 2. $8050 was spent. How many loads went where?
A) 9 from A to 1, 2 from A to 2, 9 from B to 1, and 13 from B to 2
B) 10 from A to 1, 1 from A to 2, 8 from B to 1, and 4 from B to 2
C) 0 from A to 1, 11 from A to 2, 15 from B to 1, and 7 from B to 2
D) 11 from A to 1, 0 from A to 2, 7 from B to 1, and 15 from B to 2

Answer: D

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85) Suppose that you are to cut a piece of ribbon for a wreath that is 180 inches long into two pieces so that one piece is 4 times as long as the other. How long is each piece of ribbon?
A) 45 in., 108 in.
B) 36 in., 144 in.
C) 45 in., 180 in.
D) 36 in., 180 in.

Answer: B

86) A chemistry department wants to make 3 L of a 17.5% basic solution by mixing a 20% solution with a 15% solution. How many liters of each type of basic solution should be used to produce the 17.5% solution?
A) 1 L of 15% solution and 2 L of 20% solution
B) 2 L of 15% solution and 1 L of 20% solution
C) 1.5 L of 15% solution and 1.5 L of 20% solution
D) 0.5 L of 15% solution and 2.5 L of 20% solution

Answer: C

87) Linda invests $25,000 for one year. Part is invested at 5%, another part at 6%, and the rest at 8%. The total income from all 3 investments is $1600. The income from the 5% and 6% investments is the same as the income from the 8% investment. Find the amount invested at each rate.
A) $10,000 at 5%, $10,000 at 6%, and $5000 at 8%
B) $8000 at 5%, $10,000 at 6%, and $7000 at 8%
C) $5000 at 5%, $10,000 at 6%, and $10,000 at 8%
D) $10,000 at 5%, $5000 at 6%, and $10,000 at 8%

Answer: D

88) Mike, Joe, and Bill are painting a fence. The painting can be finished if Mike and Joe work together for 4 hours and Bill works alone for 2 hours; or if Mike and Joe work together for 2 hours and Bill works alone for 5 hours; or if Mike works alone for 6 hours, Joe works alone for 2 hours, and Bill works alone for 1 hour. How much time does it take for each man working alone to complete the painting?
A) Mike: 16 hr; Joe: 8 hr; Bill: 8 hr
B) Mike: 8 hr; Joe: 8 hr; Bill: 16 hr
C) Mike: 12 hr; Joe: 10 hr; Bill: 10 hr
D) Mike: 8 hr; Joe: 16 hr; Bill: 8 hr

Answer: D

89) Jane wants to buy a photocopier. The salesperson has the following information on three models. If all three are used, a specific job is completed in 50 minutes. If copier A operates for 20 minutes and copier B operates for 50 minutes, one–half of the job is completed. If copier B operates for 30 minutes and copier C operates for 80 minutes, three–fifths of the job is completed. Which is the fastest copier, and how long does it take this copier to complete the entire job working alone?
A) C is fastest; 120 minutes
B) B is fastest; 100 minutes
C) C is fastest; 100 minutes
D) A is fastest; 120 minutes

Answer: D

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90) Janet is planning to visit Arizona, New Mexico, and California on a 20–day vacation. If she plans to spend as much time in New Mexico as she does in the other two states combined, how can she allot her time in the three states? (Let x denote the number of days in Arizona, y the number of days in New Mexico, and z the number of days in California. Let z be the parameter.)

A) $x = z - 10, y = 10, 0 \le z \le 10$
B) $x = 10, y = 10 - z, 0 \le z \le 10$
C) $x = 10 - z, y = 10, 0 \le z \le 10$
D) $x = 10, y = z - 10, 0 \le z \le 10$

Answer: C

91) A company is introducing a new soft drink and is planning to have 48 advertisements distributed among TV ads, radio ads, and newspaper ads. If the cost of TV ads is $500 each, the cost of radio ads is $200 each, and the cost of newspaper ads is $200 each, how can the ads be distributed among the three types if the company has $15,600 to spend for advertising? (Let x denote the number of TV ads, y the number of radio ads, and z the number of newspaper ads. Let z be the parameter.)

A) $x = 20, y = 28 - z, 0 \le z \le 28$
B) $x = z - 28, y = 20, 0 \le z \le 28$
C) $x = 20, y = z - 28, 0 \le z \le 28$
D) $x = 28 - z, y = 20, 0 \le z \le 28$

Answer: A

92) An investor has $400,000 to invest in stocks, bonds, and commodities. If he plans to put three times as much into stocks as in bonds, how can he distribute his money among the three types of investments? (Let x denote the amount put into stocks, y the amount put into bonds, and z the amount put into commodities. Let all amounts be in dollars, and let z be the parameter.)

A) $x = 100{,}000 - 3z/4, y = 300{,}000 - z/4, 0 \le z \le 400{,}000$
B) $x = 100{,}000 - z/2, y = 300{,}000 - z/2, 0 \le z \le 400{,}000$
C) $x = 300{,}000 - z/2, y = 100{,}000 - z/2, 0 \le z \le 400{,}000$
D) $x = 300{,}000 - 3z/4, y = 100{,}000 - z/4, 0 \le z \le 400{,}000$

Answer: D

93) A company has 120 sales representatives, each to be assigned to one of four marketing teams. If the first team is to have three times as many members as the second team and the third team is to have twice as many members as the fourth team, how can the members be distributed among the teams? (Let x denote the number of members assigned to the first team, y the number assigned to the second team, z the number assigned to the third team, and w the number assigned to the fourth team. Let w be the parameter.)

A) $x = 60 - 3w, y = 20 - w, z = 40 + 3w, 0 \le w \le 20$
B) $x = 120 - 3w, y = 40 - w, z = 3w - 40, 0 \le w \le 40$
C) $x = 90 - 9w/4, y = 30 - 3w/4, z = 2w, 0 \le w \le 40$
D) $x = 30 - 3w/4, y = 10 - w/4, z = 2w, 0 \le w \le 20$

Answer: C

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94) A school library has $27,000 to spend on new books among the four categories of biology, chemistry, physics, and mathematics. If the amount spent on biology books is to be the same as the amount spent on chemistry books and if the amount spent on mathematics books is to be the same as the total spent on chemistry and physics books, how can the money be distributed among the four types of books? (Let x denote the amount spent on biology books, y the amount spent on chemistry books, z the amount spent on physics books, and w the amount spent on mathematics books. Let all amounts be in dollars, and let w be the parameter.)

A) $x = 27{,}000 - 3w$, $y = 27{,}000 - 3w$, $z = 4w - 27{,}000$, $9000 \le w \le 18{,}000$

B) $x = 27{,}000 - 2w$, $y = 27{,}000 - 2w$, $z = 3w - 27{,}000$, $9000 \le w \le 13{,}500$

C) $x = 27{,}000 + w$, $y = 27{,}000 + w$, $z = w - 27{,}000$, $4500 \le w \le 13{,}500$

D) $x = 27{,}000 - w$, $y = 27{,}000 - w$, $z = 2w - 27{,}000$, $4500 \le w \le 9000$

Answer: B

95) A recording company is to release 60 new CDs in the categories of rock, country, jazz, and classical. If twice the number of rock CDs is to equal three times the number of country CDs and if the number of jazz CDs is to equal the number of classical CDs, how can the CDs be distributed among the four types? (Let x be the number of rock CDs, y the number of country CDs, z the number of jazz CDs, and w the number of classical CDs. Let w be the parameter.)

A) $x = 36 - w$, $y = 16 - w$, $z = w$, $0 \le w \le 20$

B) $x = 30 - 3w/5$, $y = 20 - 2w/5$, $z = w$, $0 \le w \le 26$

C) $x = 30 - 2w$, $y = 30 - 2w/5$, $z = w$, $0 \le w \le 30$

D) $x = 36 - 6w/5$, $y = 24 - 4w/5$, $z = w$, $0 \le w \le 30$

Answer: D

96) A politician is planning to spend a total of 28 hours on a campaign swing through the southern states of Arkansas, Louisiana, Mississippi, Alabama, and Georgia. Assume that he spends the same amount of time in Mississippi as in Alabama; half the amount of time in Georgia as in Arkansas; and the same amount of time in Mississippi, Alabama, and Georgia (combined) as in Arkansas and Louisiana (combined). How can he distribute his time among the five states? (Let a be the hours spent in Arkansas, b the hours spent in Louisiana, c the hours spent in Mississippi, d the hours spent in Alabama, and e the hours spent in Georgia. Let e be the parameter.)

A) $a = 2e$, $b = 14 - e$, $c = 7 - e/2$, $d = 7 - e/2$, $0 \le e \le 7$

B) $a = 2e$, $b = 14 - e$, $c = 7 - e$, $d = 7 - e$, $0 \le e \le 14$

C) $a = e$, $b = 14 - e/2$, $c = 7 - e/4$, $d = 7 - e/4$, $0 \le e \le 14$

D) $a = 2e$, $b = 14 - 2e$, $c = 7 - e/2$, $d = 7 - e/2$, $0 \le e \le 7$

Answer: D

Find the values of the variables in the equation.

97) $\begin{bmatrix} 8 & -8 \\ 6 & 9 \end{bmatrix} = \begin{bmatrix} x & y \\ 6 & z \end{bmatrix}$

A) $x = 8$, $y = 6$, $z = 9$

B) $x = 8$, $y = -8$, $z = 6$

C) $x = -8$, $y = 8$, $z = 9$

D) $x = 8$, $y = -8$, $z = 9$

Answer: D

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98) $\begin{bmatrix} -1 & -7 & x \\ 5 & y & 4 \end{bmatrix} = \begin{bmatrix} m & -7 & 6 \\ n & -8 & p \end{bmatrix}$

A) m = -1, x = 6, n = 5, y = –8, p = 4
B) m = 5, x = -7, n = -1, y = –8, p = 4
C) m = -1, x = 6, n = -7, y = –8, p = 4
D) m = -1, x = -7, n = 5, y = –8, p = 4

Answer: A

99) $\begin{bmatrix} t-1 & -4 & 0 \\ -3 & 4 & 3 \end{bmatrix} = \begin{bmatrix} -4 & -4 & 0 \\ -3 & x-8 & 3 \end{bmatrix}$

A) t = -3, x = 12
B) t = –4, x = 4
C) t = -3, x = -4
D) t = –4, x = -4

Answer: A

100) $\begin{bmatrix} -4x & y-5 & 6 \\ 7z & 5 & 0 \end{bmatrix} + \begin{bmatrix} -3x & -4 & 7 \\ 1 & 2 & 3m \end{bmatrix} = \begin{bmatrix} -7 & 8 & 4a \\ 3 & 7 & 0 \end{bmatrix}$

A) x = 1, y = 17, a = 4, z = 7, m = 0
B) x = 1, y = 17, $a = \frac{13}{4}$, $z = \frac{2}{7}$, m = 0
C) x = 2, y = 17, $a = \frac{1}{4}$, $z = \frac{2}{7}$, m = 0
D) x = 1, y = -17, $a = \frac{13}{4}$, $z = \frac{2}{7}$, m = 0

Answer: B

Perform the indicated operation, where possible.

101) $\begin{bmatrix} -9 & 1 \\ 2 & 5 \end{bmatrix} + \begin{bmatrix} 6 & 2 \\ 6 & 3 \end{bmatrix}$

A) $\begin{bmatrix} -3 & 3 \\ 8 & 8 \end{bmatrix}$
B) $\begin{bmatrix} 3 & 4 \\ 4 & 8 \end{bmatrix}$
C) $\begin{bmatrix} -3 & -7 \\ -3 & -6 \end{bmatrix}$
D) Not possible

Answer: A

102) $\begin{bmatrix} 2 & 4 \end{bmatrix} + \begin{bmatrix} -4 \\ 9 \end{bmatrix}$

A) $\begin{bmatrix} -2 \\ 13 \end{bmatrix}$
B) $\begin{bmatrix} 2 & -4 \\ 4 & 9 \end{bmatrix}$
C) $\begin{bmatrix} -2 & 13 \end{bmatrix}$
D) Not possible

Answer: D

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103) $\begin{bmatrix} -1 & 5 \\ 0 & 4 \\ 8 & -4 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 7 & 4 \\ 2 & 2 \end{bmatrix}$

A) $\begin{bmatrix} 1 & 6 \\ 7 & 8 \\ 10 & -2 \end{bmatrix}$

B) $\begin{bmatrix} -3 & 4 \\ -7 & 0 \\ 6 & -6 \end{bmatrix}$

C) $\begin{bmatrix} 3 & -4 \\ 7 & 0 \\ -6 & 6 \end{bmatrix}$

D) Not possible

Answer: B

104) $\begin{bmatrix} -1 & 6 & 1 \end{bmatrix} - \begin{bmatrix} 4 & 3 \end{bmatrix}$

A) $\begin{bmatrix} -5 & 3 & 1 \end{bmatrix}$

B) $\begin{bmatrix} -5 & 6 & -2 \end{bmatrix}$

C) $\begin{bmatrix} -5 & 3 & -2 \end{bmatrix}$

D) Not possible

Answer: D

105) $\begin{bmatrix} -1 & 0 \\ 5 & 3 \end{bmatrix} - \begin{bmatrix} -1 & 5 \\ 3 & 1 \end{bmatrix}$

A) $\begin{bmatrix} 0 & -5 \\ 2 & 2 \end{bmatrix}$

B) $\begin{bmatrix} -1 \end{bmatrix}$

C) $\begin{bmatrix} 0 & 5 \\ -2 & -2 \end{bmatrix}$

D) $\begin{bmatrix} -2 & 5 \\ 8 & 4 \end{bmatrix}$

Answer: A

106) $\begin{bmatrix} 3 \\ -1 \\ -4 \end{bmatrix} + \begin{bmatrix} -5 \\ 2 \\ 8 \end{bmatrix}$

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

B) $\begin{bmatrix} -2 \\ 1 \\ 4 \end{bmatrix}$

C) $\begin{bmatrix} 2 \\ 4 \\ 5 \end{bmatrix}$

D) $\begin{bmatrix} 3 & -5 \\ -1 & 2 \\ -4 & 8 \end{bmatrix}$

Answer: B

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107) $\begin{bmatrix} -8x - 2y & 2x + 3y \\ 2x - 3y & -2x - 3y \end{bmatrix} + \begin{bmatrix} 6x - 7y & -4x \\ 3y - 9x & -10x - 10y \end{bmatrix}$

A) $\begin{bmatrix} -2x - 9y & -2x + 3y \\ 5x - 12y & -12x - 13y \end{bmatrix}$

B) $\begin{bmatrix} -2x - 9y & -2x + 3y \\ -7x & -12x - 13y \end{bmatrix}$

C) $\begin{bmatrix} -2x - 9y & -2x + 3y \\ 11x & -12x - 7y \end{bmatrix}$

D) $\begin{bmatrix} -14x + 5y & 6 + 3y \\ 11x & 8x - 13y \end{bmatrix}$

Answer: B

Write a matrix to display the information.

108) Barges from ports X and Y went to cities A and B. Shipping costs $220 from X to A, $300 from X to B, $400 from Y to A, and $180 from Y to B. Make a 2 × 2 matrix showing the shipping costs. Assign the ports to the rows and the cities to the columns.

A) $\begin{bmatrix} 300 & 180 \\ 220 & 400 \end{bmatrix}$

B) $\begin{bmatrix} 220 & 300 \\ 400 & 180 \end{bmatrix}$

C) $\begin{bmatrix} 220 & 400 \\ 300 & 180 \end{bmatrix}$

D) $\begin{bmatrix} 400 & 180 \\ 300 & 220 \end{bmatrix}$

Answer: B

109) Factories A and B sent rice to stores 1 and 2. It cost $200 to ship from A to 1, $350 from A to 2, $300 from B to 1, and $250 from B to 2. Make a 2 × 2 matrix showing the shipping costs. Assign the factories to the rows and the stores to the columns.

A) $\begin{bmatrix} 200 & 300 \\ 350 & 250 \end{bmatrix}$

B) $\begin{bmatrix} 200 & 350 \\ 300 & 250 \end{bmatrix}$

C) $\begin{bmatrix} 350 & 250 \\ 200 & 300 \end{bmatrix}$

D) $\begin{bmatrix} 300 & 250 \\ 350 & 200 \end{bmatrix}$

Answer: B

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110) A company makes 3 types of cable. Cable A requires 3 black wires, 3 white wires, and 2 red wires. Cable B requires 1 black, 2 white, and 1 red. Cable C requires 2 black, 1 white, and 2 red. Make a 3 × 3 matrix showing the wire requirements. Assign the cable types to the rows and the wire types to the columns.

A) $\begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 1 \\ 3 & 2 & 3 \end{bmatrix}$

B) $\begin{bmatrix} 3 & 3 & 2 \\ 1 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix}$

C) $\begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix}$

D) $\begin{bmatrix} 2 & 1 & 2 \\ 3 & 2 & 1 \\ 3 & 1 & 2 \end{bmatrix}$

Answer: B

111) A bakery sells three types of cakes. Cake I requires 2 cups of flour, 2 cups of sugar, and 2 eggs. Cake II requires 4 cups of flour, 1 cup of sugar, and 1 egg. Cake III requires 2 cups of flour, 2 cups of sugar, and 3 eggs. Make a 3 × 3 matrix showing the required ingredients for each cake. Assign the cakes to the rows and the ingredients to the columns.

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

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

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

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

Answer: D

112) When the owner of a picture framing store took inventory of her unused frames, she found that she had 43 oak–8", 22 oak–12", 45 oak–18", 9 walnut–8", and 10 walnut–18". Write this information as a 2 × 3 matrix.

A) $\begin{bmatrix} 43 & 9 & 22 \\ 0 & 45 & 10 \end{bmatrix}$

B) $\begin{bmatrix} 43 & 22 \\ 45 & 10 \\ 0 & 9 \end{bmatrix}$

C) $\begin{bmatrix} 43 & 22 & 45 \\ 9 & 0 & 10 \end{bmatrix}$

D) $\begin{bmatrix} 43 & 22 \\ 45 & 9 \\ 0 & 10 \end{bmatrix}$

Answer: C

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113) At a store, Sam bought 2 batteries, 25 60–watt light bulbs, 47 100–watt light bulbs, 9 picture–hanging kits, and a hammer. Jennifer bought 7 batteries, 5 100–watt light bulbs, and a package of tacks. Write the information as a 2 × 6 matrix.

A) $\begin{bmatrix} 2 & 25 & 47 & 9 & 1 \\ 7 & 0 & 5 & 0 & 1 \end{bmatrix}$

B) $\begin{bmatrix} 2 & 7 \\ 25 & 0 \\ 47 & 5 \\ 9 & 0 \\ 1 & 0 \\ 0 & 1 \end{bmatrix}$

C) $\begin{bmatrix} 2 & 7 \\ 25 & 0 \\ 47 & 5 \\ 9 & 0 \\ 1 & 1 \end{bmatrix}$

D) $\begin{bmatrix} 2 & 25 & 47 & 9 & 1 & 0 \\ 7 & 0 & 5 & 0 & 0 & 1 \end{bmatrix}$

Answer: D

114) In the first heat of the 100–yd dash, Russell's time was 15.5 sec, Sergy's time was 15.8 sec, and Omar's time was 16.2 sec. In the second heat, Russell's time was 15.3 sec, Sergy's time was 15.4 sec, and Omar's time was 15.7 sec. Write a 3 × 1 matrix that gives the change in each of their times from the first heat to the second.

A) $\begin{bmatrix} 0.2 & 0.4 & 0.5 \end{bmatrix}$

B) $\begin{bmatrix} -0.2 \\ -0.4 \\ -0.5 \end{bmatrix}$

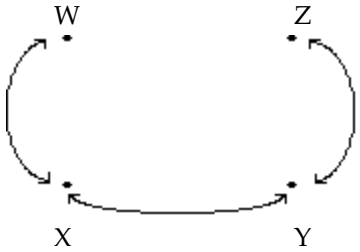
C) $\begin{bmatrix} -0.2 & -0.4 & -0.5 \end{bmatrix}$

D) $\begin{bmatrix} 0.2 \\ 0.4 \\ 0.5 \end{bmatrix}$

Answer: B

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115) Four fire towers are linked by communication devices as shown in the diagram. Assume that each tower cannot communicate with itself and that communication with the other stations takes place only in the direction of the arrows. Write a 4 × 4 matrix in which rows (and columns) 1, 2, 3, and 4 refer to W, X, Y, and Z, respectively. Make an element a 1 if the tower for that row communicates with the tower for that column, and otherwise make the element a 0.



A) $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

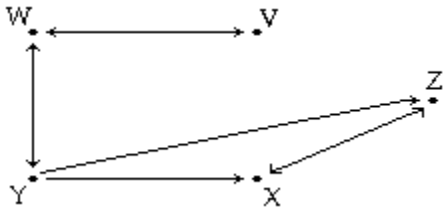
C) $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$

D) $\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix}$

Answer: A

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116) Train routes through cities V, W, X, Y, and Z are shown in the diagram. Assume that each city does not have a train route with itself. Write a 5 × 5 matrix in which rows (and columns) 1, 2, 3, 4, and 5 refer to V, W, X, Y, and Z, respectively. Make an element a 1 if the city for that row has a train route to the city for that column, and otherwise make the element a 0.



A) $\begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$

C) $\begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}$

D) $\begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$

Answer: C

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Solve the problem.

117) Barnes and Able sell life, health, and auto insurance. Their sales, in dollars, for May and June are given in the following matrices.

$$\text{May:}\quad \begin{array}{c} \begin{matrix} \text{Life} & \text{Health} & \text{Auto} \end{matrix} \\ \begin{bmatrix} 20{,}000 & 15{,}000 & 8000 \\ 30{,}000 & 0 & 17{,}000 \end{bmatrix} \end{array} \begin{matrix} \text{Able} \\ \text{Barnes} \end{matrix}$$

$$\text{June:}\quad \begin{bmatrix} 70{,}000 & 0 & 30{,}000 \\ 10{,}000 & 24{,}000 & 32{,}000 \end{bmatrix} \begin{matrix} \text{Able} \\ \text{Barnes} \end{matrix}$$

Find a matrix that gives total sales, in dollars, of each type of insurance by each salesman for the two–month period.

A) $\begin{bmatrix} 130{,}000 & 24{,}000 & 49{,}000 \end{bmatrix}$

B) $\begin{bmatrix} 90{,}000 & 15{,}000 & 38{,}000 \\ 40{,}000 & 24{,}000 & 32{,}000 \end{bmatrix}$

C) $\begin{bmatrix} 90{,}000 & 15{,}000 & 38{,}000 \\ 40{,}000 & 24{,}000 & 49{,}000 \end{bmatrix}$

D) $\begin{bmatrix} 90{,}000 & 0 & 38{,}000 \\ 40{,}000 & 0 & 49{,}000 \end{bmatrix}$

Answer: C

118) Carney and Dobler sell auto and hazard insurance. Their sales, in dollars, for the months of July and August are given in the following matrices.

$$\text{July:}\quad \begin{array}{c} \begin{matrix} \text{Auto} & \text{Hazard} \end{matrix} \\ \begin{bmatrix} 22{,}000 & 45{,}000 \\ 19{,}000 & 27{,}000 \end{bmatrix} \end{array} \begin{matrix} \text{Carney} \\ \text{Dobler} \end{matrix}$$

$$\text{August:}\quad \begin{bmatrix} 25{,}000 & 44{,}000 \\ 14{,}000 & 21{,}000 \end{bmatrix} \begin{matrix} \text{Carney} \\ \text{Dobler} \end{matrix}$$

Find a matrix that gives the increase (decrease) in sales by each salesman for each type of insurance from July to August.

A) $\begin{bmatrix} -3000 & 1000 \\ 5000 & 6000 \end{bmatrix}$

B) $\begin{bmatrix} 3000 & -1000 \\ -5000 & -6000 \end{bmatrix}$

C) $\begin{bmatrix} -8000 & 7000 \end{bmatrix}$

D) $\begin{bmatrix} 8000 & -7000 \end{bmatrix}$

Answer: B

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119) An appliance dealer has two stores in the town of Washingwell. During a given week, they have a beginning inventory of

$$B = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 44 & 25 \\ 51 & 38 \end{bmatrix} \begin{matrix} \text{Store 1} \\ \text{Store 2} \end{matrix} \end{array}$$

a purchase matrix of

$$P = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 5 & 3 \\ 7 & 0 \end{bmatrix} \begin{matrix} \text{Store 1} \\ \text{Store 2} \end{matrix} \end{array}$$

and an ending inventory of

$$E = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 8 & 1 \\ 3 & 2 \end{bmatrix} \begin{matrix} \text{Store 1} \\ \text{Store 2} \end{matrix} \end{array}$$

Find the sales matrix.

A)
$$S = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 57 & 29 \\ 61 & 40 \end{bmatrix} \begin{matrix} \text{Store 1} \\ \text{Store 2} \end{matrix} \end{array}$$

B)
$$S = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 31 & 21 \\ 41 & 36 \end{bmatrix} \begin{matrix} \text{Store 1} \\ \text{Store 2} \end{matrix} \end{array}$$

C)
$$S = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 47 & 23 \\ 47 & 40 \end{bmatrix} \begin{matrix} \text{Store 1} \\ \text{Store 2} \end{matrix} \end{array}$$

D)
$$S = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 41 & 27 \\ 55 & 36 \end{bmatrix} \begin{matrix} \text{Store 1} \\ \text{Store 2} \end{matrix} \end{array}$$

Answer: D

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120) An appliance dealer has three stores in the town of Washingwell. During a given week, they have a beginning inventory of

$$B = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 18 & 11 \\ 40 & 31 \\ 25 & 29 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$$

a sales matrix of

$$S = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 4 & 1 \\ 9 & 8 \\ 2 & 2 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$$

and an ending inventory of

$$E = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 21 & 13 \\ 46 & 35 \\ 33 & 35 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$$

Find the purchase matrix.

A)
$$P = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 7 & 5 \\ 12 & 12 \\ 10 & 9 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$$

B)
$$P = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 43 & 25 \\ 95 & 74 \\ 60 & 66 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$$

C)
$$P = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 7 & 3 \\ 15 & 12 \\ 10 & 8 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$$

D)
$$P = \begin{array}{c} \begin{matrix} \text{Washing} \\ \text{Machines} \end{matrix} \quad \begin{matrix} \text{Dish} \\ \text{Washers} \end{matrix} \\ \begin{bmatrix} 35 & 23 \\ 77 & 58 \\ 56 & 62 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$$

Answer: C

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121) The matrices give points and rebounds for five starting players in two games. Find the matrix that gives the totals.

$$F = \begin{array}{c} \text{Points} \quad \text{Rebounds} \\ \begin{bmatrix} 21 & 3 \\ 16 & 5 \\ 8 & 12 \\ 3 & 11 \\ 10 & 2 \end{bmatrix} \end{array}$$

$$S = \begin{array}{c} \text{Points} \quad \text{Rebounds} \\ \begin{bmatrix} 18 & 4 \\ 15 & 3 \\ 12 & 9 \\ 4 & 10 \\ 10 & 3 \end{bmatrix} \end{array}$$

A)
$\begin{bmatrix} 62 & 5 \end{bmatrix}$

B)
$\begin{bmatrix} 7 & 39 \\ 31 & 8 \\ 21 & 20 \\ 21 & 7 \\ 5 & 20 \end{bmatrix}$

C)
$\begin{bmatrix} 5 & 62 \end{bmatrix}$

D)
$\begin{bmatrix} 39 & 7 \\ 31 & 8 \\ 20 & 21 \\ 7 & 21 \\ 20 & 5 \end{bmatrix}$

Answer: D

122) A 3–oz serving of roasted, skinless chicken breast contains 140 calories, 27 grams of protein, and 3 grams of fat. A broccoli spear contains 50 calories, 5 grams of protein, and 1 gram of fat. A cup of whole milk contains 150 calories, 8 grams of protein, and 8 grams of fat. The amount of calories, protein, and fat in one serving of chicken breast can be represented by the matrix $C = \begin{bmatrix} 140 & 27 & 3 \end{bmatrix}$. Find the matrices B and M for the amounts of calories, protein, and fat in a broccoli spear and a cup of whole milk, respectively, and write the matrix $3C + 6B + 4M$, which represents the calories, protein, and fat in 3 servings of chicken, 6 servings of broccoli, and 4 cups of whole milk.

A)
$\begin{bmatrix} 510 & 336 & 664 \end{bmatrix}$

B)
$\begin{bmatrix} 594 & 184 & 530 \end{bmatrix}$

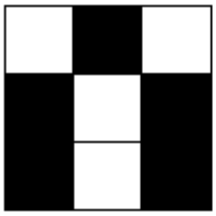
C)
$\begin{bmatrix} 1320 & 143 & 47 \end{bmatrix}$

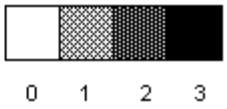
D)
$\begin{bmatrix} 340 & 40 & 12 \end{bmatrix}$

Answer: C

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123) Consider the following simplified digital photograph that has a 3 × 3 grid with four gray levels numbered from 0 to 3. It shows a letter Y in black on a light gray background.





Let A be the 3 × 3 matrix that represents this figure digitally. Find the matrix B for which B – A represents the negative image of the picture represented by A.

A)
$$\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix}$$

B)
$$\begin{bmatrix} -1 & -1 & -1 \\ -1 & -1 & -1 \\ -1 & -1 & -1 \end{bmatrix}$$

C)
$$\begin{bmatrix} 2 & 2 & 2 \\ 2 & 2 & 2 \\ 2 & 2 & 2 \end{bmatrix}$$

D)
$$\begin{bmatrix} -2 & 1 & -2 \\ 1 & -2 & 1 \\ 1 & -2 & 1 \end{bmatrix}$$

Answer: A

Provide an appropriate response.

124) What are the elements of the third row of the following matrix?
$$\begin{bmatrix} -2 & 1 & 3 & 4 \\ -3 & -1 & 4 & 7 \\ 1 & -5 & 2 & 6 \end{bmatrix}$$
A) –2, 1, 3, 4
B) 1, –5, 2, 6
C) 3, 4, 2
D) –2, –1, 2

Answer: B

125) What are the elements of the second column of the following matrix?
$$\begin{bmatrix} -2 & 1 & 3 & 4 \\ -3 & -1 & 4 & 7 \\ 1 & -5 & 2 & 6 \end{bmatrix}$$
A) 1, –1, –5
B) 1, 4, 6
C) –2, –1, 2
D) –3, –1, 4, 7

Answer: A

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SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

126) Is this a square matrix? Why or why not?

$$\begin{bmatrix} -2 & 1 & 3 & 4 \\ -3 & -1 & 4 & 7 \\ 1 & -5 & 2 & 6 \end{bmatrix}$$

Answer: No. The number of rows (3) is not the same as the number of columns (4).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

127) Give the size of the following matrix.

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

A) 4 × 4
B) 3 × 4
C) 4 × 3
D) 3 × 3

Answer: C

128) Give the size of the following matrix.

$$\begin{bmatrix} 1 & 3 & -1 & 2 & 4 \\ 3 & 5 & 1 & 0 & 6 \end{bmatrix}$$

A) 2 × 2
B) 10 × 1
C) 5 × 2
D) 2 × 5

Answer: D

129) True or False?

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

A) False
B) True

Answer: A

130) True or False?

$$\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} = \begin{bmatrix} a & b & c & d \end{bmatrix}$$

A) False
B) True

Answer: A

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131) Which choice best describes the following matrix?

$$\begin{bmatrix} 24 \\ 25 \\ 20 \\ 17 \\ 18 \end{bmatrix}$$

A) Row matrix
B) 1 × 5 matrix
C) Column matrix
D) Square matrix

Answer: C

132) If A is a 5 × 2 matrix and A + K = A, what can you say about K?
A) K is a 2 × 5 matrix and each of its entries is the negative of the corresponding entry of A.
B) K is a 5 × 2 matrix and each of its entries is the negative of the corresponding entry of A.
C) K is a 2 × 5 matrix and all entries of K are equal to 0.
D) K is a 5 × 2 matrix and all entries of K are equal to 0.

Answer: D

Find the value.

133) Let $A = \begin{bmatrix} -3 & 6 \\ 0 & 2 \end{bmatrix}$; 3A

A) $\begin{bmatrix} -9 & 6 \\ 0 & 2 \end{bmatrix}$

B) $\begin{bmatrix} -9 & 18 \\ 0 & 2 \end{bmatrix}$

C) $\begin{bmatrix} -9 & 18 \\ 0 & 6 \end{bmatrix}$

D) $\begin{bmatrix} 0 & 9 \\ 3 & 5 \end{bmatrix}$

Answer: C

134) Let $B = \begin{bmatrix} -1 & 6 & 7 & -3 \end{bmatrix}$; -3B

A) $\begin{bmatrix} 3 & 6 & 7 & -3 \end{bmatrix}$

B) $\begin{bmatrix} -3 & 4 & 5 & -5 \end{bmatrix}$

C) $\begin{bmatrix} -3 & 18 & 21 & -9 \end{bmatrix}$

D) $\begin{bmatrix} 3 & -18 & -21 & 9 \end{bmatrix}$

Answer: D

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135) Let $C = \begin{bmatrix} 6 \\ -2 \\ 12 \end{bmatrix}$; $\frac{1}{2}C$

A) $\begin{bmatrix} 3 \\ -2 \\ 12 \end{bmatrix}$

B) $\begin{bmatrix} 3 \\ -1 \\ 6 \end{bmatrix}$

C) $\begin{bmatrix} 6 \\ -1 \\ 12 \end{bmatrix}$

D) $\begin{bmatrix} 12 \\ -4 \\ 24 \end{bmatrix}$

Answer: B

136) Let $A = \begin{bmatrix} 3 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -1 & 6 \end{bmatrix}$; $3A + B$

A) $\begin{bmatrix} 9 & 13 \\ 1 & 10 \end{bmatrix}$

B) $\begin{bmatrix} 9 & 13 \\ 5 & 18 \end{bmatrix}$

C) $\begin{bmatrix} 9 & 7 \\ 5 & 10 \end{bmatrix}$

D) $\begin{bmatrix} 9 & 21 \\ 3 & 30 \end{bmatrix}$

Answer: B

137) Let $C = \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix}$ and $D = \begin{bmatrix} -1 \\ 3 \\ -2 \end{bmatrix}$; $C - 4D$

A) $\begin{bmatrix} -3 \\ 9 \\ -6 \end{bmatrix}$

B) $\begin{bmatrix} 5 \\ -15 \\ 10 \end{bmatrix}$

C) $\begin{bmatrix} 5 \\ -6 \\ 4 \end{bmatrix}$

D) $\begin{bmatrix} -5 \\ 15 \\ -10 \end{bmatrix}$

Answer: B

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138) Let $A = \begin{bmatrix} -5 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \end{bmatrix}$; $2A + 3B$

A) $\begin{bmatrix} -7 & 4 \end{bmatrix}$

B) $\begin{bmatrix} -10 & 4 \end{bmatrix}$

C) $\begin{bmatrix} -2 & 2 \end{bmatrix}$

D) $\begin{bmatrix} -9 & 4 \end{bmatrix}$

Answer: A

The sizes of two matrices A and B are given. Find the sizes of the product AB and the product BA, whenever these products exist.

139) A is 2 × 2, and B is 2 × 2.

A) 2 × 4; 2 × 4

B) 4 × 2; 4 × 2

C) 2 × 2; 2 × 2

D) 1 × 1; 1 × 1

Answer: C

140) A is 3 × 2, and B is 2 × 3.

A) 3 × 3; BA does not exist.

B) AB does not exist; 2 × 2

C) 2 × 2; 3 × 3

D) 3 × 3; 2 × 2

Answer: D

141) A is 2 × 1, and B is 1 × 1.

A) AB does not exist; 1 × 2

B) 1 × 2; 1 × 1

C) 2 × 1; BA does not exist.

D) 2 × 2; 1 × 1

Answer: C

142) A is 4 × 2, and B is 4 × 2.

A) 4 × 2; 2 × 4

B) 2 × 4; 4 × 2

C) 4 × 4; 2 × 2

D) AB does not exist; BA does not exist.

Answer: D

Find the matrix product, if possible.

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

A) $\begin{bmatrix} 2 & -6 \\ -3 & 5 \end{bmatrix}$

B) $\begin{bmatrix} -1 & 12 \\ -10 & 8 \end{bmatrix}$

C) $\begin{bmatrix} 2 & 0 \\ -4 & 8 \end{bmatrix}$

D) $\begin{bmatrix} 12 & -1 \\ 8 & -10 \end{bmatrix}$

Answer: B

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

A) $\begin{bmatrix} 0 & 4 \\ -5 & 3 \end{bmatrix}$

B) $\begin{bmatrix} -10 & -6 \\ 5 & 5 \end{bmatrix}$

C) $\begin{bmatrix} -2 & 2 \\ -7 & -13 \end{bmatrix}$

D) $\begin{bmatrix} 2 & -2 \\ -13 & 3 \end{bmatrix}$

Answer: D

145) $\begin{bmatrix} 3 & -1 \\ 3 & 0 \end{bmatrix}\begin{bmatrix} 0 & -1 \\ 3 & 6 \end{bmatrix}$

A) $\begin{bmatrix} -3 & 0 \\ 27 & -3 \end{bmatrix}$

B) $\begin{bmatrix} -3 & -9 \\ 0 & -3 \end{bmatrix}$

C) $\begin{bmatrix} 0 & 1 \\ 9 & 0 \end{bmatrix}$

D) $\begin{bmatrix} -9 & -3 \\ -3 & 0 \end{bmatrix}$

Answer: B

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

A) $\begin{bmatrix} 3 & 4 & -7 \\ -22 & 2 & 28 \end{bmatrix}$

B) $\begin{bmatrix} 0 & -6 \\ 12 & 5 \\ -12 & 8 \end{bmatrix}$

C) $\begin{bmatrix} 3 & -7 & 2 \\ 4 & -22 & 28 \end{bmatrix}$

D) Does not exist

Answer: C

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

A) $\begin{bmatrix} 9 & -6 \\ -6 & 8 \\ 3 & -5 \end{bmatrix}$

B) $\begin{bmatrix} 9 & 0 \\ 0 & 4 \end{bmatrix}$

C) $\begin{bmatrix} 9 & -6 & 3 \\ -6 & 8 & -5 \end{bmatrix}$

D) Does not exist

Answer: D

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

A) $\begin{bmatrix} 0 & -4 & 4 \\ 6 & -2 & 11 \end{bmatrix}$

B) $\begin{bmatrix} 0 & 4 & -2 \\ -4 & 6 & 11 \end{bmatrix}$

C) $\begin{bmatrix} 0 & -6 & -8 \\ 0 & -6 & 3 \end{bmatrix}$

D) Does not exist

Answer: B

149) $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 0 & 5 \end{bmatrix}\begin{bmatrix} 3 & 0 \\ -1 & 1 \\ 0 & 5 \end{bmatrix}$

A) $\begin{bmatrix} -2 & 0 \\ 25 & 9 \end{bmatrix}$

B) $\begin{bmatrix} 3 & -3 & 0 \\ 0 & 0 & 25 \end{bmatrix}$

C) $\begin{bmatrix} 0 & -2 \\ 9 & 25 \end{bmatrix}$

D) Does not exist

Answer: C

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

A) $\begin{bmatrix} 4 & -4 & 4 \\ 5 & 2 & -2 \end{bmatrix}$

B) $\begin{bmatrix} 5 & 2 & -2 \\ 4 & -4 & 4 \end{bmatrix}$

C) $\begin{bmatrix} 5 & 0 & 0 \\ 0 & -4 & 4 \end{bmatrix}$

D) Does not exist

Answer: B

151) $\left(\begin{bmatrix} -10 & -2 \\ -1 & 2 \\ 5 & -2 \end{bmatrix}\begin{bmatrix} -7 & 7 \\ -4 & 5 \end{bmatrix}\right)\begin{bmatrix} 2 \\ 5 \end{bmatrix}$

A) $\begin{bmatrix} 156 & 390 \\ -2 & -5 \\ -54 & -135 \end{bmatrix}$

B) $\begin{bmatrix} 230 \\ 1 \\ -85 \end{bmatrix}$

C) $\begin{bmatrix} -244 \\ 13 \\ 71 \end{bmatrix}$

D) Does not exist

Answer: C

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152) $\begin{bmatrix} 0 & -2 \\ 3 & 3 \end{bmatrix}\left(\begin{bmatrix} 3 & 2 & -2 \\ 6 & -9 & 7 \end{bmatrix}+\begin{bmatrix} -4 & 1 & 4 \\ -6 & 6 & -6 \end{bmatrix}\right)$

A) $\begin{bmatrix} 0 & -3 & 6 \\ 0 & -2 & 9 \end{bmatrix}$

B) $\begin{bmatrix} 0 & -6 & -12 \\ 0 & -9 & 3 \end{bmatrix}$

C) $\begin{bmatrix} 0 & 6 & -2 \\ -3 & 0 & 9 \end{bmatrix}$

D) Does not exist

Answer: C

Use a graphing calculator to find the matrix product and/or sum.

153) Find AB.

$A=\begin{bmatrix} 18 & 14 & 18 & 18 \\ 30 & 5 & 7 & 2 \\ 11 & 3 & 2 & 1 \\ 5 & 32 & 5 & 7 \end{bmatrix}$ $B=\begin{bmatrix} 18 & 5 & 3 \\ 18 & 8 & 12 \\ 7 & 4 & 2 \\ 21 & 15 & 13 \end{bmatrix}$

A) $\begin{bmatrix} 1224 & 340 & 134 \\ 792 & 352 & 528 \\ 119 & 68 & 34 \\ 1029 & 735 & 637 \end{bmatrix}$

B) $\begin{bmatrix} 468 & 364 & 468 & 468 \\ 1140 & 190 & 266 & 76 \\ 143 & 39 & 26 & 13 \\ 245 & 1568 & 245 & 343 \end{bmatrix}$

C) $\begin{bmatrix} 1080 & 544 & 492 \\ 721 & 248 & 190 \\ 287 & 102 & 86 \\ 848 & 406 & 500 \end{bmatrix}$

D) Does not exist

Answer: C

154) Find BA.

$A=\begin{bmatrix} 11 & 14 & 18 & 18 \\ 30 & 5 & 7 & 2 \\ 11 & 3 & 2 & 1 \\ 5 & 32 & 5 & 19 \end{bmatrix}$ $B=\begin{bmatrix} 12 & 5 & 3 \\ 18 & 8 & 12 \\ 7 & 4 & 2 \\ 21 & 15 & 0 \end{bmatrix}$

A) $\begin{bmatrix} 220 & 280 & 360 & 360 \\ 1140 & 190 & 266 & 76 \\ 143 & 39 & 26 & 13 \\ 180 & 1152 & 180 & 684 \end{bmatrix}$

B) $\begin{bmatrix} 888 & 509 & 237 \\ 541 & 248 & 164 \\ 221 & 102 & 73 \\ 1070 & 586 & 409 \end{bmatrix}$

C) $\begin{bmatrix} 732 & 305 & 113 \\ 792 & 352 & 528 \\ 119 & 68 & 34 \\ 1281 & 915 & 0 \end{bmatrix}$

D) Does not exist

Answer: D

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155) Find A + B.

$$A = \begin{bmatrix} -20 & -14 & 18 & 18 \\ 30 & 5 & -7 & 2 \\ 11 & 3 & -2 & 1 \\ -5 & 32 & 5 & 10 \end{bmatrix} \quad B = \begin{bmatrix} 4 & 17 & -6 & 3 \\ -12 & 5 & 9 & -2 \\ 7 & 15 & 18 & -6 \\ -4 & 3 & -22 & 14 \end{bmatrix}$$

A) $\begin{bmatrix} 24 & 31 & -24 & -15 \\ -42 & 0 & 16 & -4 \\ -4 & 12 & 20 & -7 \\ 1 & -29 & -27 & 4 \end{bmatrix}$

B) $\begin{bmatrix} -24 & -31 & 24 & 15 \\ 42 & 0 & -16 & 4 \\ 4 & -12 & -20 & 7 \\ -1 & 29 & 27 & -4 \end{bmatrix}$

C) $\begin{bmatrix} 142 & -86 & -78 & 112 \\ 3 & 436 & -305 & 150 \\ -10 & 175 & -97 & 53 \\ -408 & 180 & 188 & 31 \end{bmatrix}$

D) $\begin{bmatrix} -16 & 3 & 12 & 21 \\ 18 & 10 & 2 & 0 \\ 18 & 18 & 16 & -5 \\ -9 & 35 & -17 & 24 \end{bmatrix}$

Answer: D

156) Find A(B + C).

$$A = \begin{bmatrix} 19 & -14 & 18 & 18 \\ 30 & 5 & -7 & 2 \\ 11 & 3 & -2 & 1 \\ -5 & 32 & 5 & 10 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 17 & 12 \\ 7 & 6 & -4 \\ -12 & -9 & 15 \\ 3 & -2 & -14 \end{bmatrix} \quad C = \begin{bmatrix} 7 & -4 & 3 \\ -16 & -19 & 20 \\ -6 & -15 & -8 \\ 5 & 16 & 17 \end{bmatrix}$$

A) $\begin{bmatrix} -158 & 37 & 305 \\ 259 & 580 & 297 \\ 97 & 206 & 88 \\ 174 & 58 & -28 \end{bmatrix}$

B) $\begin{bmatrix} 174 & 37 & 305 \\ 457 & 521 & 487 \\ 97 & 206 & 88 \\ 174 & -461 & 502 \end{bmatrix}$

C) $\begin{bmatrix} 174 & 249 & 241 \\ 457 & 521 & 487 \\ 149 & 166 & 202 \\ -358 & -461 & 502 \end{bmatrix}$

D) Does not exist

Answer: C

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157) Find (B + C)A.

$$A = \begin{bmatrix} -2 & -14 & 18 & 18 \\ 30 & 5 & -7 & 2 \\ 11 & 3 & -2 & 1 \\ -5 & 32 & 5 & 10 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 17 & 12 \\ 7 & 6 & -4 \\ -12 & -9 & 15 \\ 3 & -2 & -14 \end{bmatrix} \quad C = \begin{bmatrix} 7 & -4 & 3 \\ -16 & -19 & 20 \\ -6 & -15 & -8 \\ 5 & 16 & 17 \end{bmatrix}$$

A) $\begin{bmatrix} -263 & -320 & 53 \\ 259 & 580 & 297 \\ 97 & 206 & 88 \\ 174 & 58 & -28 \end{bmatrix}$

B) $\begin{bmatrix} -78 & -24 & -74 \\ 457 & 521 & 557 \\ 149 & 166 & 222 \\ -358 & -461 & 452 \end{bmatrix}$

C) $\begin{bmatrix} -78 & -320 & -74 \\ 259 & 521 & 297 \\ 149 & 206 & 222 \\ -174 & -58 & 452 \end{bmatrix}$

D) Does not exist

Answer: D

158) Find AB + AC.

$$A = \begin{bmatrix} 17 & -14 & 18 & 18 \\ 30 & 5 & -7 & 2 \\ 11 & 3 & -2 & 1 \\ -5 & 32 & 5 & 10 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 17 & 12 \\ 7 & 6 & -4 \\ -12 & -9 & 15 \\ 3 & -2 & -14 \end{bmatrix} \quad C = \begin{bmatrix} 7 & -4 & 3 \\ -16 & -19 & 20 \\ -6 & -15 & -8 \\ 5 & 16 & 17 \end{bmatrix}$$

A) $\begin{bmatrix} 150 & 3 & 281 \\ 457 & 521 & 487 \\ 97 & 206 & 88 \\ 174 & -461 & 502 \end{bmatrix}$

B) $\begin{bmatrix} -168 & 3 & 281 \\ 259 & 580 & 297 \\ 97 & 206 & 88 \\ 174 & 58 & -28 \end{bmatrix}$

C) $\begin{bmatrix} 150 & 223 & 211 \\ 457 & 521 & 487 \\ 149 & 166 & 202 \\ -358 & -461 & 502 \end{bmatrix}$

D) Does not exist

Answer: C

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Solve the problem.

159) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers X and Y. Multiply the matrices.

$$A = \begin{array}{c} \begin{matrix} \text{sugar} & \text{choc} & \text{milk} \end{matrix} \\ \begin{bmatrix} 4 & 6 & 1 \\ 5 & 3 & 1 \\ 3 & 3 & 1 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{array}{c} \begin{matrix} X & Y \end{matrix} \\ \begin{bmatrix} 3 & 2 \\ 3 & 4 \\ 2 & 2 \end{bmatrix} \end{array} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A)

$$\begin{array}{c} \begin{matrix} X & Y \end{matrix} \\ \begin{bmatrix} 32 & 34 \\ 26 & 24 \\ 20 & 20 \end{bmatrix} \end{array} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

B)

$$\begin{array}{c} \begin{matrix} X & Y \end{matrix} \\ \begin{bmatrix} 32 & 34 \\ 26 & 24 \\ 20 & 20 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

C)

$$\begin{array}{c} \begin{matrix} X & Y \end{matrix} \\ \begin{bmatrix} 22 & 33 \\ 36 & 27 \\ 14 & 14 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

D)

$$\begin{array}{c} \begin{matrix} X & Y \end{matrix} \\ \begin{bmatrix} 33 & 22 \\ 27 & 36 \\ 14 & 14 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

Answer: B

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160) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers X and Y. What is the cost of 100 batches of each candy using ingredients from supplier X?

$$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 4 & 6 & 1 \\ 5 & 3 & 1 \\ 3 & 3 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{bmatrix} X & Y \\ 3 & 2 \\ 3 & 4 \\ 2 & 2 \end{bmatrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $7800
B) $6600
C) $4800
D) $3300

Answer: A

161) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers X and Y. What is the cost of 100 batches of each candy using ingredients from supplier Y?

$$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 4 & 6 & 1 \\ 5 & 3 & 1 \\ 3 & 3 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{bmatrix} X & Y \\ 3 & 2 \\ 3 & 4 \\ 2 & 2 \end{bmatrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $3300
B) $4800
C) $6600
D) $7800

Answer: D

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162) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers R and S. Multiply the matrices.

$$A = \begin{array}{c} \begin{array}{ccc} \text{sugar} & \text{choc} & \text{milk} \end{array} \\ \left[\begin{array}{ccc} 4 & 6 & 1 \\ 7 & 3 & 1 \\ 4 & 3 & 1 \end{array}\right] \end{array} \begin{array}{l} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{array}$$

$$B = \begin{array}{c} \begin{array}{cc} \text{R} & \text{S} \end{array} \\ \left[\begin{array}{cc} 6 & 5 \\ 6 & 7 \\ 2 & 2 \end{array}\right] \end{array} \begin{array}{l} \text{sugar} \\ \text{choc} \\ \text{milk} \end{array}$$

A)
$$\begin{array}{c} \begin{array}{cc} \text{R} & \text{S} \end{array} \\ \left[\begin{array}{cc} 62 & 64 \\ 74 & 72 \\ 44 & 43 \end{array}\right] \end{array} \begin{array}{l} \text{sugar} \\ \text{choc} \\ \text{milk} \end{array}$$

B)
$$\begin{array}{c} \begin{array}{cc} \text{R} & \text{S} \end{array} \\ \left[\begin{array}{cc} 62 & 64 \\ 62 & 58 \\ 44 & 43 \end{array}\right] \end{array} \begin{array}{l} \text{cherry} \\ \text{almond} \\ \text{raisin} \end{array}$$

C)
$$\begin{array}{c} \begin{array}{cc} \text{R} & \text{S} \end{array} \\ \left[\begin{array}{cc} 55 & 66 \\ 91 & 78 \\ 16 & 16 \end{array}\right] \end{array} \begin{array}{l} \text{cherry} \\ \text{almond} \\ \text{raisin} \end{array}$$

D)
$$\begin{array}{c} \begin{array}{cc} \text{R} & \text{S} \end{array} \\ \left[\begin{array}{cc} 66 & 55 \\ 78 & 91 \\ 16 & 16 \end{array}\right] \end{array} \begin{array}{l} \text{cherry} \\ \text{almond} \\ \text{raisin} \end{array}$$

Answer: B

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163) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers R and S. What is the cost of 100 batches of each candy using ingredients from supplier R?

$$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 4 & 6 & 1 \\ 7 & 3 & 1 \\ 4 & 3 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{bmatrix} R & S \\ 6 & 5 \\ 6 & 7 \\ 2 & 2 \end{bmatrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $17,900
B) $16,800
C) $13,200
D) $6600

Answer: B

164) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers R and S. What is the cost of 100 batches of each candy using ingredients from supplier S?

$$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 4 & 6 & 1 \\ 7 & 3 & 1 \\ 4 & 3 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{bmatrix} R & S \\ 6 & 5 \\ 6 & 7 \\ 2 & 2 \end{bmatrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $16,500
B) $12,000
C) $13,200
D) $6600

Answer: A

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165) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers J and K. Multiply the matrices.

$$A = \begin{array}{c} \begin{matrix} \text{sugar} & \text{choc} & \text{milk} \end{matrix} \\ \begin{bmatrix} 6 & 8 & 1 \\ 6 & 4 & 1 \\ 5 & 7 & 1 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{array}{c} \begin{matrix} \text{J} & \text{K} \end{matrix} \\ \begin{bmatrix} 4 & 3 \\ 4 & 5 \\ 2 & 2 \end{bmatrix} \end{array} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A)
$$\begin{array}{c} \begin{matrix} \text{J} & \text{K} \end{matrix} \\ \begin{bmatrix} 58 & 60 \\ 42 & 40 \\ 50 & 52 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

B)
$$\begin{array}{c} \begin{matrix} \text{J} & \text{K} \end{matrix} \\ \begin{bmatrix} 58 & 60 \\ 42 & 40 \\ 50 & 52 \end{bmatrix} \end{array} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

C)
$$\begin{array}{c} \begin{matrix} \text{J} & \text{K} \end{matrix} \\ \begin{bmatrix} 60 & 45 \\ 44 & 55 \\ 26 & 26 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

D)
$$\begin{array}{c} \begin{matrix} \text{J} & \text{K} \end{matrix} \\ \begin{bmatrix} 45 & 60 \\ 55 & 44 \\ 26 & 26 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

Answer: A

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166) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers J and K. What is the cost of 100 batches of each candy using ingredients from supplier J?

$$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 6 & 8 & 1 \\ 6 & 4 & 1 \\ 5 & 7 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{bmatrix} \text{J} & \text{K} \\ 4 & 3 \\ 4 & 5 \\ 2 & 2 \end{bmatrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $12,000
B) $15,200
C) $6000
D) $15,000

Answer: D

167) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers J and K. What is the cost of 100 batches of each candy using ingredients from supplier K?

$$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 6 & 8 & 1 \\ 6 & 4 & 1 \\ 5 & 7 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{bmatrix} \text{J} & \text{K} \\ 4 & 3 \\ 4 & 5 \\ 2 & 2 \end{bmatrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $12,000
B) $6000
C) $15,200
D) $9400

Answer: C

Given matrices $A = \begin{bmatrix} 2 & 3 \\ -1 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 4 & -2 \\ -2 & -1 \end{bmatrix}$, and $C = \begin{bmatrix} -5 & 2 \\ 0 & 1 \end{bmatrix}$, decide if the statement is true or false.

168) (AB)C = A(BC)
A) True
B) False

Answer: A

169) AB is a 2 × 2 matrix.
A) True
B) False

Answer: A

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170) $(A + B)(B - A) = A^2 - B^2$, where $A^2 = AA$ and $B^2 = BB$.
A) True
B) False
Answer: B

171) $(A + B)^2 = A^2 + 2AB + B^2$, where $A^2 = AA$ and $B^2 = BB$.
A) True
B) False
Answer: B

172) $k(A + B) = kA + kB$ for any real number k.
A) True
B) False
Answer: A

173) $A(B + C) = AB + AC$
A) True
B) False
Answer: A

174) ABC is a 2×4 matrix.
A) True
B) False
Answer: B

175) $AB = BA$.
A) True
B) False
Answer: B

Decide whether the matrices are inverses of each other. (Check to see if their product is the identity matrix I.)

176) $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$ and $\begin{bmatrix} 2 & -3 \\ -3 & 5 \end{bmatrix}$
A) Yes
B) No
Answer: A

177) $\begin{bmatrix} 10 & 1 \\ -1 & 0 \end{bmatrix}$ and $\begin{bmatrix} 0 & 1 \\ -1 & 10 \end{bmatrix}$
A) Yes
B) No
Answer: B

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178) $\begin{bmatrix} -2 & 4 \\ 4 & -4 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{4} \end{bmatrix}$

A) Yes
B) No

Answer: B

179) $\begin{bmatrix} -5 & 1 \\ -7 & 1 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{7}{2} & -\frac{5}{2} \end{bmatrix}$

A) Yes
B) No

Answer: A

180) $\begin{bmatrix} 6 & -5 \\ -3 & 5 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{3} & \frac{1}{3} \\ \frac{1}{5} & \frac{2}{5} \end{bmatrix}$

A) Yes
B) No

Answer: A

181) $\begin{bmatrix} 9 & 4 \\ 4 & 4 \end{bmatrix}$ and $\begin{bmatrix} -0.2 & 0.2 \\ 0.2 & -0.45 \end{bmatrix}$

A) Yes
B) No

Answer: B

182) $\begin{bmatrix} 9 & -2 \\ 7 & -2 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ -\frac{7}{4} & -\frac{9}{4} \end{bmatrix}$

A) Yes
B) No

Answer: B

183) $\begin{bmatrix} -5 & -1 \\ 6 & 0 \end{bmatrix}$ and $\begin{bmatrix} 0 & \frac{1}{6} \\ -1 & \frac{5}{6} \end{bmatrix}$

A) Yes
B) No

Answer: B

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184) $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 1 & -2 \\ 1 & 0 & -1 \end{bmatrix}$ and $\begin{bmatrix} 1 & -1 & 2 \\ -3 & -2 & 4 \\ -1 & 1 & 1 \end{bmatrix}$

A) Yes

B) No

Answer: B

185) $\begin{bmatrix} 1 & 2 & 0 \\ -2 & 0 & 2 \\ 3 & 2 & -4 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & -1 & -\frac{1}{2} \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} \end{bmatrix}$

A) Yes

B) No

Answer: A

Find the inverse, if it exists, for the matrix.

186) $\begin{bmatrix} -6 & 5 \\ -4 & 5 \end{bmatrix}$

A) $\begin{bmatrix} -\frac{1}{2} & \frac{1}{2} \\ -\frac{2}{5} & \frac{3}{5} \end{bmatrix}$

B) $\begin{bmatrix} -\frac{2}{5} & \frac{3}{5} \\ -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$

C) $\begin{bmatrix} -\frac{1}{2} & -\frac{1}{2} \\ \frac{2}{5} & \frac{3}{5} \end{bmatrix}$

D) $\begin{bmatrix} \frac{3}{5} & \frac{1}{2} \\ -\frac{2}{5} & -\frac{1}{2} \end{bmatrix}$

Answer: A

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187) $\begin{bmatrix} 0 & -6 \\ -1 & -6 \end{bmatrix}$

A) $\begin{bmatrix} 0 & -1 \\ -\frac{1}{6} & 1 \end{bmatrix}$

B) $\begin{bmatrix} 1 & 1 \\ \frac{1}{6} & 0 \end{bmatrix}$

C) $\begin{bmatrix} 1 & -1 \\ -\frac{1}{6} & 0 \end{bmatrix}$

D) $\begin{bmatrix} -\frac{1}{6} & 0 \\ 1 & -1 \end{bmatrix}$

Answer: C

188) $\begin{bmatrix} 5 & 0 \\ -4 & 1 \end{bmatrix}$

A) $\begin{bmatrix} \frac{1}{5} & 0 \\ -\frac{4}{5} & 1 \end{bmatrix}$

B) $\begin{bmatrix} \frac{1}{5} & 0 \\ \frac{4}{5} & 1 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 0 \\ \frac{4}{5} & \frac{1}{5} \end{bmatrix}$

D) No inverse

Answer: B

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189) $\begin{bmatrix} 8 & 2 \\ -7 & 1 \end{bmatrix}$

A) $\begin{bmatrix} \frac{1}{23} & -\frac{2}{23} \\ \frac{7}{23} & \frac{8}{23} \end{bmatrix}$

B) $\begin{bmatrix} 1 & -2 \\ 7 & 8 \end{bmatrix}$

C) $\begin{bmatrix} \frac{1}{23} & \frac{2}{23} \\ -\frac{7}{23} & \frac{8}{23} \end{bmatrix}$

D) No inverse

Answer: D

190) $\begin{bmatrix} -4 & 1 \\ 0 & 1 \end{bmatrix}$

A) $\begin{bmatrix} 0 & 1 \\ -\frac{1}{4} & \frac{1}{4} \end{bmatrix}$

B) $\begin{bmatrix} -\frac{1}{4} & \frac{1}{4} \\ 0 & 1 \end{bmatrix}$

C) $\begin{bmatrix} -\frac{1}{4} & -\frac{1}{4} \\ 0 & 1 \end{bmatrix}$

D) $\begin{bmatrix} 1 & \frac{1}{4} \\ 0 & -\frac{1}{4} \end{bmatrix}$

Answer: B

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191) $\begin{bmatrix} -4 & 4 \\ 3 & 0 \end{bmatrix}$

A) $\begin{bmatrix} 0 & -\frac{1}{3} \\ -\frac{1}{4} & \frac{1}{3} \end{bmatrix}$

B) $\begin{bmatrix} \frac{1}{3} & \frac{1}{3} \\ \frac{1}{4} & 0 \end{bmatrix}$

C) $\begin{bmatrix} 0 & \frac{1}{3} \\ \frac{1}{4} & \frac{1}{3} \end{bmatrix}$

D) $\begin{bmatrix} \frac{1}{4} & \frac{1}{3} \\ 0 & \frac{1}{3} \end{bmatrix}$

Answer: C

192) $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

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

B) $\begin{bmatrix} -1 & 0 & 0 \\ -1 & -1 & 0 \\ -1 & -1 & -1 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

D) $\begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: A

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

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

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

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

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

Answer: A

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

A) $\begin{bmatrix} -1 & 1 & \frac{5}{6} \\ -\frac{4}{3} & 2 & \frac{13}{6} \\ \frac{1}{3} & 0 & -\frac{1}{6} \end{bmatrix}$

B) $\begin{bmatrix} -\frac{2}{3} & 1 & \frac{5}{6} \\ -\frac{4}{3} & 2 & \frac{13}{6} \\ \frac{1}{3} & 0 & -\frac{1}{6} \end{bmatrix}$

C) $\begin{bmatrix} -\frac{2}{3} & 1 & \frac{5}{6} \\ -\frac{4}{3} & 2 & \frac{13}{6} \\ \frac{1}{3} & 0 & 0 \end{bmatrix}$

D) $\begin{bmatrix} -\frac{2}{3} & 1 & \frac{5}{6} \\ -1 & 2 & 2 \\ \frac{1}{3} & 0 & -\frac{1}{6} \end{bmatrix}$

Answer: B

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195) $A = \begin{bmatrix} 2 & -3 & 0 & 2 \\ 6 & -6 & 0 & 4 \\ 6 & -12 & 0 & 6 \\ 0 & 0 & -2 & 0 \end{bmatrix}$

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

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

C) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{3} & 0 & \frac{1}{2} \\ \frac{1}{6} & -\frac{1}{6} & 0 & \frac{1}{4} \\ \frac{1}{6} & -\frac{1}{12} & 0 & \frac{1}{6} \\ 0 & 0 & -\frac{1}{2} & 0 \end{bmatrix}$

D) No inverse

Answer: B

Solve the system of equations by using the inverse of the coefficient matrix if it exists and by the echelon method if the inverse doesn't exist.

196) $-2x - 6y = -2$

$2x - y = -5$

A) (–1, 2)

B) (–2, 1)

C) (2, –1)

D) (1, –2)

Answer: B

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197) -3x + 9y = 9
3x + 2y = 13
A) (2, 3)
B) (–3, –2)
C) (3, 2)
D) (–2, –3)
Answer: C

198) -10x + 4y = 6
6x – y = 2
A) (–1, –4)
B) (4, 1)
C) (1, 4)
D) (–4, –1)
Answer: C

199) 3x - 6y = -3
3x + 4y = –23
A) (2, 5)
B) (5, 2)
C) (–5, –2)
D) (–2, 5)
Answer: C

200) –5x + 3y = 8
-2x + 4y = 20
A) (6, 2)
B) (–2, –6)
C) (2, 6)
D) (–6, –2)
Answer: C

201) 4x + 3y = 7
5x + 3y = 5
A) No inverse, no solution for system
B) (-2, 5)
C) (-2, -5)
D) (5, -2)
Answer: B

202) 3x + y = 15
2x + 4y = 0
A) (-3, -6)
B) (-3, 6)
C) (6, -3)
D) No inverse, no solution for system
Answer: C

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203) $3x - 6y = -3$
$6x - 12y = -9$
A) No inverse, $\left(-1 - \frac{1}{2}y, y\right)$
B) (-3, -9)
C) No inverse, no solution for system
D) (2, 2)
Answer: C

204) $9x - 3y = 0$
$27x - 9y = 0$
A) No inverse, $\left(0 + \frac{1}{3}y, y\right)$
B) (3, 9)
C) No inverse, no solution for system
D) (-3, -9)
Answer: A

Solve the system of equations by using the inverse of the coefficient matrix.

205) $x + y + z = -5$
$x - y + 3z = -3$
$4x + y + z = 1$
A) (2, –4, -3)
B) (-3, 2, –4)
C) (-3, –4, 2)
D) No inverse, no solution for system
Answer: A

206) $x - y + 3z = 5$
$2x + z = 1$
$x + 4y + z = -7$
A) (1, -2, 0)
B) (0, -2, 1)
C) (1, 0, -2)
D) No inverse, no solution for system
Answer: B

207) $x - y + z = -7$
$x + y + z = 1$
$x + y - z = -1$
A) (1, -4, 4)
B) (-4, 1, 4)
C) (-4, 4, 1)
D) No inverse, no solution for system
Answer: C

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208) $2x + 4y + z = -10$
$4x - 4y - z = -8$
$5x + y + 4z = -1$
A) (4, -2, -3)
B) (-3, -2, 4)
C) (-3, 4, -2)
D) No inverse, no solution for system
Answer: B

209) $-4x + 7z = -17$
$-7x + 8y - 5z = -31$
$9x - 8y = 38$
A) (7, 0, 1)
B) (2, 1, 2)
C) (6, 2, 1)
D) (6, -2, -1)
Answer: C

210) $9x - 2y + 5z = 78$
$2x + 3y - 9z = -50$
$3x - 8y + 6z = 49$
A) (5, 1, 7)
B) (1, 7, 1)
C) (5, -1, -7)
D) (6, –1, 7)
Answer: A

211) $-4x + 8y - z = 45$
$x + 5y + 7z = 99$
$-7x + y + z = -19$
A) (5, -9, -7)
B) (5, 9, 7)
C) (6, 7, 7)
D) (9, 7, 9)
Answer: B

212) $x - y + 2z = -2$
$5x + z = 0$
$x + 4y + z = 8$
A) (0, 0, 2)
B) (0, 2, 0)
C) (0, 2, -2)
D) No inverse, no solution for system
Answer: B

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213)
$$\begin{aligned} x - 2y + 3z &= 3 \\ y - z + w &= -6 \\ -2x + 2y - 2z + 4w &= -18 \\ 2y - 3z + w &= -10 \end{aligned}$$

A) (-3, 2, 4, –5)
B) (-2, 2, 3, –5)
C) (-2, 3, 3, –6)
D) (–1, 1, 2, –4)

Answer: B

Use graphing calculator to find the inverse of the matrix. Give 5 decimal places.

214) $A = \begin{bmatrix} \sqrt{3} & -4 \\ \frac{2}{7} & 0.932 \end{bmatrix}$

A) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 1.97703 & -8.48511 \\ -0.60608 & 3.67416 \end{bmatrix}$

C) $\begin{bmatrix} 0.33803 & 1.45078 \\ -0.10363 & 0.62821 \end{bmatrix}$

D) $\begin{bmatrix} 0.57735 & -0.25 \\ 3.5 & 1.07296 \end{bmatrix}$

Answer: C

215) $A = \begin{bmatrix} \frac{4}{3} & 52 \\ \sqrt{21} & 8.754 \end{bmatrix}$

A) $\begin{bmatrix} -0.70513 & 0.41667 \\ 0.36859 & -0.10417 \end{bmatrix}$

B) $\begin{bmatrix} -0.03863 & 0.22946 \\ 0.02022 & -0.00588 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

D) $\begin{bmatrix} 0.75 & 0.01923 \\ 0.21822 & 0.11423 \end{bmatrix}$

Answer: B

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216) $A = \begin{bmatrix} 1.52 & 5.55 & 4 \\ -0.63 & 7.33 & 3.21 \\ 8.2 & 0.003 & -2.8 \end{bmatrix}$

A) $\begin{bmatrix} 0.15171 & -0.11491 & 0.08500 \\ -0.18145 & 0.27379 & 0.05467 \\ 0.44411 & -0.33622 & -0.10815 \end{bmatrix}$

B) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

C) $\begin{bmatrix} 0.02137 & -0.01623 & 0.01192 \\ -0.27464 & 0.34436 & 0.00245 \\ 0.62294 & -0.47163 & -0.00792 \end{bmatrix}$

D) $\begin{bmatrix} 0.65789 & 0.18018 & 0.25 \\ -1.58730 & 0.13643 & 0.31153 \\ 0.12195 & 333.33333 & -0.35714 \end{bmatrix}$

Answer: A

217) $A = \begin{bmatrix} 1/3 & 2/7 & 4/5 \\ 17/11 & 5 & 0 \\ 18/13 & -5/6 & 8/7 \end{bmatrix}$

A) $\begin{bmatrix} 3 & 3.5 & 1.25 \\ 0.64706 & 5 & 0 \\ 0.72222 & -1.2 & 1.14286 \end{bmatrix}$

B) $\begin{bmatrix} -1.10557 & 0.19216 & 0.77390 \\ 0.34172 & 0.14061 & -0.23920 \\ 1.58861 & -0.13028 & -0.23703 \end{bmatrix}$

C) $\begin{bmatrix} 2.65952 & 0.15830 & -1.86167 \\ -9.04238 & -0.33824 & 6.32966 \\ 3.37129 & 0.05484 & -1.48490 \end{bmatrix}$

D) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

Answer: B

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Solve the matrix equation AX = B for X by finding A^{-1}, given A and B as follows. Use a graphing calculator to obtain your answer, rounding all numbers to four decimal places.

218) $A = \begin{bmatrix} 2 & -1 & 3 \\ -3 & 4 & -5 \\ -4 & 0 & 6 \end{bmatrix}$, $B = \begin{bmatrix} -8 \\ -3 \\ -6 \end{bmatrix}$

A) $\begin{bmatrix} -2.8966 \\ -6.5862 \\ -2.9310 \end{bmatrix}$

B) $\begin{bmatrix} -2.8966 \\ -6.5862 \\ 2.5172 \end{bmatrix}$

C) $\begin{bmatrix} -2.2759 \\ -6.5862 \\ 1.4828 \end{bmatrix}$

D) $\begin{bmatrix} -4.3448 \\ -3.8966 \\ -2.9310 \end{bmatrix}$

Answer: A

219) $A = \begin{bmatrix} 2 & 8 & 0 & -6 \\ 3 & 1 & -5 & 4 \\ -3 & 0 & 7 & -7 \\ 0 & -1 & 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} -9 \\ 8 \\ 7 \\ -6 \end{bmatrix}$

A) $\begin{bmatrix} 17.9565 \\ -1.7174 \\ -2.8043 \\ -12.8913 \end{bmatrix}$

B) $\begin{bmatrix} 17.9565 \\ -15.2826 \\ -4.1957 \\ -12.8913 \end{bmatrix}$

C) $\begin{bmatrix} 15.2174 \\ -15.2826 \\ -4.1957 \\ 6.1087 \end{bmatrix}$

D) $\begin{bmatrix} 15.2174 \\ -15.2826 \\ -4.1957 \\ -12.8913 \end{bmatrix}$

Answer: B

Solve the problem.

220) A company makes 3 types of cable. Cable A requires 3 black wires, 3 white wires, and 2 red wires. Cable B requires 1 black, 2 white, and 1 red. Cable C requires 2 black, 1 white, and 2 red. If 100 black wires, 110 white wires, and 90 red wires were used, then how many of each cable were made?

A) 20 cable A, 30 cable B, 10 cable C

B) 10 cable A, 30 cable B, 20 cable C

C) 10 cable A, 103 cable B, 20 cable C

D) 10 cable A, 30 cable B, 93 cable C

Answer: B

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221) A company makes 3 types of cable. Cable A requires 3 black wires, 3 white wires, and 2 red wires. Cable B requires 1 black, 2 white, and 1 red. Cable C requires 2 black, 1 white, and 2 red. If 95 black wires, 100 white wires, and 85 red wires were used, then how many of each cable were made?

A) 53 cable A, 25 cable B, 17 cable C
B) 10 cable A, 17 cable B, 20 cable C
C) 25 cable A, 10 cable B, 20 cable C
D) 10 cable A, 25 cable B, 20 cable C

Answer: D

222) A bakery sells three types of cakes, each requiring the amount of ingredients shown.

	Cake I	Cake II	Cake III
flour (cups)	2	4	2
sugar (cups)	2	1	2
eggs	2	1	3

To fill its orders for these cakes, the bakery used 72 cups of flour, 48 cups of sugar, and 63 eggs. How many cakes of each type were made?

A) 29 cake I, 8 cake II, 12 cake III
B) 7 cake I, 8 cake II, 15 cake III
C) 5 cake I, 8 cake II, 15 cake III
D) 15 cake I, 8 cake II, 5 cake III

Answer: C

223) A basketball fieldhouse seats 15,000. Courtside seats cost $10, endzone seats cost $6, and balcony seats cost $4. The total revenue for a sellout is $82,000. If half the courtside seats, half the balcony seats, and all the endzone seats are sold; then the total revenue is $47,000. How many of each type of seat are there?

A) 3000 courtside, 4000 endzone, 8000 balcony
B) 4000 courtside, 3000 endzone, 8000 balcony
C) 3200 courtside, 1800 endzone, 10,000 balcony
D) 3000 courtside, 2000 endzone, 10,000 balcony

Answer: D

Find the production matrix for the input–output and demand matrices using the open model.

224) $A = \begin{bmatrix} 0.2 & 0.1 \\ 0.5 & 0.4 \end{bmatrix}$, $D = \begin{bmatrix} 3 \\ 6 \end{bmatrix}$

A) $\begin{bmatrix} 6.98 \\ 18.31 \end{bmatrix}$

B) $\begin{bmatrix} 5.55 \\ 7.88 \end{bmatrix}$

C) $\begin{bmatrix} 5.58 \\ 14.65 \end{bmatrix}$

D) $\begin{bmatrix} 5.13 \\ 14.65 \end{bmatrix}$

Answer: C

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225) $A = \begin{bmatrix} 0.25 & 0.08 \\ 0.33 & 0.11 \end{bmatrix}$, $D = \begin{bmatrix} 600 \\ 700 \end{bmatrix}$

A)
$\begin{bmatrix} 876 \\ 1031 \end{bmatrix}$

B)
$\begin{bmatrix} 920 \\ 1128 \end{bmatrix}$

C)
$\begin{bmatrix} 1191 \\ 897 \end{bmatrix}$

D)
$\begin{bmatrix} 1150 \\ 1410 \end{bmatrix}$

Answer: B

226) $A = \begin{bmatrix} 0 & 0.25 & 0.33 \\ 0.50 & 0 & 0.25 \\ 0.25 & 0.25 & 0 \end{bmatrix}$, $D = \begin{bmatrix} 518 \\ 265 \\ 154 \end{bmatrix}$

A)
$\begin{bmatrix} 1130 \\ 1067 \\ 734 \end{bmatrix}$

B)
$\begin{bmatrix} 942 \\ 889 \\ 612 \end{bmatrix}$

C)
$\begin{bmatrix} 942 \\ 1067 \\ 612 \end{bmatrix}$

D)
$\begin{bmatrix} 688 \\ 640 \\ 92 \end{bmatrix}$

Answer: B

Find the ratios of products A, B, and C using a closed model.

227)
$$\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0.3 & 0.3 & 0.8 \\ 0.5 & 0.6 & 0 \\ 0.2 & 0.1 & 0.2 \end{bmatrix} \end{array}$$

A) 8: 10: 3

B) 32: 40: 13

C) 8: 13: 32

D) 8: 10: 40

Answer: B

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228)

	A	B	C
A	0.2	0.3	0.1
B	0.3	0.1	0.8
C	0.5	0.6	0.1

A) 33: 67: 63
B) 13: 25: 100
C) 1: 25: 25
D) 1: 149: 100

Answer: A

229)

	A	B	C
A	0.4	0.3	0.4
B	0.2	0.1	0.4
C	0.4	0.6	0.2

A) 3: 2: 3
B) 8: 16: 3
C) 3: 3: 2
D) 4: 8: 3

Answer: A

230)

	A	B	C
A	0.4	0	0.4
B	0	0.8	0.2
C	0.6	0.2	0.4

A) 1: 3: 3
B) 2: 3: 3
C) 6: 3: 3
D) 3: 2: 3

Answer: B

231)

	A	B	C
A	0.1	0.5	0.5
B	0.8	0.3	0.4
C	0.1	0.2	0.1

A) 2: 3: 3
B) 33: 24: 10
C) 8: 11: 10
D) 55: 76: 23

Answer: D

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Solve the problem.

232) Suppose the following matrix represents the input–output matrix of a primitive economy that depends on two basic goods, yams and pigs. How much of each commodity should be produced to get 5 bushels of yams and 7 pigs? (It is not necessary to round to a whole–number quantity of pigs.)

$$\begin{array}{c} \\ \text{yams} \\ \text{pigs} \end{array} \begin{array}{c} \begin{array}{cc} \text{yams} & \text{pigs} \end{array} \\ \begin{bmatrix} 1/4 & 1/6 \\ 1/2 & 0 \end{bmatrix} \end{array}$$

A) 9.25 bushels of yams and 11.63 pigs
B) 15.38 bushels of yams and 9.13 pigs
C) 12.75 bushels of yams and 9.13 pigs
D) 9.25 bushels of yams and 13.5 pigs

Answer: A

233) Suppose the following matrix represents the input–output matrix of a simplified economy that involves just three commodity categories: manufacturing, agriculture, and transportation. How many units of each commodity should be produced to satisfy a demand of 700 units for each commodity?

$$\begin{array}{c} \\ \text{Mfg} \\ \text{Agri} \\ \text{Trans} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Mfg} & \text{Agri} & \text{Trans} \end{array} \\ \begin{bmatrix} 0 & 1/4 & 1/3 \\ 1/2 & 0 & 1/4 \\ 1/4 & 1/4 & 0 \end{bmatrix} \end{array}$$

A) 1743 units of manufacturing, 1974 units of agriculture, and 1631 units of transportation
B) 1960 units of manufacturing, 1631 units of agriculture, and 1757 units of transportation
C) 1757 units of manufacturing, 1960 units of agriculture, and 1631 units of transportation
D) 1757 units of manufacturing, 1631 units of agriculture, and 1743 units of transportation

Answer: A

234) Suppose the following matrix represents the input–output matrix of a primitive economy that depends on two basic goods, yams and pigs. How much of each commodity should be produced to satisfy a demand for 50 bushels of yams and 95 pigs? (It is not necessary to round to a whole–number quantity of pigs.)

$$\begin{array}{c} \\ \text{yams} \\ \text{pigs} \end{array} \begin{array}{c} \begin{array}{cc} \text{yams} & \text{pigs} \end{array} \\ \begin{bmatrix} 1/4 & 1/6 \\ 1/2 & 0 \end{bmatrix} \end{array}$$

A) 98.75 bushels of yams and 163.13 pigs
B) 98.75 bushels of yams and 144.38 pigs
C) 146.25 bushels of yams and 119.38 pigs
D) 181.88 bushels of yams and 119.38 pigs

Answer: B

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235) Suppose the following matrix represents the input–output matrix of a simplified economy with just three sectors: manufacturing, agriculture, and transportation.

$$\begin{array}{c} \\ \text{Mfg} \\ \text{Agri} \\ \text{Trans} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Mfg} & \text{Agri} & \text{Trans} \end{array} \\ \begin{bmatrix} 0 & 0.25 & 0.33 \\ 0.50 & 0 & 0.25 \\ 0.25 & 0.25 & 0 \end{bmatrix} \end{array}$$

Suppose also that the demand matrix is as follows:

$$D = \begin{bmatrix} 512 \\ 273 \\ 137 \end{bmatrix}$$

Find the amount of each commodity that should be produced.

A) 685 units of manufacturing, 636 units of agriculture, and 73 units of transportation
B) 931 units of manufacturing, 1063 units of agriculture, and 591 units of transportation
C) 1117 units of manufacturing, 1063 units of agriculture, and 709 units of transportation
D) 931 units of manufacturing, 886 units of agriculture, and 591 units of transportation

Answer: D

236) The input–output matrix for an economy is given below.

$$\begin{array}{c} \\ \text{Agri.} \\ \text{Mfg.} \end{array} \begin{array}{c} \begin{array}{cc} \text{Agri.} & \text{Mfg.} \end{array} \\ \begin{bmatrix} 0.04 & 0.18 \\ 0.02 & 0.22 \end{bmatrix} \end{array}$$

The demand matrix is

$$D = \begin{bmatrix} 700 \\ 1000 \end{bmatrix}$$

Find the amount of each commodity that should be produced.

A) 861.5 units of agriculture and 1108.3 units of manufacturing
B) 1074.2 units of agriculture and 1397.3 units of manufacturing
C) 1207.2 units of agriculture and 985.0 units of manufacturing
D) 974.2 units of agriculture and 1307.0 units of manufacturing

Answer: D

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237) The input–output matrix for an economy is

$$\begin{array}{c} \\ \text{Agri.} \\ \text{Mfg.} \end{array} \begin{array}{c} \begin{array}{cc} \text{Agri.} & \text{Mfg.} \end{array} \\ \begin{bmatrix} 0.04 & 0.18 \\ 0.02 & 0.22 \end{bmatrix} \end{array}$$

The demand matrix is

$$D = \begin{bmatrix} 700 \\ 1000 \end{bmatrix}$$

Find the internal consumption.

A) 507.2 units of agriculture and 57.0 units of manufacturing
B) 374.2 units of agriculture and 397.3 units of manufacturing
C) 274.2 units of agriculture and 307.0 units of manufacturing
D) 161.5 units of agriculture and 108.3 units of manufacturing

Answer: C

238) Suppose the following matrix represents the input–output matrix, T, of a simplified economy.

$$\begin{array}{c} \\ \text{Manufacturing} \\ \text{Agriculture} \\ \text{Transportation} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Manufacturing} & \text{Agriculture} & \text{Transportation} \end{array} \\ \begin{bmatrix} 0 & 1/4 & 1/3 \\ 1/2 & 0 & 1/4 \\ 1/4 & 1/4 & 0 \end{bmatrix} \end{array}$$

The demand matrix is

$$D = \begin{bmatrix} 1200 \\ 1200 \\ 1200 \end{bmatrix}$$

Find the amount of each commodity that should be produced.

A) 3012 units of manufacturing, 3360 units of agriculture, and 2791.2 units of transportation.
B) 3012 units of manufacturing, 2796 units of agriculture, and 2976 units of transportation.
C) 2976 units of manufacturing, 3386.4 units of agriculture, and 2791.2 units of transportation.
D) 3360 units of manufacturing, 2796 units of agriculture, and 3012 units of transportation.

Answer: C

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239) A simplified economy has only two industries, the electric company and the gas company. Each dollar's worth of the electric company's output requires 0.20 of its own output and 0.4 of the gas company's output. Each dollar's worth of the gas company's output requires 0.50 of its own output and 0.7 of the electric company's output. Construct the input–output matrix.

A)
$$\begin{array}{c} \\ \text{Electric} \\ \text{Gas} \end{array}\begin{array}{c} \begin{array}{cc} \text{Electric} & \text{Gas} \end{array} \\ \begin{bmatrix} 0.20 & 0.70 \\ 0.40 & 0.50 \end{bmatrix} \end{array}$$

B)
$$\begin{array}{c} \\ \text{Electric} \\ \text{Gas} \end{array}\begin{array}{c} \begin{array}{cc} \text{Electric} & \text{Gas} \end{array} \\ \begin{bmatrix} 0.20 & 0.50 \\ 0.40 & 0.70 \end{bmatrix} \end{array}$$

C)
$$\begin{array}{c} \\ \text{Electric} \\ \text{Gas} \end{array}\begin{array}{c} \begin{array}{cc} \text{Electric} & \text{Gas} \end{array} \\ \begin{bmatrix} 0.20 & 0.40 \\ 0.70 & 0.50 \end{bmatrix} \end{array}$$

D)
$$\begin{array}{c} \\ \text{Electric} \\ \text{Gas} \end{array}\begin{array}{c} \\ \begin{bmatrix} 0.70 \\ 1.10 \end{bmatrix} \end{array}$$

Answer: A

240) A simplified economy has only two industries, the electric company and the gas company. Each dollar's worth of the electric company's output requires 0.20 of its own output and 0.4 of the gas company's output. Each dollar's worth of the gas company's output requires 0.50 of its own output and 0.7 of the electric company's output. What should the production of electricity and gas be (in dollars) if there is a $16 million demand for electricity and a $7 million demand for gas?

A) Electricity: $97.5 million; gas: $103 million
B) Electricity: $107.5 million; gas: $100 million
C) Electricity: $115 million; gas: $103.5 million
D) Electricity: $125 million; gas: $92.5 million

Answer: B

241) A simplified economy is based on agriculture, manufacturing, and transportation. Each unit of agricultural output requires 0.3 unit of its own output, 0.5 of manufacturing, and 0.2 unit of transportation output. Each unit of manufacturing output requires 0.3 unit of its own output, 0.1 of agricultural, and 0.4 unit of transportation output. Each unit of transportation output requires 0.4 unit of its own output, 0.2 of agricultural, and 0.1 of manufacturing output. There is demand for 35 units of agricultural, 90 units of manufacturing, and 50 units of transportation output. How many units should each segment of the economy produce?

A) Agriculture: 356; manufacturing: 256; transportation: 329
B) Agriculture: 329; manufacturing: 356; transportation: 256
C) Agriculture: 256; manufacturing: 329; transportation: 356
D) Agriculture: 356; manufacturing: 329; transportation: 256

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

242) How many solutions are there to a dependent system?

Answer: Infinitely many solutions

243) If a variable is expressed in terms of another variable, what is the other variable called?

Answer: A parameter

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244) Describe in your own words what $-1R_1 + R_3 \to R_3$ means.

Answer: Each element in row 1 is multiplied by –1 and added to the corresponding element in row 3. The result is the new row 3. All other rows (including row 1) are left unchanged. (Explanations may vary.)

245) Describe the proper form for the system to be in before the Gauss–Jordan method can be used.

Answer: The terms with variables should be on the left and the constants on the right in each equation, with the variables in the same order in each equation.

246) An m × n zero matrix serves as an m × n _____.

Answer: additive identity

247) The _____ property does not apply to matrix multiplication.

Answer: commutative

248) Does a matrix with a column of all zeros have an inverse? Why or why not?

Answer: No. Assume that the matrix had an inverse. In multiplying the row of zeros by the corresponding elements in the columns of the "inverse," you would get all 0's. It would be impossible to multiply the two matrices and get the identity matrix, which has all 1's on the diagonal. (Explanations may vary.)

249) Let $A = \begin{bmatrix} c & d \\ a & b \end{bmatrix}$. Show that $AI = A$.

Answer: $AI = \begin{bmatrix} c & d \\ a & b \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$$= \begin{bmatrix} c(1) + d(0) & c(0) + d(1) \\ a(1) + b(0) & a(0) + b(1) \end{bmatrix}$$

$$= \begin{bmatrix} c & d \\ a & b \end{bmatrix} = A$$

250) Let $A = \begin{bmatrix} c & d \\ a & b \end{bmatrix}$

Find A^{-1}.

Answer: $A^{-1} = \begin{bmatrix} \frac{-b}{ad - bc} & \frac{d}{ad - bc} \\ \frac{a}{ad - bc} & \frac{-c}{ad - bc} \end{bmatrix}$

251) Can non–square matrices have inverses? Why or why not?

Answer: No. Only square matrices can have inverses, because both $A^{-1}A$ and AA^{-1} must exist and be equal to I. (Explanations may vary.)

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