PRACTICE MCQs

CLASS 12 MATHS (TERM - I)

DETERMINANTS

BY

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learning simplified

Question 1:

The value of x, if $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$

Answer:

(a) √3

(b) -√3

(c) ±√3

(d) None of these

Answer: (c) ±√3

Given,

$$\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$$

=> $2 * 1 – 5 * 4 = 2x * x – 6 * 4$

=> $2 – 20 = 2x^2 - 24$

=> $-18 = 2x^2 - 24$

=> $2x^2 = 24 – 18$

=> $2x^2 = 6$

=> $x^2 = 3$

=> $x = \pm\sqrt{3}$

So, the value of x is ±√3

Question 2:

Which of the following is correct?

(a) Determinant is a square matrix.

(b) Determinant is a number associated to a matrix.

(c) Determinant is a number associated to a square matrix.

(d) None of these

Answer: (c) Determinant is a number associated to a square matrix

We know that to every square matrix, $A = [a_{ij}]$ of order n. We can associate a number called the determinant of square matrix A, where $a_{ij} = (i, j)^{th}$ element of A.

Thus, the determinant is a number associated to a square matrix.

Question 3:

The area of the triangle whose vertices are (3, 8), (-4, 2) and (5, 1) is

(a) 21/2

(b) 41/2

(c) 61/2

(d) 81/2

Answer: (c) 61/2

The area of the triangle with vertices (3, 8), (-4, 2) and (5, 1) is given by the relation,

$$\Delta = (1/2)\begin{vmatrix} 3 & 8 & 1 \\ -4 & 2 & 1 \\ 5 & 1 & 1 \end{vmatrix}$$

=> Δ = (1/2)[3(2 - 1) – 8(-4 - 5) + 1(-4 - 10)]

=> Δ = (1/2)(3 + 72 - 14)

=> Δ = 61/2

Question 4:

If the area of triangle is 35 square units with vertices (2, -6), (5, 4) and (k, 4), then the value of k is

(a) 12

(b) −2

(c) -12, -2

(d) 12, -2

Answer: (d) 12, -2

The area of the triangle with vertices (2, -6), (5, 4), and (k, 4) is given by the relation,

$$\Delta = (1/2)\begin{vmatrix} 2 & -6 & 1 \\ 5 & 4 & 1 \\ k & 4 & 1 \end{vmatrix}$$

=> Δ = (1/2)[2(4 - 4) + 6(5 - k) + 1(20 – 4k)]

=> Δ = (1/2)[0 + 30 – 6k + 20 – 4k]

=> Δ = (1/2)[50 – 10k]

=> Δ = 25 – 5k

It is given that the area of the triangle is ±35.

Therefore, we have:

=> 25 – 5k = ±35

=> 5(5 – k) = ±35

=> 5 – k = ±7

When 5 − k = −7, then k = 5 + 7 = 12

When 5 − k = 7, then k = 5 − 7 = −2

So, k = 12, −2

Question 5:

Value of k, for which A = $\begin{pmatrix} k & 8 \\ 4 & 2k \end{pmatrix}$ is a singular matrix is:

(a) 4

(b) -4

(c) ±4

(d) 0

Answer: (c) ±4

Given, A is a singular matrix.

So, determinant of A is zero

=> |A| = 0

=> $\begin{vmatrix} k & 8 \\ 4 & 2k \end{vmatrix} = 0$

=> $2k^2 - 32 = 0$

=> $2k^2 = 32$

=> $k^2 = 16$

=> k = ±4

Question 6:

Let $A = \begin{pmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{pmatrix}$, where $0 \leq \theta \leq 2\pi$, then

(a) Det (A) = 0

(b) Det (A) ϵ $(2, \infty)$

(c) Det (A) ϵ (2, 4)

(d) Det (A) ϵ [2, 4]

Answer: (d) Det (A) ϵ [2, 4]

Given,

$$A = \begin{pmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{pmatrix}$$

Now, $|A| = 1(1 + \sin^2\theta) - \sin\theta(-\sin\theta + \sin\theta) + 1(\sin^2\theta + 1)$

=> $|A| = 1 + \sin^2\theta + \sin^2\theta + 1$

=> $|A| = 2 + 2\sin^2\theta$

=> $|A| = 2(1 + \sin^2\theta)$

Now, $0 \leq \theta \leq 2\pi$

=> $\sin 0 \leq \sin\theta \leq \sin 2\pi$

=> $0 \leq \sin\theta \leq 1$

=> $0 \leq \sin^2\theta \leq 1$

=> $1 + 0 \leq 1 + \sin^2\theta \leq 1 + 1$

=> $1 \leq 1 + \sin^2\theta \leq 2$

=> $2 * 1 \leq 2(1 + \sin^2\theta) \leq 2 * 2$

=> $2 \leq 2(1 + \sin^2\theta) \leq 4$

So, Det (A) ϵ [2, 4]

Question 7:

If A is a square matrix of order 3 such that |adj A| = 36, then |A| =

(a) 6

(b) 12

(c) 18

(d) 36

Answer: (a) 6

If A is a square matrix of order n then

$|adj\ A| = |A|^{n-1}$

Here n = 3

So, $|adj\ A| = |A|^{3-1}$

=> $36 = |A|^2$

=> |A| = 6

Question 8:

If A is a square matrix so that A * (adj A) = diag(k, k, k) then |adj A| =

(a) k

(b) k^2

(c) k^3

(d) k^6

Answer: (d) k^6

Given, A * (adj A) = diag(k, k, k)

=> $|A| * I_n = k^3$

=> $|A| = k^3$ and $n = 3$

We know that $|adj\ A| = |A|^{n-1}$

Here n = 3

So, $|adj\ A| = |A|^{3-1}$

=> $|adj\ A| = |A|^2$

=> $|adj\ A| = (k^2)^3$

=> $|adj\ A| = k^6$

Question 9:

If the points A(3, -2), B(k, 2) and C(8, 8) are collinear then the value of k is

(a) 2

(b) -3

(c) 5

(d) -4

Answer: (c) 5

Given, the points A(3, -2), B(k, 2) and C(8, 8) are collinear.

If the points are collinear then the value of determinant is zero.

$$\Rightarrow \begin{vmatrix} 3 & -2 & 1 \\ k & 2 & 1 \\ 8 & 8 & 1 \end{vmatrix} = 0$$

=> 3(2 * 1 – 1 * 8) – (-2)(k * 1 – 1 * 8) + 1(k * 8 – 8 * 2) = 0

=> 3(2 - 8) + 2(k - 8) + 8k – 16 = 0

=> 3 * (-6) + 2k – 16 + 8k – 16 = 0

=> -18 + 2k – 16 + 8k – 16 = 0

=> 10 – 50 = 0

=> 10k = 50

=> k = 5

Question 10:

For matrix A = $\begin{pmatrix} 2 & 5 \\ -11 & 7 \end{pmatrix}$, (adj A)' is equal to

(a) $\begin{pmatrix} -2 & -5 \\ -11 & -7 \end{pmatrix}$

(b) $\begin{pmatrix} 7 & 5 \\ 11 & 2 \end{pmatrix}$

(c) $\begin{pmatrix} 7 & 11 \\ -5 & 2 \end{pmatrix}$

(d) $\begin{pmatrix} 7 & -5 \\ 11 & 2 \end{pmatrix}$

Answer: (c) $\begin{pmatrix} \mathbf{7} & \mathbf{11} \\ \mathbf{-5} & \mathbf{2} \end{pmatrix}$

Let A = $\begin{pmatrix} 2 & 5 \\ -11 & 7 \end{pmatrix}$

Now, $A_{11} = 7$, $A_{12} = 11$, $A_{21} = -5$, $A_{22} = 2$

So, adj(A) = $\begin{pmatrix} A_{11} & A_{21} \\ A_{12} & A_{22} \end{pmatrix} = \begin{pmatrix} 7 & -5 \\ 11 & 2 \end{pmatrix}$

Again, (adj A)' = $\begin{pmatrix} 7 & 11 \\ -5 & 2 \end{pmatrix}$

Question 11:

The inverse of the matrix $\begin{pmatrix} -1 & 5 \\ -3 & 2 \end{pmatrix}$, is

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

(b) (1/13) $\begin{pmatrix} 2 & -5 \\ 3 & 1 \end{pmatrix}$

(c) (1/13) $\begin{pmatrix} 2 & 5 \\ 3 & -1 \end{pmatrix}$

(d) (1/13) $\begin{pmatrix} 2 & -5 \\ 3 & -1 \end{pmatrix}$

Answer: (d) (1/13) $\begin{pmatrix} \mathbf{2} & \mathbf{-5} \\ \mathbf{3} & \mathbf{-1} \end{pmatrix}$

Let A = $\begin{pmatrix} -1 & 5 \\ -3 & 2 \end{pmatrix}$

Now, |A| = (-1) * 2 – 5 * (-3) = -2 + 15 = 13

Now, A_{11} = 2, A_{12} = 3, A_{21} = -5, A_{22} = -1

So, adj(A) = $\begin{pmatrix} A_{11} & A_{21} \\ A_{12} & A_{22} \end{pmatrix} = \begin{pmatrix} 2 & -5 \\ 3 & -1 \end{pmatrix}$

Now, A^{-1} = (adj A)/|A|

$$= (1/13)\begin{pmatrix} 2 & -5 \\ 3 & -1 \end{pmatrix}$$

Question 12:

If A and B are square matrices of order 3 and |A| = 5 and |B| = 3, then the value of |3AB| is

(a) 400

(b) 405

(c) 403

(d) 401

Answer: (b) 405

As we know

$|KA| = K^n |A|$

Where n is the order of the matrix.

So, $|3AB| = 3^3 |A| |B|$ (Since order given is 3)

=> |3AB| = 27 * 5 * 3 = 27 * 15 = 405

Question 13:

If A is an invertible matrix of order 2, then $\det(A^{-1})$ is

(a) det(A)

(b) 1/det(A)

(c) 1

(d) 0

Answer: (b) 1/det(A)

We know that $AA^{-1} = I$

Taking determinant on both sides, we get

$|AA^{-1}| = |I|$

=> $|A||A^{-1}| = 1$

=> $|A^{-1}| = 1/|A|$

=> $|A^{-1}| = 1/\det(A)$

Question 14:

If every element of third order determinant of Δ is multiplied by 4 then value of new determinant equals to,

(a) Δ

(b) 4Δ

(c) 16Δ

(d) 64Δ

Answer: (d) 64Δ

We know that $|kA| = k^n |A|$, where n is order of matrix

Let $\Delta = |A|$

So, $\Delta' = |4A| = 4^3 |A|$

=> $\Delta' = 64\Delta$

Question 15:

If the value of a third order determinant is 11, then the value of the determinant formed by replacing each element by its cofactors will be

(a) 11

(b) 121

(c) 1331

(d) 14641

Answer: (b) 121

Let A is the determinant.

Given, |A| = 11

Also, we know that if A is a square matrix of order n, then

$|\text{adj } A| = |A|^{n-1}$

For n = 3,

$|\text{adj } A| = |A|^{3-1} = |A|^{3-1} = |A|^2 = (11)^2 = 121$

Question 16:

Given that A = $[a_{ij}]$ is a square matrix of order 3 * 3 and |A| = -7, then the value of $\Sigma a_{i2}A_{i2} = 1$ (i = 1 to 3), where A_{ij} denotes the cofactor of element a_{ij} is:

(a) 7

(b) -7

(c) 0

(d) 49

Answer: (b) -7

$\Sigma a_{i2}A_{i2} = a_{12}A_{12} + a_{22}A_{22} + a_{22}A_{22}$ [i = 1 to 3]

= Sum of product of elements of column C_2 with its corresponding cofactors

= Determinant of A

= |A|

= -7

Question 17:

Consider the following in respect to two non-singular matrices A and B of same order:

(i) det(A + B) = det(A) + det(B)

(ii) $(A + B)^{-1} = A^{-1} + B^{-1}$

Which of the following is/are correct?

(a) (i) only

(b) (ii) only

(c) Both (i) and (ii)

(d) Neither (i) nor (ii)

Answer: (d) Neither (i) nor (ii)

(i) det(A + B) ≠ det(A) + det(B)

(ii) $(A + B)^{-1} \neq A^{-1} + B^{-1}$

Question 18:

A determinant (Δ) of 3 rows (R_1, R_2, R_3) and 3 columns (C_1, C_2, C_3) has a value Δ = 15. If two columns C_2 and C_3 of determinant (Δ) are interchanged, then the value of determinant will be

(a) 15

(b) -15

(c) 45

(d) -45

Answer: (b) -15

If any two rows (or columns) of a determinant are interchanged, then sign of determinant changes.

Given, two columns C_2 and C_3 of determinant (Δ) are interchanged.

So, the value of determinant (Δ) = -15

Question 19:

The determinant of matrix A is 5 and determinant of matrix B is 10. The determinant of matrix AB is

(a) 5

(b) 10

(c) 15

(d) 50

Answer: (d) 50

If A is square matrix of size n and another matrix is of size m, then

det(A * B) = det(A) * det(B)

Given, det(A) = 5 and det(B) = 10

Now, det(A * B) = 5 * 10 = 50

Question 20:

If $A = \begin{pmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{pmatrix}$, then

(a) $A^{-1} = B$

(b) $A^{-1} = 6B$

(c) $B^{-1} = B$

(d) $B^{-1} = A/6$

Answer: (d) $B^{-1} = A/6$

First, we multiply A and B.

Now, AB = $\begin{pmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{pmatrix}\begin{pmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{pmatrix}$

$$= \begin{pmatrix} 2+4+0 & 2-2+0 & -4+4+0 \\ 4-12+8 & 4+6-2 & -8-12+20 \\ 0-4+4 & 0+2-2 & 0-4+10 \end{pmatrix}$$

$$= \begin{pmatrix} 6 & 0 & 0 \\ 0 & 6 & 0 \\ 0 & 0 & 6 \end{pmatrix}$$

$$= 6\begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

=> AB = 6I

=> AB/6 = I

=> $B^{-1} = A/6$

Question 21:

Given that A is a non-singular matrix of order 3 such that $A^2 = 2A$, then value of |2A| is:

(a) 4

(b) 8

(c) 64

(d) 16

Answer: (c) 64

Given, $A^2 = 2A$

Taking determinant both sides, we get

$|A^2| = |2A|$

$|A * A| = |2A|$

$|A| * |A| = |2A|$

$|A| * |A| = 2^3|A|$ [Since $|kA| = k^n|A|$, where n is order of matrix]

$|A| * |A| = 8|A|$

$|A| * |A| - 8|A| = 0$

$|A|(|A| - 8) = 0$

$|A| = 0$ or $|A| = 8$

Since, A is non-singular matrix.

So, $|A| = 8$

Now, $|2A| = 2^3|A| = 8 * 8 = 64$

Question 22:

If $A = \begin{pmatrix} 0 & 2 \\ 3 & -4 \end{pmatrix}$ and $kA = \begin{pmatrix} 0 & 3a \\ 2b & 24 \end{pmatrix}$, then the values of k, a and b respectively are:

(a) -6, -12, -18

(b) -6, -4, -9

(c) -6, 4, 9

(d) -6, 12, 18

Answer: (b) -6, -4, -9

Given, A = $\begin{pmatrix} 0 & 2 \\ 3 & -4 \end{pmatrix}$

Now, kA = k$\begin{pmatrix} 0 & 2 \\ 3 & -4 \end{pmatrix}$

=> kA = $\begin{pmatrix} 0 & 2k \\ 3k & -4k \end{pmatrix}$

=> $\begin{pmatrix} 0 & 3a \\ 2b & 24 \end{pmatrix}$ = $\begin{pmatrix} 0 & 2k \\ 3k & -4k \end{pmatrix}$

Now, -4k = 24

=> k = -6

3a = 2k

=> a = 2k/3 = (-6 * 2)/3 = -2 * 2 = -4

2b = 3k

=> b = 3k/2 = (-6 * 3)/2 = -18/2 = -9

So, k = -6, a = -4 and b = -9

Question 23:

For A = $\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, then $14A^{-1}$ is given by:

(a) 14$\begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$

(b) $\begin{pmatrix} 4 & -2 \\ 2 & 6 \end{pmatrix}$

(c) 2$\begin{pmatrix} 2 & -1 \\ 1 & -3 \end{pmatrix}$

(d) $2\begin{pmatrix} -3 & -1 \\ 1 & -2 \end{pmatrix}$

Answer: (b) $\begin{pmatrix} \mathbf{4} & \mathbf{-2} \\ \mathbf{2} & \mathbf{6} \end{pmatrix}$

We know that $A^{-1} = (\text{adj } A)/|A|$

Now, $|A| = \begin{vmatrix} 3 & 1 \\ -1 & 2 \end{vmatrix}$

=> $|A| = 3 * 2 – (-1) * 1$

=> $|A| = 6 + 1$

=> $|A| = 7$

Now, adj A = $\begin{pmatrix} 2 & -3 \\ 1 & 3 \end{pmatrix}$

So, $A^{-1} = (1/7) * \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$

Now, $14A^{-1} = 14 * (1/7) * \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$

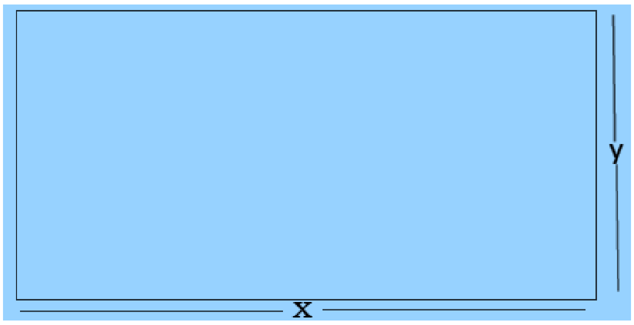
=> $14A^{-1} = 2\begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$

=> $14A^{-1} = \begin{pmatrix} 4 & -2 \\ 2 & 6 \end{pmatrix}$

Case study based questions

Question 24:

Manjit wants to donate a rectangular plot of land for a school in his village. When he was asked to give dimensions of the plot, he told that if its length is decreased by 50 m and breadth is increased by 50 m, then its area will remain same, but if length is decreased by 10 m and breadth is decreased by 20 m, then its area will decrease by 5300 m^2.



Based on the information given above, answer the following questions:

(i). The equations in terms of X and Y are

(a) x – y = 50, 2x – y = 550

(b) x – y = 50, 2x + y = 550

(c) x + y = 50, 2x + y = 550

(d) x + y = 50, 2x + y = 550

(ii). Which of the following matrix equation is represented by the given information

(a) $\begin{pmatrix} 1 & -1 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 50 \\ 550 \end{pmatrix}$

(b) $\begin{pmatrix} 1 & 1 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 50 \\ 550 \end{pmatrix}$

(c) $\begin{pmatrix} 1 & 1 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 50 \\ 550 \end{pmatrix}$

(d) $\begin{pmatrix} 1 & 1 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -50 \\ -550 \end{pmatrix}$

(iii). The value of x (length of rectangular field) is

(a) 150 m

(b) 400 m

(c) 200 m

(d) 320 m

(iv). The value of y (breadth of rectangular field) is

(a) 150 m

(b) 200 m

(c) 430 m

(d) 350 m

(v). How much is the area of rectangular field?

(a) 60000 Sq.m.

(b) 30000 Sq.m.

(c) 30000 m

(d) 3000 m

Answers:

(i). (b) $x - y = 50, 2x + y = 550$

Let length of plot = x m

And breadth of plot = y m

Now, area of plot = x * y

Given, if its length is decreased by 50 m and breadth is increased by 50 m, then its area will remain same.

$\Rightarrow (x - 50)(y + 50) = xy$

$\Rightarrow xy + 50x - 50y - 2500 = xy$

$\Rightarrow 50x - 50y = 2500$

$\Rightarrow x - y = 50$ ………..1

Again, if length is decreased by 10 m and breadth is decreased by 20 m, then its area will decrease by 5300 m^2

$\Rightarrow (x - 10)(y - 20) = xy - 5300$

$\Rightarrow xy - 20x - 10y + 200 = xy - 5300$

$\Rightarrow -20x - 10y = -5300 - 200$

$\Rightarrow -20x - 10y = -5500$

$\Rightarrow 2x + y = 50$ ………..2

Hence, equations are:

$x - y = 50$

$2x + y = 50$

(ii). (a) $\begin{pmatrix} 1 & -1 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 50 \\ 550 \end{pmatrix}$

Given equations are:

$x - y = 50$

2x + y = 550

We can write it

$$\begin{pmatrix} 1 & -1 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 50 \\ 550 \end{pmatrix}$$

(iii). (c) 200 m

Given equations are:

x – y = 50 1

2x + y = 550 2

Adding equations 1 and 2, we get

x – y + 2x + y = 50 + 550

=> 3x = 600

=> x = 200 m

(iv). (a) 150 m

Given equations are:

x – y = 50 1

2x + y = 550 2

Put value of x [from (iii)] in equation 1, we get

200 – y = 50

=> y = 200 – 50

=> y = 150 m

(v). (b) 30000 Sq.m

Area of rectangular field = Length * Breadth

= x * y

= 200 * 150 [From (iii) and (iv)]

= 30000 Sq.m

Question 25:

The management committee of a residential colony decided to award some of its members (say x) for honesty, some (say y) for helping others and some others (say z) for supervising the workers to kept the colony neat and clean. The sum of all the awardees is 12. Three times the sum of awardees for cooperation and supervision added to two times the number of awardees for honesty is 33. The sum of number of awardees for honesty and supervision is twice the number of awardees for helping.

Answer the following questions using the above information.

(i). x + y + z =

(a) 3

(b) 5

(c) 7

(d) 12

(ii). The value of x – 2y in terms of z is

(a) z

(b) -z

(c) 2z

(d) -2z

(iii). The value of z is

(a) 3

(b) 4

(c) 5

(d) 6

(iv). The value of x + 2y is

(a) 9

(b) 10

(c) 11

(d) 12

(v). The value of 2x + 3y + 5z is

(a) 40

(b) 43

(c) 50

(d) 53

Answer:

Given, awards for honesty = x

Awards for helping (cooperation) = y

Awards for supervising = z

Again, sum of all the awardees = 12

=> x + y + z = 12 1

Also, three times the sum of awardees for cooperation and supervision added to two times the number of awardees for honesty is 33

=> 3(y + z) + 2x = 33

=> 2x + 3y + 3z = 33 2

Again, the sum of number of awardees for honesty and supervision is twice the number of awardees for helping

=> x + z = 2y

=> x – 2y + z = 0 3

(i). (d) x + y + z = 12

From equation 1,

x + y + z = 12

(ii). (b) -z

From equation 3,

x – 2y + z = 0

=> x – 2y = -z

(iii). (c) z = 5

The equations are:

x + y + z = 12 1

2x + 3y + 3z = 33 2

x – 2y + z = 0 3

Now, we write the above equations as AX = B

$$\begin{pmatrix} 1 & 1 & 1 \\ 2 & 3 & 3 \\ 1 & -2 & 1 \end{pmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 12 \\ 33 \\ 0 \end{bmatrix}$$

Here, $A = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 3 & 3 \\ 1 & -2 & 1 \end{pmatrix}$, $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, $B = \begin{bmatrix} 12 \\ 33 \\ 0 \end{bmatrix}$

Now,

$$|A| = \begin{vmatrix} 1 & 1 & 1 \\ 2 & 3 & 3 \\ 1 & -2 & 1 \end{vmatrix}$$

$= 1(3 + 6) – 1(2 - 3) + 1(-4 - 3)$

$= 9 + 1 – 7$

$= 3$

Since $|A| \neq 0$,

So, the system of equation is consistent and has unique solution.

Now, $AX = B$

$\Rightarrow X = A^{-1}B$

We can calculate A^{-1} as

$A^{-1} = (\text{adj } A)/|A|$

Now, $\text{adj } A = \begin{pmatrix} 9 & -3 & 0 \\ 1 & 0 & -1 \\ -7 & 3 & 1 \end{pmatrix}$

So, $A^{-1} = (1/3)\begin{pmatrix} 9 & -3 & 0 \\ 1 & 0 & -1 \\ -7 & 3 & 1 \end{pmatrix}$

Also, $X = A^{-1}B$

$$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = (1/3)\begin{pmatrix} 9 & -3 & 0 \\ 1 & 0 & -1 \\ -7 & 3 & 1 \end{pmatrix}\begin{bmatrix} 12 \\ 33 \\ 0 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = (1/3)\begin{pmatrix} 9 * 12 - 3 * 33 + 0 \\ 1 * 12 + 0 * 33 + 0 \\ -7 * 12 + 3 * 33 + 1 * 0 \end{pmatrix}$$

$$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = (1/3)\begin{bmatrix} 9 \\ 12 \\ 15 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{pmatrix} 9/3 \\ 12/3 \\ 15/3 \end{pmatrix} = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$$

So, x = 3, y = 4, z = 5

(iv). (c) 11

We have, x = 3, y = 4 and z = 5

Now, x + 2y = 3 + 2 * 4

= 3 + 8

= 11

(v). (b) 43

We have, x = 3, y = 4 and z = 5

Now, 2x + 3y + 5z = 2 * 3 + 3 * 4 + 5 * 5

= 6 + 12 + 25

= 43

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