BYJU'S Study Planner for Board Term I
(CBSE Grade 12)

Date: 12/11/2021

Subject: Mathematics

Topic : Matrices and Determinants

Class: Standard XII

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1. If a matrix $A = [a_{ij}]_{3\times 2}$ is given by $a_{ij} = \dfrac{i^2 + j^2}{2}$, then the matrix is

✗ **A.** $\begin{bmatrix} 1 & \frac{5}{2} & 5 \\ \frac{5}{2} & 4 & \frac{13}{2} \end{bmatrix}$

✓ **B.** $\begin{bmatrix} 1 & \frac{5}{2} \\ \frac{5}{2} & 4 \\ 5 & \frac{13}{2} \end{bmatrix}$

✗ **C.** $\begin{bmatrix} 1 & \frac{3}{2} \\ \frac{3}{2} & 2 \\ 2 & \frac{5}{2} \end{bmatrix}$

✗ **D.** $\begin{bmatrix} 1 & \frac{3}{2} & 2 \\ \frac{3}{2} & 2 & \frac{5}{2} \end{bmatrix}$

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Let, $A = [a_{ij}]_{3\times 2} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix}$

Given, $a_{ij} = \dfrac{i^2 + j^2}{2}$

$\therefore a_{11} = \dfrac{1+1}{2} = 1$

$a_{12} = \dfrac{1+4}{2} = \dfrac{5}{2}$

$a_{21} = \dfrac{4+1}{2} = \dfrac{5}{2}$

$a_{22} = \dfrac{4+4}{2} = 4$

$a_{31} = \dfrac{9+1}{2} = 5$

$a_{32} = \dfrac{9+4}{2} = \dfrac{13}{2}$

Hence,

$$A = \begin{bmatrix} 1 & \frac{5}{2} \\ \frac{5}{2} & 4 \\ 5 & \frac{13}{2} \end{bmatrix}$$

2. Which of the following is a scalar matrix

✗ **A.** $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 6 & 0 \\ 0 & 0 & 7 \end{bmatrix}$

✗ **B.** $\begin{bmatrix} 5 & 0 & 0 \\ 0 & -5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$

✗ **C.** $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & 1\frac{1}{2} & 0 \\ 0 & 0 & 2\frac{1}{2} \end{bmatrix}$

✓ **D.** $\begin{bmatrix} 6 & 0 & 0 \\ 0 & 6 & 0 \\ 0 & 0 & 6 \end{bmatrix}$

A scalar matrix has all the main diagonal entries same, with zeros everywhere else.

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3. If a matrix $A = [a_{ij}]$ is given as $A = \begin{bmatrix} 1 & 2 & 3 & -1 \\ 3 & -2 & 1 & 0 \\ 0 & 3 & 2 & 4 \end{bmatrix}$, then the value of $\sum_{i=1}^{3} a_{ii} =$

- A. 0
- B. 1 ✔
- C. 7
- D. 4

Given : $A = \begin{bmatrix} 1 & 2 & 3 & -1 \\ 3 & -2 & 1 & 0 \\ 0 & 3 & 2 & 4 \end{bmatrix}$

$\Rightarrow a_{11} = 1, a_{22} = -2, a_{33} = 2$

$\Rightarrow a_{11} + a_{22} + a_{33} = 1$

$= (1) + (-2) + (2) = 1$

4. Let $A = [a_{ij}]_{2\times2}$, where $a_{ij} = (i^2 - j^2)$, then, which of the following is correct

- A. $A = \begin{bmatrix} 0 & -3 \\ 3 & 0 \end{bmatrix}$ ✔
- B. Trace of A is a negative number
- C. Trace of A is a positive number
- D. $A = \begin{bmatrix} 0 & -1 \\ 3 & -3 \end{bmatrix}$

For $A = [a_{ij}]_{2\times2}$; $i = 1, 2$ and $j = 1, 2$

Elements of the matrix A are given by

$a_{11} = 1^2 - 1^2 = 0$

$a_{12} = 1^2 - 2^2 = -3$

$a_{21} = 2^2 - 1^2 = 3$

$a_{22} = 2^2 - 2^2 = 0$

$\Rightarrow A = \begin{bmatrix} 0 & -3 \\ 3 & 0 \end{bmatrix}$

$\Rightarrow Tr(A) = 0$

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5. A matrix having one row and many columns is known as

- ✔ **A.** Row matrix
- ✖ **B.** Column matrix
- ✖ **C.** Diagonal matrix
- ✖ **D.** Square matrix

In row matrix there is only one row and n column.
$A = \begin{bmatrix} a & b & c & \cdots & n \end{bmatrix}_{1\times n}$

6. If $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$, then (x, y) is

- ✖ **A.** $(2, 6)$
- ✖ **B.** $(1, 6)$
- ✔ **C.** $(2, 9)$
- ✖ **D.** $(3, 6)$

We have $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$

$$\Rightarrow \begin{bmatrix} 2x & 10 \\ 14 & 2y-6 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 2x+3 & 10-4 \\ 14+1 & 2y-6+2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 2x+3 & 6 \\ 15 & 2y-4 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

$\Rightarrow 2x + 3 = 7$ and $2y - 4 = 14$
$\Rightarrow 2x = 7 - 3$ and $2y = 18$
$\Rightarrow x = \dfrac{4}{2}$ and $y = \dfrac{18}{2}$
$\therefore x = 2; y = 9.$

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7. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$, then

A. $\alpha = a^2 + b^2, \beta = ab$

B. $\alpha = a^2 + b^2, \beta = 2ab$ ✔

C. $\alpha = a^2 + b^2, \beta = a^2 - b^2$

D. $\alpha = 2ab, \beta = a^2 + b^2$

$A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix} = \begin{bmatrix} a & b \\ b & a \end{bmatrix}\begin{bmatrix} a & b \\ b & a \end{bmatrix}$

$= \begin{bmatrix} a^2+b^2 & 2ab \\ 2ab & a^2+b^2 \end{bmatrix} = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ (Given)

$\therefore$ On comparing, we get : $\alpha = a^2 + b^2, \beta = 2ab$

8. If the matrix $A = \begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix}$ satisfies the quadratic function $f(x) = (x-1)(x-\alpha)$, then α is

A. -2

B. $\frac{2}{7}$

C. 2 ✔

D. $\frac{7}{2}$

$f(A) = (A - I)(A - \alpha I)$

$= A^2 - (\alpha+1)A + \alpha I = O$

$\Rightarrow \begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix}\begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix} - (\alpha+1)\begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix} + \alpha\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = O$

$\Rightarrow \begin{bmatrix} -5 & 6 \\ -9 & 10 \end{bmatrix} + \begin{bmatrix} (\alpha+1) & -2(\alpha+1) \\ 3(\alpha+1) & -4(\alpha+1) \end{bmatrix} + \begin{bmatrix} \alpha & 0 \\ 0 & \alpha \end{bmatrix} = O$

Comparing first element on both sides, we have

$-5 + (\alpha+1) + \alpha = 0$

$\Rightarrow \alpha = 2$

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9. If $A = \begin{bmatrix} 1 & -3 & 2 \\ 2 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \end{bmatrix}$, then the matrix C such that $A + B + C$ is a zero matrix, is

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

B. $\begin{bmatrix} -3 & 4 & -1 \\ -3 & 0 & -1 \end{bmatrix}$ ✔

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

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

$A + B + C = O$
$C = -A - B$

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

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

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

Hence, $C = \begin{bmatrix} -3 & 4 & -1 \\ -3 & 0 & -1 \end{bmatrix}$

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10. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$, then $(aI + bE)^3 =$

- A. $aI + bE$
- B. $a^3I + 3a^2bE$ ✔
- C. $a^3I + 3ab^2E$
- D. $a^3I + b^3E$

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}; E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$$

$$aI + bE = \begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix} + \begin{bmatrix} 0 & b \\ 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} a & b \\ 0 & a \end{bmatrix}$$

$$\Rightarrow (aI + bE)^2 = \begin{bmatrix} a & b \\ 0 & a \end{bmatrix} \begin{bmatrix} a & b \\ 0 & a \end{bmatrix}$$

$$= \begin{bmatrix} a^2 & 2ab \\ 0 & a^2 \end{bmatrix}$$

$$\Rightarrow (aI + bE)^3 = \begin{bmatrix} a^2 & 2ab \\ 0 & a^2 \end{bmatrix} \begin{bmatrix} a & b \\ 0 & a \end{bmatrix}$$

$$= \begin{bmatrix} a^3 & 3a^2b \\ 0 & a^3 \end{bmatrix}$$

$$= \begin{bmatrix} a^3 & 0 \\ 0 & a^3 \end{bmatrix} + \begin{bmatrix} 0 & 3a^2b \\ 0 & 0 \end{bmatrix}$$

$$= a^3 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + 3a^2b \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$$

$$= a^3I + 3a^2bE$$

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11. If $A = \begin{bmatrix} -1 & 0 & 2 \\ 3 & 1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -2 & 5 \\ 1 & -3 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -5 & -2 \\ 6 & 0 & -4 \end{bmatrix}$, then $2A - 3B + 4C$ is

✔ **A.** $\begin{bmatrix} 2 & -14 & -19 \\ 27 & 11 & -11 \end{bmatrix}$

✖ **B.** $\begin{bmatrix} 2 & 11 & -19 \\ -14 & 11 & -11 \end{bmatrix}$

✖ **C.** $\begin{bmatrix} 2 & -14 & -19 \\ 11 & 17 & -11 \end{bmatrix}$

✖ **D.** $\begin{bmatrix} -14 & -14 & -2 \\ 17 & 11 & -11 \end{bmatrix}$

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

$$3B = 3\begin{bmatrix} 0 & -2 & 5 \\ 1 & -3 & 1 \end{bmatrix} = \begin{bmatrix} 0 & -6 & 15 \\ 3 & -9 & 3 \end{bmatrix}$$

$$4C = 4\begin{bmatrix} 1 & -5 & -2 \\ 6 & 0 & -4 \end{bmatrix} = \begin{bmatrix} 4 & -20 & -8 \\ 24 & 0 & -16 \end{bmatrix}$$

$$2B - 3B + 4C = \begin{bmatrix} -2 & 0 & 4 \\ 6 & 2 & 8 \end{bmatrix} - \begin{bmatrix} 0 & -6 & 15 \\ 3 & -9 & 3 \end{bmatrix} + \begin{bmatrix} 4 & -20 & -8 \\ 24 & 0 & -16 \end{bmatrix}$$

$$= \begin{bmatrix} -2 - 0 + 4 & 0 + 6 - 20 & 4 - 15 - 8 \\ 6 - 3 + 24 & 2 + 9 + 0 & 8 - 3 - 16 \end{bmatrix}$$

$$= \begin{bmatrix} 2 & -14 & -19 \\ 27 & 11 & -11 \end{bmatrix}$$

Hence, $2A - 3B + 4C = \begin{bmatrix} 2 & -14 & -19 \\ 27 & 11 & -11 \end{bmatrix}$

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12. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then the value of α for which $A^2 = B$ is:

- **A.** 1
- **B.** 2
- **C.** 4
- **D.** No real values. ✔

Given, $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ and $A^2 = B$

$$\Rightarrow A^2 = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} \alpha^2 & 0 \\ \alpha+1 & 1 \end{bmatrix}$$

Now, $A^2 = B$

$$\Rightarrow \begin{bmatrix} \alpha^2 & 0 \\ \alpha+1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$$

$\Rightarrow \alpha^2 = 1$ and $\alpha + 1 = 5$ which is not possible at the same time.

$\therefore$ No real values of α.

13. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the correct statement is

- **A.** $A^2 + 5A - 7I = O$
- **B.** $-A^2 + 5A + 7I = O$
- **C.** $A^2 - 5A + 7I = O$ ✔
- **D.** $A^2 + 5A + 7I = O$

Here, $A^2 = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$

$$\therefore A^2 - 5A + 7I = \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$$

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

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14. $A=\begin{bmatrix}3 & a & -1\\ 2 & 5 & c\\ b & 8 & 2\end{bmatrix}$ is symmetric and $B=\begin{bmatrix}d & 3 & a\\ b-a & e & -2b-c\\ -2 & 6 & -f\end{bmatrix}$ is skew-symmetric, then AB is

A. $\begin{bmatrix}4 & -3 & 6\\ 31 & -54 & 26\\ 28 & -9 & 50\end{bmatrix}$

B. $\begin{bmatrix}-4 & -31 & -28\\ 3 & 54 & 9\\ -6 & -26 & -50\end{bmatrix}$

C. $\begin{bmatrix}-4 & 3 & -6\\ -31 & 54 & -26\\ -28 & 9 & -50\end{bmatrix}$ ✔

D. $\begin{bmatrix}4 & 31 & 28\\ -3 & -54 & -9\\ 6 & 26 & 50\end{bmatrix}$

A is symmetric

$\Rightarrow A^T=A$

$\Rightarrow \begin{bmatrix}3 & 2 & b\\ a & 5 & 8\\ -1 & c & 2\end{bmatrix}=\begin{bmatrix}3 & a & -1\\ 2 & 5 & c\\ b & 8 & 2\end{bmatrix}$

$\Rightarrow a=2, b=-1, c=8$

B is skew- symmetric

$\Rightarrow B^T=-B$

$\Rightarrow \begin{bmatrix}d & b-a & -2\\ 3 & e & 6\\ a & -2b-c & -f\end{bmatrix}=\begin{bmatrix}-d & -3 & -a\\ a-b & -e & 2b+c\\ 2 & -6 & f\end{bmatrix}$

$\Rightarrow d=-d, f=-f$ and $e=-e$

$\Rightarrow d=e=f=0$

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

$$\Rightarrow AB=\begin{bmatrix}3 & 2 & -1\\ 2 & 5 & 8\\ -1 & 8 & 2\end{bmatrix}\begin{bmatrix}0 & 3 & 2\\ -3 & 0 & -6\\ -2 & 6 & 0\end{bmatrix}$$

$$=\begin{bmatrix}-4 & 3 & -6\\ -31 & 54 & -26\\ -28 & 9 & -50\end{bmatrix}$$

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15. If $A = \begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$ and $A + A^T = I$, where I is 2×2 unit matrix and A^T is the transpose of A, then the value of θ is equal to

✔ **A.** $\frac{\pi}{6}$

✖ **B.** $\frac{\pi}{2}$

✖ **C.** $\frac{\pi}{3}$

✖ **D.** $\frac{3\pi}{2}$

We have, $A = \begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

$\Rightarrow A^T = \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

$\Rightarrow A + A^T = \begin{bmatrix} 2\cos 2\theta & 0 \\ 0 & 2\cos 2\theta \end{bmatrix} = I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow 2\cos 2\theta = 1$

$\Rightarrow \cos 2\theta = \frac{1}{2} = \cos\frac{\pi}{3}$

$\Rightarrow 2\theta = 2n\pi \pm \frac{\pi}{3}$

$\therefore \theta = \frac{\pi}{6}$

16. If $A = \text{diag}(2, -5, 9), B = \text{diag}(1, 1, -4)$, then $A - 2B$ is:

✖ **A.** $\text{diag}(2, -5, 17)$

✔ **B.** $\text{diag}(0, -7, 17)$

✖ **C.** $\text{diag}(7, 0, 17)$

✖ **D.** $\text{diag}(17, 0, -2)$

$A - 2B = \text{diag}\ (2, -5, 9) - 2\text{diag}(1, 1, -4)$
$= \text{diag}(2, -5, 9) - \text{diag}(2, 2, -8)$
$= \text{diag}(2 - 2, -5 - 2, 9 + 8)$
$= \text{diag}(0, -7, 17)$
Hence, $A - 2B = \text{diag}(0, -7, 17)$

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17. If $A = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$, then the value of $A + A^2 + A^3 + \ldots A^n =$

A. A

B. nA ✔

C. $(n+1)A$

D. 0

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

$A^2 = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix} = A$

We can observe:
$A^2 = A^3 = A^4 \ldots . = A$
$\therefore$ Required value $= nA$

18. If A and B are symmetric matrices of the same order and $X = AB + BA$ and $Y = AB - BA$, then XY^T is equal to

A. XY

B. YX

C. $-XY$ ✔

D. None of these

Given A and B are symmetric.
$A^T = A, B^T = B$
$\Rightarrow XY^T = (AB + BA)(AB - BA)^T$
$= (AB + BA)((AB)^T - (BA)^T)$
$= (AB + BA)(B^T A^T - A^T B^T)$
$= (AB + BA)(BA - AB)$
$= -(AB + BA)(AB - BA)$
$= -XY$
$\Rightarrow XY^T = -XY$

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19. Two farmers Ramkrishnan and Gurcharan Singh cultivates only three varieties of rice namely Basmathi, Permal and Naura. The sale (in Rupees) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B.

September Sales (in Rupees)

Basmathi Permal Naura

$$A = \begin{bmatrix} 10,000 & 20,000 & 30,000 \\ 50,000 & 30,000 & 10,000 \end{bmatrix} = \begin{bmatrix} \text{Ramakrishnan} \\ \text{Gurucharan Singh} \end{bmatrix}$$

October Sales (in Rupees)

Basmathi Permal Naura

$$B = \begin{bmatrix} 5000 & 10,000 & 6000 \\ 20,000 & 10,000 & 10,000 \end{bmatrix} = \begin{bmatrix} \text{Ramakrishnan} \\ \text{Gurucharan Singh} \end{bmatrix}$$

The combined sales in September and October for each farmer in each variety is

A. $\begin{bmatrix} 36,000 & 30,000 & 36,000 \\ 70,000 & 40,000 & 20,000 \end{bmatrix}$

B. $\begin{bmatrix} 15,000 & 30,000 & 36,000 \\ 35,000 & 40,000 & 20,000 \end{bmatrix}$

C. $\begin{bmatrix} 15,000 & 30,000 & 36,000 \\ 70,000 & 40,000 & 20,000 \end{bmatrix}$ ✔

D. $\begin{bmatrix} 35,000 & 40,000 & 360,00 \\ 70,000 & 20,000 & 20,000 \end{bmatrix}$

Combined sales in September and October for each farmer in each variety is given by

Basmathi Permal Naura

$$A + B = \begin{bmatrix} 15,000 & 30,000 & 36,000 \\ 70,000 & 40,000 & 20,000 \end{bmatrix} = \begin{bmatrix} \text{Ramakrishnan} \\ \text{Gurucharan Singh} \end{bmatrix}$$

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20. In a certain city there are 30 colleges. Each college has 15 peons, 6 clerks, 1 typist and 1 section officer. The total number of posts of each kind in all the colleges is

- **A.** 600
- **B.** 690
- **C.** 750
- **D.** 700

Let $A=$Each college posts$=\begin{bmatrix}15\\6\\1\\1\end{bmatrix}$

The total number of posts of each kind in all 30 colleges is

$$30A=30\begin{bmatrix}15\\6\\1\\1\end{bmatrix}=\begin{bmatrix}450\\180\\30\\30\end{bmatrix}$$

Hence, the total number of posts of each kind in all the colleges
$=450+180+30+30=690$