# MATRICES

**Main Points :**

- An arrangement of numbers in to rows and columns is called matrix.
- In scalar matrix, the principal diagonol elements are equal
- $A=\begin{bmatrix}5 & 2\end{bmatrix}$, $B=\begin{bmatrix}x\\y\end{bmatrix}$ then i) $AB=\begin{bmatrix}5x+2y\end{bmatrix}$

  ii) $BA=\begin{bmatrix}5x & 2x\\5y & 2y\end{bmatrix}$
- $A=\begin{pmatrix}a & b\\c & d\end{pmatrix}\Rightarrow A^{-1}=\frac{1}{ad-bc}\begin{pmatrix}d & -b\\-c & a\end{pmatrix}$
- $(AB)^{-1} = B^{-1}.A^{-1}$
- $|A| = 0 \Leftrightarrow$ A is singular matrix $\Leftrightarrow A^{-1}$ does not exists
- $|A| \neq 0 \Leftrightarrow$ A is non - singular matrix $\Leftrightarrow A^{-1}$ exists
- $AB = K.I, K \in R \quad A^{-1}=\frac{1}{K}.B$

## 4 Marks Questions

**1.** $A=\begin{pmatrix}a & b\\c & d\end{pmatrix}, I=\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$ **then show that $A^2 – (a + d)A = (bc – ad) I$.**

**Sol:** $A=\begin{pmatrix}a & b\\c & d\end{pmatrix}$

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

L.H.S. $A^2 – (a + d)A$

$= A \times A – (a+ d) A$

$=\begin{pmatrix}a & b\\c & d\end{pmatrix}\begin{pmatrix}a & b\\c & d\end{pmatrix}-(a+d)\begin{pmatrix}a & b\\c & d\end{pmatrix}$

$=\begin{pmatrix}a^2+bc & ab+bd\\ca+dc & bc+d^2\end{pmatrix}-\begin{pmatrix}a^2+ad & ab+bd\\ac+dc & ad+d^2\end{pmatrix}$

$=\begin{pmatrix}\cancel{a^2}+bc-\cancel{a^2}-ad & \cancel{ab}+\cancel{bd}-\cancel{ab}-\cancel{bd}\\\cancel{ca}+\cancel{dc}-\cancel{ac}-\cancel{dc} & bc+\cancel{d^2}-ad-\cancel{d^2}\end{pmatrix}$

$$= \begin{pmatrix} bc-ad & 0 \\ 0 & bc-ad \end{pmatrix}$$

$$= (bc-ad)\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$= (bc-ad)I = \text{R.H.S.}$$

R.H.S.

Hence it is Proved.

2. $A = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix}, B = \begin{pmatrix} -2 & 5 \\ 6 & 1 \end{pmatrix}, C = \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$ **then verify A (B + C) = AB + AC.**

**Sol:** $A = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix}$

$$B = \begin{pmatrix} -2 & 5 \\ 6 & 1 \end{pmatrix}$$

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

L.H.S.

$$B + C = \begin{pmatrix} -2 & 5 \\ 6 & 1 \end{pmatrix} + \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} -2+1 & 5+2 \\ 6+3 & 1+0 \end{pmatrix}$$

$$= \begin{pmatrix} -1 & 7 \\ 9 & 1 \end{pmatrix}$$

$$A(B+C) = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix}\begin{pmatrix} -1 & 7 \\ 9 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} -2+36 & 14+4 \\ -3+54 & 21+6 \end{pmatrix}$$

$$= \begin{pmatrix} 34 & 18 \\ 51 & 27 \end{pmatrix} \text{.....(1)}$$

R.H.S. AB + AC

$$AB = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix}\begin{pmatrix} -2 & 5 \\ 6 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} -4+24 & 10+4 \\ -6+36 & 15+6 \end{pmatrix}$$

$$= \begin{pmatrix} 20 & 14 \\ 30 & 21 \end{pmatrix}$$

$$AC=\begin{pmatrix}2&4\\3&6\end{pmatrix}\begin{pmatrix}1&2\\3&0\end{pmatrix}$$

$$=\begin{pmatrix}2+12&4+0\\3+18&6+0\end{pmatrix}$$

$$=\begin{pmatrix}14&4\\21&6\end{pmatrix}$$

$$AB+AC=\begin{pmatrix}20&14\\30&21\end{pmatrix}+\begin{pmatrix}14&4\\21&6\end{pmatrix}$$

$$=\begin{pmatrix}34&18\\51&27\end{pmatrix}$$

from (1) & (2) A (B + C) = AB + AC

**3.** $A=\begin{pmatrix}-2&1\\3&-1\end{pmatrix}, B=\begin{pmatrix}2&0\\5&-3\end{pmatrix}$ **then verify $(AB)^{-1} = B^{-1}.A^{-1}$**

**Sol:** $A=\begin{pmatrix}-2&1\\3&-1\end{pmatrix}$, $B=\begin{pmatrix}2&0\\5&-3\end{pmatrix}$

L.H.S. $(AB)^{-1}$

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

$$=\begin{pmatrix}-4+5&0-3\\6-5&0+3\end{pmatrix}$$

$$=\begin{pmatrix}1&-3\\1&3\end{pmatrix}$$

$$A=\begin{pmatrix}a&b\\c&d\end{pmatrix}\Rightarrow A^{-1}=\frac{1}{ad-bc}\begin{pmatrix}d&-b\\-c&a\end{pmatrix}$$

$$AB=\begin{pmatrix}1&-3\\1&3\end{pmatrix}\Rightarrow (AB)^{-1}=\frac{1}{(1\times3)-(-3\times1)}\begin{pmatrix}3&3\\-1&1\end{pmatrix}$$

$$=\frac{1}{3+3}\begin{pmatrix}3&3\\-1&1\end{pmatrix}=\frac{1}{6}\begin{pmatrix}3&3\\-1&1\end{pmatrix}$$

$$=\begin{pmatrix}\frac{1}{6}\times3&\frac{1}{6}\times3\\\frac{1}{6}\times-1&\frac{1}{6}\times1\end{pmatrix}$$

$$=\begin{pmatrix}1/2&1/2\\-1/6&1/6\end{pmatrix}\text{.....(1)}$$

R.H.S. $B^{-1}.A^{-1}$

$$B=\begin{pmatrix}2 & 0\\ 5 & -3\end{pmatrix}\Rightarrow B^{-1}=\frac{1}{(2\times-3)-(0\times5)}\begin{pmatrix}-3 & 0\\ -5 & 2\end{pmatrix}$$

$$=\frac{1}{-6}\begin{pmatrix}-3 & 0\\ -5 & 2\end{pmatrix}$$

$$=\begin{pmatrix}\frac{1}{-6}\times-3 & \frac{1}{-6}\times0\\ \frac{1}{-6}\times-5 & \frac{1}{-6}\times2\end{pmatrix}$$

$$\begin{pmatrix}1/2 & 0\\ 5/6 & -1/3\end{pmatrix}$$

$$A=\begin{pmatrix}-2 & -1\\ 3 & -1\end{pmatrix}\Rightarrow A^{-1}=\frac{1}{(-2\times-1)-(1\times3)}\begin{pmatrix}-1 & -1\\ -3 & -2\end{pmatrix}$$

$$=\frac{1}{2-3}\begin{pmatrix}-1 & -1\\ -3 & -2\end{pmatrix}$$

$$=\begin{pmatrix}1 & 1\\ 3 & 2\end{pmatrix}$$

$$\text{consider } B^{-1}A^{-1}=\begin{pmatrix}1/2 & 0\\ 5/6 & -1/3\end{pmatrix}\begin{pmatrix}1 & 1\\ 3 & 2\end{pmatrix}$$

$$=\begin{pmatrix}\frac{1}{2}+0 & \frac{1}{2}+0\\ \frac{5}{6}-\frac{3}{3} & \frac{5}{6}-\frac{2}{3}\end{pmatrix}$$

$$=\begin{pmatrix}\frac{1}{2} & \frac{1}{2}\\ \frac{5-6}{6} & \frac{5-4}{6}\end{pmatrix}$$

$$=\begin{pmatrix}\frac{1}{2} & \frac{1}{2}\\ \frac{-1}{6} & \frac{1}{6}\end{pmatrix}\text{.....(2)}$$

from (1) & (2) $(AB)^{-1} = B^{-1}.A^{-1}$

**4. Solve 3x + 4y – 8 = 0, $y=\frac{x-10}{6}$ by using cramer's rule**

**Sol:** 3x – 4y – 8 = 0

3x – 4y = 8 .....(1)

$$y = \frac{x-10}{6}$$

$6y = x - 10$

$x - 6y = 10$ .....(2)

from (1) & (2)

$3x + 4y = 8$

$x - 6y = 10$

Matrix equation form is

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

$AX = B$

$$A = \begin{bmatrix} 3 & 4 \\ 1 & -6 \end{bmatrix} X = \begin{bmatrix} x \\ y \end{bmatrix} B = \begin{bmatrix} 8 \\ 10 \end{bmatrix}$$

$|A| = ad - bc$

$= 3(-6) - (4 \times 1)$

$= -18 - 4$

$= -22 \neq 0$

Cramer's rule is applicable

$$B_1 = \begin{bmatrix} 8 & 4 \\ 10 & -6 \end{bmatrix}$$

$\Rightarrow |B_1| = 8(-6) - 4(10)$

$= -48 - 40$

$= -88$

$$B_2 = \begin{bmatrix} 3 & 8 \\ 1 & 10 \end{bmatrix}$$

$\Rightarrow |B_2| = 3(10) - 8(1)$

$= 30 - 8$

$= 22$

$$x = \frac{|B_1|}{|A|} = \frac{-88}{22} = 4$$

$$y = \frac{|B_2|}{|A|} = \frac{22}{22} = -1$$

$\therefore x = 4, y = -1$

**5. Solve x + 5y = 17, 5x + y = 13 by using Matrix inversion method?**

**Sol:** $x + 5y = 17$ .....(1)

$5x + y = 13$ .....(2)

Matrix equatioin form is

$$\begin{pmatrix}1 & 5\\ 5 & 1\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}17\\ 13\end{pmatrix}$$

AX = B

$$A=\begin{pmatrix}1 & 5\\ 5 & 1\end{pmatrix} X=\begin{pmatrix}x\\ y\end{pmatrix} B=\begin{pmatrix}17\\ 13\end{pmatrix}$$

|A| = ad – bc

= (1 × 1) – (5 × 5)

= 1 – 25

= – 24 ≠ 0

∴ Matrix insession method is applicable

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

$$X=\frac{1}{ad-bc}\begin{pmatrix}d & -b\\ -c & a\end{pmatrix}\begin{pmatrix}p\\ q\end{pmatrix}$$

$$=\frac{1}{-24}\begin{pmatrix}1 & -5\\ -5 & 1\end{pmatrix}\begin{pmatrix}17\\ 13\end{pmatrix}$$

$$=\frac{1}{-24}\begin{pmatrix}17-65\\ -85+13\end{pmatrix}$$

$$=\frac{1}{-24}\begin{pmatrix}-48\\ -72\end{pmatrix}$$

$$=\begin{pmatrix}\frac{1}{-24}\times -48\\ \frac{1}{-24}\times -72\end{pmatrix}$$

$$=\begin{pmatrix}2\\ 3\end{pmatrix}$$

∴ x = 2, y = 3

## 2 Marks Questions

**1. If** $A=\begin{pmatrix}3x+2y & 6\\ 2 & 2x-3y\end{pmatrix}=\begin{pmatrix}5 & 6\\ 7 & 8\end{pmatrix}$ **then find x and y?**

**Sol:** $\begin{pmatrix}3x+2y & 6\\ 2 & 2x-3y\end{pmatrix}=\begin{pmatrix}5 & 6\\ 7 & 8\end{pmatrix}$

By equating the corresponding elements

3x + 2y = 5 × (3)

2x – 3y = 8 × (2)

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9x + 6y = 15

4x – 6y = 16

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$13x = 31$

$\Rightarrow x = \frac{31}{13}$

$3\left(\frac{31}{13}\right) + 2y = 5$

$2y = 5 - \frac{93}{13}$

$2y = \frac{65 - 93}{13}$

$y = \frac{-28}{13 \times 2} = \frac{-14}{13}$

$x = \frac{31}{13}, y = \frac{-14}{13}$

**2. Find x and y if $\begin{bmatrix} x & y \end{bmatrix}\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix} = \begin{bmatrix} 6 & 10 \end{bmatrix}$ then find x and y?**

**Sol:** $\begin{bmatrix} x & y \end{bmatrix}\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix} = \begin{bmatrix} 6 & 10 \end{bmatrix}$

$\Rightarrow \begin{bmatrix} 2x + 0 & 3x + y \end{bmatrix} = \begin{bmatrix} 6 & 10 \end{bmatrix}$

$\Rightarrow 2x = 6$
$\Rightarrow x = 3$

$3x + 4 = 10$
$3(3) + y = 10$
$9 + y = 10$
$y = 10 - 9$
$y = 1$

**3. $A = \begin{pmatrix} 1 & 4 \\ 0 & -1 \end{pmatrix}, B = \begin{pmatrix} 2 & m \\ 0 & -1/2 \end{pmatrix}$; find 'm' if AB = BA.**

**Sol:** $A = \begin{pmatrix} 1 & 4 \\ 0 & -1 \end{pmatrix}$

$B = \begin{pmatrix} 2 & m \\ 0 & -1/2 \end{pmatrix}$

$AB = \begin{pmatrix} 1 & 4 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 2 & m \\ 0 & -1/2 \end{pmatrix}$

$\begin{pmatrix} 2 & m-2 \\ 0+0 & 0+\frac{1}{2} \end{pmatrix}$

$\begin{pmatrix} 2 & m-2 \\ 0 & -\frac{1}{2} \end{pmatrix}$

$$BA = \begin{pmatrix} 2 & m \\ 0 & -\frac{1}{2} \end{pmatrix}\begin{pmatrix} 1 & 4 \\ 0 & -1 \end{pmatrix}$$

$$= \begin{pmatrix} 2+0 & 8-m \\ 0+0 & 0+\frac{1}{2} \end{pmatrix}$$

$$= \begin{pmatrix} 2 & 8-m \\ 0 & \frac{1}{2} \end{pmatrix}$$

Given that AB = BA

$$\Rightarrow \begin{pmatrix} 2 & m-2 \\ 0 & \frac{1}{2} \end{pmatrix} = \begin{pmatrix} 2 & 8-m \\ 0 & \frac{1}{2} \end{pmatrix}$$

$m - 2 = 8 - m$

$m + m = 8 + 2$

$2m = 10$

$m = 5$

**4. If $P = \begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix}$, show that 'P' is it's own inverse.**

**Sol:** $P = \begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix}$,

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

$$P = \begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix} \Rightarrow P^{-1} = \frac{1}{(1\times -1)-(4\times 0)}\begin{bmatrix} -1 & -4 \\ 0 & 1 \end{bmatrix}$$

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

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

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

$= P$

Here $P^{-1} = P$

$\therefore$ P is it's own inverse

**5. If $B=\begin{bmatrix}1 & 2\\ 1 & 3\end{bmatrix}$ then show that $B + B^{-1} = 4I$**

**Sol:** $B=\begin{bmatrix}1 & 2\\ 1 & 3\end{bmatrix}$

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

$$B=\begin{bmatrix}1 & 2\\ 1 & 3\end{bmatrix}\Rightarrow B^{-1}=\frac{1}{1(3)-2(1)}\begin{bmatrix}3 & -2\\ -1 & 1\end{bmatrix}$$

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

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

$$B+B^{-1}=\begin{bmatrix}1 & 2\\ 1 & 3\end{bmatrix}+\begin{bmatrix}3 & -2\\ -1 & 1\end{bmatrix}$$

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

$$=\begin{bmatrix}4 & 0\\ 0 & 4\end{bmatrix}$$

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

$= 4I$

$\therefore B + B^{-1} = 4I$

## 1 Marks Questions.

**1. If $A=\begin{bmatrix}4 & x\\ x & 9\end{bmatrix}$ doesn't have multiplicative inverse then find x**

**Sol:** $A=\begin{bmatrix}4 & x\\ x & 9\end{bmatrix}$

Since A doesn't have multiplicative inverse

$\Rightarrow |A| = 0$

$$\Rightarrow\begin{bmatrix}4 & x\\ x & 9\end{bmatrix}=0$$

$\Rightarrow (4 \times 9 - x \times x) = 0$

$\Rightarrow 36 - x^2 = 0$

$\Rightarrow 36 = x^2$

$\Rightarrow x^2 = 36$

$\Rightarrow x = \pm 6$

**2. Write the matrix equation form of $3x + 8y - 7 = 0, 6x - y = 31$**

**Sol:** $3x + 8y - 7 = 0 \Rightarrow 3x + 8y = 7$

$6x - y = 31$

Matrix equation form is

$$\begin{bmatrix} 3 & 8 \\ 6 & -1 \end{bmatrix}\begin{bmatrix} x \\ 9 \end{bmatrix} = \begin{bmatrix} 7 \\ 31 \end{bmatrix}$$

**3. Find X, if $X+2I = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}$**

**Sol:** $X + 2I = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}$

$$\Rightarrow X = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix} - 2I$$

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

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

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

$$\Rightarrow X = \begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix}$$

**4. If $\begin{bmatrix} 4 & -3 \\ 2 & 64 \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 2 & 2^t \end{bmatrix}$ then find 't'**

**Sol:** $\begin{bmatrix} 4 & -3 \\ 2 & 64 \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 2 & 2^t \end{bmatrix}$

$\Rightarrow 64 = 2t$

$\Rightarrow 26 = 2t$

$\Rightarrow 6 = t$

$\Rightarrow t = 6$

**5. Define Skew-symmetric matrix**

**Sol:** A matrix "A" is said to be skew symmetric matrix if $A^T = -A$ or $A^T + A = 0$

**6. If $\begin{vmatrix} 2 & -4 \\ 5 & d-2 \end{vmatrix} = 4$ then find 'd'**

**Sol:** $\begin{vmatrix} 2 & -4 \\ 5 & d-2 \end{vmatrix} = 4$

$\Rightarrow 2(d-2)-(4\times 5)=4$
$\Rightarrow 2d-4+20=4$
$\Rightarrow 2d=4+4-20$
$\Rightarrow 2d=\,=-12$
$\Rightarrow d=-6$

## Multiple Choice Questions

**1. _____ introduced the concept of matices (B)**

a) J. J. Sylvestor
b) Sir Arthe Cayley
c) Sir Ronald Fisher
d) George Cantor

**2. If $P=\begin{bmatrix}3 & 0\\ 0 & \lambda\end{bmatrix}$ is a scalar matrix, then $\lambda$ = _____**

a) 0
b) 3
c )– 3
d) 1

**3. $A=\begin{bmatrix}5 & 2\end{bmatrix}$ $B=\begin{bmatrix}x\\ y\end{bmatrix}$ then AB =**

a) $\begin{bmatrix}5x & 2y\end{bmatrix}$
b) $\begin{bmatrix}5x & 5y\\ 2y & 2x\end{bmatrix}$
c) (5x+2y)
d) None

**4. The order of matrix [1 2 3] is _____**

a) 3 × 1
b) 1 × 3
c) 2 × 3
d) 3 × 2

**5. If $MX=\begin{bmatrix}1 & 2\\ 0 & 3\end{bmatrix}=\begin{bmatrix}2 & 3\end{bmatrix}$ then order of M is**

a) 1 × 2
b) 2 × 2
c) 2 × 1
d) 1 × 1

**6. If $\begin{bmatrix}a & 3\\ 1 & 2\end{bmatrix}=\begin{bmatrix}2\\ -1\end{bmatrix}=\begin{bmatrix}5\\ 6\end{bmatrix}$ then 'a' = _____**

a) 1
b) 2
c) 3
d) 4

**7. $A=\begin{bmatrix}2 & 3\\ 5 & 4\end{bmatrix}$ then |A| = _____**

a) 7
b) – 7
c) 1/7
d) 49

**8. If $\begin{bmatrix}2 & -5\\ 4 & d-2\end{bmatrix}=2$ then 'd' = _____**

a) 7
b) 4
c) – 7
d) 3

**9. If $A=\begin{bmatrix} p & q \\ r & s \end{bmatrix}$ is to be singular then**

a) ps = qr  b) ps ≠ qs  c) pr = qs  d) pr ≠ qs

**10. If $\begin{vmatrix} 2a & 5 \\ 6 & 3 \end{vmatrix}=0$ then 'a' = _____**

a) 5  b) 5  c) ± 5  d) None

**11. If $\begin{bmatrix} a & b \end{bmatrix}\begin{bmatrix} 1 & 1 \\ 0 & 2 \end{bmatrix}=\begin{bmatrix} 1 & 2 \end{bmatrix}$ then 'a' = _____**

a) 2  b) 1  c) 3  d) 0

**12. If $\begin{bmatrix} 4 & -3 \\ 2 & 64 \end{bmatrix}=\begin{bmatrix} 4 & -3 \\ 2 & 2^t \end{bmatrix}$ then 't' = _____**

a) 5  b) 6  c) 7  d) 8

**13. A 3 ×4 matrix has _____**

a) 3 columns and 4 rows  b) 3 rows and 4 columns
c) 12 rows and 7 columns  d) 12 columns and 7 rows

**14. If $A=\begin{bmatrix} 4 & 5 \\ 6 & 7 \end{bmatrix} B=\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ then A – B = _____**

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

c) $\begin{bmatrix} 3 & 3 \\ 3 & 3 \end{bmatrix}$  d) $\begin{bmatrix} 4 & 4 \\ 4 & 4 \end{bmatrix}$

**15. Matrix equation form of ax+by = p and cx + dy = q is _____**

a) $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} y \\ x \end{pmatrix}=\begin{pmatrix} p \\ q \end{pmatrix}$  b) $\begin{pmatrix} a & b \\ x & y \end{pmatrix}\begin{pmatrix} p \\ q \end{pmatrix}=\begin{pmatrix} c \\ d \end{pmatrix}$

c) $\begin{pmatrix} a & b \\ x & y \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix}=\begin{pmatrix} p \\ q \end{pmatrix}$  d) $\begin{pmatrix} a & b \\ x & y \end{pmatrix}\begin{pmatrix} p \\ q \end{pmatrix}=\begin{pmatrix} x \\ y \end{pmatrix}$

**KEY:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1) b | 2) b | 3) c | 4) b | 5) a | 6) d | 7) b | 8) c |
| 9) a | 10) c | 11) b | 12) b | 13) b | 14) b | 15) c | |

## Fill in the blanks

1. If $\begin{bmatrix} 5 & 0 \\ x & x \end{bmatrix}$ is a scalar matrix then x = _____
2. If AB = KI where k∈r then $A^{-1}$ = _____
3. AB = I then $B^{-1}$ = _____
4. If |A| ≠ 0 then A is _____ matrix
5. If $\begin{bmatrix} p & q \\ r & s \end{bmatrix}$ has multiplicative inverse then = _____
6. $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ then order of A is = _____
7. $(A + B)^T$ = _____
8. Multiplicative identity of 2 × 2 matrices is _____
9. $A = \begin{bmatrix} 5 & 6 \\ 7 & 8 \\ 1 & 7 \end{bmatrix}$ then $A^T$ = _____
10. $\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$ = _____

**KEY:**

1) 5 2) $\frac{1}{k}$.B 3) A 4) Non-Singular 5) ps ≠ qr

6) 2×3 7) $A^T+B^T$ 8) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 9) $\begin{bmatrix} 5 & 7 & 1 \\ 6 & 8 & 7 \end{bmatrix}$ 10) 1