# Review Exercise

**Q1. Select the correct answer in each of the following.**

**(i) The order of matrix $[2 \quad 1]$ is .....**

**(a)** 2-by-1 **(b)** 1-by-2

**(c)** 1-by-1 **(d)** 2-by-2

**(ii)** $\begin{bmatrix} \sqrt{2} & 0 \\ 0 & \sqrt{2} \end{bmatrix}$ **is called ..... matrix.**

**(a)** zero **(b)** unit

**(b)** scalar **(d)** singular

**(iii) Which is order of square matrix.....**

**(a)** 2-by-1 **(b)** 1-by-2

**(c)** 2-by-1 **(d)** 3-by-2

**(iv) Order of transpose of** $\begin{bmatrix} 2 & 1 \\ 0 & 1 \\ 3 & 2 \end{bmatrix}$ **.....**

**(a)** 3-by-2 **(b)** 2-by-3

**(c)** 1-by-3 **(d)** 3-by-1

**(v) Ad joint of** $\begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$ **is .....**

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

(c) $\begin{bmatrix} -1 & 2 \\ 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix}$

(vi) **Product of** $[x \quad y]\begin{bmatrix} 2 \\ -1 \end{bmatrix}$ **is.....**

(a) $[2x + y]$ (b) $[x - 2y]$

c) $[2x - y]$ (d) $[x + 2y]$

(vii) **If** $\begin{bmatrix} 2 & 6 \\ 3 & x \end{bmatrix}$ **= 0, then x is equal to...a = .....**

(a) 9 (b) - 6

(c) 6 (d) - 9

(viii) **If** $X + \begin{bmatrix} -1 & -2 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$**, then X is equal to.....**

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

(c) $\begin{bmatrix} 2 & 0 \\ 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & 2 \\ 0 & 2 \end{bmatrix}$

**Answers**

(i) b (ii) c (iii)a (iv) b

(v) a (vi) c (vii) a (viii) d

**Q2. Complete the following:**

(i) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ is called ..... matrix.

(ii) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is called ..... matrix.

**(iii)** Additive inverse of $\begin{bmatrix} 1 & -2 \\ 0 & -1 \end{bmatrix}$ is .....

**(iv)** In matrix multiplication, in general, AB ..... BA.

**(v)** Matrix A + B may be found if order of A and B is .....

**(vi)** A matrix is called ..... matrix if number of rows and columns are equal.

**Answers:**

**(i) Null** **(ii) Unit** **(iii)** $\begin{bmatrix} -1 & 2 \\ 0 & 1 \end{bmatrix}$

**(iv)** $\neq$ **(v) Same** **(vi) Square**

**Q3. If** $\begin{bmatrix} a+3 & 4 \\ 6 & b-1 \end{bmatrix} = \begin{bmatrix} -3 & 4 \\ 6 & 2 \end{bmatrix}$**, then find a and b.**

**Solution:**

By comparing the corresponding elements, we get

$$a + 3 = -3$$

$$a = -3 - 3 = -6$$

$$\boldsymbol{a = -6}$$ Answer

and $$b - 1 = 2$$

$$b = 2 + 1$$

$$\boldsymbol{b = 3}$$ Answer

**Q4. If A =** $\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix}$**, B =** $\begin{bmatrix} 5 & -4 \\ -2 & -1 \end{bmatrix}$**, then find the following.**

**(i)** 2A + 3B **(ii)** -3A+ 2B

**(iii)** -3 (A + 2B) **(iv)** $\frac{2}{3}$(2A – 3B)

**Solution:**

**(i) 2A + 3B**

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

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

$$= \begin{bmatrix} 4 & 6 \\ 2 & 0 \end{bmatrix} + \begin{bmatrix} 15 & -12 \\ -6 & -3 \end{bmatrix}$$

$$= \begin{bmatrix} 4 + 15 & 6 - 12 \\ 2 - 6 & 0 - 3 \end{bmatrix}$$

$$\mathbf{2A + 3B} = \begin{bmatrix} \mathbf{19} & \mathbf{-6} \\ \mathbf{-4} & \mathbf{-3} \end{bmatrix}$$

**(ii) -3A + 2B**

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

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

$$= \begin{bmatrix} -6 & -9 \\ -3 & 0 \end{bmatrix} + \begin{bmatrix} 10 & -8 \\ -4 & -2 \end{bmatrix}$$

$$= \begin{bmatrix} (-6) + 10 & (-9) + (-8) \\ -3 + (-4) & 0 + (-2 \end{bmatrix}$$

$$\mathbf{- 3A + 2B} = \begin{bmatrix} \mathbf{4} & \mathbf{-17} \\ \mathbf{-7} & \mathbf{-2} \end{bmatrix}$$

**(iii) - 3(A + 2B)**

$$= -3 \left( \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} + 2 \times \begin{bmatrix} 5 & -4 \\ -2 & -1 \end{bmatrix} \right)$$

$$= -3 \left( \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} + \begin{bmatrix} 2 \times 5 & 2 \times (-4) \\ 2 \times (-2) & 2 \times (-1) \end{bmatrix} \right)$$

$$= -3 \left( \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} + \begin{bmatrix} 10 & -8 \\ -4 & -2 \end{bmatrix} \right)$$

$$= -3 \begin{bmatrix} 2 + 10 & 3 - 8 \\ 1 - 4 & 0 + -2 \end{bmatrix}$$

$$= \quad -3\begin{bmatrix}12 & -5\\ -3 & -2\end{bmatrix}$$

$$= \quad -\begin{bmatrix}3\times 12 & 3\times(-5)\\ 3\times(-3) & 3\times(-2)\end{bmatrix}$$

$$= \quad -\begin{bmatrix}36 & -15\\ -9 & -6\end{bmatrix}$$

$$\textbf{-3(A + 2B)} \quad = \quad \begin{bmatrix}-36 & 15\\ 9 & 6\end{bmatrix}$$

**(iv)** $\frac{2}{3}$**(2A – 3B)**

$$= \quad \tfrac{2}{3}\left(2\,x\begin{bmatrix}2 & 3\\ 1 & 0\end{bmatrix} - 3\,x\begin{bmatrix}5 & -4\\ -2 & -1\end{bmatrix}\right)$$

$$= \quad \tfrac{2}{3}\left(\begin{bmatrix}2\times 2 & 2\times 3\\ 2\times 1 & 2\times 0\end{bmatrix} - \begin{bmatrix}3\times 5 & 3\times(-4)\\ 3\times(-2) & 3\times(-1)\end{bmatrix}\right)$$

$$= \quad \tfrac{2}{3}\left(\begin{bmatrix}4 & 6\\ 2 & 0\end{bmatrix} - \begin{bmatrix}15 & -12\\ -6 & -3\end{bmatrix}\right)$$

$$= \quad \begin{bmatrix}4-15 & 6+2\\ 2+6 & 0+3\end{bmatrix}$$

$$= \quad \begin{bmatrix}-11 & 185\\ 8 & 3\end{bmatrix}$$

$$\tfrac{2}{3}\textbf{(2A – 3B)} \quad = \quad \begin{bmatrix}-\frac{22}{3} & \mathbf{12}\\ \frac{16}{3} & \mathbf{2}\end{bmatrix}$$

**Q5. Find the value of X, if** $\begin{bmatrix}2 & 1\\ 3 & -3\end{bmatrix}$ **+ X =** $\begin{bmatrix}4 & -2\\ -1 & -2\end{bmatrix}$.

**Solution:**

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

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

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

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

**Q6.** If $A = \begin{bmatrix} 0 & 1 \\ 2 & -3 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 4 \\ 5 & -2 \end{bmatrix}$, then prove that

**(i)** $AB \neq BA$ **(ii)** $A(BC) = (AB)C$

**Solution:**

**(i)** $AB = \begin{bmatrix} 0 & 1 \\ 2 & -3 \end{bmatrix}\begin{bmatrix} -3 & 4 \\ 5 & -2 \end{bmatrix}$

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

$$= \begin{bmatrix} 0+5 & 0-2 \\ -6-15 & 8+6 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & 2 \\ -21 & 14 \end{bmatrix} \quad \text{--------- (i)}$$

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

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

$$= \begin{bmatrix} 0+8 & -3-12 \\ 0-4 & 5+6 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & -15 \\ -4 & 11 \end{bmatrix} \quad \text{--------- (ii)}$$

From (i) and (ii), it is clear that $AB \neq BA$

**(ii)** **A (BC) = (AB)C**

Solution is not possible because matrix C is not given.

**Q7.** If $A = \begin{bmatrix} 3 & 2 \\ 1 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 4 \\ -3 & -5 \end{bmatrix}$, then verify that

(i) $(AB)^t = B^t A^t$ (ii) $(AB)^{-1} = B^{-1}A^{-1}$

**Solution:**

**(i)** $(AB)^t = B^t A^t$

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

$$B^t = \begin{bmatrix} 2 & 4 \\ -3 & -5 \end{bmatrix}^t = \begin{bmatrix} 2 & -3 \\ 4 & -5 \end{bmatrix}$$

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

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

$$= \begin{bmatrix} 6-6 & 12-10 \\ 2+3 & 4+5 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ 5 & 9 \end{bmatrix}$$

$$(AB)^t = \begin{bmatrix} 0 & 2 \\ 5 & 9 \end{bmatrix}^t$$

$$= \begin{bmatrix} 0 & 5 \\ 2 & 9 \end{bmatrix} \quad \text{-------- (i)}$$

$$B^t A^t = \begin{bmatrix} 2 & -3 \\ 4 & -5 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 2 & -1 \end{bmatrix}$$

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

$$= \begin{bmatrix} 6-6 & 2+3 \\ 12-10 & 4+5 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & 5 \\ 2 & 9 \end{bmatrix} \quad \text{-------- (ii)}$$

From (i) and (ii), it is clear that $(AB)^t = B^t A^t$

**(ii)** $(\mathbf{AB})^{-1} = \mathbf{B^{-1}A^{-1}}$

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

$$|A| = 3 \times (-1) - 1 \times 2 = -3 - 2 = -5 \neq 0$$

$$A^{-1} = \frac{Adj\ A}{|A|}$$

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

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

$$|B| = 2 \times (-5) - 4 \times (-3) = -10 + 12 = 2 \neq 0$$

$$B^{-1} = \frac{Adj\ B}{|B|}$$

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

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

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

$$= \begin{bmatrix} 6 - 6 & 12 - 10 \\ 2 + 3 & 4 + 5 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ 5 & 9 \end{bmatrix}$$

$$|AB| = 0 \times 9 - 2 \times 5 = 0 - 10 = -10 \neq 0$$

$$(AB)^{-1} = \frac{Adj\ AB}{|AB|}$$

$$= \frac{1}{10}\begin{bmatrix} 9 & -2 \\ -5 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{-9}{10} & \frac{1}{5} \\ \frac{1}{2} & 0 \end{bmatrix} \qquad \text{---------- (i)}$$

Now by solving $B^{-1}A^{-1}$

$$= \begin{bmatrix} -\frac{5}{2} & -2 \\ \frac{3}{2} & 1 \end{bmatrix} \times \begin{bmatrix} \frac{1}{5} & \frac{2}{5} \\ \frac{1}{5} & -\frac{3}{5} \end{bmatrix}$$

$$= \begin{bmatrix} \frac{-5}{2} \times \frac{1}{5} + (-2) \times \frac{1}{5} & \frac{-5}{2} \times \frac{2}{5} + (-2) \times \frac{-3}{5} \\ \frac{3}{2} \times \frac{1}{5} + 1 \times \frac{1}{5} & \frac{3}{2} \times \frac{2}{5} + 1 \times \frac{-3}{5} \end{bmatrix}$$

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

$$= \begin{bmatrix} \frac{-5-4}{10} & \frac{-5+6}{5} \\ \frac{3+2}{10} & \frac{3-3}{5} \end{bmatrix}$$

$$= \begin{bmatrix} \frac{-9}{10} & \frac{1}{5} \\ \frac{1}{2} & 0 \end{bmatrix} \qquad \text{---------- (ii)}$$

From (i) and (ii), it is clear that $(AB)^{-1} = B^{-1}A^{-1}$

9th Mathematics Chapter 01 MCQs Notes