Board –ICSE	Class – 10th	Topic – Operations on Matrices

Q1 Find the values of x, y, a and b, if :

$$\begin{bmatrix} x-2 & y \\ a/2 & b+1 \end{bmatrix} = \begin{bmatrix} 0 & 3 \\ 1 & 5 \end{bmatrix}$$

Soln.

$$x-2=0 \Rightarrow x=2$$
$$y=3 \Rightarrow a=2$$
$$a/2=1 \Rightarrow b=4$$
$$b+1=5 \Rightarrow b=4$$

$\therefore x=2, y=3, a=2$ and $b=4$

[If two matrices are equal, their corresponding elements are also equal.]

Q2 If $A=\begin{bmatrix} 5 & 4 \\ 3 & -1 \end{bmatrix}$; $B=\begin{bmatrix} 2 & 1 \\ 0 & 4 \end{bmatrix}$ and $C=\begin{bmatrix} -3 & 2 \\ 1 & 0 \end{bmatrix}$; find :

(i) $A+C$

(ii) $B-A$

(iii) $A+B-C$.

Soln.

(i)

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

Q3 Given $A=\begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}$, $B=\begin{bmatrix} -2 & -1 \\ 1 & 2 \end{bmatrix}$ and $C=\begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix}$,

find : $A+2B=3C$.

Soln.

$$A+2B-3C=\begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}+2\begin{bmatrix} -2 & -1 \\ 1 & 2 \end{bmatrix}-3\begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix}$$
$$=\begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}+\begin{bmatrix} -4 & -2 \\ 2 & 4 \end{bmatrix}-\begin{bmatrix} 0 & 9 \\ 6 & -3 \end{bmatrix}$$
$$=\begin{bmatrix} -3 & 0 \\ 0 & 7 \end{bmatrix}-\begin{bmatrix} 0 & 9 \\ 6 & -3 \end{bmatrix}=\begin{bmatrix} -3 & -9 \\ -6 & 10 \end{bmatrix}$$

Q4. Given, matrix $A = \begin{bmatrix} 5 \\ -3 \end{bmatrix}$ and matrix $B = \begin{bmatrix} -1 \\ 7 \end{bmatrix}$; find matrix X such that :

$A + 2X = B$

Soln.

$$A + 2X = B \Rightarrow 2X = B - A$$

$$= \begin{bmatrix} -1 \\ 7 \end{bmatrix} - \begin{bmatrix} 5 \\ -3 \end{bmatrix} = \begin{bmatrix} -6 \\ 10 \end{bmatrix}$$

$$\Rightarrow X = \frac{1}{2}\begin{bmatrix} -6 \\ 10 \end{bmatrix} = \begin{bmatrix} \frac{1}{2} \times -6 \\ \frac{1}{2} \times 10 \end{bmatrix} = \begin{bmatrix} -3 \\ 5 \end{bmatrix}$$

Q5. Let $A = \begin{bmatrix} -3 & 3 \\ 2 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 6 \\ 4 & 6 \end{bmatrix}$; find the matrix AB. Write the conclusion, if any, that you can draw from the result obtained.

Soln. $AB = \begin{bmatrix} -3 & 3 \\ 2 & -2 \end{bmatrix}\begin{bmatrix} 4 & 6 \\ 4 & 6 \end{bmatrix} = \begin{bmatrix} -12 + 12 & -18 + 18 \\ 8 - 8 & 12 - 12 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

The result obtained is $AB = 0$, zero matrix.

Conclusion :

The product of two non-zero matrices can be a zero matrix.

Q6. If $A = \begin{bmatrix} 4 & -4 \\ -3 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 6 & 5 \\ 3 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 3 \\ -1 & -2 \end{bmatrix}$ show that $AB = AC$. Write the conclusion, if any, that you can draw from the result obtained above.

Soln. $AB = \begin{bmatrix} 4 & -4 \\ -3 & 3 \end{bmatrix}\begin{bmatrix} 6 & 5 \\ 3 & 0 \end{bmatrix} = \begin{bmatrix} 24 - 12 & 20 + 0 \\ -18 + 9 & -15 + 0 \end{bmatrix} = \begin{bmatrix} 12 & 20 \\ -9 & -15 \end{bmatrix}$

$AC = \begin{bmatrix} 4 & -4 \\ -3 & 3 \end{bmatrix}\begin{bmatrix} 2 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} 8 + 4 & 12 + 8 \\ -6 - 3 & -9 - 6 \end{bmatrix} = \begin{bmatrix} 12 & 20 \\ -9 & -15 \end{bmatrix}$

From I and II, we get : $AB = AC$

Conclusion :

$AB = AC \Rightarrow$ Matrices B and C are not equal and matrix A is not a zero-matrix, even then $AB = AC$.