Exercise 3.2

Q1. **Find x, y, z, from the followings, if possible. Mention the reason if not possible.**

(a) $[x \quad 9] = [2 \quad y]$

Solution: $[x \quad 9] = [2 \quad y]$

We equate the corresponding elements of the matrices:

$\Rightarrow$ $x = 2$

$\Rightarrow$ $9 = y$

Thus, the solution is $x = 2, y = 9$.

(b) $\begin{bmatrix} 6 & 3 \\ 4 & x \end{bmatrix} = \begin{bmatrix} 7 & 3 \\ 4 & 0 \end{bmatrix}$

Solution:

To find the values of x from the equation $\begin{bmatrix} 6 & 3 \\ 4 & x \end{bmatrix} = \begin{bmatrix} 7 & 3 \\ 4 & 0 \end{bmatrix}$

We equate the corresponding elements of the matrices:

$\Rightarrow$ $6 = 7$ (this is not true)

$\Rightarrow$ $3 = 3$ (this is true)

$\Rightarrow$ $4 = 4$ (this is true)

$\Rightarrow$ $x = 0$

Impossible, corresponding elements are not equal.

(c) $\begin{bmatrix} 5x \\ 2y \end{bmatrix} = [-10 \quad 20]$

Solution: $\begin{bmatrix} 5x \\ 2y \end{bmatrix} = [-10 \quad 20]$

Impossible; orders of matrices are not equal.

(d) $-\begin{bmatrix} 2x & 3y \\ 4z & 10 \end{bmatrix} = \begin{bmatrix} 8 & 6 \\ 32 & -10 \end{bmatrix}$

Solution:

The given matrix equation is: $-\begin{bmatrix} 2x & 3y \\ 4z & 10 \end{bmatrix} = \begin{bmatrix} 8 & 6 \\ 32 & -10 \end{bmatrix}$

To solve for x, y, and z, we first remove the negative sign by multiplying the entire left matrix by -1.

$\Rightarrow$ $\begin{bmatrix} 2x & 3y \\ 4z & 10 \end{bmatrix} = -\begin{bmatrix} 8 & 6 \\ 32 & -10 \end{bmatrix}$ $\Rightarrow$ $\begin{bmatrix} 2x & 3y \\ 4z & 10 \end{bmatrix} = \begin{bmatrix} -8 & -6 \\ -32 & 10 \end{bmatrix}$

Now, we equate the corresponding elements of the matrices:

$\Rightarrow$ $2x = -8$

$\Rightarrow \quad 3y = -6$
$\Rightarrow \quad 4z = -32$
$\Rightarrow \quad 10 = 10$ (This holds true)

- **Solving for x:** $2x = -8 \quad \Rightarrow \quad x = \frac{-8}{2} = -4$
- **Solving for y:** $3y = -6 \quad \Rightarrow \quad y = \frac{-6}{3} = -2$
- **Solving for z:** $4z = -32 \quad \Rightarrow \quad z = \frac{-32}{4} = -8$

Thus, the solutions are $x = -4, y = -2, z = -8$.

(e) $\begin{bmatrix} x & -2y \\ 6 & x+y \end{bmatrix} = \begin{bmatrix} 3 & -6 \\ 6 & z \end{bmatrix}$

Solution: The given matrix equation is: $\begin{bmatrix} x & -2y \\ 6 & x+y \end{bmatrix} = \begin{bmatrix} 3 & -6 \\ 6 & z \end{bmatrix}$

To solve for $x, y,$ and z, we equate the corresponding elements of the matrices:

$\Rightarrow \quad x = 3$
$\Rightarrow \quad -2y = -6$
$\Rightarrow \quad 6 = 6$ (This holds true)
$\Rightarrow \quad x + y = z$

- **Solving for y:** $-2y = -6 \quad \Rightarrow \quad y = \frac{-6}{-2} = 3$

Using $x = 3$ and $y = 3$ to solve for z.
Substitute $x = 3$ and $y = 3$ into $x + y = z$.
$\Rightarrow \quad 3 + 3 = z \quad \Rightarrow \quad z = 6$
Thus, the solutions are $x = 3, y = 3, z = 6$.

(f) $\begin{bmatrix} 5 \\ 6 \\ 7 \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ x & 0 \\ 7 & 0 \end{bmatrix}$

Solution:

Impossible; orders of matrices are not equal.

(g) $\begin{bmatrix} x+y \\ x-y \end{bmatrix} = \begin{bmatrix} 11 \\ 1 \end{bmatrix}$

Solution:

To solve the given system of equations represented by the matrix equation:

$\Rightarrow \quad \begin{bmatrix} x+y \\ x-y \end{bmatrix} = \begin{bmatrix} 11 \\ 1 \end{bmatrix}$

We equate the corresponding elements:

$\Rightarrow \quad x + y = 11$
$\Rightarrow \quad x - y = 1$

Add the two equations.

$\Rightarrow \quad (x + y) + (x - y) = 11 + 1$

This simplifies to: $2x = 12 \Rightarrow x = \frac{12}{2} = 6$

Substitute $x = 6$ into one of the equations to find y.

Using the first equation $x + y = 11$.

$\Rightarrow \quad 6 + y = 11 \quad \Rightarrow \quad y = 11 - 6 = 5$

Thus, the solution is $x = 6, y = 5$.

(h) $\begin{bmatrix} 5 & 10 \\ 15 & x \end{bmatrix} + \begin{bmatrix} 5 & y \\ 15 & 5 \end{bmatrix} = \begin{bmatrix} z & 15 \\ 30 & 7 \end{bmatrix}$

Solution:

We first perform the matrix addition on the left side:

$$\Rightarrow \begin{bmatrix} 5+5 & 10+y \\ 15+15 & x+5 \end{bmatrix} = \begin{bmatrix} z & 15 \\ 30 & 7 \end{bmatrix}$$

This simplifies to:

$$\Rightarrow \begin{bmatrix} 10 & 10+y \\ 30 & x+5 \end{bmatrix} = \begin{bmatrix} z & 15 \\ 30 & 7 \end{bmatrix}$$

Now, we equate the corresponding elements:

$\Rightarrow \quad 10 = z$

$\Rightarrow \quad 10 + y = 15$

$\Rightarrow \quad 30 = 30$ (This is already true)

$\Rightarrow \quad x + 5 = 7$

- **Solving for y:** $10 + y = 15 \Rightarrow y = 15 - 10 = 5$
- **Solving for x:** $x + 5 = 7 \Rightarrow x = 7 - 5 = 2$

Thus, the solutions are $x = 2, y = 5, z = 10$.

(i) $5\begin{bmatrix} x \\ 3y \end{bmatrix} - \begin{bmatrix} 36 \\ 26 \end{bmatrix} = 2\begin{bmatrix} -2x \\ y \end{bmatrix}$

Solution:

We first expand the matrices:

The equation becomes: $\begin{bmatrix} 5x \\ 15y \end{bmatrix} - \begin{bmatrix} 36 \\ 26 \end{bmatrix} = \begin{bmatrix} -4x \\ 2y \end{bmatrix}$

This can be rewritten as: $\begin{bmatrix} 5x - 36 \\ 15y - 26 \end{bmatrix} = \begin{bmatrix} -4x \\ 2y \end{bmatrix}$

Now, equate the corresponding elements:

$\Rightarrow \quad 5x - 36 = -4x$

$\Rightarrow \quad 15y - 26 = 2y$

- **Solving for x:**

$\Rightarrow \quad 5x - 36 = -4x \quad \Rightarrow \quad 5x + 4x = 36$

$\Rightarrow \quad 9x = 36 \quad \Rightarrow \quad x = \frac{36}{9} = 4$

- **Solving for y:**

$\Rightarrow \quad 15y - 26 = 2y \quad \Rightarrow \quad 15y - 2y = 26$

$\Rightarrow \quad 13y = 26 \quad \Rightarrow \quad y = \frac{26}{13} = 2$

Thus, the solutions are $x = 4, y = 2$.

(j) $\begin{bmatrix} x & y & z \\ -2 & -4 & 5 \end{bmatrix} + 2 \times \begin{bmatrix} 5 & 3 & 2 \\ 1 & 6 & 3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 8 & 11 \end{bmatrix}$

Solution:

Multiply the second matrix by 2 and add this result to the first matrix:

$\Rightarrow \quad \begin{bmatrix} x & y & z \\ -2 & -4 & 5 \end{bmatrix} + \begin{bmatrix} 10 & 6 & 4 \\ 2 & 12 & 6 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 8 & 11 \end{bmatrix}$

Now, equate it to the resulting matrix:

$\Rightarrow \quad \begin{bmatrix} x+10 & y+6 & z+4 \\ 0 & 8 & 11 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 8 & 11 \end{bmatrix}$

Equating the corresponding elements:

$\Rightarrow \quad x + 10 = 0$

$\Rightarrow \quad y + 6 = 0$

$\Rightarrow \quad z + 4 = 0$

- **Solving for x:** $\quad x + 10 = 0 \quad \Rightarrow \quad x = -10$
- **Solving for y:** $\quad y + 6 = 0 \quad \Rightarrow \quad y = -6$
- **Solving for z:** $\quad z + 4 = 0 \quad \Rightarrow \quad z = -4$

Thus, the solutions are $x = -10, y = -6, z = -4$.

Q2. Find the additive inverses of the following.

$R = \begin{bmatrix} 5 & 0 & 3 \\ 7 & -9 & -1 \\ -8 & 5 & 6 \end{bmatrix}, \quad S = \begin{bmatrix} -5 & 2 \\ 3 & -6 \\ -9 & 4 \end{bmatrix}, \quad T = [5 \quad -6 \quad 1]$

Solution:

To find the additive inverse of a matrix, you simply negate each element of:

➢ **Matrix R:** Given, $R = \begin{bmatrix} 5 & 0 & 3 \\ 7 & -9 & -1 \\ -8 & 5 & 6 \end{bmatrix}$

- ***Additive inverse of R:*** $\quad -R = \begin{bmatrix} -5 & 0 & -3 \\ -7 & 9 & 1 \\ 8 & -5 & -6 \end{bmatrix}$

➢ **Matrix *S*:** Given, $S = \begin{bmatrix} -5 & 2 \\ 3 & -6 \\ -9 & 4 \end{bmatrix}$

- **Additive inverse of S:** $\quad -S = \begin{bmatrix} 5 & -2 \\ -3 & 6 \\ 9 & -4 \end{bmatrix}$

➢ **Matrix T:** Given, $T = [5 \quad -6 \quad 1]$

- **Additive inverse of T:** $-T = [-5 \quad 6 \quad -1]$

These are the additive inverses of the matrices **R, S,** and **T.**

Q3. **If** $A = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix}$, $C = \begin{bmatrix} 15 & 6 \\ 0 & -12 \end{bmatrix}$, **then find:**

(i) $2A + \frac{1}{2}B - \frac{1}{3}C$ **(ii)** $A - \frac{1}{2}B$

Solution:

(i) $2A + \frac{1}{2}B - \frac{1}{3}C$

$$\Rightarrow 2A + \frac{1}{2}B - \frac{1}{3}C = 2\begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix} + \frac{1}{2}\begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix} - \frac{1}{3}\begin{bmatrix} 15 & 6 \\ 0 & -12 \end{bmatrix}$$

$$\Rightarrow 2A + \frac{1}{2}B - \frac{1}{3}C = \begin{bmatrix} 10 & 6 \\ -4 & 12 \end{bmatrix} + \begin{bmatrix} 5 & 4 \\ -4 & 3 \end{bmatrix} - \begin{bmatrix} 5 & 2 \\ 0 & -4 \end{bmatrix}$$

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

$$= \begin{bmatrix} 15 & 10 \\ -8 & 15 \end{bmatrix} - \begin{bmatrix} 5 & 2 \\ 0 & -4 \end{bmatrix}$$

$$\Rightarrow 2A + \frac{1}{2}B - \frac{1}{3}C = \begin{bmatrix} 15-5 & 10-2 \\ -8-0 & 15-(-4) \end{bmatrix} = \begin{bmatrix} 10 & 8 \\ -8 & 19 \end{bmatrix}$$

(ii) $A - \frac{1}{2}B$

$$\Rightarrow A - \frac{1}{2}B = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix} - \frac{1}{2}\begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix}$$

$$\Rightarrow A - \frac{1}{2}B = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix} - \begin{bmatrix} 5 & 4 \\ -4 & 3 \end{bmatrix}$$

Subtract corresponding elements:

$$= \begin{bmatrix} 5-5 & 3-4 \\ -2-(-4) & 6-3 \end{bmatrix} = \begin{bmatrix} 0 & -1 \\ 2 & 3 \end{bmatrix}$$

Q4. **If** $A = \begin{bmatrix} 1 & 2 \\ 3 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 \\ 3 & 3 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 0 \\ 6 & 0 \end{bmatrix}$, $D = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$, $E = \begin{bmatrix} 2 & 2 \\ 6 & 6 \end{bmatrix}$.

Then check whether:

(i) $A + B = C$ **(ii)** $C + D = E$

(iii) $D + D = E$ **(iv)** $E - D = C$

Solution:

(i) **Check if** $A + B = C$

Given: $A = \begin{bmatrix} 1 & 2 \\ 3 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 \\ 3 & 3 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 0 \\ 6 & 0 \end{bmatrix}$

Calculate $A + B$**:**

$$\Rightarrow A + B = \begin{bmatrix} 1+1 & 2+(-2) \\ 3+3 & -3+3 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 6 & 0 \end{bmatrix} = C$$

Since $\mathbf{A} + \mathbf{B} = \mathbf{C}$, statement **(i)** is true.

(ii) **Check if $\mathbf{C} + \mathbf{D} = \mathbf{E}$**

Given: $\mathbf{C} = \begin{bmatrix} 2 & 0 \\ 6 & 0 \end{bmatrix}$, $\mathbf{D} = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$, $\mathbf{E} = \begin{bmatrix} 2 & 2 \\ 6 & 6 \end{bmatrix}$

To perform the addition $\mathbf{C} + \mathbf{D}$, we need compatible dimensions / order of matrix. $\mathbf{C}$ has dimensions / order $\mathbf{2 \times 2}$ and $\mathbf{D}$ has dimensions / order $\mathbf{2 \times 1}$, so matrix addition is not possible here. Therefore, statement **(ii)** is false due to incompatible dimensions / order.

(iii) **Check if $\mathbf{D} + \mathbf{D} = \mathbf{E}$**

Calculate $\mathbf{D} + \mathbf{D}$: $\mathbf{D} + \mathbf{D} = \begin{bmatrix} 2 \\ 6 \end{bmatrix} + \begin{bmatrix} 2 \\ 6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \end{bmatrix}$

Given: $\mathbf{E} = \begin{bmatrix} 2 & 2 \\ 6 & 6 \end{bmatrix}$

Since $\mathbf{D} + \mathbf{D}$ does not equal $\mathbf{E}$ due to different dimensions / order, statement **(iii)** is false.

(iv) **Check if $\mathbf{E} - \mathbf{D} = \mathbf{C}$**

Calculate $\mathbf{E} - \mathbf{D}$: $\mathbf{E} - \mathbf{D} = \begin{bmatrix} 2 & 2 \\ 6 & 6 \end{bmatrix} - \begin{bmatrix} 2 \\ 6 \end{bmatrix}$

Subtracting $\mathbf{D}$ from $\mathbf{E}$ is not directly possible due to incompatible dimensions/ order, so statement **(iv)** is false.

Q5. Taking matrices A and B from Q.3, verify commutative property of matrix addition.

Solution:

The commutative property of matrix addition states that for any two matrices $\mathbf{A}$ and $\mathbf{B}$ of the same dimensions, $\mathbf{A} + \mathbf{B} = \mathbf{B} + \mathbf{A}$.

Let's verify this using the given matrices:

$\Rightarrow$ $\mathbf{A} = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix}$

- **Calculate $\mathbf{A} + \mathbf{B}$:**

$\Rightarrow$ $\mathbf{A} + \mathbf{B} = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix} + \begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix} = \begin{bmatrix} 5 + 10 & 3 + 8 \\ -2 + (-8) & 6 + 6 \end{bmatrix} = \begin{bmatrix} 15 & 11 \\ -10 & 12 \end{bmatrix}$

- **Calculate $\mathbf{B} + \mathbf{A}$:**

$\Rightarrow$ $\mathbf{B} + \mathbf{A} = \begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix} + \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix} = \begin{bmatrix} 10 + 5 & 8 + 3 \\ -8 + (-2) & 6 + 6 \end{bmatrix} = \begin{bmatrix} 15 & 11 \\ -10 & 12 \end{bmatrix}$

Since $\mathbf{A} + \mathbf{B} = \mathbf{B} + \mathbf{A} = \begin{bmatrix} 15 & 11 \\ -10 & 12 \end{bmatrix}$, the commutative property of matrix addition is verified.

Q6. Taking matrices A, B and C from Q.3, verify associative property of matrix addition.

Solution:

The associative property of matrix addition states that for any three matrices $\mathbf{A}, \mathbf{B}$, and $\mathbf{C}$ of the same dimensions, the following holds:

$\Rightarrow \quad (A+B)+C = A+(B+C)$

Let's verify this property using the given matrices:

$\Rightarrow \quad A = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix}, B = \begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix}, C = \begin{bmatrix} 15 & 6 \\ 0 & -12 \end{bmatrix}$

➢ **Calculate** $(A+B)+C$

- **Calculate $A+B$:** $A+B = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix} + \begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix} = \begin{bmatrix} 15 & 11 \\ -10 & 12 \end{bmatrix}$

Add C to the result.

$\Rightarrow \quad (A+B)+C = \begin{bmatrix} 15 & 11 \\ -10 & 12 \end{bmatrix} + \begin{bmatrix} 15 & 6 \\ 0 & -12 \end{bmatrix} = \begin{bmatrix} 30 & 17 \\ -10 & 0 \end{bmatrix}$

➢ **Calculate** $A+(B+C)$

- **Calculate $B+C$:** $B+C = \begin{bmatrix} 10 & 8 \\ -8 & 6 \end{bmatrix} + \begin{bmatrix} 15 & 6 \\ 0 & -12 \end{bmatrix} = \begin{bmatrix} 25 & 14 \\ -8 & -6 \end{bmatrix}$

Add A to the result.

$\Rightarrow \quad A+(B+C) = \begin{bmatrix} 5 & 3 \\ -2 & 6 \end{bmatrix} + \begin{bmatrix} 25 & 14 \\ -8 & -6 \end{bmatrix} = \begin{bmatrix} 30 & 17 \\ -10 & 0 \end{bmatrix}$

Both $(A+B)+C$ and $A+(B+C)$ result in the same matrix: $\begin{bmatrix} 30 & 17 \\ -10 & 0 \end{bmatrix}$

Thus, the associative property of matrix addition is verified.

Q7. Taking matrices A and B from Q.4, verify that $A^t + B^t = (A+B)^t$.

Solution:

To verify that $A^t + B^t = (A+B)^t$, we need to calculate each side of the equation using the given matrices A and B.

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

Calculate A^t and B^t.

- **<u>Transpose of A:</u>** $A^t = \begin{bmatrix} 1 & 3 \\ 2 & -3 \end{bmatrix}$
- **<u>Transpose of B:</u>** $B^t = \begin{bmatrix} 1 & 3 \\ -2 & 3 \end{bmatrix}$

Calculate $A^t + B^t$.

$\Rightarrow \quad A^t + B^t = \begin{bmatrix} 1 & 3 \\ 2 & -3 \end{bmatrix} + \begin{bmatrix} 1 & 3 \\ -2 & 3 \end{bmatrix} = \begin{bmatrix} 1+1 & 3+3 \\ 2+(-2) & -3+3 \end{bmatrix} = \begin{bmatrix} 2 & 6 \\ 0 & 0 \end{bmatrix}$

Calculate $A+B$.

$\Rightarrow \quad A+B = \begin{bmatrix} 1 & 2 \\ 3 & -3 \end{bmatrix} + \begin{bmatrix} 1 & -2 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1+1 & 2+(-2) \\ 3+3 & -3+3 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 6 & 0 \end{bmatrix}$

Calculate $(A+B)^t$.

$\Rightarrow \quad (A+B)^t = \begin{bmatrix} 2 & 6 \\ 0 & 0 \end{bmatrix}$

- **Conclusion:**

Since $A^t + B^t = \begin{bmatrix} 2 & 6 \\ 0 & 0 \end{bmatrix}$ and $(A+B)^t = \begin{bmatrix} 2 & 6 \\ 0 & 0 \end{bmatrix}$.

We have verified that $A^t + B^t = (A+B)^t$.

Q8. Find the matrix 'Z' from these equations.

(i) $4\begin{bmatrix} 5 \\ 10 \end{bmatrix} - 5Z = \sqrt{5}\begin{bmatrix} \sqrt{45} \\ \sqrt{5} \end{bmatrix}$ **(ii)** $Z + \begin{bmatrix} 5 \\ -7 \end{bmatrix} = 3Z - \begin{bmatrix} 5 \\ 3 \end{bmatrix}$

Solution:

(i) $4\begin{bmatrix} 5 \\ 10 \end{bmatrix} - 5Z = \sqrt{5}\begin{bmatrix} \sqrt{45} \\ \sqrt{5} \end{bmatrix}$

$\Rightarrow \begin{bmatrix} 20 \\ 40 \end{bmatrix} - 5Z = \sqrt{5}\begin{bmatrix} 3\sqrt{5} \\ \sqrt{5} \end{bmatrix}$; $[\because \sqrt{45} = \sqrt{9 \times 5} = 3\sqrt{5}]$

$\Rightarrow \begin{bmatrix} 20 \\ 40 \end{bmatrix} - 5Z = \begin{bmatrix} 3 \times 5 \\ 5 \end{bmatrix}$ $\Rightarrow$ $\begin{bmatrix} 20 \\ 40 \end{bmatrix} - 5Z = \begin{bmatrix} 15 \\ 5 \end{bmatrix}$

$\Rightarrow 5Z = \begin{bmatrix} 20 \\ 40 \end{bmatrix} - \begin{bmatrix} 15 \\ 5 \end{bmatrix}$ $\Rightarrow$ $5Z = \begin{bmatrix} 5 \\ 35 \end{bmatrix}$

$\Rightarrow Z = \begin{bmatrix} \frac{5}{5} \\ \frac{35}{5} \end{bmatrix} = \begin{bmatrix} 1 \\ 7 \end{bmatrix}$; (Divided by 5)

Q9. (a) <u>Mention the order of the indicated products where possible.</u>

(i) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \times [5 \quad 3]$

Solution: The first matrix is $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ which is a 2×2 matrix.

The second matrix is $[5 \quad 3]$ which is a 1×2 matrix.

Matrix multiplication is only possible if the number of columns in the first matrix equals the number of rows in the second matrix.

In this case, the first matrix has 2 columns, and the second matrix has 1 row. Since these numbers do not match, the **multiplication is not possible.**

(ii) $[5 \quad 3] \times \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$

Solution: The first matrix is a 1×2 matrix: $[5 \quad 3]$

The second matrix is a 2×2 *matrix:* $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$

Matrix multiplication is possible when the number of columns in the first matrix is equal to the number of rows in the second matrix.

Here, the first matrix has 2 columns, and the second matrix has 2 rows, so the **<u>multiplication is possible.</u>**