

Exercise 5a

Question 1.

If $A = \begin{bmatrix} 5 & -2 & 6 & 1 \\ 7 & 0 & 8 & -3 \\ \sqrt{2} & \frac{3}{5} & 4 & 3 \end{bmatrix}$ then write

- i. the number of rows in A,
- ii. the number of columns in A,
- iii. the order of the matrix A,
- iv. the number of all entries in A,
- v. the elements a_{23} , a_{31} , a_{14} , a_{33} , a_{22} of A.

Answer:

(i) Number of rows = 3

(ii) Number of columns = 4

(iii) Order of matrix = Number of rows x Number of columns = (3 x 4)

(iv) Number of entries = (Number of rows) x (Number of columns)

$$= 3 \times 4$$

$$= 12$$

(V) a_{ij} = *element of i^{th} row and j^{th} column*

$$a_{23} = 8$$

$$a_{31} = \sqrt{2}$$

$$a_{14} = 1$$

$$a_{33} = 4$$

$$a_{22} = 0$$

Question 2.

Write the order of each of the following matrices:

$$\text{i. } A = \begin{bmatrix} 3 & 5 & 4 & -2 \\ 0 & \sqrt{3} & -1 & \frac{4}{9} \end{bmatrix}$$

$$\text{ii. } B = \begin{bmatrix} 6 & -5 \\ \frac{1}{2} & \frac{3}{4} \\ -2 & -1 \end{bmatrix}$$

$$\text{iii. } C = \begin{bmatrix} 7 - \sqrt{2} & 5 & 0 \end{bmatrix}$$

$$\text{iv. } D = [8 \ -3]$$

$$\text{v. } E = \begin{bmatrix} -2 \\ 3 \\ 0 \end{bmatrix}$$

$$\text{vi. } F = [6]$$

Answer:

$$\text{i. } A = \begin{bmatrix} 3 & 5 & 4 & -2 \\ 0 & \sqrt{3} & -1 & \frac{4}{9} \end{bmatrix}$$

Order of matrix = Number of rows x Number of columns

$$= (2 \times 4)$$

$$\text{ii. } B = \begin{bmatrix} 6 & -5 \\ \frac{1}{2} & \frac{3}{4} \\ -2 & -1 \end{bmatrix}$$

Order of matrix = Number of rows x Number of columns

$$= (4 \times 2)$$

$$\text{iii. } C = \begin{bmatrix} 7 - \sqrt{2} & 5 & 0 \end{bmatrix}$$

Order of matrix = Number of rows x Number of columns

$$= (1 \times 4)$$

$$\text{iv. } D = [8 \ -3]$$

Order of matrix = Number of rows x Number of columns

$$= (1 \times 2)$$

$$\text{v. } E = \begin{bmatrix} -2 \\ 3 \\ 0 \end{bmatrix}$$

Order of matrix = Number of rows x Number of columns

$$= (3 \times 1)$$

$$\text{vi, } F = [6]$$

Order of matrix = Number of rows x Number of columns

$$= (1 \times 1)$$

Question 3.

If a matrix has 18 elements, what are the possible orders it can have?

Answer:

$$\text{Number of entries} = (\text{Number of rows}) \times (\text{Number of columns}) = 18$$

If order is $(a \times b)$ then, Number of entries = $a \times b$

So now $a \times b = 18$ (in this case)

Possible cases are (1×18) , (2×9) , (3×6) , (6×3) , (9×2) , (18×1)

Conclusion: If a matrix has 18 elements, then possible orders are (1×18) , (2×9) , (3×6) , (6×3) , (9×2) , (18×1)

Question 4.

Find all possible orders of matrices having 7 elements.

Answer:

$$\text{Number of entries} = (\text{Number of rows}) \times (\text{Number of columns}) = 7$$

If order is $(a \times b)$ then, Number of entries = $a \times b$

So now $a \times b = 7$ (in this case)

Possible cases are (1×7) , (7×1)

Conclusion: If a matrix has 18 elements, then possible orders are (1×7) , (7×1)

Question 5.

Construct a 3×2 matrix whose elements are given by $a_{ij} = (2i - j)$.

Answer:

$$\text{Given: } a_{ij} = (2i - j)$$

$$\text{Now, } a_{11} = (2 \times 1 - 1) = 2 - 1 = 1$$

$$a_{12} = 2 \times 1 - 2 = 2 - 2 = 0$$

$$a_{21} = 2 \times 2 - 1 = 4 - 1 = 3$$

$$a_{22} = 2 \times 2 - 2 = 4 - 2 = 2$$

$$a_{31} = 2 \times 3 - 1 = 6 - 1 = 5$$

$$a_{32} = 2 \times 3 - 2 = 6 - 2 = 4$$

Therefore,

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

Question 6.

Construct a 4×3 matrix whose elements are given by $a_{ij} = \frac{i}{j}$.

Answer:

It is (4×3) matrix. So it has 4 rows and 3 columns

$$\text{Given } a_{ij} = \frac{i}{j}.$$

$$\text{So, } a_{11} = 1, a_{12} = \frac{1}{2}, a_{13} = \frac{1}{3},$$

$$a_{21} = 2, a_{22} = 1, a_{23} = \frac{2}{3},$$

$$a_{31} = 3, a_{32} = \frac{3}{2}, a_{33} = 1,$$

$$a_{41} = 4, a_{42} = 2, a_{43} = \frac{4}{3}$$

$$\text{So, the matrix} = \begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} \\ 2 & 1 & \frac{2}{3} \\ 3 & \frac{3}{2} & 1 \\ 4 & 2 & \frac{4}{3} \end{bmatrix}$$

Conclusion: Therefore, Matrix is $\begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} \\ 2 & 1 & \frac{2}{3} \\ 3 & \frac{3}{2} & 1 \\ 4 & 2 & \frac{4}{3} \end{bmatrix}$

Question 7.

Construct a 2×2 matrix whose elements are $a_{ij} = \frac{(i+2j)^2}{2}$.

Answer:

It is a (2×2) matrix. So, it has 2 rows and 2 columns.

$$\text{Given } a_{ij} = \frac{(i+2j)^2}{2}$$

$$\text{So, } a_{11} = \frac{9}{2}, a_{12} = \frac{25}{2},$$

$$a_{21} = 8, a_{22} = 18$$

$$\text{So, the matrix} = \begin{bmatrix} \frac{9}{2} & \frac{25}{2} \\ 8 & 18 \end{bmatrix}$$

$$\text{Conclusion: Therefore, Matrix is} = \begin{bmatrix} \frac{9}{2} & \frac{25}{2} \\ 8 & 18 \end{bmatrix}$$

Question 8.

Construct a 2×3 matrix whose elements are $a_{ij} = \frac{(i-2j)^2}{2}$.

Answer:

It is a (2×3) matrix. So, it has 2 rows and 3 columns.

$$\text{Given } a_{ij} = \frac{(i-2j)^2}{2}$$

$$\text{So, } a_{11} = \frac{1}{2}, a_{12} = \frac{9}{2}, a_{13} = \frac{25}{2},$$

$$a_{21} = 0, a_{22} = 2, a_{23} = 8$$

$$\text{So, the matrix} = \begin{bmatrix} \frac{1}{2} & \frac{9}{2} & \frac{25}{2} \\ \frac{1}{2} & \frac{9}{2} & \frac{25}{2} \\ 0 & 2 & 8 \end{bmatrix}$$

$$\text{Conclusion: Therefore, Matrix is } \begin{bmatrix} \frac{1}{2} & \frac{9}{2} & \frac{25}{2} \\ \frac{1}{2} & \frac{9}{2} & \frac{25}{2} \\ 0 & 2 & 8 \end{bmatrix}$$

Question 9.

Construct a 3×4 matrix whose elements are given by $a_{ij} = \frac{1}{2} |-3i + j|$.

Answer:

It is a (3×4) matrix. So, it has 3 rows and 4 columns.

$$\text{Given } a_{ij} = \frac{|-3i+j|}{2}$$

$$\text{So, } a_{11} = 1, a_{12} = \frac{1}{2}, a_{13} = 0, a_{14} = \frac{1}{2},$$

$$a_{21} = \frac{5}{2}, a_{22} = 2, a_{23} = \frac{3}{2}, a_{24} = 1,$$

$$a_{31} = 4, a_{32} = \frac{7}{2}, a_{33} = 3, a_{34} = \frac{5}{2}$$

$$\text{So, the matrix} = \begin{bmatrix} 1 & \frac{1}{2} & 0 & \frac{1}{2} \\ \frac{5}{2} & 2 & \frac{3}{2} & 1 \\ 4 & \frac{7}{2} & 3 & \frac{5}{2} \end{bmatrix}$$

$$\text{Conclusion: Therefore, Matrix is } \begin{bmatrix} 1 & \frac{1}{2} & 0 & \frac{1}{2} \\ \frac{5}{2} & 2 & \frac{3}{2} & 1 \\ 4 & \frac{7}{2} & 3 & \frac{5}{2} \end{bmatrix}$$