MATRIX

What Is Matrix?

- Matrix is a rectangular grid with rows and columns.
- It is a two-dimensional gird
- No. of rows are denoted by ‘n’ and no. of columns are denoted by ‘m’

Ex:

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$ order of matrix ➔ 2 X 3

In the above matrix, A [0][2] = 3

A [2][2] = 9

Properties of the Matrix:

$$\begin{bmatrix} 1 & 0 & 5 & 10 \\ 4 & 5 & 6 & 7 \\ 15 & 12 & 10 & 9 \\ 5 & 4 & 3 & 2 \end{bmatrix}$$

row = [0……n – 1]

col = [0……n – 1]

it is a 4 X 4 matrix.

All diagonal elements have the same rows and column. In the above example,

the diagonal elements are [1, 5, 10, 2]. Anti-diagonal elements are, [10,6,12,5]

Diagonal Elements		
	rows	col
1	0	0
5	1	1
10	2	2
12	3	3

Anti-Diagonal		
	rows	col
10	0	3
6	1	2
12	2	1
5	3	0

The sum of rows and columns is always equal to n in this case 3.

- In a matrix, if no. of rows is equal to no. of columns, it is called a square matrix.
- If no. of rows is not equal to no. of columns, it is called rectangle matrix.

For a rectangular matrix,

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{bmatrix}$$

the diagonal elements are [1, 6, 11] and the anti-diagonal elements are [4, 7, 10].

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

In the above matrix, the elements in the first column i.e., column '0' are [1, 4, 7]. In this, the value of row increases but the value of column is constant. In the same way, for the elements in the first row i.e., row '0' are [7, 8, 9] in which, the value of the row is constant, but the value of column increases.

Matrix Representation in Python

In a list, if you have another list,

[

[,1 2, 3], A [0][1] → 2
[4, 5, 6], A [2][2] → 9
[7, 8, 9] A [1][2] → 6

]

the simplest form to get a matrix in one line would be,

[[0 for _ in range (m)] for _ in range (n)]

[[0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0]]

We can replace elements in the matrix as following:

>>> [[0 for _ in range (m)] for _ in range (n)]

[[0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0]]

>>> A[0][0] = 5

>>> A

[[5, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0]]

>>> A[0][3] = 15

>>> A

[[5, 0, 0, 15], [0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0]]

To print elements from the matrix.

No. of rows = 3 = len(A).

No. of columns = 3 = len(A[0])

Q) print all elements of row 2.

INPUT	OUTPUT:
`for i in range (m):` `  print (A[x-1][i])`	4 5 6

Q) print all elements in col 1.

INPUT	OUTPUT:
`for i in range (n):` `  print (A[i] [x-1]])`	2 5 8

```
for i in range(n):
    for j in range(m):
        print(A[i][j])
```

this prints all elements in the matrix.

INPUT:	OUTPUT:

`for i in range(n):`
`  for j in range(m):`
`  print (A[i][j], end=" ")`
`  print ()`
	1 2 3
	4 5 6
	7 8 9

Q) to print diagonal elements.

INPUT:

```
row = 0
col = 0
while row < n and col < m:
    print(A[row][col])
    row += 1
    col += 1
```

OR

```
for i in range (min(m,n)):
    print(A[i][i])
```

OUTPUT:

1
5
9