06. 2D Matrices

14:08

Agenda:
1. Definition and Introduction
2. Problems

1. Introduction

A 2D matrix is a specific type of 2D array that has a rectangular grid of numbers, where each number is called an element. It is a mathematical structure that consists of a set of numbers arranged in rows and columns.

2D matrix can be declared as:

int mat[N][M]
int is the datatype.
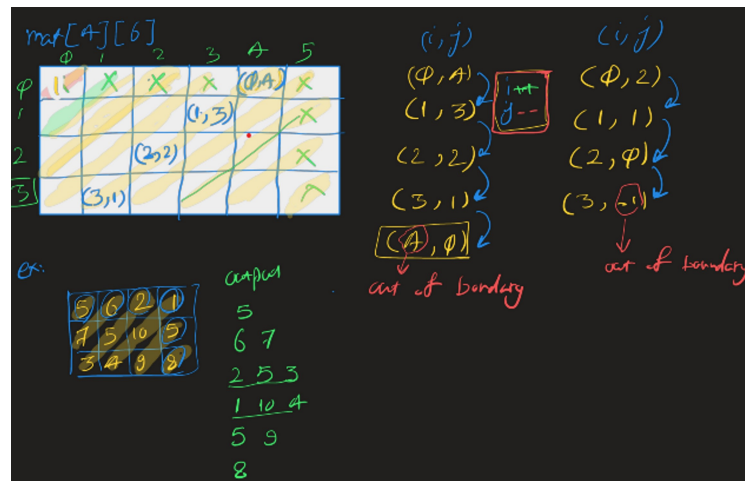mat is the matrix name.
N is the number of rows in matrix.
M is the number of columns in matrix.

mat[i][j] represents the element present in the i-th row of j-th column.
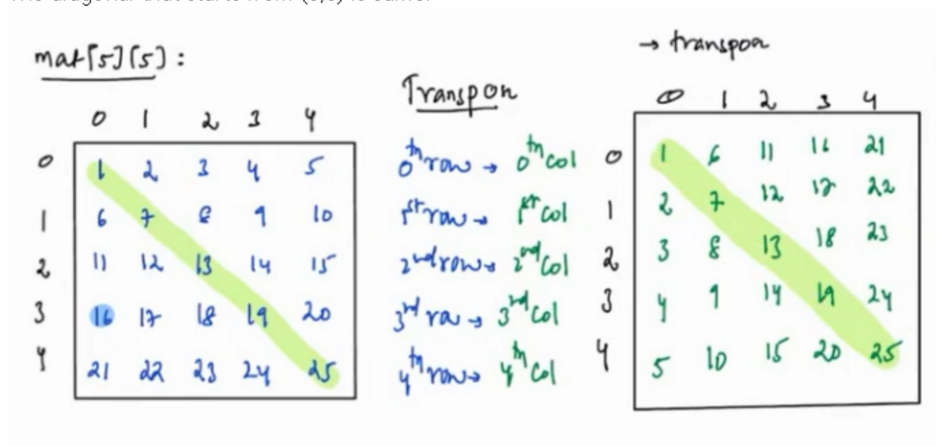

2. Problems

1. You are given a matrix A and an integer B, you have to perform scaler multiplication of matrix A with integer B.

3. You are given two matrices check that both the matrix are same.

4. Create two matrix and return sum of it.

5. Return difference of all elements of two matrix, both matrix are of same size.

6. You are given a 2 D matrix make all the elements of rows and columns zero, if A[i][j]=0.

7. Row Sum
     The approach is to traverse each row and while traversing take the sum of all the elements present in that row.

8. Column Sum
     While traversing each column, we can calculate sum of all the elements present in that column.

9. Given a square matrix print diagonals and anti-diagonals

10. Given a 2D matrix mat print all the elements diagonally from right to left

mat[4][6]

(i,j)   (i,j)

(0,4)   (0,2)
(1,3)   (1,1)
(2,2)   (2,0)
(3,1)   (3,-1)
(4,0)

out of bondary   out of bondary

ex.

output
5
67
253
1 10 4
59
8

11. Transpose of a square matrix

Observation

- After performing the transpose, what is same in the original matix and its transpose ?
  The diagonal that starts from (0,0) is same.

mat[5][5] :

→ transpoa

Transpon

0th row → 0th col
1st row → 1st col
2nd row → 2nd col
3rd row → 3rd col
4th row → 4th col

- Along the diagonals, the elements have swapped their positions with corresponding elements.

12. Rotate a matrix to 90 degree clockwise

Observation:

Yes, if we reverse all the rows, then it will become rotated matrix.
The rotated matrix looks like:

	0	1	2	3	4
0	1	2	3	4	5
1	6	7	8	9	10
2	11	12	13	14	15
3	16	17	18	19	20
4	21	22	23	24	25

	0	1	2	3	4
0	21	16	11	6	1
1	22	17	12	7	2
2	23	18	13	8	3
3	24	19	14	9	4
4	25	20	15	10	5

Transpose and rotated matrix:

Calculate transpose + Reverse Every Row = [Rotate mat by 90°]

	0	1	2	3	4
0	1	6	11	16	21
1	2	7	12	17	22
2	3	8	13	18	23
3	4	9	14	19	24
4	5	10	15	20	25

reverse → 0
reverse → 1
reverse → 2
reverse → 3
reverse → 4

	0	1	2	3	4
0	21	16	11	6	1
1	22	17	12	7	2
2	23	18	13	8	3
3	24	19	14	9	4
4	25	20	15	10	5