Java - Introduction to Programming
Lecture 11

2D Arrays In Java

It is similar to 2D matrices that we studied in 11th and 12th class.

a. Creating a 2D Array - with new keyword

```
int[][] marks = new int[3][3];
```

b. Taking a matrix as an input and printing its elements.

```
import java.util.*;

public class TwoDArrays {
   public static void main(String args[]) {
       Scanner sc = new Scanner(System.in);
       int rows = sc.nextInt();
       int cols = sc.nextInt();

       int[][] numbers = new int[rows][cols];

       //input
       //rows
       for(int i=0; i<rows; i++) {
           //columns
           for(int j=0; j<cols; j++) {
               numbers[i][j] = sc.nextInt();
           }
       }



       for(int i=0; i<rows; i++) {
           for(int j=0; j<cols; j++) {
                   System.out.print(numbers[i][j]+" ");
               }
               System.out.println();
           }
   }
}
```

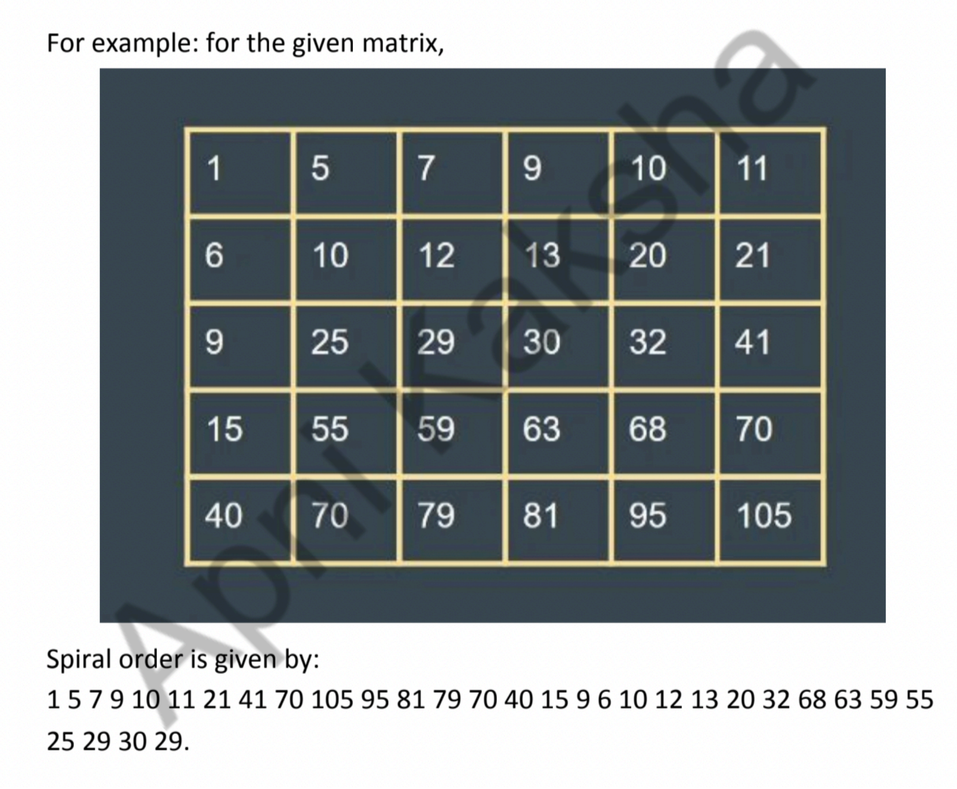
c. Searching for an element x in a matrix.

```
import java.util.*;

public class TwoDArrays {
   public static void main(String args[]) {
       Scanner sc = new Scanner(System.in);
       int rows = sc.nextInt();
       int cols = sc.nextInt();

       int[][] numbers = new int[rows][cols];

       //input
       //rows
       for(int i=0; i<rows; i++) {
           //columns
           for(int j=0; j<cols; j++) {
               numbers[i][j] = sc.nextInt();
           }
       }

       int x = sc.nextInt();

       for(int i=0; i<rows; i++) {
           for(int j=0; j<cols; j++) {
               //compare with x
               if(numbers[i][j] == x) {
                   System.out.println("x found at location (" + i + ", " + j + ")");
               }
           }
       }



   }
}
```

[redacted]

Homework Problems

1. Print the spiral order matrix as output for a given matrix of numbers. [Difficult for Beginners]



For example: for the given matrix,

1	5	7	9	10	11
6	10	12	13	20	21
9	25	29	30	32	41
15	55	59	63	68	70
40	70	79	81	95	105

Spiral order is given by:
1 5 7 9 10 11 21 41 70 105 95 81 79 70 40 15 9 6 10 12 13 20 32 68 63 59 55 25 29 30 29.

APPROACH :

Algorithm: (We are given a 2D matrix of n X m).

1. We will need 4 variables:

a. row_start - initialized with 0.

b. row_end - initialized with n-1.

c. column_start - initialized with 0.

d. column_end - initialized with m-1.

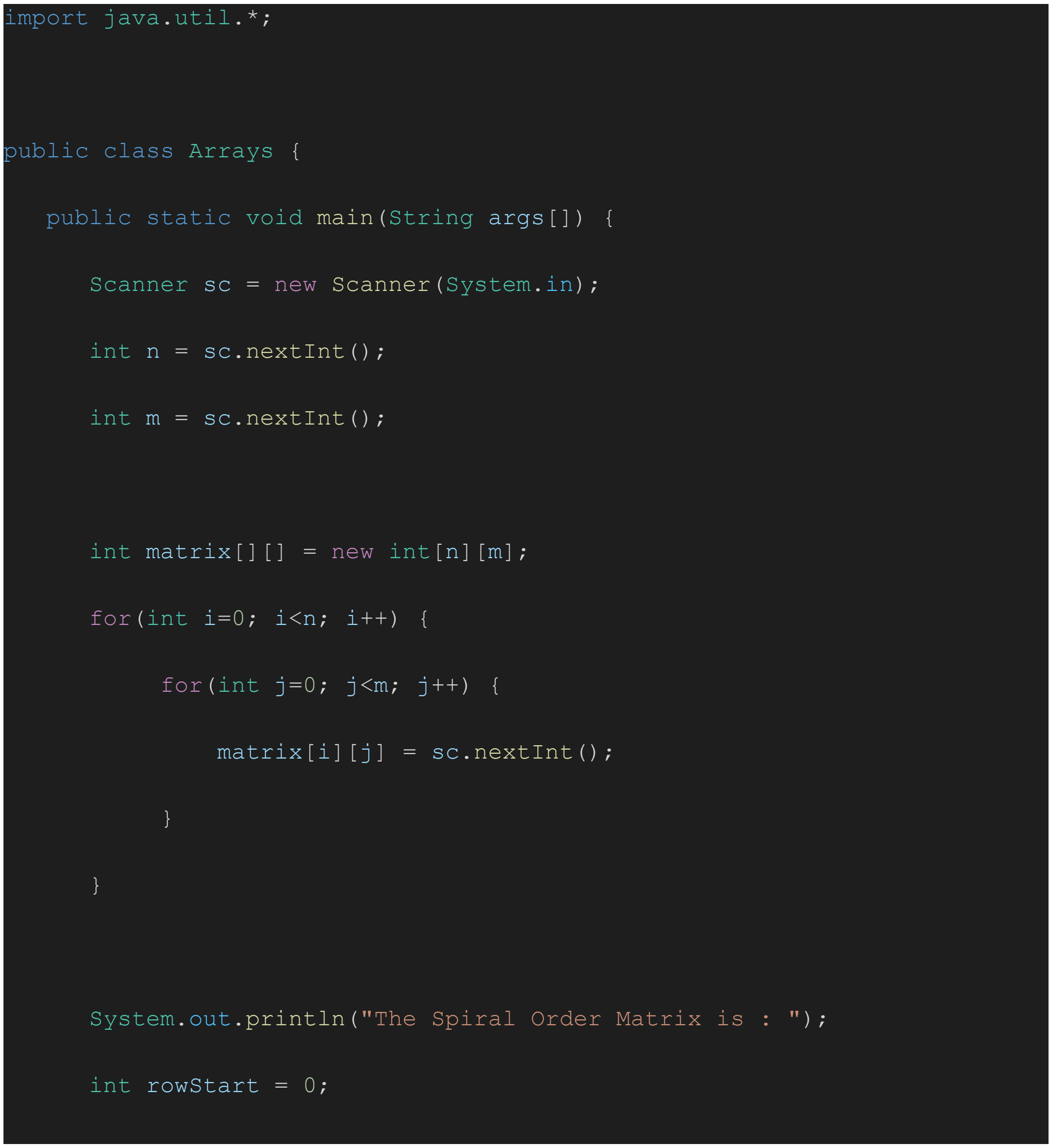
2. First of all, we will traverse in the row row_start from column_start *to column_end and we will increase the row_start with 1 as we have traversed the starting row.*

3. Then we will traverse in the column column_end from row_start to row_end and decrease the column_end by 1.

4. Then we will traverse in the row row_end from column_end to column_start and decrease the row_end by 1.

5. Then we will traverse in the column column_start from row_end to row_start and increase the column_start by 1.

6. We will do the above steps from 2 to 5 until row_start <= row_end and column_start <= column_end.



```
import java.util.*;


public class Arrays {

   public static void main(String args[]) {

      Scanner sc = new Scanner(System.in);

      int n = sc.nextInt();

      int m = sc.nextInt();



      int matrix[][] = new int[n][m];

      for(int i=0; i<n; i++) {

           for(int j=0; j<m; j++) {

               matrix[i][j] = sc.nextInt();

           }

      }



      System.out.println("The Spiral Order Matrix is : ");

      int rowStart = 0;
```

```
        int rowEnd = n-1;

        int colStart = 0;

        int colEnd = m-1;


        //To print spiral order matrix

        while(rowStart <= rowEnd && colStart <= colEnd) {

            //1

            for(int col=colStart; col<=colEnd; col++) {

                System.out.print(matrix[rowStart][col] + " ");

            }

            rowStart++;


            //2

            for(int row=rowStart; row<=rowEnd; row++) {

                System.out.print(matrix[row][colEnd] +" ");

            }

            colEnd--;


            //3

            for(int col=colEnd; col>=colStart; col--) {

                System.out.print(matrix[rowEnd][col] + " ");

            }

            rowEnd--;


            //4

            for(int row=rowEnd; row>=rowStart; row--) {
                System.out.print(matrix[row][colStart] + " ");
            }
            colStart++;

            System.out.println();
        }
    }
}
```

2. For a given matrix of N x M, print its transpose.

```
import java.util.*;

public class Arrays {
    public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        int m = sc.nextInt();

        int matrix[][] = new int[n][m];
        for(int i=0; i<n; i++) {
             for(int j=0; j<m; j++) {
                 matrix[i][j] = sc.nextInt();
             }
        }
```

```
      System.out.println("The transpose is : ");
      //To print transpose
      for(int j=0; j<m ;j++) {
          for(int i=0; i<n; i++) {
              System.out.print(matrix[i][j]+" ");
          }
          System.out.println();
      }
   }
}
```