

Java - Introduction to Programming

Lecture 11

2D Arrays In Java

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

- Creating a 2D Array - with `new` keyword

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

- 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 +
")");
                }
            }
        }
    }
}
```

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 $n \times m$).

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 $N \times M$, 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();

}

}

}
```