

Programming Paradigms Laboratory

B.Tech.



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Faculty	Engineering & Technology
Programme	B. Tech. in Computer Science and Engineering
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Name of the Laboratory	Programming Paradigms Laboratory
Laboratory Code	19CSL217A

Laboratory 4

Title of the Laboratory Exercise: Two dimensional arrays

1. Questions
 - a. Develop a GradeBookTest class with an instance variables **string course name** and **2D array(5*3) of marks** of several student, each row indicates students three term test marks and each column indicates grades of all students, define a constructor to initialize instance variables and display average marks of each student, lowest grade and highest grade.
 - b. Develop a java program to read a square matrix and print its upper and lower triangle of a square matrix.
2. Calculations/Computations/Algorithms

```
package program4;

import java.util.Scanner;
public class Program4 {
    int[][] b=new int[5][3];
    int[] arr=new int[5];
    int c=0;
    public Program4(int[][] a)
    {
        for(int i=0;i<a.length;i++)
        {
            for(int j=0;j<a[i].length;j++)
            {
                b[i][j]=a[i][j];
            }
        }
        System.out.println("The Martrix is");
        for(int i=0;i<a.length;i++)
        {
            System.out.println(" ");
            System.out.print("The student"+(i+1)+"marks");
            for(int j=0;j<a[i].length;j++)
            {
                System.out.print(" "+a[i][j]+" ");
            }
        }
    }
}
```

Fig 1.1

```

public void avg(int[][] b)
{
    for(int i=0;i<b.length;i++)
    {
        for(int j=0;j<b[i].length;j++)
        {
            arr[i]=arr[i]+b[i][j];
        }
    }
    int avg;
    for(int i=0;i<b.length;i++)
    {
        c=c+arr[i];
    }
    avg=c/5;

    System.out.println("The Average of the marks is: "+avg);
}

public void small(int[][] a)
{
    int min=arr[0];
    for(int i=0;i<arr.length;i++)
    {
        if(arr[i]>min)
        {
            min=arr[i];
        }
    }
    System.out.println("The Smallest marks is: "+min);
}

```

Fig 1.2

```

public void large(int[][] a)
{
    int max=arr[0];
    for(int i=0;i<arr.length;i++)
    {
        if(arr[i]<max)
        {
            max=arr[i];
        }
    }
    System.out.println("The Largest marks is: "+max);
}

public static void main(String[] args) {
    int[][] a=new int[5][3];

    Scanner obj=new Scanner(System.in);
    System.out.print("Enter the 5*3 matrix");
    for(int i=0;i<a.length;i++)
    {
        for(int j=0;j<a[i].length;j++)
        {
            a[i][j]=obj.nextInt();
        }
    }
    Program4 obj1=new Program4(a);
    obj1.avg(a);
    obj1.small(a);
    obj1.large(a);
}
}

```

Fig 1.3, 1.2, 1.1 Represents the java program of GradeBookTest class with an instance variables **string** course name and 2D array(5*3) of marks of several student

```

package Program4a;
public class Program4a{
    static void lower(int matrix[][] ,int row,int col) {
        int i,j;
        for (i=0;i<row;i++)
        {   for (j=0;j<col;j++)
            {
                if(i<j)
                {
                    System.out.print("0" + " ");
                }
                else
                {
                    System.out.print(matrix[i][j]+ " ");
                }
            }
            System.out.println();
        }
    }

    static void upper(int matrix[][] ,int row,int col)
    {
        int i,j;
        for (i=0;i<row;i++)
        {
            for(j=0;j<col;j++)
            {
                if (i>j)
                {
                    System.out.print("0" + " ");
                }
            }
        }
    }
}

```

Fig 2.1

```

        }
        System.out.println();
    }

}

public static void main(String[] args)
{
    int matrix[][]={{3,2,8},
                    {4,7,2},
                    {7,3,9}};

    int row = 3,col =3 ;
    System.out.println("lower matrix:");
    lower( matrix, row, col);
    System.out.println("upper matrix:");
    upper(matrix,row,col);
}
}

```

Fig 2.2, 2.1 represents the java program to read a square matrix and print its upper and lower triangle of a square matrix.

3. Presentation of Results

```
Enter the 5*3 matrix: 14 14 14
25 25 25
36 36 36
78 78 78
98 98 98
The Matrix is

The student1marks 14 14 14
The student2marks 25 25 25
The student3marks 36 36 36
The student4marks 78 78 78
The student5marks 98 98 98 The Average of the marks is: 150
The Smallest marks is: 14
The Largest marks is: 98
BUILD SUCCESSFUL (total time: 20 seconds)
|
```

Fig 1.4 represents the output of the GradeBookTest class with an instance variables **string course name** and **2D array(5*3) of marks** of several student

```
The Original matrix is
328
472
739
lower matrix:
300
470
739
upper matrix:
328
072
009
```

Fig 2.3 represents the output of the java program to read a square matrix and print its upper and lower triangle of a square matrix.

4. Conclusions

We have learned how to use 2-dimensional array in java and how to use it to do several operations like retrieving the upper and lower triangle of a square matrix, and like many other things that are same as the single dimensional array.

5. Limitations of Experiments and Results

We cannot do any operation in array without importing the array packages and their methods and the 2 dimensional array cannot be accessed by initializing the array by `[][]` in the declaration part.