Programming Paradigms Laboratory

B.Tech.

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Faculty of Engineering & Technology

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Faculty	Engineering & Technology
Programme	B. Tech. in Computer Science and Engineering
Year/Semester	2nd Year / 4th Semester
Name of the Laboratory	Programming Paradigms Laboratory
Laboratory Code	19CSL217A

Laboratory 4

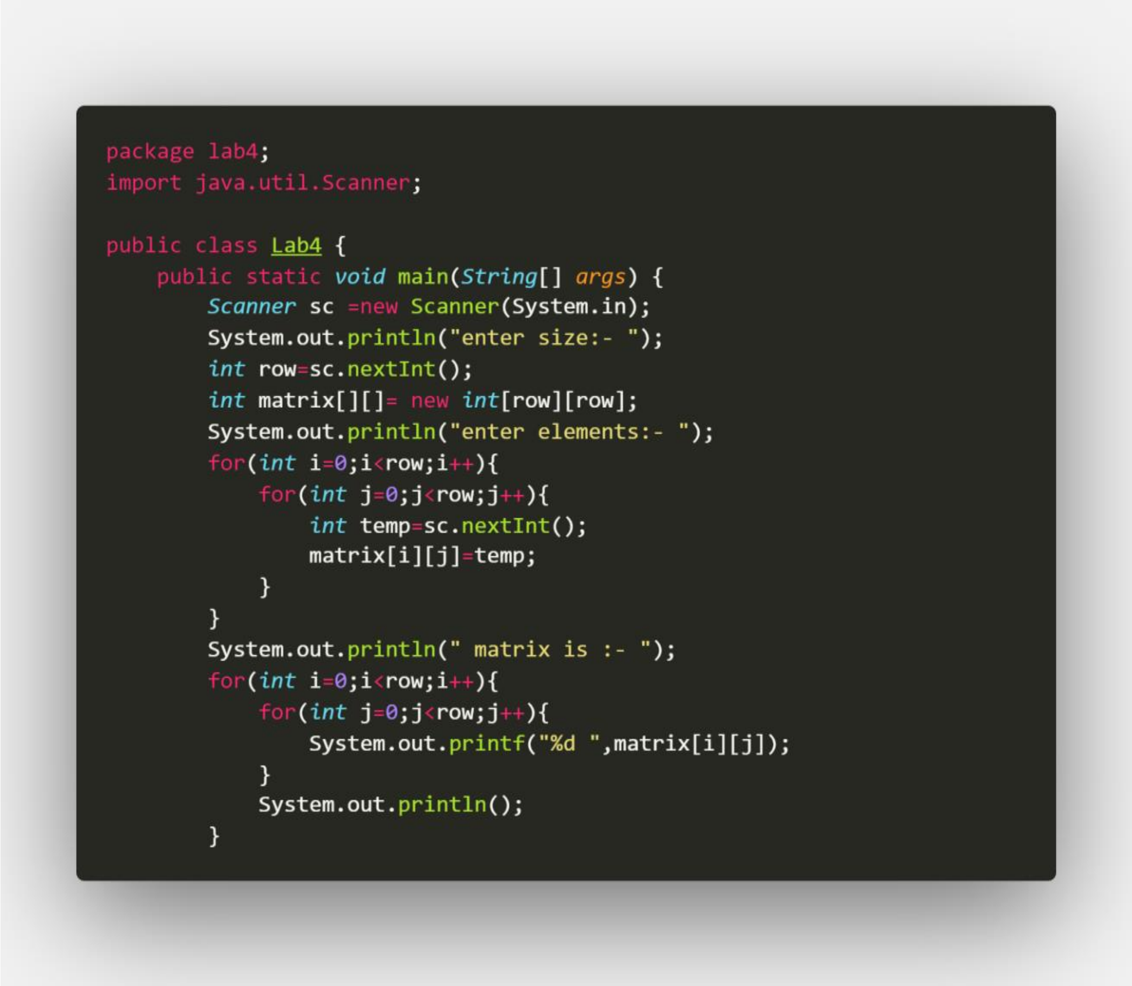
Title of the Laboratory Exercise: Two dimensional arrays

1. Questions

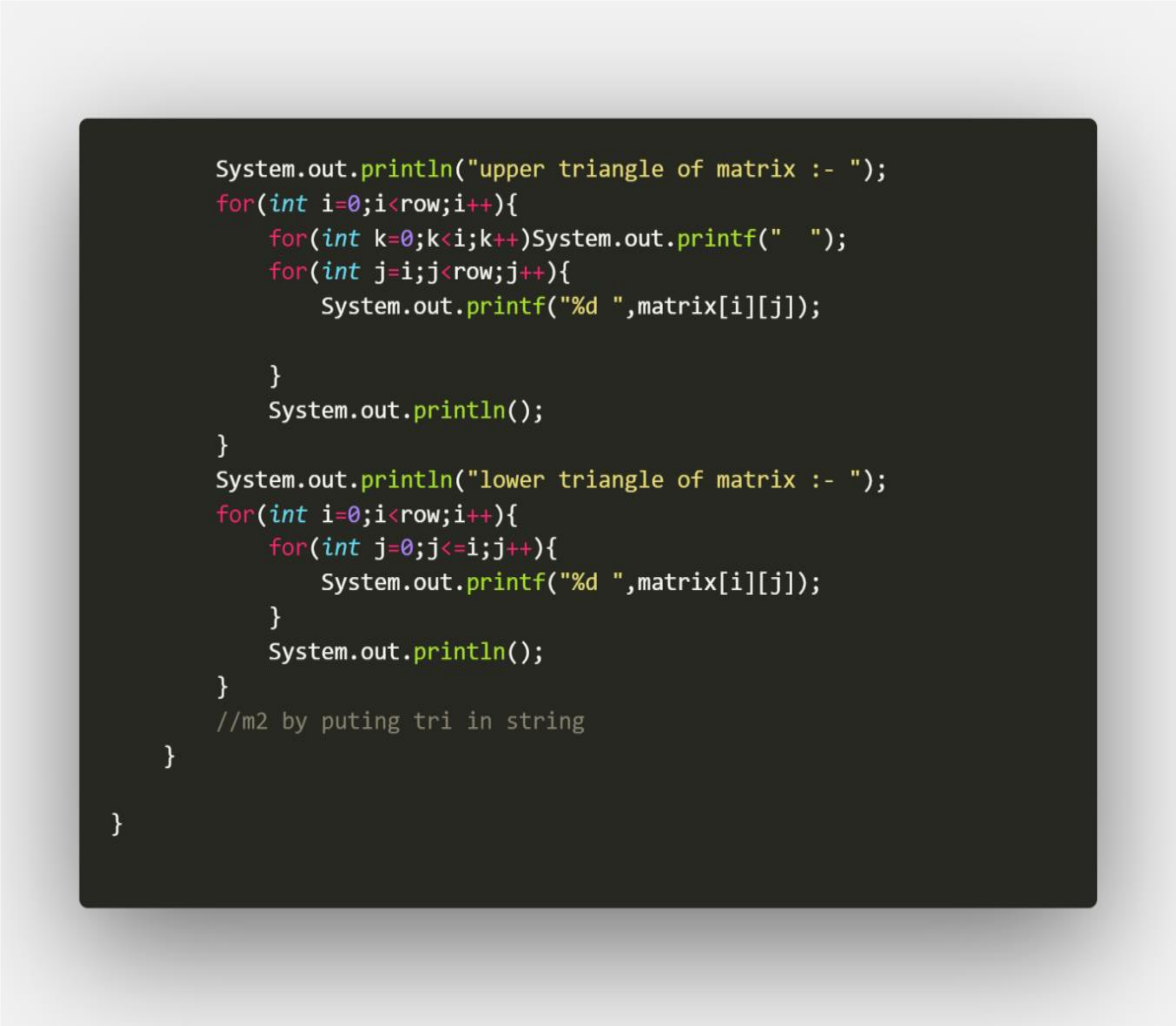
a. Develop a GradeBookTest class with an instance variables **string course name** and **2D array(8*3) of marks** of several student, each row indicates students three term test marks and each column indicates grades of all students, define a constructor to initialize instance variables and display average 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

Part B:-



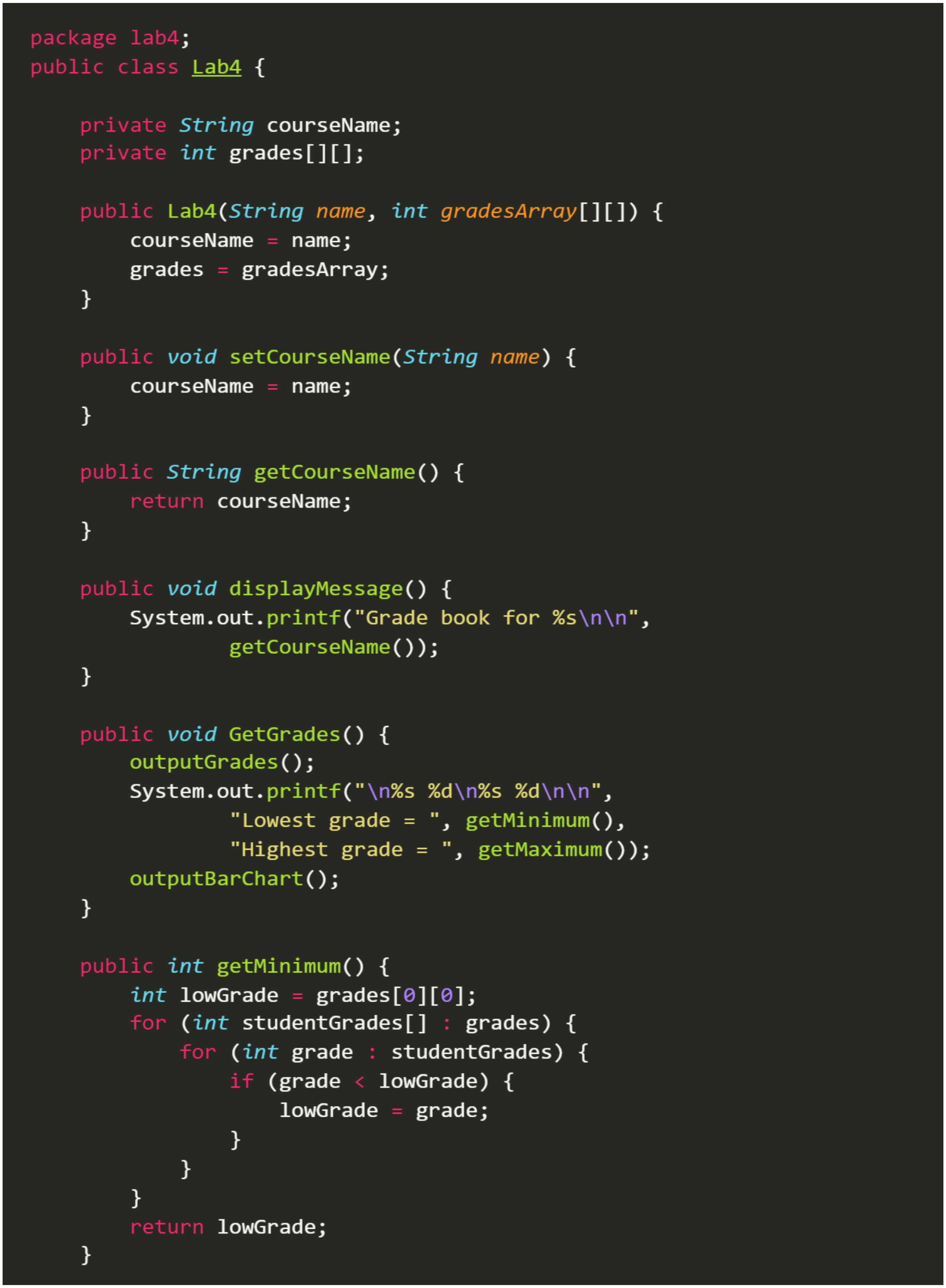
```
package lab4;
import java.util.Scanner;

public class Lab4 {
    public static void main(String[] args) {
        Scanner sc =new Scanner(System.in);
        System.out.println("enter size:- ");
        int row=sc.nextInt();
        int matrix[][]= new int[row][row];
        System.out.println("enter elements:- ");
        for(int i=0;i<row;i++){
            for(int j=0;j<row;j++){
                int temp=sc.nextInt();
                matrix[i][j]=temp;
            }
        }
        System.out.println(" matrix is :- ");
        for(int i=0;i<row;i++){
            for(int j=0;j<row;j++){
                System.out.printf("%d ",matrix[i][j]);
            }
            System.out.println();
        }
```



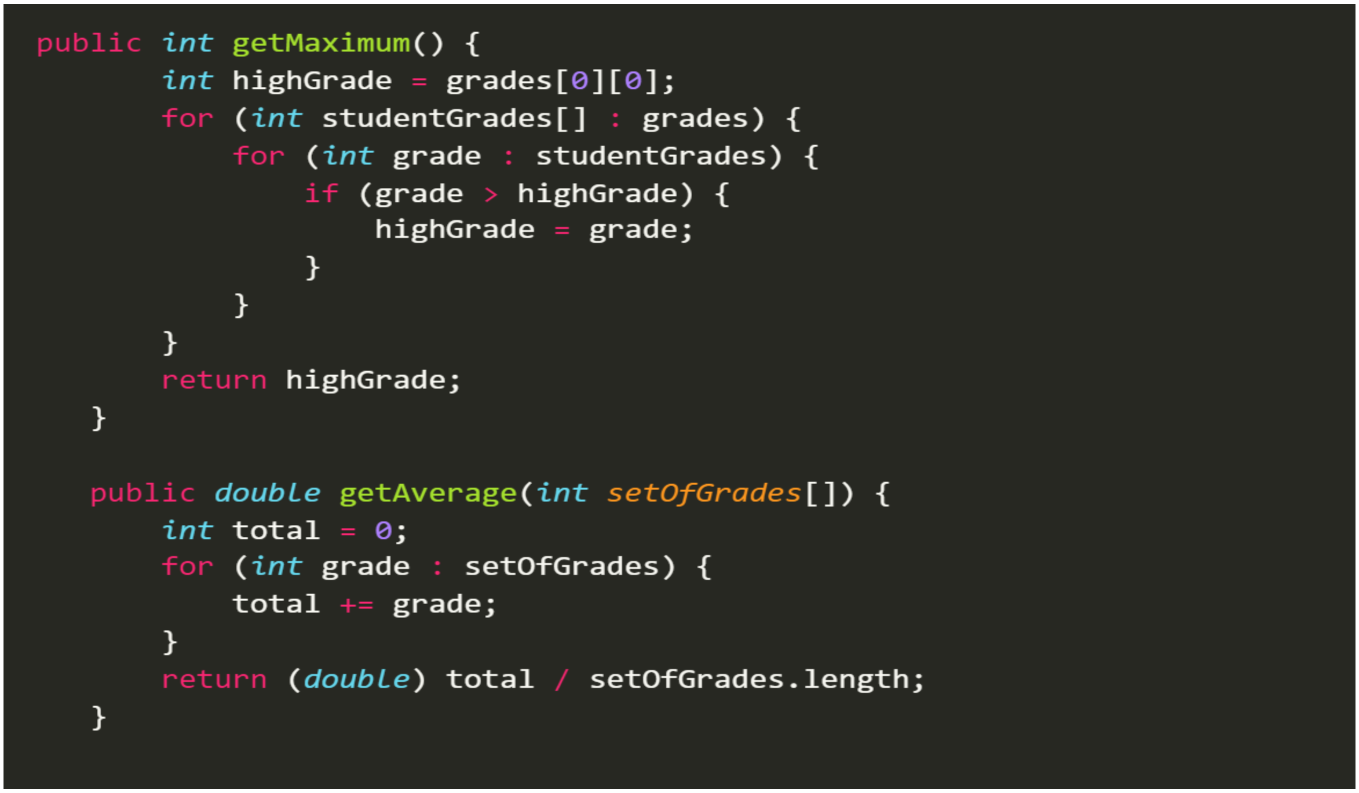
```
        System.out.println("upper triangle of matrix :- ");
        for(int i=0;i<row;i++){
            for(int k=0;k<i;k++)System.out.printf("  ");
            for(int j=i;j<row;j++){
                System.out.printf("%d ",matrix[i][j]);

            }
            System.out.println();
        }
        System.out.println("lower triangle of matrix :- ");
        for(int i=0;i<row;i++){
            for(int j=0;j<=i;j++){
                System.out.printf("%d ",matrix[i][j]);
            }
            System.out.println();
        }
        //m2 by puting tri in string
    }

}
```

Part A:-

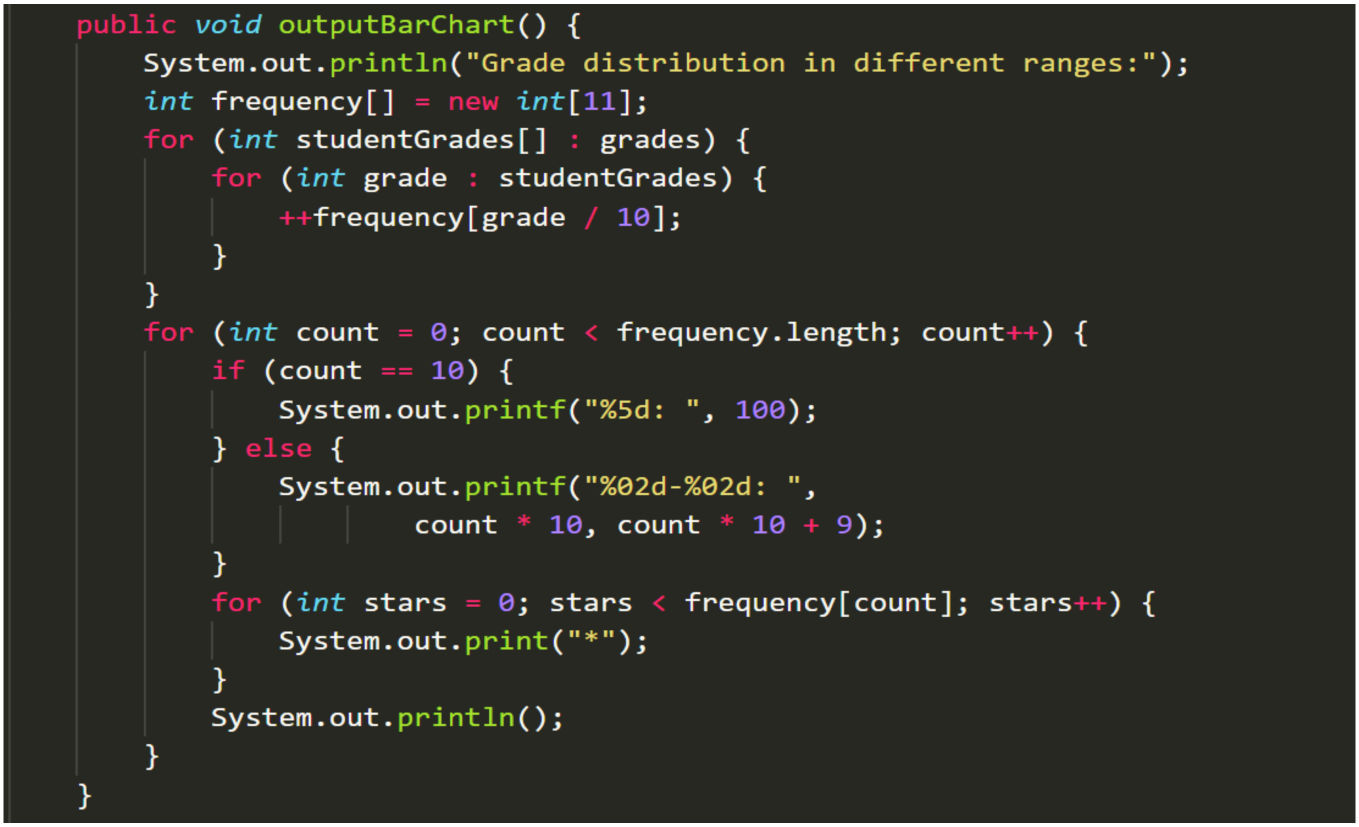
P.T.O



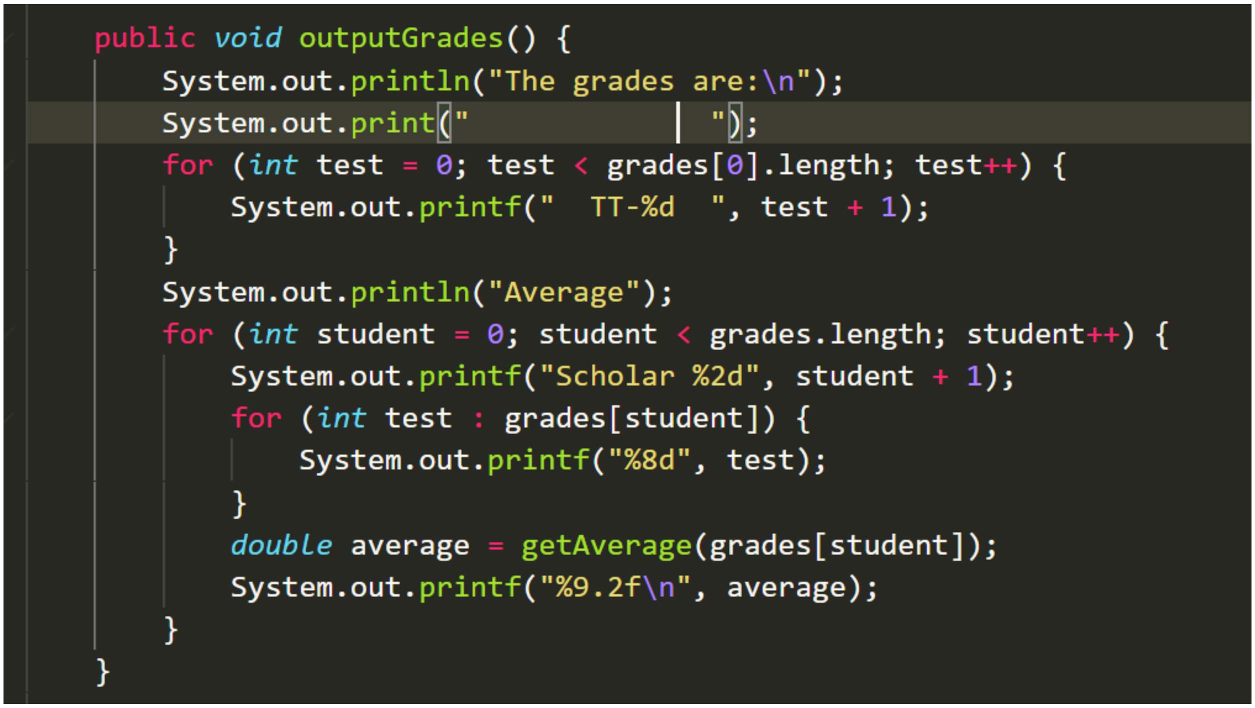
```java
package lab4;
public class Lab4 {

    private String courseName;
    private int grades[][];

    public Lab4(String name, int gradesArray[][]) {
        courseName = name;
        grades = gradesArray;
    }

    public void setCourseName(String name) {
        courseName = name;
    }

    public String getCourseName() {
        return courseName;
    }

    public void displayMessage() {
        System.out.printf("Grade book for %s\n\n",
                getCourseName());
    }

    public void GetGrades() {
        outputGrades();
        System.out.printf("\n%s %d\n%s %d\n\n",
                "Lowest grade = ", getMinimum(),
                "Highest grade = ", getMaximum());
        outputBarChart();
    }

    public int getMinimum() {
        int lowGrade = grades[0][0];
        for (int studentGrades[] : grades) {
            for (int grade : studentGrades) {
                if (grade < lowGrade) {
                    lowGrade = grade;
                }
            }
        }
        return lowGrade;
    }
```



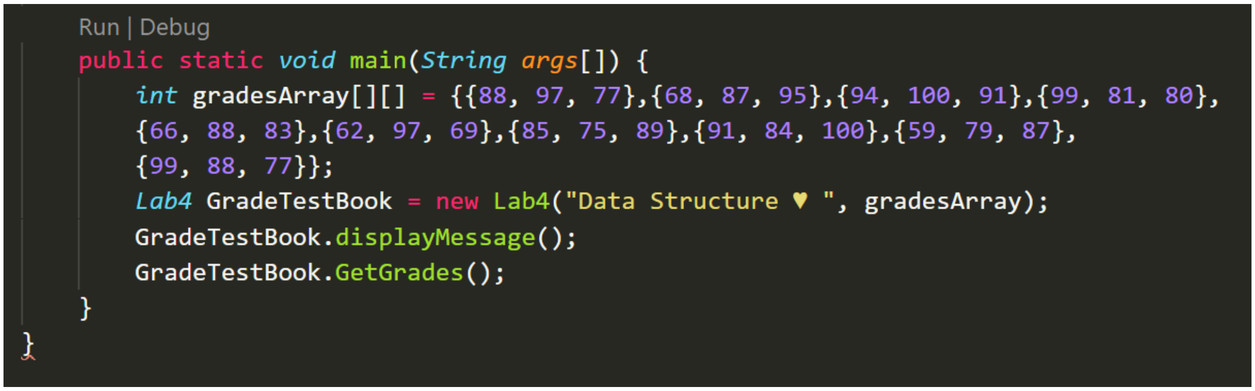
```
public int getMaximum() {
       int highGrade = grades[0][0];
       for (int studentGrades[] : grades) {
           for (int grade : studentGrades) {
               if (grade > highGrade) {
                   highGrade = grade;
               }
           }
       }
       return highGrade;
   }

   public double getAverage(int setOfGrades[]) {
       int total = 0;
       for (int grade : setOfGrades) {
           total += grade;
       }
       return (double) total / setOfGrades.length;
   }
```



```
public void outputBarChart() {
    System.out.println("Grade distribution in different ranges:");
    int frequency[] = new int[11];
    for (int studentGrades[] : grades) {
        for (int grade : studentGrades) {
            ++frequency[grade / 10];
        }
    }
    for (int count = 0; count < frequency.length; count++) {
        if (count == 10) {
            System.out.printf("%5d: ", 100);
        } else {
            System.out.printf("%02d-%02d: ",
                    count * 10, count * 10 + 9);
        }
        for (int stars = 0; stars < frequency[count]; stars++) {
            System.out.print("*");
        }
        System.out.println();
    }
}
```



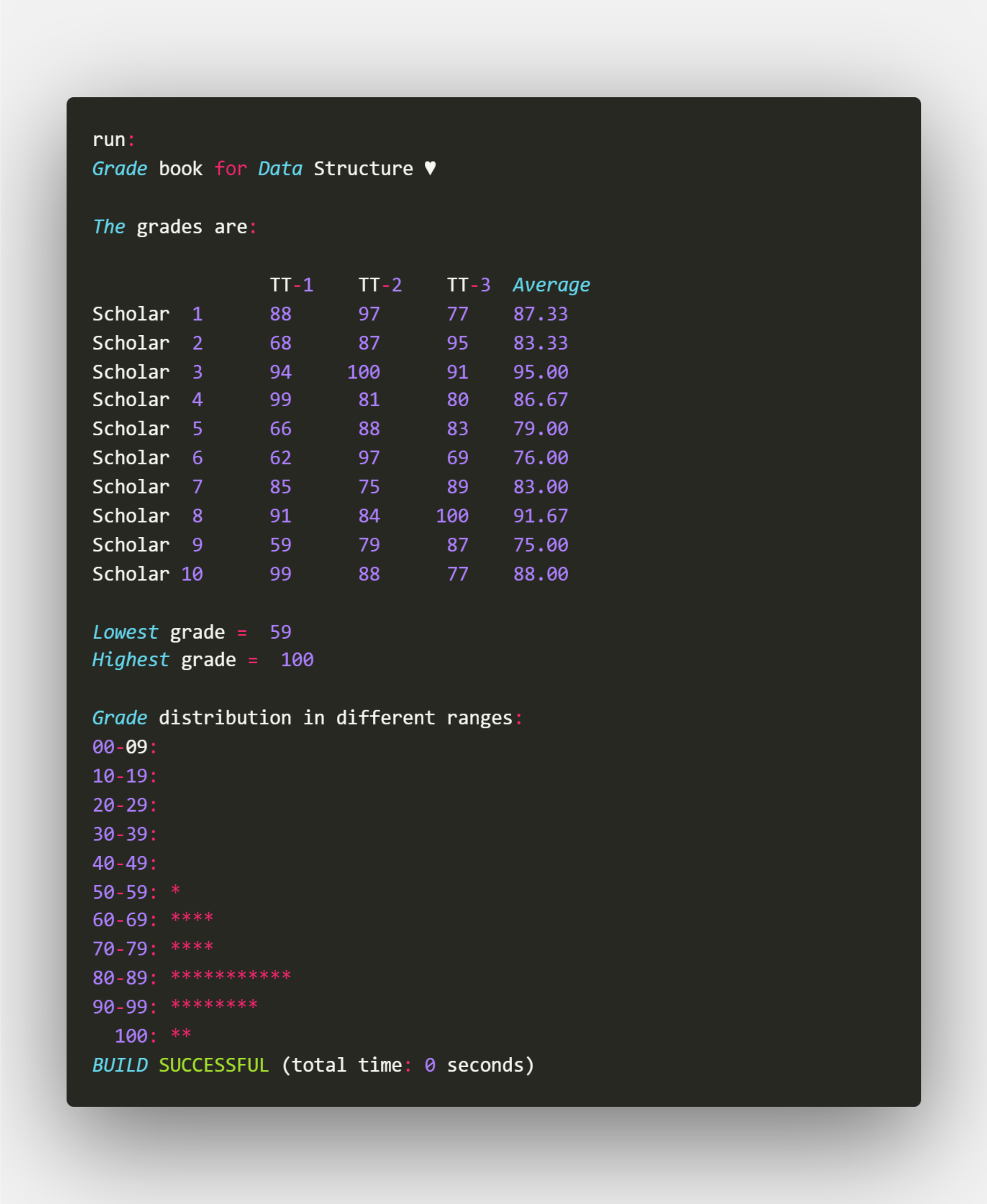
```java
    public void outputGrades() {
        System.out.println("The grades are:\n");
        System.out.print("              ");
        for (int test = 0; test < grades[0].length; test++) {
            System.out.printf("  TT-%d  ", test + 1);
        }
        System.out.println("Average");
        for (int student = 0; student < grades.length; student++) {
            System.out.printf("Scholar %2d", student + 1);
            for (int test : grades[student]) {
                System.out.printf("%8d", test);
            }
            double average = getAverage(grades[student]);
            System.out.printf("%9.2f\n", average);
        }
    }
```



```java
    Run | Debug
    public static void main(String args[]) {
        int gradesArray[][] = {{88, 97, 77},{68, 87, 95},{94, 100, 91},{99, 81, 80},
        {66, 88, 83},{62, 97, 69},{85, 75, 89},{91, 84, 100},{59, 79, 87},
        {99, 88, 77}};
        Lab4 GradeTestBook = new Lab4("Data Structure ♥ ", gradesArray);
        GradeTestBook.displayMessage();
        GradeTestBook.GetGrades();
    }
}
```

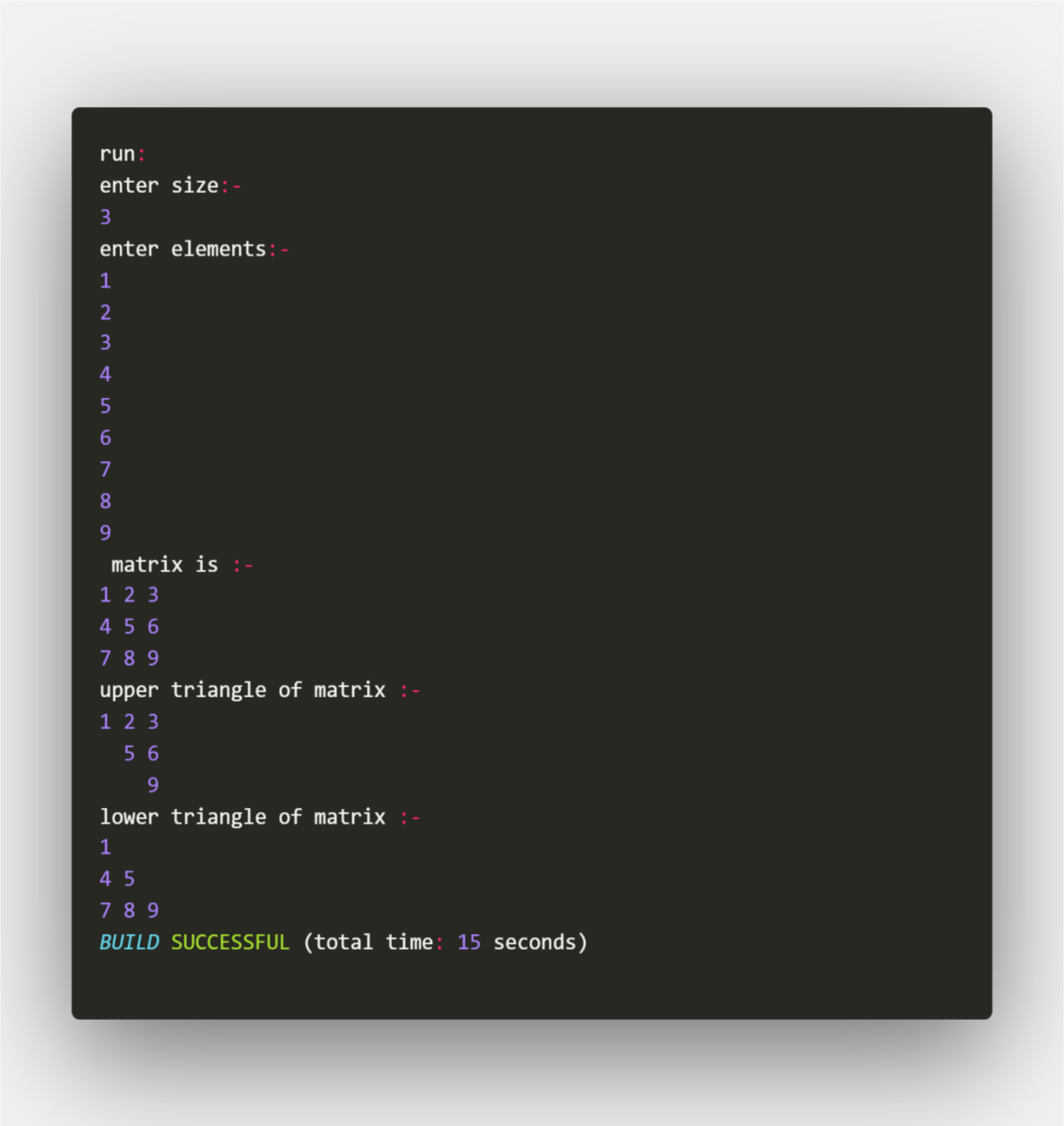
3. Presentation of Results:-

Part A:-



```
run:
Grade book for Data Structure ♥

The grades are:

                TT-1    TT-2    TT-3  Average
Scholar  1      88      97      77    87.33
Scholar  2      68      87      95    83.33
Scholar  3      94     100      91    95.00
Scholar  4      99      81      80    86.67
Scholar  5      66      88      83    79.00
Scholar  6      62      97      69    76.00
Scholar  7      85      75      89    83.00
Scholar  8      91      84     100    91.67
Scholar  9      59      79      87    75.00
Scholar 10      99      88      77    88.00

Lowest grade =  59
Highest grade =  100

Grade distribution in different ranges:
00-09:
10-19:
20-29:
30-39:
40-49:
50-59: *
60-69: ****
70-79: ****
80-89: ***********
90-99: ********
  100: **
BUILD SUCCESSFUL (total time: 0 seconds)
```

Part B:-



```
run:
enter size:-
3
enter elements:-
1
2
3
4
5
6
7
8
9
 matrix is :-
1 2 3
4 5 6
7 8 9
upper triangle of matrix :-
1 2 3
  5 6
    9
lower triangle of matrix :-
1
4 5
7 8 9
BUILD SUCCESSFUL (total time: 15 seconds)
```

4. Conclusions :-

Two – dimensional array is the simplest form of a multidimensional array. A two – dimensional array can be seen as an array of one – dimensional array for easier understanding.

Declaration Syntax:-

```
data_type[][] array_name = new data_type[x][y];
```

For example: int[][] arr = new int[10][20];

Initialization – Syntax:-

```
array_name[row_index][column_index] = value;
```

For example: arr[0][0] = 1;

5. Limitations of Experiments and Results

Disadvantages of array in java

- Arrays are Strongly Typed.
- Arrays does not have add or remove methods.
- We need to mention the size of the array. Fixed length.
- So there is a chance of memory wastage.
- To delete an element in an array we need to traverse throughout the array so this will reduce performance.