LAB # 2

Good practices of programming

OBJECTIVE

Implementing good code practices and code optimization techniques.

Lab Task:

1. Create a design for the mark sheet by taking runtime value of student name, total marks, obtained marks and calculate its percentage, grade and GPA. Use good practices of programming that we have studied and ensure that the outcomes should be presented in a proper Viewable approach.

```java
package marksheet;
import java.util.Scanner;
public class MarkSheet {
    private static String calculateGrade(double percentage) {
        if (percentage >= 85) return "A+";
        else if (percentage >= 75) return "A";
        else if (percentage >= 65) return "B";
        else if (percentage >= 55) return "C";
        else if (percentage >= 45) return "D";
        else return "F";
    }
    private static double calculateGPA(String grade) {
        switch (grade) {
            case "A+": return 4.0;
            case "A": return 3.7;
            case "B": return 3.3;
            case "C": return 2.7;
            case "D": return 2.0;
            default: return 0.0;
        }
    }

    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter Student Name: ");
        String studentName = input.nextLine();
```

```java
        String studentName = input.nextLine();
        System.out.print("Enter Total Marks: ");
        double totalMarks = input.nextDouble();
        System.out.print("Enter Obtained Marks: ");
        double obtainedMarks = input.nextDouble();
        // Calculate percentage
        double percentage = (obtainedMarks / totalMarks) * 100;
        // Calculate grade and GPA
        String grade = calculateGrade(percentage);
        double gpa = calculateGPA(grade);
        // Output
        System.out.println("\n-------------------- MARKSHEET --------------------");
        System.out.printf("%-20s : %s\n", "Student Name", studentName);
        System.out.printf("%-20s : %.2f / %.2f\n", "Marks", obtainedMarks, totalMarks);
        System.out.printf("%-20s : %.2f%%\n", "Percentage", percentage);
        System.out.printf("%-20s : %s\n", "Grade", grade);
        System.out.printf("%-20s : %.2f\n", "GPA", gpa);
        System.out.println("---------------------------------------------------");
```

```
run:
Enter Student Name: Laiba
Enter Total Marks: 500
Enter Obtained Marks: 300

-------------------- MARKSHEET --------------------
Student Name         : Laiba
Marks                : 300.00 / 500.00
Percentage           : 60.00%
Grade                : C
GPA                  : 2.70
---------------------------------------------------
```

2. Create a class Rectangle with attributes length and width, each of which defaults to 1. Provide methods that calculate the rectangle's perimeter and area. It has set and get methods for both length and width. The set methods should verify that length and width are each floating-point numbers larger than 0.0 and less than 20.0. Write a program to test class Rectangle.

```java
package rectangle;
import java.util.Scanner;
public class Rectangle {
    private double length;
    private double width;

    public Rectangle() {
        this.length = 1.0;
        this.width = 1.0;
    }

    public void setLength(double length) {
        if (length > 0.0 && length < 20.0)
            this.length = length;
        else
            System.out.println("Invalid length! Must be greater than 0.0 and less than 20.0");
    }

    public void setWidth(double width) {
        if (width > 0.0 && width < 20.0)
            this.width = width;
        else
            System.out.println("Invalid width! Must be greater than 0.0 and less than 20.0");
    }

    public double getLength() {
        return length;
    }

    public double getWidth() {
        return width;
    }

    public double calculateArea() {
        return length * width;
    }

    public double calculatePerimeter() {
        return 2 * (length + width);
    }

    // Method to display rectangle details
    public void displayDetails() {
        System.out.println("\n---------- RECTANGLE DETAILS ----------");
        System.out.printf("Length      : %.2f\n", length);
        System.out.printf("Width       : %.2f\n", width);
        System.out.printf("Area        : %.2f\n", calculateArea());
        System.out.printf("Perimeter   : %.2f\n", calculatePerimeter());
        System.out.println("---------------------------------------");
    }

    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        Rectangle rectangle = new Rectangle();

        System.out.print("Enter length (0.0 < length < 20.0): ");
        double len = input.nextDouble();
        rectangle.setLength(len);

        System.out.print("Enter width (0.0 < width < 20.0): ");
        double wid = input.nextDouble();
        rectangle.setWidth(wid);

        rectangle.displayDetails();
    }
}
```

```
put - Rectangle (run) ×

run:
Enter length (0.0 < length < 20.0): 9.5
Enter width (0.0 < width < 20.0): 3.2

---------- RECTANGLE DETAILS ----------
Length      : 9.50
Width       : 3.20
Area        : 30.40
Perimeter   : 25.40
---------------------------------------
BUILD SUCCESSFUL (total time: 26 seconds)
```