ASSIGNMENT – 4

Q1. Write a program to print the average of three numbers entered by user by creating a class named 'Average' having a method to calculate and print the average. Define another Main class to demonstrate the basic operation.

```
import java.util.Scanner;

class Average {
   public static double calculateAverage(double a, double b, double c) {
      return (a + b + c) / 3.0;
   }
}
   public static void main(String[] args)
{
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter 3 numbers: ");
      double a = sc.nextDouble();
      double b = sc.nextDouble();
      double c = sc.nextDouble();
      double avg = Average.calculateAverage(a, b, c);
      System.out.println("The average of 3 numbers is " + avg);
}
```

OUTPUT :

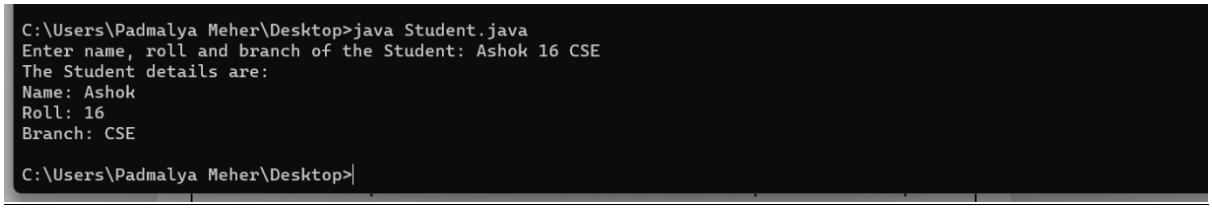
```
C:\Users\Padmalya Meher\Desktop\java assignments>javac Average.java

C:\Users\Padmalya Meher\Desktop\java assignments>java Average.java
Enter 3 numbers: 20 35 40
The average of 3 numbers is 31.666666666666668
```

Q2. Write a program to create a class named 'Student' with members 'name', 'roll', 'branch'. Declare two methods to input the student details and display the details of the student. Create a Main class to test the functionalities of the above class.

```
class Student {
```

```
    private String name;
    private int roll;
    private String branch;
    public void inputDetails(String name, int roll, String branch) {
        this.name = name;
        this.roll = roll;
        this.branch = branch;
    }
    public void displayDetails() {
        System.out.println("Student Details:");
        System.out.println("Name: " + name);
        System.out.println("Roll Number: " + roll);
        System.out.println("Branch: " + branch);
    }
}
    public static void main(String[] args) {
        // Create an object of the Student class
        Student student = new Student();
        student.inputDetails("Amit Kumar", 101, "Computer Science"
        student.displayDetails();
    }
```

OUTPUT :



Q3. Declare a class Complex with member real and imaginary part. Define a method initialise() to input the two complex numbers, display() to display the

complex number and add() to add the two complex numbers. Declare another class to illustrate the operations of the Complex class.

```
class Complex {
   private double real; // Real part of the complex number
   private double imag; // Imaginary part of the complex number
   public Complex(double real, double imag) {
      this.real = real;
      this.imag = imag;
  }
   public void display() {
      System.out.println(real + (imag >= 0 ? "+" : "") + imag + "i");
   }
   public Complex add(Complex other) {
      return new Complex(this.real + other.real, this.imag + other.imag);
   }
}
   public  void main(String[] args)
      Complex c1 = new Complex(5, 3);
      Complex c2 = new Complex(2, -4);
      System.out.print("First Complex Number: ");
      c1.display();
      System.out.print("Second Complex Number: ");
      c2.display();
      Complex sum = c1.add(c2);
      System.out.print("Sum of the Complex Numbers: ");
      sum.display();
   }
```

OUTPUT :

```
:\Users\Padmalya Meher\Desktop>javac ComplexDemo.java

:\Users\Padmalya Meher\Desktop>java ComplexDemo.java
irst Complex Number: 3.5 + 2.5i
econd Complex Number: 1.5 + 4.5i
um of Complex Numbers: 5.0 + 7.0i

:\Users\Padmalya Meher\Desktop>
```

Q4. Write a program to print the area of a rectangle by creating a class named 'Area' having two methods. First method named as 'setDim ()' takes length and breadth of rectangle as parameters and the second method named as 'getArea ()' returns the area of the rectangle. Length and breadth of rectangle are entered through keyboard. [use 'this' keyword]

```
import java.util.Scanner;

class Area {
   private double length, breath;
   public void setDim(double length, double breath) {
      validate(length, "Length");
      validate(breath, "Breath");
      this.length = length;
      this.breath = breath;
   }
   public double getArea() {
      return length * breath;
   }
   private  void validate(double value, String name) {
      if (value <= 0) {
         System.out.println(name + " can only be positive");
         System.exit(0);
      }
   }
}
```

```
  public  void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    Area area = new Area();
    System.out.print("Enter the length and breath of the rectangle: ");
    double length = sc.nextDouble();
    double breath = sc.nextDouble();
    area.setDim(length, breath);
    System.out.println("The area of the rectangle is " + area.getArea());
}
```

OUTPUT :

```
C:\Users\Padmalya Meher\Desktop>javac Area.java

C:\Users\Padmalya Meher\Desktop>java Area.java
Enter the length and breath of the rectangle: 10 12
The area of the rectangle is 120.0
```

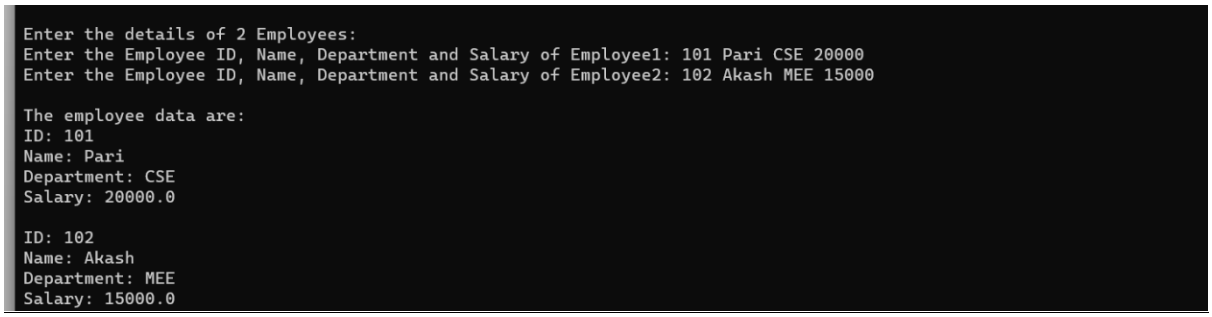
Q5. Write a program to declare a class employee with data members id, name, department, salary. Add a method getData(), putData() to accept and display the details of n employees. Define a Main class to create the objects of employee class and perform basic operations.

```
import java.util.Scanner;
class Employee {
  private int id;
  private String name, department;
  private double salary;
  public void putData(int id, String name, String department, double salary) {
    if (id <= 0) {
      System.out.println("Employee ID can only be positive");
      System.exit(0);
    }
    if (salary < 0.0) {
      System.out.println("Salary cannot be negative");
```

```
            System.exit(0);
        }
        this.id = id;
        this.name = name;
        this.department = department;
        this.salary = salary;
    }
    public void getData() {
        System.out.println("ID: " + id);
        System.out.println("Name: " + name);
        System.out.println("Department: " + department);
        System.out.println("Salary: " + salary);
        System.out.println();
    }
}
    public  void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the number of Employee details you want to add: ");
        int size = sc.nextInt();
        Employee[] employees = new Employee[size];
        System.out.println("\nEnter the details of " + size + " Employees:");
        for (int i = 0; i < size; i++) {
            employees[i] = new Employee();
            System.out.print("Enter the Employee ID, Name, Department and Salary of
Employee" + (i+ 1) + ": ");
            int id = sc.nextInt();
            String name = sc.next();
            String department = sc.next();
```

```
        double salary = sc.nextDouble();
        employees[i].putData(id, name, department, salary);
    }
    System.out.println("\nThe employee data are: ");
    for (Employee employee : employees) {
        employee.getData();
    }
  }
```

OUTPUT :



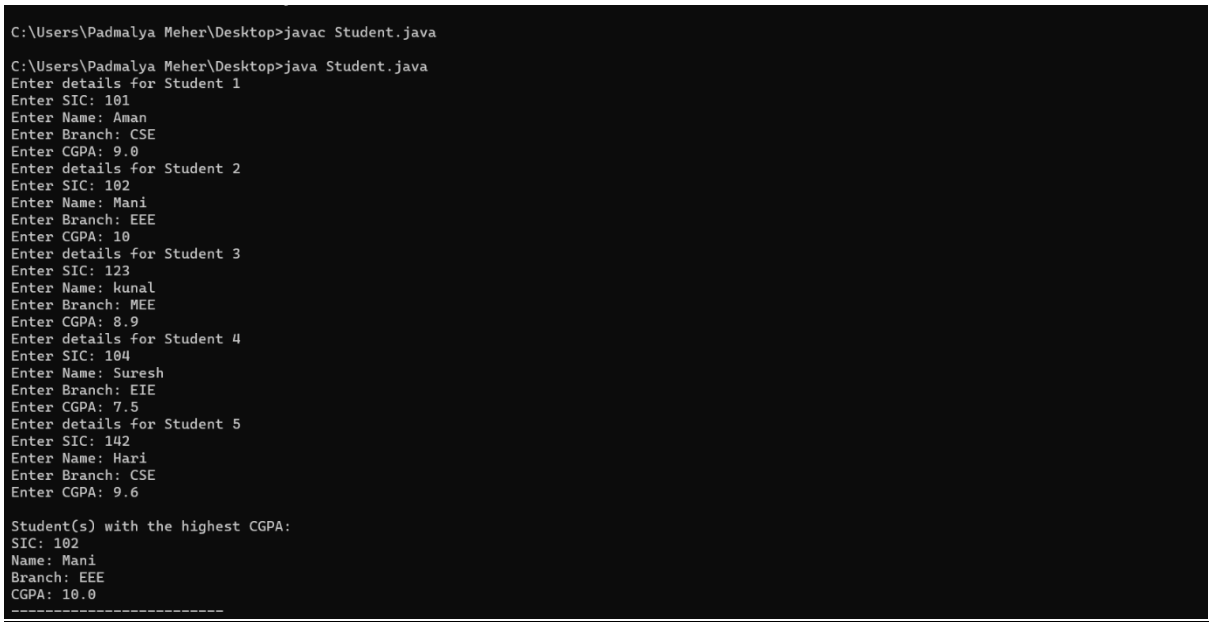
Q6. Define a class Student having the attribute sic, name, branch and cgpa. Write 2 methods to accept and display the student details. Read the details of 5 students using an array of Student class object. Display the student details who have secured the highest CGPA.

```
import java.util.Scanner;
class Student {    int sic;
   String name;
   String branch;
   double cgpa;
 void acceptDetails(Scanner sc) {
      System.out.print("Enter SIC: ");
      sic = sc.nextInt();
      sc.nextLine(); // consume newline
      System.out.print("Enter Name: ");
```

```
        name = sc.nextLine();
        System.out.print("Enter Branch: ");
        branch = sc.nextLine();
        System.out.print("Enter CGPA: ");
        cgpa = sc.nextDouble();
    }
    void displayDetails() {
        System.out.println("SIC: " + sic);
        System.out.println("Name: " + name);
        System.out.println("Branch: " + branch);
        System.out.println("CGPA: " + cgpa);
        System.out.println("-------------------------");
    }
}
    public void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        Student[] students = new Student[5];
        for (int i = 0; i < 5; i++) {
            System.out.println("Enter details for Student " + (i + 1));
            students[i] = new Student();
            students[i].acceptDetails(sc);
        }
        double highestCgpa = students[0].cgpa;
        for (int i = 1; i < 5; i++) {
            if (students[i].cgpa > highestCgpa) {
                highestCgpa = students[i].cgpa;
            }
        }
```

```
    System.out.println("\nStudent(s) with the highest CGPA:");
    for (Student s : students) {
      if (s.cgpa == highestCgpa) {
        s.displayDetails();
      }
    sc.close();
  }
```

OUTPUT :

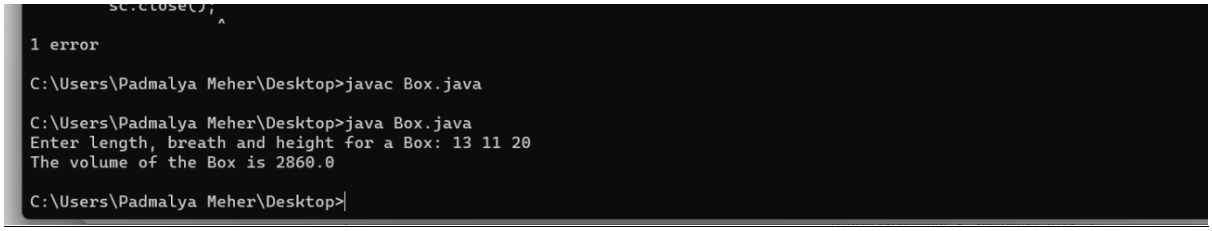


Q7. Define a class ‘Box’ that uses a parameterized constructor to initialize the dimensions of a box. The dimensions of the Box are length, breath, height. The class should have a method that can return the volume of the box. Create an object of the Box class and test the functionalities [use this keyword].

```
import java.util.Scanner;
class Box {
  private double length, breath, height;
  public Box(double length, double breath, double height) {
    validate(length, "Length");
    validate(breath, "Breath");
```

```
        validate(height, "Height");
        this.length = length;
        this.breath = breath;
        this.height = height;
    }
    public double computeVolume() {
        return length * breath * height;
    }
    private void validate(double value, String name) {
        if (value <= 0) {
            System.out.println(name + " can only be positive");
            System.exit(0);
        }
    }
}
    public  void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter length, breath and height for a Box: ");
        double length = sc.nextDouble();
        double breath = sc.nextDouble();
        double height = sc.nextDouble();
        Box box = new Box(length, breath, height);
        System.out.println("The volume of the Box is " + box.computeVolume());
    }
```

OUTPUT :



Q8. Design a class 'Complex' to manipulate Complex numbers having data members as real and imag. The class should have a parameterizedconstructor to initialize its data members. It should also have methods display() to display the complex number (in the format 5+3i for example), add() to add two Complex numbers. Test these methods by creating main method in another class

```
class Complex {
   private double real; // Real part of the complex number
   private double imag; // Imaginary part of the complex number
   public Complex(double real, double imag) {
      this.real = real;
      this.imag = imag;
   }
   public void display() {
      System.out.println(real + (imag >= 0 ? "+" : "") + imag + "i");
   }
   public Complex add(Complex other) {
      return new Complex(this.real + other.real, this.imag + other.imag);
   }
}
   public  void main(String[] args) {
      Complex c1 = new Complex(5, 3);
      Complex c2 = new Complex(2, -4);
      System.out.print("First Complex Number: ");
      c1.display();
```

```
    System.out.print("Second Complex Number: ");
    c2.display();
    Complex sum = c1.add(c2);
    System.out.print("Sum of the Complex Numbers: ");
    sum.display();
  }
```

OUTPUT :

```
1 error

C:\Users\Padmalya Meher\Desktop>javac Complex.java

C:\Users\Padmalya Meher\Desktop>java Complex.java
First Complex Number: 5.0+3.0i
Second Complex Number: 2.0-4.0i
Sum of the Complex Numbers: 7.0-1.0i

C:\Users\Padmalya Meher\Desktop>
```

Q9. Design a class 'Point' with data members as x and y. The class should have a parameterized constructor to initialize its data members. Define a method distance() which returns the distance between two points.

```
public class Point {
  private int x; // x-coordinate
  private int y; // y-coordinate
  public Point(int x, int y) {
    this.x = x;
    this.y = y;
  }
  public double distance(Point other) {
    int dx = this.x - other.x;
    int dy = this.y - other.y;
    return Math.sqrt(dx * dx + dy * dy); // Using the distance formula
  }
  public static void main(String[] args) {
    Point p1 = new Point(3, 4); // First point
```

```
    Point p2 = new Point(7, 1); // Second point
    System.out.println("Distance between p1 and p2: " + p1.distance(p2));
  }
}
```

OUTPUT :

Q10. Design a class 'Time' having data members as hour, minute and second. The class should have a parameterized constructor to initialize its data members. It should also have methods display() to display the time in HH:MM:SS format and add() to add two times. Test these methods by creating a main method in another class.

```
public class Time {
  private int hour;
  private int minute;
  private int second;
  public Time(int hour, int minute, int second) {
    this.hour = hour;
    this.minute = minute;
    this.second = second;
    normalizeTime(); // Ensure time is valid
  }
  public void display() {
    System.out.printf("%02d:%02d:%02d%n", hour, minute, second);
  }
  public Time add(Time other) {
    int totalSeconds = this.toSeconds() + other.toSeconds();
```

```
        return fromSeconds(totalSeconds);
    }
    private int toSeconds() {
        return hour * 3600 + minute * 60 + second;
    }
    private  Time fromSeconds(int totalSeconds) {
        int h = (totalSeconds / 3600) % 24;
        int m = (totalSeconds % 3600) / 60;
        int s = totalSeconds % 60;
        return new Time(h, m, s);
    }
    private void normalizeTime() {
        if (second >= 60) {
            minute += second / 60;
            second %= 60;
        }
        if (minute >= 60) {
            hour += minute / 60;
            minute %= 60;
        }
        hour %= 24; // Keep hour in 24-hour format
    }
}
    public  void main(String[] args) {
        Time time1 = new Time(10, 45, 30);
        Time time2 = new Time(2, 20, 40);
        System.out.print("Time 1: ");
        time1.display();
```

```
    System.out.print("Time 2: ");
    time2.display();
    Time result = time1.add(time2);
    System.out.print("Resultant Time after addition: ");
    result.display();
  }
```

OUTPUT :

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Date of Exp: 05/09/25