ASSIGNMENT - 6

1. Create an abstract class Bank that has abstract method getROI(). Create two classes SBI, PNB, BOI inherited from Bank. Create a driver class that prints the rate of interest of each bank using super class memory reference.

```
abstract class Bank {
	abstract double getROI();
}

class SBI extends Bank {
	double getROI() {
		return 6.5;
	}
}

class PNB extends Bank {
	double getROI() {
		return 7.0;
	}
}

class BOI extends Bank {
	double getROI() {
		return 6.8;
	}
}

class BankROI {
	public static void main(String args[]) {
		Bank b;

		b = new SBI();
		System.out.println("SBI Rate of Interest: " + b.getROI() + "%");

		b = new PNB();
		System.out.println("PNB Rate of Interest: " + b.getROI() + "%");

		b = new BOI();
		System.out.println("BOI Rate of Interest: " + b.getROI() + "%");
	}
}
```

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```
C:\24becc16\Assignment_6\q1>javac BankROI.java

C:\24becc16\Assignment_6\q1>java BankROI
SBI Rate of Interest: 6.5%
PNB Rate of Interest: 7.0%
BOI Rate of Interest: 6.8%
```

2. Define an interface Calculator which has the basic methods add(), sub( ), mul() and div(). Define a concrete class named as DemoCalculator that implements the interface. Define the driver class, which creates object reference of the interface Calculator and performs all basic operation of the calculator.

```
import java.util.Scanner;
interface Calc {
	double add(double a, double b);
	double sub(double a, double b);
	double mul(double a, double b);
	double div(double a, double b);
}

class DemoCalculator implements Calc{
	double add(double a, double b) {
		return a + b;
	}

	double sub(double a, double b) {
		return a - b;
	}

	double mul(double a, double b) {
		return a * b;
	}

	double div(double a, double b) {
		if(b == 0) {
			System.out.println("MathError: Can't be divided by zero");
			return 0;
		}
		else {
			return a / b;
		}
	}
}

class Calculator {
	public static void main(String args[]) {
		Scanner sc = new Scanner(System.in);
```

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```
		System.out.print("Enter the first operand: ");
		double op1 = sc.nextDouble();
		System.out.print("Enter the second operand: ");
		double op2 = sc.nextDouble();

		System.out.print("Enter the operator: ");
		char optr = sc.next().charAt(0);

		DemoCalculator calc = new DemoCalculator();
		double res = 0;
		switch(optr) {
			case '+':
				res = calc.add(op1, op2);
				break;
			case '-':
				res = calc.sub(op1, op2);
				break;
			case '*':
				res = calc.mul(op1, op2);
				break;
			case '/':
				res = calc.div(op1, op2);
				break;
			default :
				System.out.println("Enter a valid operator!");
				return;
		}
		System.out.println("The result is: "+res);
	}
}
```

```
C:\24becc16\Assignment_6\q2>javac Calculator.java

C:\24becc16\Assignment_6\q2>java Calculator
Enter the first operand: 7
Enter the second operand: 9
Enter the operator: *
The result is: 63.0
```

3. Create an abstract class 'Shape' with three abstract methods namely 'RectangleArea' taking two parameters, 'SquareArea' and 'CircleArea' taking one parameter each. The parameters of 'RectangleArea' are its length and breadth, that of 'SquareArea' is its side and that of 'CircleArea' is its radius. Now create another class 'Area' containing all the three methods 'RectangleArea', 'SquareArea' and 'CircleArea' for printing the area of rectangle, square and circle respectively. Create an object of class 'Area' and call all the three methods.

```
import java.util.Scanner;
```

```
abstract class Shape {
	abstract double RectangleArea(double length, double width);
	abstract double SquareArea(double side);
	abstract double CircleArea(double radius);
}

class Area1 extends Shape {
	double RectangleArea(double length, double width) {
		return length * width;
	}

	double SquareArea(double side) {
		return side * side;
	}

	double CircleArea(double radius) {
		return 3.14 * radius * radius;
	}
}

class ShapeArea {
	public static void main(String args[]) {
		Scanner sc = new Scanner(System.in);
		Area1 area = new Area1();
		System.out.print("Enter the length: ");
		double l = sc.nextDouble();
		System.out.print("Enter the width: ");
		double w = sc.nextDouble();
		System.out.println("The area of rectangle: "+area.RectangleArea(l, w));

		System.out.println("Enter the side: ");
		double s = sc.nextDouble();
		System.out.println("The area of Square: "+area.SquareArea(s));

		System.out.println("Enter the radius: ");
		double r = sc.nextDouble();
		System.out.println("The area of Circle: "+area.CircleArea(r));
	}
}
```

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```
C:\24becc16\Assignment_6\q3>javac ShapeArea.java

C:\24becc16\Assignment_6\q3>java ShapeArea
Enter the length: 7
Enter the width: 9
The area of rectangle: 63.0
Enter the side:
7
The area of Square: 49.0
Enter the radius:
20
The area of Circle: 1256.0
```

4. Write a program to implement multiple inheritance using interface.

```
import java.util.Scanner;
interface Add {
	double add(double a, double b);
}

interface Sub {
	double sub(double a, double b);
}

interface Mul {
	double mul(double a, double b);
}

interface Div {
	double div(double a, double b);
}

interface Power {
	double pow(double base, double exp);
}

class Calculator implements Add, Sub, Mul, Div, Power {
	public double add(double a, double b) {
		return a + b;
	}

	public double sub(double a, double b) {
		return a - b;
	}

	public double mul(double a, double b) {
		return a * b;
	}

	public double div(double a, double b) {
```

```
		if(b == 0) {
			System.out.println("MathError: Can't be divided by 0!");
			return -1;
		}
		else {
			return a / b;
		}
	}

	public double pow(double base, double exp) {
		return Math.pow(base, exp);
	}

	double quadratic(double x) {
		return add(pow(x, 2), add(mul(2, x), 1));
	}
}

class Driver {
	public static void main(String args[]) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter the first operand: ");
		double op1 = sc.nextDouble();
		System.out.print("Enter the second operand: ");
		double op2 = sc.nextDouble();

		System.out.print("Enter the operator: ");
		char optr = sc.next().charAt(0);

		Calculator calc = new Calculator();
		double res = 0;
		switch(optr) {
			case '+':
				res = calc.add(op1, op2);
				break;
			case '-':
				res = calc.sub(op1, op2);
				break;
			case '*':
				res = calc.mul(op1, op2);
				break;
			case '/':
				res = calc.div(op1, op2);
				break;
			case '^':
				res = calc.pow(op1, op2);
				break;
```

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```
                case 'q':
                        res = calc.quadratic(op1);
                        break;
                default :
                        System.out.println("Enter a valid operator!");
                        return;
                }
                System.out.println("The result is: "+res);
        }
}
```

```
C:\24becc16\Assignment_6\q4>javac Driver.java

C:\24becc16\Assignment_6\q4>java Driver
Enter the first operand: 9
Enter the second operand: 4
Enter the operator: -
The result is: 5.0
```

5. Create an interface Servicing that has abstract methods getServiceTime(). Create two class Car, Bike that implement interface. Create a driver class that creates the objects of two class and displays the service time.

```
interface Servicing {
        int getServiceTime();
}

class Car implements Servicing {
        public int getServiceTime() {
                return 120;
        }
}

class Bike implements Servicing {
        public int getServiceTime() {
                return 45;
        }
}

public class ServiceDemo {
        public static void main(String[] args) {
                Servicing car = new Car();
                Servicing bike = new Bike();

                System.out.println("Car service time: " + car.getServiceTime() + " minutes");
                System.out.println("Bike service time: " + bike.getServiceTime() + " minutes");
        }
}
```

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```
C:\24becc16\Assignment_6\q5>javac ServiceDemo.java

C:\24becc16\Assignment_6\q5>java ServiceDemo
Car service time: 120 minutes
Bike service time: 45 minutes
```

6. Create a Package *btech* which has one class *Student*. Accept student detail through parameterized constructor of *Student* class. Write a method *display*()to display the student details. Create another class *Test* containing the main method which will use the package *btech* and calculate total marks and percentage of marks.
B_Tech / Student.java

```
package B_Tech;

public class Student {
	private int rollNo;
	private String Name;
	private int sub1, sub2, sub3, sub4, sub5;

	public Student(String Name, int rollNo, int sub1, int sub2, int sub3, int sub4, int sub5)
{
		this.rollNo = rollNo;
		this.Name = Name;
		this.sub1 = sub1;
		this.sub2 = sub2;
		this.sub3 = sub3;
		this.sub4 = sub4;
		this.sub5 = sub5;
	}

	public int totalMarks() {
		return sub1 + sub2 + sub3 + sub4 + sub5;
	}

	public double percentage() {
		return totalMarks() / 5.0;
	}

	public void display() {
		System.out.println("The name is: "+Name);
		System.out.println("The roll no is: "+rollNo);
		System.out.println("The marks of subject 1: "+sub1);
		System.out.println("The marks of subject 2: "+sub2);
		System.out.println("The marks of subject 3: "+sub3);
		System.out.println("The marks of subject 4: "+sub4);
		System.out.println("The marks of subject 5: "+sub5);
```

```
                System.out.println("The total marks: "+totalMarks());
                System.out.println("The percentage we get: "+percentage()+"%");
        }
}
```

StudentRecord.java

```
import B_Tech.Student;
import java.util.Scanner;

public class StudentRecord {
        public static void main(String args[]) {
                Scanner sc = new Scanner(System.in);
                System.out.print("Enter the name: ");
                String name = sc.nextLine();
                System.out.print("Enter the roll no: ");
                int rollNo = sc.nextInt();
                System.out.print("Enter the marks of subject 1: ");
                int m1 = sc.nextInt();
                System.out.print("Enter the marks of subject 2: ");
                int m2 = sc.nextInt();
                System.out.print("Enter the marks of subject 3: ");
                int m3 = sc.nextInt();
                System.out.print("Enter the marks of subject 4: ");
                int m4 = sc.nextInt();
                System.out.print("Enter the marks of subject 5: ");
                int m5 = sc.nextInt();

                System.out.println("/-------Student Details-------/");
                Student s = new Student(name, rollNo, m1, m2, m3, m4, m5);

                s.display();
        }
}
```

7. Create a sub-package called *arithmetic* under the package *btech*. The *arithmetic* package should contain a class *MyMath* having methods to deal with different arithmetic operations (addition, subtraction, multiplication, division and mod). Create a class *Test* containing the main method which will use the methods of sub-package *arithmetic*.

B_Tech / Arithmetic / MyMath.java

```
package B_Tech.Arithmetic;
```

```
public class MyMath {
	public int add(int a, int b) {
		return a + b;
	}

	public int sub(int a, int b) {
		return a - b;
	}

	public int mul(int a, int b) {
		return a * b;
	}

	public double div(int a, int b) {
		if (b == 0) {
		System.out.println("Division by zero not allowed");
		}
		return (double) a / b;
	}

	public int mod(int a, int b) {
		if (b == 0) {
		System.out.println("Modulus by zero not allowed");
		}
		return a % b;
	}
}
```

Calculator.java

```
import B_Tech.Arithmetic.MyMath;
import java.util.Scanner;

public class Calculator {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		MyMath math = new MyMath();

		System.out.print("Enter first number: ");
		int a = sc.nextInt();
		System.out.print("Enter second number: ");
		int b = sc.nextInt();

		System.out.println("Addition       = " + math.add(a, b));
	System.out.println("Subtraction    = " + math.sub(a, b));
		System.out.println("Multiplication = " + math.mul(a, b));
		System.out.println("Division       = " + math.div(a, b));
```

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```
            System.out.println("Modulus       = " + math.mod(a, b));
        }
}
```

```
C:\24becc16\Assignment_6\q7>javac Calculator.java

C:\24becc16\Assignment_6\q7>java Calculator
Enter first number: 8
Enter second number: 2
Addition       = 10
Subtraction    = 6
Multiplication = 16
Division       = 4.0
Modulus        = 0
```

8. Create a sub-package named *shapes*under a package *org*. Create some classes in the package representing some common geometric shapes like *Square*, *Triangle*, *Circle* and so on. The classes should contain the *area*( ) and *perimeter*( ) methods in them. Compile the package. Use this package to find area and perimeter of different shapes as chosen by the user.

Org / Shapes / Circle.java

```
package Org.Shapes;

public class Circle {
        private double radius;

        public Circle(double radius) {
                this.radius = radius;
        }

        public double area() {
                return Math.PI * radius * radius;
        }

        public double perimeter() {
                return 2 * Math.PI * radius;
        }
}
```

Org / Shapes / Square.java

```
package Org.Shapes;

public class Square {
        private double side;

        public Square(double side) {
```

```
            this.side = side;
        }

        public double area() {
            return side * side;
        }

        public double perimeter() {
            return 4 * side;
        }
}
```

Org / Shapes / Triangle.java

```
package Org.Shapes;

public class Triangle {
        private double a, b, c;

        public Triangle(double a, double b, double c) {
            this.a = a;
            this.b = b;
            this.c = c;
        }

        public double perimeter() {
            return a + b + c;
        }

        public double area() {
            double s = perimeter() / 2;
            return Math.sqrt(s * (s - a) * (s - b) * (s - c));
        }
}
```

ShapeCalculator.java

```
import Org.Shapes.Square;
import Org.Shapes.Triangle;
import Org.Shapes.Circle;
import java.util.Scanner;

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

            System.out.println("Choose shape:");
```

```
                System.out.println("1. Square");
                System.out.println("2. Triangle");
                System.out.println("3. Circle");
                System.out.print("Enter choice: ");
                int choice = sc.nextInt();

                switch(choice) {
                case 1:
                                System.out.print("Enter side of square: ");
                                double side = sc.nextDouble();
                                Square sq = new Square(side);
                                System.out.println("Area = " + sq.area());
                                System.out.println("Perimeter = " + sq.perimeter());
                                break;

                        case 2:
                                System.out.print("Enter sides a, b, c of triangle: ");
                                double a = sc.nextDouble();
                                double b = sc.nextDouble();
                                double c = sc.nextDouble();
                                Triangle tri = new Triangle(a, b, c);
                                System.out.println("Area = " + tri.area());
                                System.out.println("Perimeter = " + tri.perimeter());
                                break;

                case 3:
                                System.out.print("Enter radius of circle: ");
                                double r = sc.nextDouble();
                                Circle cir = new Circle(r);
                                System.out.println("Area = " + cir.area());
                                System.out.println("Perimeter = " + cir.perimeter());
                                break;

                default:
                                System.out.println("Invalid choice");
                }
        }
}
```

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```
C:\24becc16\Assignment_6\q8>javac ShapeCalculator.java

C:\24becc16\Assignment_6\q8>java ShapeCalculator
Choose shape:
1. Square
2. Triangle
3. Circle
Enter choice: 2
Enter sides a, b, c of triangle: 5 7 8
Area = 17.320508075688775
Perimeter = 20.0
```

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