VINAY LAB-6 ASSIGNMENT

1. Create a class called Person with attributes such as name and age. Derive a class called Student from Person that adds an attribute studentId. Write a program to demonstrate single inheritance by creating objects of both classes and displaying their attributes.

```
package vinay.com;
public class Person {
	protected String name;
	protected int age;
	public Person(String name, int age) {
		this.name=name;
		this.age=age;
	}
	public void display() {
      System.out.println("Name: " + name);
      System.out.println("Age: " + age);
	}
}
public class Student extends Person {
	private String studentId;
   public Student(String name, int age, String studentId) {
      super(name, age);
      this.studentId = studentId;
   }
   public void display() {
      super.display();
      System.out.println("Student ID: " + studentId);
   }
	public static void main(String[] args) {
		Person p = new  Student("vinay", 27, "AF0313970");
		p.display();

	}

}
```

Output:

Name: vinay
Age: 27
Student ID: AF0313970

2. Design a class called Shape with methods to calculate the area and perimeter. Derive classes like Circle, Rectangle, and Triangle from Shape. Write a program to create objects of these classes and compute their areas and perimeters.

```
package vinay.com;
abstract class Shape {
```

```
        abstract double Area();
    abstract double Perimeter();
}
public class Circle extends Shape {
        private double radius;
        public Circle(double radius) {
                this.radius=radius;
        }
        double Area() {
                return Math.PI*radius*radius;
        }
        double Perimeter() {
                return Math.PI*radius;
        }
}
public class Rectangle extends Shape {
        private double length;
    private double width;

    public Rectangle(double length, double width) {
        this.length = length;
        this.width = width;
    }
        double Area() {
                return length*width;
        }
        double Perimeter() {

                return 2*(length*width);
        }
}
public class Triangle extends Shape {
        private double side1;
    private double side2;
    private double side3;
    public Triangle(double side1, double side2, double side3) {
        this.side1 = side1;
        this.side2 = side2;
        this.side3 = side3;
    }
        double Area() {
                double s = (side1 + side2 + side3) / 2; // calculate semiperimeter
        return Math.sqrt(s * (s - side1) * (s - side2) * (s - side3));
        }


        double Perimeter() {
                return side1 + side2 + side3;
        }
}
```

```
public class ShapeSimulation {
	public static void main(String []a) {
		Shape c,r,t;
		c = new Circle(2);
		r = new Rectangle(2, 1.5);
		t = new Triangle(3, 3, 3);
		System.out.println("Area of the Circle = "+c.Area());
		System.out.println("Perimeter of the Circle = "+c.Perimeter());

	System.out.println("=========================================");
		System.out.println("Area of the Rectangle = "+r.Area());
		System.out.println("Perimeter of the Rectangle = "+r.Perimeter());

	System.out.println("=========================================");
		System.out.println("Area of the Triangle = "+t.Area());
		System.out.println("Perimeter of the Triangle = "+t.Perimeter());
	}
}
```

Output:

```
Area of the Circle = 12.566370614359172
Perimeter of the Circle = 6.283185307179586
=========================================
Area of the Rectangle = 3.0
Perimeter of the Rectangle = 6.0
=========================================
Area of the Triangle = 3.897114317029974
Perimeter of the Triangle = 9.0
```

3. Create a base class called Animal with a method named sound(), which prints "Animal makes a sound." Derive classes Cat and Dog from Animal. Override the sound() method in each derived class to print "Cat meows" and "Dog barks" respectively. Write a program to demonstrate method overriding by creating objects of the derived classes and calling the sound() method.

```
package vinay.com;
public class Animals {
	//Overriding
	public void Sound() {
		System.out.println("Animal makes a sound.");
	}
}
public class Cat extends Animals {
	//Overriding
	public void Sound() {
```

```
                System.out.println("Cat meows");
        }
}
public class Dog extends Animals {
        //Overriding
        public void Sound() {
                System.out.println("Dog barks");
        }
}
public class AnimalSimulation {
        public static void main(String[] args) {
                Animals a,c, d;
                a = new Animals();
                c = new Cat();
                d = new Dog();
                a.Sound();
                c.Sound();
                d.Sound();
        }
}
```

Output:

Animal makes a sound.
Cat meows..!!
Dog barks..!!

4. Design a class called Shape with a method named calculateArea(). Derive classes such as Circle, Rectangle, and Triangle from Shape and override the calculateArea() method in each derived class to compute the area specific to that shape. Write a program to create objects of these classes and invoke the calculateArea() method to calculate and display their respective areas.

```
package vinay.com;
abstract class Shape {
        abstract double CaculateArea();
}

public class Circle extends Shape {
        private double radius;
        public Circle(double radius) {
                this.radius=radius;
        }

        //Overriding
        double CaculateArea() {
                return Math.PI*radius*radius;
        }
```

```
}

public class Rectangle extends Shape {
        private double length;
   private double width;

   public Rectangle(double length, double width) {
      this.length = length;
      this.width = width;
       }
       //Overriding
        double CaculateArea() {
                return length*width;
        }
}

public class Triangle extends Shape {
        private double side1;
   private double side2;
   private double side3;
   public Triangle(double side1, double side2, double side3) {
      this.side1 = side1;
      this.side2 = side2;
      this.side3 = side3;
       }
       //Overriding
        double CaculateArea() {
                double s = (side1 + side2 + side3) / 2; // calculate semiperimeter
      return Math.sqrt(s * (s - side1) * (s - side2) * (s - side3));
        }
}

public class ShapeSimulation {
        public static void main(String []a) {
                Shape c,r,t;
                c = new Circle(2);
                r = new Rectangle(2, 1.5);
                t = new Triangle(3, 3, 3);
                System.out.println("Area of the Rectangle = "+r.Area());

                System.out.println("Area of the Rectangle = "+r.Area());

                System.out.println("Area of the Triangle = "+t.Area());
        }
}
```

Output:

```
Area of the Circle = 12.566370614359172
Area of the Rectangle = 3.0
```

Area of the Triangle = 3.897114317029974