# E.V.K.Deepthi (AF0311771)

**Q1. Create a class called Person with attributes such as name and age. Derive a class called Student from Person that adds an attribute student Id. Write a program to demonstrate single inheritance by creating objects of both classes and displaying their attributes.**

```java
package LAB6;
public class Person {
    private String name;
    private int age;

    // Constructor
    public Person(String name, int age)
    {
        this.name = name;
        this.age = age;
    }

    // Display method
    public void display() {
        System.out.println("Name: " + name);
        System.out.println("Age: " + age);
    }
}

package LAB6;
public class Student extends Person {
    private int studentId;

    // Constructor
    public Student(String name, int age, int studentId) {
        super(name, age);
        this.studentId = studentId;
    }

    // Display method (overrides the display method in Person class)

    public void display() {
        super.display();
        System.out.println("Student ID: " + studentId);
    }
```

```
}


package LAB6;
public class Main {
    public static void main(String[] args) {
// Create a Person object
Person person = new Person("Deepthi", 25);

        // Display Person attributes
        System.out.println("Person Details:");
        person.display();

        // Create a Student object
        Student student = new Student("Keerthi", 21, 1603);

        // Display Student attributes
        System.out.println("\nStudent Details:");
        student.display();
    }
}
```

**Output:**

Person Details:
Name: Deepthi
Age: 25

Student Details:
Name: Keerthi
Age: 21
Student ID: 1603

**Q2. 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.**

```java
package LAB6;
public class Shape {
        public double calculateArea()
{
    return 0.0;
  }
        public double calculatePerimeter()
 {
    return 0.0;
  }
}


package LAB6;
public class Circle extends Shape {
   private double radius;

   public Circle(double radius)
 {
     this.radius = radius;
   }
   public double calculateArea()
 {
     return Math.PI * Math.pow(radius, 2);
   }
   public double calculatePerimeter()
{
     return 2 * Math.PI * radius;
   }

}


package LAB6;
public class Rectangle extends Shape {
   private double length;
   private double width;

   public Rectangle(double length, double width)
 {
```

```java
        this.length = length;
        this.width = width;
    }
    public double calculateArea()
{

    return length * width;

    }
    public double calculatePerimeter()
{

    return 2 * (length + width);

    }

}

package LAB6;
public class Triangle extends Shape {
    private double sideA;
    private double sideB;
    private double sideC;

    public Triangle(double sideA, double sideB, double sideC)
{

    this.sideA = sideA;
    this.sideB = sideB;
    this.sideC = sideC;
    }
    public double calculateArea() {
        // Using Heron's formula to calculate the area of a triangle
        double s = (sideA + sideB + sideC) / 2;
        return Math.sqrt(s * (s - sideA) * (s - sideB) * (s - sideC));
    }
    public double calculatePerimeter() {
        return sideA + sideB + sideC;
    }
}
package LAB6;
public class Mains {
        public static void main(String[] args)
{

    Circle circle = new Circle(5);
    System.out.println("Circle Area: " + circle.calculateArea());
    System.out.println("Circle Perimeter: " + circle.calculatePerimeter());
```

```java
        Rectangle rectangle = new Rectangle(4, 6);
        System.out.println("Rectangle Area: " + rectangle.calculateArea());
        System.out.println("Rectangle Perimeter: " +
rectangle.calculatePerimeter());

        Triangle triangle = new Triangle(3, 4, 5);
        System.out.println("Triangle Area: " + triangle.calculateArea());
        System.out.println("Triangle Perimeter: " + triangle.calculatePerimeter());
    }

}
```

**Output:**
Circle Area: 78.53981633974483
Circle Perimeter: 31.41592653589793
Rectangle Area: 24.0
Rectangle Perimeter: 20.0
Triangle Area: 6.0
Triangle Perimeter: 12.0

**Q3. 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.**

```java
package LAB6;
public class Animal {
    public void sound()
    {
        System.out.println("Animal makes a sound.");
    }
}
package LAB6;
public class Cat extends Animal {

    public void sound()
    {
        System.out.println("Cat meows.");
    }
}
package LAB6;
public class Dog extends Animal {

    public void sound()
    {
        System.out.println("Dog barks.");
    }
}
package LAB6;
public class Main3 {
    public static void main(String[] args) {
        Animal animal = new Animal();
        animal.sound();

        Cat cat = new Cat();
        cat.sound();

        Dog dog = new Dog();
        dog.sound();
    }
```

**Output:**
Animal makes a sound.
Cat meows.
Dog barks.

**Q4. Design a class called Shape with a method named calculate Area().Derive classes such as Circle, Rectangle, and Triangle from Shape and override the calculate Area() 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 calculate Area() method to calculate and display their respective areas.**

```java
package LAB6;
public class Shape4 {
   public void calculateArea()
 {
     System.out.println("Calculating area of the shape");
   }

}

package LAB6;
public class Circle4 extends Shape {
   private double radius;

   public Circle4(double radius)
   {
     this.radius = radius;
   }
   public double calculateArea()
   {
     return Math.PI * radius * radius;
    }
}
package LAB6;
public class Rectangle4  extends Shape {
   private double length;
   private double width;
       private double height;

   public Rectangle4(double width, double height)
   {
     this.width = width;
     this.height = height;
   }

   public double calculateArea()
   {
```

```java
        return width * height;
    }
}
package LAB6;
public class Triangle4  extends Shape {
    private double base;
    private double height;

    public Triangle4(double base, double height)
    {
        this.base = base;
        this.height = height;
    }
    public double calculateArea()

    {
        double area = 0.5 * base * height;
        System.out.println("Area of the triangle: " + area);
                return area;
    }

}

package LAB6;
public class Main4 {
        public static void main(String[] args) {
                Circle circle = new Circle(4.0);
        System.out.println("Circle Area: " + circle.calculateArea());

        Rectangle4 rectangle4 = new Rectangle4(1.0, 3.0);
        System.out.println("Rectangle Area: " + rectangle4.calculateArea());

        Triangle4 triangle4 = new Triangle4(2.0, 6.0);
        System.out.println("Triangle Area: " + triangle4.calculateArea());
    }
}
```

**Output:**
Circle Area: 50.26548245743669
Rectangle Area: 3.0
Area of the triangle: 6.0
Triangle Area: 6.0