**Program 06 : Abstract Class**

**Develop a JAVA program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.**

### Java Code

abstract class Shape {

abstract double calculateArea();

abstract double calculatePerimeter();

}

class Circle extends Shape {

private double radius;

public Circle(double radius) {

this.radius = radius;

}

@Override

double calculateArea() {

return Math.PI \* radius \* radius;

}

@Override

double calculatePerimeter() {

return 2 \* Math.PI \* radius;

}

}

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;

}

@Override

double calculateArea() {

// Using Heron's formula to calculate the area of a triangle

double s = (side1 + side2 + side3) / 2;

return Math.sqrt(s \* (s - side1) \* (s - side2) \* (s - side3));

}

@Override

double calculatePerimeter() {

return side1 + side2 + side3;

}

}

public class ShapeDemo {

public static void main(String[] args) {

// Creating Circle and Triangle objects

Circle circle = new Circle(5.0);

Triangle triangle = new Triangle(3.0, 4.0, 5.0);

// Calculating and displaying area and perimeter

System.out.println("Circle Area: " + circle.calculateArea());

System.out.println("Circle Perimeter: " + circle.calculatePerimeter());

System.out.println("\nTriangle Area: " + triangle.calculateArea());

System.out.println("Triangle Perimeter: " + triangle.calculatePerimeter());

}

}

### Output

$ java ShapeDemo

Circle Area: 78.53981633974483

Circle Perimeter: 31.41592653589793

Triangle Area: 6.0

Triangle Perimeter: 12.0