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.

Save Filename as: ShapeMain.java

Solution:-

```
abstract class Shape
{
 // Abstract methods to calculate area and perimeter
 public abstract double calculateArea ();
 public abstract double calculatePerimeter ();
}
class Circle extends Shape
{
 private double radius;
 // Constructor
 public Circle (double radius)
{
    this.radius = radius;
 }
public double calculateArea ()
 {
   return Math.PI * radius * radius;
 }
public double calculatePerimeter ()
 {
   return 2 * Math.PI * radius;
 }
```

```
}
class Triangle extends Shape
{
 private double side1;
 private double side2;
 private double side3;
 // Constructor
 public Triangle (double side1, double side2, double side3)
 {
   this.side1 = side1;
   this.side2 = side2;
   this.side3 = side3;
 }
 public double calculateArea ()
 {
   double s = (side1 + side2 + side3) / 2;
   return Math.sqrt (s * (s - side1) * (s - side2) * (s – side3));
 }
 public double calculatePerimeter ()
 {
   return side1 + side2 + side3;
 }
}
public class ShapeMain
{
   public static void main (String[] args)
```

```
  {
    Circle c = new Circle (5.0);
    Triangle t = new Triangle (3.0, 4.0, 5.0);
    System.out.println ("Circle:");
    System.out.println ("Area: " + circle.calculateArea ());
    System.out.println ("Perimeter: " + circle.calculatePerimeter ());
    System.out.println ();
    System.out.println ("Triangle:");
    System.out.println ("Area: " + triangle.calculateArea ());
    System.out.println ("Perimeter: " + triangle.calculatePerimeter ());
 }
}
```

Compile As: javac ShapeMain.java

Run As: java ShapeMain

Output:

Circle:

Area: 78.53981633974483

Perimeter: 31.41592653589793

Triangle:

Area: 6.0

Perimeter: 12.0