Aim:

Write a Java program that provides an interactive menu for users to perform calculations on 2D shapes. The program should allow users to calculate the area of different shapes: circle and square. Implement the program using the concept of inheritance and method overriding to achieve runtime polymorphism.

Source Code:

ShapeCalculator.java

```
import java.util.Scanner;

abstract class Shape {
    abstract double calculateArea();
}

//write your code here..
class Circle extends Shape {
   double r;
   Circle(double r) {
      this.r = r;
   }
   double calculateArea(){
      return (Math.PI * r * r);
   }
}
class Square extends Shape {
   double s;
   Square(double s){
      this.s = s;
   }
   double calculateArea(){
      return (s * s);
   }
}
class ShapeCalculator{
   public static void main(String[] args){
      Scanner sc = new Scanner(System.in);
      while(true) {
         System.out.println("Select an option:");
         System.out.println("1. Area of Circle");
         System.out.println("2. Area of Square");
         System.out.println("3. Exit");
         System.out.print("Enter option: ");
         int ch = sc.nextInt();
         switch(ch) {
            case 1: System.out.print("radius: ");
                       double v1 = sc.nextDouble();
                    Circle ob1 = new Circle(v1);
                    System.out.println("Area: "+ob1.calculateArea());
                    break;
            case 2: System.out.print("side: ");
                     double v2 = sc.nextDouble();
                     Square ob2 = new Square(v2);
```


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```
                    System.out.println("Area: "+ob2.calculateArea());
                     break;
            case 3: System.exit(0);
            default: System.out.println("Invalid choice");
          }
       }
    }
 }
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Select an option: 1
1. Area of Circle 1
2. Area of Square 1
3. Exit 1
Enter option: 1
radius: 3.75
Area: 44.178646691106465 2
Select an option: 2
1. Area of Circle 2
2. Area of Square 2
3. Exit 2
Enter option: 2
side: 40
Area: 1600.0 5
Select an option: 5
1. Area of Circle 5
2. Area of Square 5
3. Exit 5
Enter option: 5
Invalid choice 3
Select an option: 3
1. Area of Circle 3
2. Area of Square 3
3. Exit 3
Enter option: 3

Test Case - 2
User Output
Select an option: 1
1. Area of Circle 1
2. Area of Square 1
3. Exit 1
Enter option: 1
radius: 3.3578
Area: 35.4208943214851 5
Select an option: 5
1. Area of Circle 5
2. Area of Square 5

3. Exit 5
Enter option: 5
Invalid choice 3
Select an option: 3
1. Area of Circle 3
2. Area of Square 3
3. Exit 3
Enter option: 3