MODULE -2

PROGRAM -2 :

Aim:

To develop a Java program that demonstrates abstraction and interfaces by implementing an abstract class Shape with three subclasses: Rectangle, Triangle, and Circle. Each subclass provides its own implementation of the printArea() method to calculate and display the area.

Algorithm:

1. Create an abstract class Shape with two integer attributes and an abstract method printArea().

2. Create an interface Area that declares the method printArea().

3. Implement three classes: Rectangle, Triangle, and Circle.

4. Each class should extend Shape and implement Area.

5. Override the printArea() method in each class to calculate and display the area:

Rectangle: Area = length × breadth

Triangle: Area = 0.5 × base × height

Circle: Area = π × radius²

6. Use a main method to accept user input, instantiate objects of different shapes, and display their areas.

PROGRAM:

import java.util.Scanner;

// Abstract class Shape

abstract class Shape {

int dimension1, dimension2;

// Constructor

Shape(int d1, int d2) {

this.dimension1 = d1;

this.dimension2 = d2;

}

// Abstract method to print area

abstract void printArea();

}

// Interface

interface Area {

void printArea();

}

// Rectangle class implementing Area interface

class Rectangle extends Shape implements Area {

Rectangle(int length, int breadth) {

super(length, breadth);

}

public void printArea() {

int area = dimension1 \* dimension2;

System.out.println("Area of Rectangle: " + area);

}

}

// Triangle class implementing Area interface

class Triangle extends Shape implements Area {

Triangle(int base, int height) {

super(base, height);

}

public void printArea() {

double area = 0.5 \* dimension1 \* dimension2;

System.out.println("Area of Triangle: " + area);

}

}

// Circle class implementing Area interface

class Circle extends Shape implements Area {

Circle(int radius) {

super(radius, 0);

}

public void printArea() {

double area = Math.PI \* dimension1 \* dimension1;

System.out.println("Area of Circle: " + area);

}

}

// Main class

public class ShapeAreaCalculator {

public static void main(String[] args) {

Scanner sc = new Scanner(System.in);

// Rectangle

System.out.println("Enter length and breadth of rectangle:");

int length = sc.nextInt();

int breadth = sc.nextInt();

Rectangle rect = new Rectangle(length, breadth);

rect.printArea();

// Triangle

System.out.println("Enter base and height of triangle:");

int base = sc.nextInt();

int height = sc.nextInt();

Triangle tri = new Triangle(base, height);

tri.printArea();

// Circle

System.out.println("Enter radius of circle:");

int radius = sc.nextInt();

Circle cir = new Circle(radius);

cir.printArea();

sc.close();

}

}

Output:

(Sample Input and Output for length=10, breadth=5, base=6, height=8, radius=7)

Enter length and breadth of rectangle:

10 5

Area of Rectangle: 50

Enter base and height of triangle:

6 8

Area of Triangle: 24.0

Enter radius of circle:

7

Area of Circle: 153.93804002589985

RESULT:

Thus the java program that demonstrates abstraction and interfaces by implementing an abstract class Shape with three subclasses: Rectangle, Triangle, and Circle. Each subclass provides its own implementation of the printArea() method to calculate and display the area is executed and verified successfully.