Experiment 12
Calculate Area and Perimeter Using

Problem Statement

Write a Java Program to create an interface having prototypes of functions ‘area()‘ and ‘perimeter()‘. Create two classes ‘Circle‘ and ‘Rectangle‘ which implement the above interface. Develop a menu-driven program to find the area and perimeter of these shapes.

Source Code :

```
import java.util.Scanner;

interface Shape {
    double area();
    double perimeter();
}

class Circle implements Shape {
    double radius;

    Circle(double radius) {
        this.radius = radius;
    }

    public double area() {
        return Math.PI * radius * radius;
    }

    public double perimeter() {
        return 2 * Math.PI * radius;
    }
}

class Rectangle implements Shape {
    double length, width;

    Rectangle(double length, double width) {
        this.length = length;
        this.width = width;
    }

    public double area() {
        return length * width;
    }

    public double perimeter() {
        return 2 * (length + width);
    }
}

public class AreaPerimeterCalculator{
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        while (true) {
            System.out.println("\nChoose a shape:");
            System.out.println("1. Circle");
            System.out.println("2. Rectangle");
            System.out.println("3. Exit");
            System.out.print("Enter your choice: ");
            int choice = scanner.nextInt();
```

```
            if (choice == 1) {
                System.out.print("Enter radius of the circle: ");
                double radius = scanner.nextDouble();
                Circle circle = new Circle(radius);
                System.out.println("Area: " + circle.area());
                System.out.println("Perimeter: " + circle.perimeter());
            }
            else if (choice == 2) {
                System.out.print("Enter length of the rectangle: ");
                double length = scanner.nextDouble();
                System.out.print("Enter width of the rectangle: ");
                double width = scanner.nextDouble();
                Rectangle rectangle = new Rectangle(length, width);
                System.out.println("Area: " + rectangle.area());
                System.out.println("Perimeter: " + rectangle.perimeter());
            }
            else if (choice == 3) {
                System.out.println("Exiting...");
                break;
            }
            else {
                System.out.println("Invalid choice. Please try again.");
            }
        }
        scanner.close();
    }
}
```

Output :

```
24mca13@mcaserver:~/java$ java AreaPerimeterCalculator

Choose a shape:
1. Circle
2. Rectangle
3. Exit
Enter your choice: 1
Enter radius of the circle: 12
Area: 452.3893421169302
Perimeter: 75.39822368615503

Choose a shape:
1. Circle
2. Rectangle
3. Exit
Enter your choice: 2
Enter length of the rectangle: 12
Enter width of the rectangle: 10
Area: 120.0
Perimeter: 44.0
```

Experiment 13
Program to Manage Employee Collection

Problem Statement

Create a Java program to manage a collection of employees in a company. Implement an abstract class Employee with fields name (String) and salary (double), and an abstract method calculateSalary(). Create two subclasses: Manager (with a bonus field) and Developer (with an experience field), both overriding calculateSalary() to calculate the total salary. Implement an interface Benefits with a method calculateBenefits(), where Manager provides a fixed insurance benefit and Developer provides an allowance based on experience. Use polymorphism to store Employee objects in a list and display employee details and salary. Add method overloading in Manager for project assignment, where one method takes just a project name and the other takes both the project name and the number of team members.

Source Code :

```
import java.util.ArrayList;
import java.util.Scanner;

abstract class Employee {
    String name;
    double salary;

    Employee(String name, double salary) {
        this.name = name;
        this.salary = salary;
    }

    abstract double calculateSalary();

    void displayDetails() {
        System.out.println("Name: " + name);
        System.out.println("Salary: " + salary);
    }
}

interface Benefits {
    double calculateBenefits();
}

class Manager extends Employee implements Benefits {
    double bonus;

    Manager(String name, double salary, double bonus) {
        super(name, salary);
        this.bonus = bonus;
    }

    @Override
    double calculateSalary() {
        return salary + bonus;
    }

    @Override
    public double calculateBenefits() {
        return 5000;
    }

    void assignProject(String projectName) {
        System.out.println(name + " assigned to project: " + projectName);
    }

    void assignProject(String projectName, int teamSize) {
        System.out.println(name + " assigned to project: " + projectName + " with team size: " + teamSize);
    }

    void display() {
```

```
    void display() {
        displayDetails();
        System.out.println("Bonus: " + bonus);
        System.out.println("Total Salary: " + calculateSalary());
        System.out.println("Benefits: " + calculateBenefits());
    }
}

class Developer extends Employee implements Benefits {
    int experience;

    Developer(String name, double salary, int experience) {
        super(name, salary);
        this.experience = experience;
    }

    @Override
    double calculateSalary() {
        return salary + (experience * 1000);
    }

    @Override
    public double calculateBenefits() {
        return experience * 500;
    }

    void display() {
        displayDetails();
        System.out.println("Experience: " + experience + " years");
        System.out.println("Total Salary: " + calculateSalary());
        System.out.println("Benefits: " + calculateBenefits());
    }
}

public class ManageEmployee{
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        ArrayList<Employee> employees = new ArrayList<>();

        System.out.println("Enter Manager details:");
        System.out.print("Name: ");
        String mgrName = scanner.nextLine();
        System.out.print("Salary: ");
        double mgrSalary = scanner.nextDouble();
        System.out.print("Bonus: ");
        double mgrBonus = scanner.nextDouble();
        scanner.nextLine();
        Manager manager = new Manager(mgrName, mgrSalary, mgrBonus);
        employees.add(manager);

        System.out.println("\nEnter Developer details:");
```

```
        System.out.println("\nEnter Developer details:");
        System.out.print("Name: ");
        String devName = scanner.nextLine();
        System.out.print("Salary: ");
        double devSalary = scanner.nextDouble();
        System.out.print("Experience (years): ");
        int devExp = scanner.nextInt();
        Developer developer = new Developer(devName, devSalary, devExp);
        employees.add(developer);

        System.out.println("\n--- Employee Details ---");
        for (Employee emp : employees) {
            if (emp instanceof Manager) {
                ((Manager) emp).display();
                ((Manager) emp).assignProject("AI Research");
                ((Manager) emp).assignProject("Cloud Computing", 5);
            } else if (emp instanceof Developer) {
                ((Developer) emp).display();
            }
            System.out.println("----------------------");
        }

        scanner.close();
    }
}
```

Output : Shape

```
Enter Manager details:
Name: Athul
Salary: 500000
Bonus: 10000

Enter Developer details:
Name: Anandhu
Salary: 500000
Experience (years): 2

--- Employee Details ---
Name: Athul
Salary: 500000.0
Bonus: 10000.0
Total Salary: 510000.0
Benefits: 5000.0
Athul assigned to project: AI Research
Athul assigned to project: Cloud Computing with team size: 5
----------------------
Name: Anandhu
Salary: 500000.0
Experience: 2 years
Total Salary: 502000.0
Benefits: 1000.0
----------------------
```

Experiment 14
Graphics Package for Geometric Figures

Problem Statement

Create a Graphics package that contains classes and interfaces for geometric figures such as ‘Rectangle‘, ‘Triangle‘, ‘Square‘, and ‘Circle‘. Test the package by finding the area of these figures.

Source Code :

src/Main.java

```java
import graphics.*; // Importing the graphics package
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        // Rectangle
        System.out.println("Enter length and width of the Rectangle:");
        double length = scanner.nextDouble();
        double width = scanner.nextDouble();
        Rectangle rect = new Rectangle(length, width);
        System.out.println("Area of Rectangle: " + rect.area());

        // Triangle
        System.out.println("\nEnter base and height of the Triangle:");
        double base = scanner.nextDouble();
        double height = scanner.nextDouble();
        Triangle tri = new Triangle(base, height);
        System.out.println("Area of Triangle: " + tri.area());

        // Square
        System.out.println("\nEnter side of the Square:");
        double side = scanner.nextDouble();
        Square square = new Square(side);
        System.out.println("Area of Square: " + square.area());

        // Circle
        System.out.println("\nEnter radius of the Circle:");
        double radius = scanner.nextDouble();
        Circle circle = new Circle(radius);
        System.out.println("Area of Circle: " + circle.area());

        scanner.close();
    }
}
```

graphics/Circle.java

```java
package graphics;

public class Circle implements Shape {
    double radius;

    public Circle(double radius) {
        this.radius = radius;
    }

    @Override
    public double area() {
        return Math.PI * radius * radius;
    }
}
```

graphics/Rectangle.java

```java
package graphics;

public class Rectangle implements Shape {
    double length, width;

    public Rectangle(double length, double width) {
        this.length = length;
        this.width = width;
    }

    @Override
    public double area() {
        return length * width;
    }
}
```

graphics/Shape.java

```java
package graphics;

public interface Shape {
    double area();
}
```

graphics/Square.java

```java
package graphics;

public class Square implements Shape {
    double side;

    public Square(double side) {
        this.side = side;
    }

    @Override
    public double area() {
        return side * side;
    }
}
```

graphics/Triangle.java

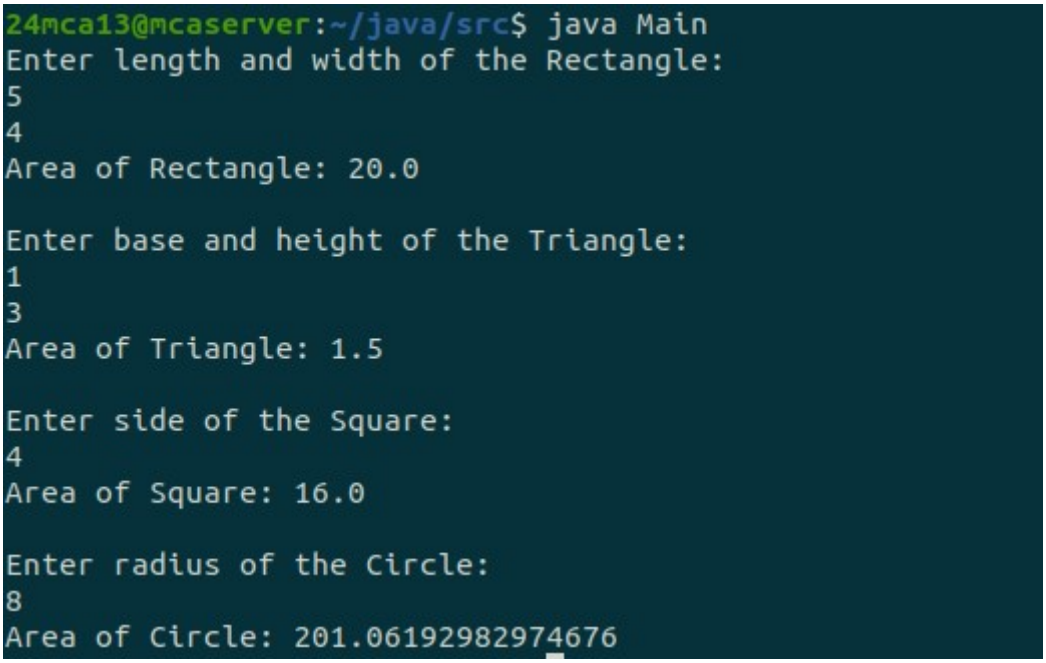
```java
package graphics;

public class Triangle implements Shape {
    double base, height;

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

    @Override
    public double area() {
        return 0.5 * base * height;
    }
}
```

Output :


24mca13@mcaserver:~/java/src$ java Main
Enter length and width of the Rectangle:
5
4
Area of Rectangle: 20.0
Enter base and height of the Triangle:
1
3
Area of Triangle: 1.5
Enter side of the Square:
4
Area of Square: 16.0
Enter radius of the Circle:
8
Area of Circle: 201.06192982974676