

# Rajalakshmi Engineering College

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## 2024\_28\_III\_OOPS Using Java Lab

### REC\_2028\_OOPS using Java\_Week 6\_CY

Attempt : 1

Total Mark : 40

Marks Obtained : 40

### Section 1 : Coding

#### 1. Problem Statement

A painter needs to determine the cost to paint different shapes based on their surface area. The program should be designed to handle the area of a sphere and calculate the total painting cost using the following formulas:

Area of sphere:  $\text{Area} = 4 * \pi * r^2$  where  $\pi = 3.14$   
Total painting cost:  $\text{Cost} = \text{cost per square meter} * \text{area of sphere}$

The program will consist of three classes:

Shape class: This class should set the shape type and radius.

Area class: This class should extend Shape to calculate the area.

Cost class: This class should extend Area to calculate the total painting cost.

#### **Input Format**

The input consists of a string representing the shape type, a double value

representing the radius, and another double value representing the cost per square meter on each line.

### **Output Format**

For a valid shape type of "Sphere":

- The first line prints: "Area of Sphere is: <calculated\_area>" rounded to two decimal places.
- The second line prints: "Cost to paint the shape is: <total\_painting\_cost>" rounded to two decimal places.

For any other shape types, print: "Invalid type".

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: Sphere

3.4

5.8

Output: Area of Sphere is: 145.19

Cost to paint the shape is: 842.12

### **Answer**

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

```
class Shape {  
    String shapeName = "";  
    double radius;  
    void setShape(String x, Scanner scanner) {  
        shapeName = x;  
        if (x.equals("Sphere")) {  
            radius = scanner.nextDouble();  
        } else {  
            System.out.println("Invalid type");  
            return;  
        }  
    }  
}
```

```

    }

class Area extends Shape {
    double area;
    void calculateArea() {
        if (shapeName.equals("Sphere")) {
            area = 4 * 3.14 * radius * radius;
            System.out.printf("Area of Sphere is: %.2f%n", area);
        }
    }
}

class Cost extends Area {
    double costPerMtrSquare;

    void setCost(double x) {
        costPerMtrSquare = x;
    }

    void calculateCost() {
        double totalCost = costPerMtrSquare * area;
        if (area > 0) {
            System.out.printf("Cost to paint the shape is: %.2f%n", totalCost);
        }
    }
}

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        String s = scanner.next();
        Cost shape = new Cost();
        shape.setShape(s, scanner);
        double costToPaint = scanner.nextDouble();
        shape.calculateArea();
        shape.setCost(costToPaint);
        shape.calculateCost();
    }
}

```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

Teena is launching a new airline, Boeing747, and needs to calculate the total revenue generated from ticket sales based on the ticket cost and seat availability. Teena's airline offers two types of seats: regular and premium. The ticket cost and seat availability for both types of seats need to be considered for revenue calculation.

To help with this, Teena wants to implement a system using multilevel inheritance with three classes:

**Airline:** This class will have the ticket cost as an attribute and defines the method `setCost(double cost)` and `double getCost()`. **Indigo:** This class will extend **Airline** and add the seat availability attribute and defines the method `getSeatAvailability()` and `setSeatAvailability(int seatAvailability)`. **Boeing747:** This class will extend **Indigo** and include a method `calculateTotalRevenue()` based on the ticket cost and seat availability.

Teena needs to calculate the total revenue using the formula:

$$\text{Total Revenue} = \text{ticket cost} * \text{seat availability}$$

Help Teena implement this system for calculating the revenue of her airline.

### ***Input Format***

The first line of input consists of a double value, representing the flight's ticket cost.

The second line consists of an integer, representing seat availability.

### ***Output Format***

The first line of output prints "Ticket Cost: Rs. " followed by a double value representing the ticket cost rounded to one decimal place.

The second line of output prints "Seat Availability: X seats" where X is an integer value representing the seat availability.

The third line of output prints "Total Revenue: Rs. " followed by a double value representing the total revenue rounded to one decimal place.

Refer to the sample output for the exact text and format.

### **Sample Test Case**

Input: 1000.0

100

Output: Ticket Cost: Rs. 1000.0

Seat Availability: 100 seats

Total Revenue: Rs. 100000.0

### **Answer**

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

```
class Airline {  
    private double cost;  
    public void setCost(double cost) {  
        this.cost = cost;  
    }  
    public double getCost() {  
        return cost;  
    }  
}  
class Indigo extends Airline {  
    private int seatAvailability;  
    public void setSeatAvailability(int seatAvailability) {  
        this.seatAvailability = seatAvailability;  
    }  
    public int getSeatAvailability() {  
        return seatAvailability;  
    }  
}  
class Boeing747 extends Indigo {  
    public double calculateTotalRevenue() {  
        return getCost() * getSeatAvailability();  
    }  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
        Boeing747 plane = new Boeing747();  
    }  
}
```

```

double ticketCost = scanner.nextDouble();
plane.setCost(ticketCost);
int seatAvailability = scanner.nextInt();
plane.setSeatAvailability(seatAvailability);

System.out.printf("Ticket Cost: Rs. %.1f\n", plane.getCost());
System.out.println("Seat Availability: " + plane.getSeatAvailability() + "
seats");
System.out.printf("Total Revenue: Rs. %.1f\n",
plane.calculateTotalRevenue());
}
}

```

**Status :** Correct

**Marks :** 10/10

### 3. Problem Statement

Mary is managing a business and wants to analyze its profitability. She operates both a regular business model and a seasonal business model. To assess profitability, she uses a program that calculates and compares the profit margins for both models based on revenue and cost.

The program defines:

BusinessUtility class with a method calculateMargin(double revenue, double cost). SeasonalBusinessUtility (inherits from BusinessUtility) and overrides calculateMargin(double revenue, double cost), adding a seasonal adjustment of 10% to the base margin. ProfitabilityChecker class with a method checkProfitability(double regularMargin), which prints "Business is profitable." if the regular margin is 10% or more, otherwise prints "Business is not profitable.".

Mary inputs revenue and cost, and the program compute and display the regular and seasonal margins using:

$$\text{Margin} = ((\text{Revenue} - \text{Cost}) / \text{Revenue}) \times 100$$

$$\text{Seasonal Margin} = \text{Margin} + 10$$

**Input Format**

The first line of input consists of a double value  $r$ , representing the revenue.

The second line consists of a double value  $c$ , representing the cost.

### **Output Format**

The first line prints a double value, representing the regular profit margin, rounded to two decimal places, in the format: "Regular Margin: X. XX%", where X.XX denotes the calculated regular margin.

The second line prints a double value, representing the seasonal profit margin, rounded to two decimal places, in the format: "Seasonal Margin: X. XX%", where X.XX denotes the calculated seasonal margin.

The third line prints a string, indicating whether the business is profitable or not profitable, based on the regular margin.

If the regular margin is less than 10, print "Business is not profitable.". If it is 10 or greater, print "Business is profitable."

Refer to the sample output for the formatting specifications.

### **Sample Test Case**

Input: 1000.0  
800.0

Output: Regular Margin: 20.00%  
Seasonal Margin: 30.00%  
Business is profitable.

### **Answer**

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

```
class BusinessUtility {  
    public double calculateMargin(double revenue, double cost) {  
        double margin = ((revenue - cost) / revenue) * 100;  
        return margin;  
    }  
}
```

```

    }
    class SeasonalBusinessUtility extends BusinessUtility {
        public double calculateMargin(double revenue, double cost) {
            double baseMargin = super.calculateMargin(revenue, cost);
            double seasonalMargin = baseMargin + 10;
            return seasonalMargin;
        }
    }

    class ProfitabilityChecker {
        public void checkProfitability(double regularMargin) {
            if (regularMargin < 10) {
                System.out.println("Business is not profitable.");
            } else {
                System.out.println("Business is profitable.");
            }
        }
    }

    class Main {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            double revenue = scanner.nextDouble();
            double cost = scanner.nextDouble();
            BusinessUtility business = new BusinessUtility();
            SeasonalBusinessUtility seasonalBusiness = new
SeasonalBusinessUtility();
            double regularMargin = business.calculateMargin(revenue, cost);
            double seasonalMargin = seasonalBusiness.calculateMargin(revenue,
cost);

            System.out.printf("Regular Margin: %.2f%%\n", regularMargin);
            System.out.printf("Seasonal Margin: %.2f%%\n", seasonalMargin);

            ProfitabilityChecker checker = new ProfitabilityChecker();
            checker.checkProfitability(regularMargin);
            scanner.close();
        }
    }

```

**Status :** Correct

**Marks :** 10/10

#### 4. Problem Statement

A bank provides two types of deposit schemes: Fixed Deposits (FD) and Recurring Deposits (RD). Customers want to calculate the interest they can earn based on their selected scheme.

Develop a Java program using inheritance to compute the interest for FD and RD. The program should include:

A base class Account with attributes accountHolder and principalAmount, along with a method for interest calculation. A subclass FixedDeposit that calculates interest for FD. A subclass RecurringDeposit that calculates interest for RD.

Formulas Used:

Interest for FD:  $(\text{principal amount} * \text{duration in years} * \text{rate of interest}) / 100$

Interest for RD:  $(\text{maturity amount} * \text{duration in months} * \text{rate of interest}) / (12 * 100)$ , where maturity amount = monthly deposit \* duration in months.

#### ***Input Format***

The first line of input consists of the choice (1 for FD, 2 for RD).

If the choice is 1, the following lines consist of account holder (string), principal amount (double), duration in years (int), and rate of interest (double).

If the choice is 2, the following lines consist of account holder (string), monthly deposit (int), duration in months (int), and rate of interest (double).

#### ***Output Format***

The output prints the calculated interest with one decimal place in the following format.

For choice 1: "Interest for FD: <calculated interest >"

For choice 2: "Interest for FD: <calculated interest >"

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 1

Alice

50000.56

5

6.5

Output: Interest for FD: 16250.2

### **Answer**

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

```
class Account {
```

```
    String accountHolder;
```

```
    double principalAmount;
```

```
    public Account(String accountHolder, double principalAmount) {
```

```
        this.accountHolder = accountHolder;
```

```
        this.principalAmount = principalAmount;
```

```
    }
```

```
    double calculateInterest() {
```

```
        return 0;
```

```
    }
```

```
}
```

```
class FixedDeposit extends Account {
```

```
    int durationInYears;
```

```
    double rateOfInterest;
```

```
    public FixedDeposit(String accountHolder, double principalAmount, int  
durationInYears, double rateOfInterest) {
```

```
        super(accountHolder, principalAmount);
```

```
        this.durationInYears = durationInYears;
```

```
        this.rateOfInterest = rateOfInterest;
```

```
    }
```

```
    double calculateInterest() {
```

```
        return (principalAmount * durationInYears * rateOfInterest) / 100;
```

```

    }
}

class RecurringDeposit extends Account {
    int durationInMonths;
    double rateOfInterest;
    int monthlyDeposit;
    public RecurringDeposit(String accountHolder, int monthlyDeposit, int
durationInMonths, double rateOfInterest) {
        super(accountHolder, 0);
        this.monthlyDeposit = monthlyDeposit;
        this.durationInMonths = durationInMonths;
        this.rateOfInterest = rateOfInterest;
    }
    double calculateInterest() {
        double maturityAmount = monthlyDeposit * durationInMonths;
        return (maturityAmount * durationInMonths * rateOfInterest) / (12 * 100);
    }
}

```

```

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

        int choice = sc.nextInt();

        switch (choice) {
            case 1:
                sc.nextLine();
                String fdName = sc.nextLine();
                double fdPrincipal = sc.nextDouble();
                int fdDuration = sc.nextInt();
                double fdRate = sc.nextDouble();

                FixedDeposit fd = new FixedDeposit(fdName, fdPrincipal, fdDuration,
fdRate);
                System.out.printf("Interest for FD: %.1f", fd.calculateInterest());
                break;

            case 2:
                sc.nextLine();
                String rdName = sc.nextLine();
                int rdDeposit = sc.nextInt();

```

```
int rdDuration = sc.nextInt();
double rdRate = sc.nextDouble();

RecurringDeposit rd = new RecurringDeposit(rdName, rdDeposit,
rdDuration, rdRate);
System.out.printf("Interest for RD: %.1f", rd.calculateInterest());
break;

default:
    System.out.println("Invalid Choice");
}
}
}
```

**Status :** Correct

**Marks :** 10/10