

# Rajalakshmi Engineering College

Name: GOWTHAM KUMAR P.S  
Email: 240701826@rajalakshmi.edu.in  
Roll no: 240701826  
Phone: 9345582664  
Branch: REC  
Department: CSE - Section 8  
Batch: 2028  
Degree: B.E - CSE

Scan to verify results



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

### **REC\_2028\_OOPS using Java\_Week 7\_CY**

Attempt : 1  
Total Mark : 40  
Marks Obtained : 40

#### **Section 1 : Coding**

##### **1. Problem Statement**

A developer aims to create a budget management system using two interfaces, ExpenseRecorder for recording expenses and BudgetCalculator for calculating remaining budgets.

The ExpenseTracker class implements these interfaces, allowing users to input an initial budget and record expenses iteratively until entering 0.0 as a sentinel value.

The program then computes and displays the remaining budget or notifies of budget exceedance.

**Example**

**Input**

100.0

20.0 30.0 10.0 0.0

Output

Remaining budget: Rs. 40.00

### Explanation

The initial budget is 100.0. Expenses of 20.0, 30.0, and 10.0 are recorded.

Remaining budget is calculated ( $100.0 - 20.0 - 30.0 - 10.0 = 40.0$ ).

### ***Input Format***

The first line of input is the initial budget as a double-point number (double type).

The budget is a positive number.

The second line of input consists of individual expenses as double-point numbers. Each expense is separated by space.

To end the input, an expense of 0.0 is used.

### ***Output Format***

The output displays the remaining budget, formatted to two decimal places, in the following format:

If the remaining budget (double type) is non-negative, it prints "Remaining budget: Rs. [remainingBudget]".

If the remaining budget is negative, it prints "No remaining budget, You've exceeded your budget!".

Refer to the sample output for the formatting specifications.

### ***Sample Test Case***

Input: 100.0

20.0 30.0 10.0 0.0

Output: Remaining budget: Rs. 40.00

**Answer**

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

```
interface ExpenseRecorder {  
    void recordExpense(double expense);  
}
```

```
interface BudgetCalculator {  
    double calculateRemainingBudget();  
}
```

```
class ExpenseTracker implements ExpenseRecorder, BudgetCalculator {  
    private double budget;  
    private double totalExpenses = 0.0;
```

```
    public ExpenseTracker(double budget) {  
        this.budget = budget;  
    }
```

```
    @Override  
    public void recordExpense(double expense) {  
        if (expense != 0.0) {  
            totalExpenses += expense;  
        }  
    }
```

```
    @Override  
    public double calculateRemainingBudget() {  
        return budget - totalExpenses;  
    }  
}
```

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

```
double budget = scanner.nextDouble();

ExpenseTracker tracker = new ExpenseTracker(budget);

double expense;
do {
    expense = scanner.nextDouble();
    tracker.recordExpense(expense);
} while (expense != 0.0);

double remainingBudget = tracker.calculateRemainingBudget();
if (remainingBudget >= 0) {
    System.out.printf("Remaining budget: Rs. %.2f", remainingBudget);
} else {
    System.out.println("No remaining budget, You've exceeded your
budget!");
}
}
```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

Maria, an online store owner, is looking to implement a pricing system that calculates the final price of products after applying discounts. She needs a program that takes the original price of a product and the discount percentage as input and computes the final discounted price. The discount is applied as a percentage of the original price. Maria wants to ensure that the final price is formatted to display exactly two decimal places.

Implement this functionality using the PriceCalculator interface and the DiscountCalculator class.

### ***Input Format***

The first line of input consists of the original price (a double value).

The second line of input consists of a discount percentage (a double value).

## **Output Format**

The output displays the final price after the discount, adhering to the following format: "Final Price after discount: \$[final\_price]".

Here, [final\_price] should be replaced with the calculated final price, formatted as a currency value with two decimal places.

Refer to the sample output for the formatting specifications.

## **Sample Test Case**

Input: 100.0

10.0

Output: Final Price after discount: \$90.00

## **Answer**

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

```
interface PriceCalculator {  
    double calculatePrice(double originalPrice, double discountPercentage);  
}  
  
class DiscountCalculator implements PriceCalculator {  
    @Override  
    public double calculatePrice(double originalPrice, double discountPercentage)  
    {  
        double discountAmount = (originalPrice * discountPercentage) / 100.0;  
        return originalPrice - discountAmount;  
    }  
}
```

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

```

        double discount = scanner.nextDouble();
        PriceCalculator calculator = new DiscountCalculator();
        double finalPrice = calculator.calculatePrice(originalPrice, discount);
        System.out.printf("Final Price after discount: $%.2f%n", finalPrice); //
Formats output to 2 decimal places
    }
}

```

**Status : Correct**

**Marks : 10/10**

### 3. Problem Statement:

Sam is developing a geometry application and needs a class for trapezoid calculations. Create a "Trapezoid" class implementing a "ShapeInput" interface with a method to input trapezoid dimensions.

Also, implement a "ShapeCalculator" interface with methods to compute area and perimeter. In the "Main" class, instantiate Trapezoid, gather user input, and display the calculated area and perimeter with two decimal places.

#### Note

Area of Trapezoid =  $(1/2) * (base1 + base2) * height$

Perimeter of Trapezoid =  $base1 + base2 + side1 + side2$

#### *Input Format*

The first line of input is a double-point value representing base1 of the trapezoid.

The second line of input is a double-point value representing base2 of the trapezoid.

The third line of input is a double-point value representing the height of the trapezoid.

The fourth line of input is a double-point value representing side1 of the trapezoid.

The fifth line of input is a double-point value representing side2 of the trapezoid.

### ***Output Format***

The output displays the two lines of the calculated area (double type) and perimeter (double type) of the trapezoid, each rounded to two decimal places in the following format:

"Area of the Trapezoid: <<calculated area>>".

Perimeter of the Trapezoid: <<calculated perimeter>>".

Refer to the sample output for the formatting specifications.

### ***Sample Test Case***

Input: 1.0  
2.0  
1.0  
3.0  
1.0

Output: Area of the Trapezoid: 1.50

Perimeter of the Trapezoid: 7.00

### ***Answer***

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

```
interface ShapeInput {  
    void getInput();  
}
```

```
interface ShapeCalculator {  
    double calculateArea();  
    double calculatePerimeter();  
}
```

```
class Trapezoid implements ShapeInput, ShapeCalculator {  
    private double base1, base2, height, side1, side2;
```

```
@Override
public void getInput() {
    Scanner sc = new Scanner(System.in);
    if (sc.hasNextDouble()) base1 = sc.nextDouble();
    if (sc.hasNextDouble()) base2 = sc.nextDouble();
    if (sc.hasNextDouble()) height = sc.nextDouble();
    if (sc.hasNextDouble()) side1 = sc.nextDouble();
    if (sc.hasNextDouble()) side2 = sc.nextDouble();
    sc.close();
}

@Override
public double calculateArea() {
    return 0.5 * (base1 + base2) * height;
}

@Override
public double calculatePerimeter() {
    return base1 + base2 + side1 + side2;
}
}
```

```
public class Main {
    public static void main(String[] args) {
        Trapezoid trapezoid = new Trapezoid();
        trapezoid.getInput();

        double area = trapezoid.calculateArea();
        double perimeter = trapezoid.calculatePerimeter();

        System.out.println("Area of the Trapezoid: " + String.format("%.2f", area));
        System.out.println("Perimeter of the Trapezoid: " + String.format("%.2f",
perimeter));
    }
}
```

Status : Correct

Marks : 10/10

#### 4. Problem Statement:

Ray is developing a tax calculation program in Java. The program includes an interface named TaxCalculator with a method to calculate tax based on salary. The SimpleTaxCalculator class implements this interface and determines the tax to be paid based on the salary amount using progressive tax slabs.

Your task is to implement this system. The program first takes an integer T representing the number of test cases, followed by T salary values. For each salary, calculate the total tax to be paid based on the following progressive tax rules:

For the first 50,000 of salary, the tax rate is 5%. For the next 50,000 (i.e., from 50,001 to 1,00,000), the tax rate is 10%. For any amount above 1,00,000, the tax rate is 20%. (That is, only the amount above 1,00,000 is taxed at 20%).

#### Example

##### Input

3

78000

110000

23000

##### Output

5300

9500

1150

#### Explanation

For Salary Rs. 78,000

$$\text{Tax} = 0.1 * (78,000 - 50,000) + 0.05 * 50,000 = 5,300$$

For Salary Rs. 1,10,000

$$\text{Tax} = 0.2 * (110000 - 100000) + 0.1 * 50,000 + 0.05 * 50,000 = 9,500$$

For Salary Rs. 23,000

$$\text{Tax} = 0.05 * 23,000 = 1,150$$

### ***Input Format***

The first line of the input consists of an integer, T, representing the number of test cases.

The next T lines of the input consist of a single integer, representing the annual salary of an individual, separated by a line.

### ***Output Format***

The output displays the calculated tax as an integer for each test case, separated by a line.

Refer to the sample output for the formatting specifications.

### ***Sample Test Case***

Input: 2

100

300

Output: 5

15

### ***Answer***

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

```
interface TaxCalculator {  
    int calculateTax(double salary);  
}
```

```
class SimpleTaxCalculator implements TaxCalculator {  
    public int calculateTax(double salary) {  
        double tax = 0;
```

```
        if (salary <= 50000) {  
            tax = 0.05 * salary;  
        } else if (salary <= 100000) {  
            tax = 0.05 * 50000 + 0.10 * (salary - 50000);  
        } else {  
            tax = 0.05 * 50000 + 0.10 * 50000 + 0.20 * (salary - 100000);  
        }  
        return (int) tax;  
    }  
}
```

```
class Main {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
        int T = scanner.nextInt();  
  
        TaxCalculator taxCalculator = new SimpleTaxCalculator();  
  
        for (int i = 0; i < T; i++) {  
            int salary = scanner.nextInt();  
            int tax = taxCalculator.calculateTax(salary);  
            System.out.println(tax);  
        }  
        scanner.close();  
    }  
}
```

**Status :** Correct

**Marks :** 10/10