

# Rajalakshmi Engineering College

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Department: AI & ML - Section 1

Batch: 2028

Degree: B.E - AI & ML

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## 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

Alex and Bob are designing a control system for household appliances, and one of the appliances is a washing machine. You want to create a program to help them that models the washing machine as a motor and calculates its electricity consumption based on its capacity.

Define an interface named Motor with the following methods:

void run() double consume(double capacity)

Create a class called WashingMachine that implements the Motor interface.

In the WashingMachine class:

Implement the run() method to print "Washing machine is

running."Implement a consume() method to print "Washing machine is consuming electricity."Implement the consume(double capacity) method to calculate the electricity consumption (in kWh) of the washing machine based on its capacity. The formula for electricity consumption is (capacity \* 0.05).

### ***Input Format***

The input consists of a double value representing the capacity of the washing machine in kW.

### ***Output Format***

The first line of output prints "Washing machine is running."

The second line prints "Washing machine is consuming electricity."

The third line prints "Electricity consumption: X kWh" where X is a double value, rounded off to two decimal places, representing the electricity consumption.

Refer to the sample output for formatting specifications.

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

Input: 2.5

Output: Washing machine is running.

Washing machine is consuming electricity.

Electricity consumption: 0.13 kWh

### ***Answer***

```
import java.util.Scanner;  
  
interface Motor {  
    void run();  
    double consume(double capacity);  
}  
  
class WashingMachine implements Motor {  
  
    public void run() {  
        System.out.println("Washing machine is running.");  
    }  
}
```

```

public void consume() {
    System.out.println("Washing machine is consuming electricity.");
}

public double consume(double capacity) {
    double consumption = capacity * 0.05;
    return consumption;
}

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

        WashingMachine washingMachine = new WashingMachine();

        double capacity = scanner.nextDouble();

        washingMachine.run();
        washingMachine.consume();

        double consumption = washingMachine.consume(capacity);
        System.out.printf("Electricity consumption: %.2f kWh", consumption);

        scanner.close();
    }
}

```

**Status : Correct**

**Marks : 10/10**

## 2. Problem Statement:

Rathish is planning a road trip and needs a program to convert speeds between miles per hour (MPH) and kilometers per hour (KPH).

Create an interface, SpeedConverter, with a method convertSpeed(double mph). Implement the interface with MPHtoKPHConverter class, allowing Rathish to input MPH and receive the converted speed in KPH, rounded to two decimal points.

Formula: Speed in KPH = 1.60934 \* Speed in MPH.

### ***Input Format***

The input consists of a single double-point number representing the speed in miles per hour (MPH).

### ***Output Format***

The output displays the converted speed (double-point number) in kilometers per hour (KPH) rounded off to two decimal points in the following format:

"Speed in KPH: <>converted speed<>".

Refer to the sample output for the formatting specifications.

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

Input: 1.0

Output: Speed in KPH: 1.61

### ***Answer***

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

```
interface SpeedConverter {  
    double convertSpeed(double mph);  
}  
  
class MPHtoKPHConverter implements SpeedConverter {  
    public double convertSpeed(double mph) {  
        return mph * 1.60934;  
    }  
}  
  
class SpeedConversionApp {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        double speedInMPH = scanner.nextDouble();
```

```
        SpeedConverter converter = new MPHtoKPHConverter();

        double speedInKPH = converter.convertSpeed(speedInMPH);

        System.out.printf("Speed in KPH: %.2f\n", speedInKPH);

        scanner.close();
    }
}
```

**Status :** Correct

**Marks :** 10/10

### 3. 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(int salary);
}

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

        if (salary <= 50000) {
            tax = (int) (0.05 * salary);
        } else if (salary <= 100000) {
            tax = (int) (0.1 * (salary - 50000) + 0.05 * 50000);
        } else {
            tax = (int) (0.2 * (salary - 100000) + 0.1 * 50000 + 0.05 * 50000);
        }

        return 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

#### 4. Problem Statement

John is developing a car loan calculator and has structured his program using two interfaces, Principal and InterestRate, defining methods for principal and interest rate retrieval.

The Loan class implements these interfaces, taking principal and annual interest rates as parameters. User input is solicited for these values, and the program ensures their validity before performing calculations. If input values are invalid (less than or equal to zero), an error message is displayed.

Note: Total interest = principal \* interest rate \* years

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

The first line of input consists of a double value P, representing the principal.

The second line consists of a double value R, representing the annual interest rate.

The third line consists of an integer value N, representing the loan duration in years.

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

If the input values are valid, print "Total interest paid: Rs. " followed by a double value, representing the total interest paid, rounded off to two decimal places.

If the input values are invalid (negative or zero values for principal, annual interest rate, or loan duration), print "Invalid input values!".

Refer to the sample output for formatting specifications.

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

Input: 20000.00

0.05

5

Output: Total interest paid: Rs.5000.00

**Answer**

```
import java.util.Scanner;

interface Principal {
    double getPrincipal();
}

interface InterestRate {
    double getInterestRate();
}

class Loan implements Principal, InterestRate {
    private double principal;
    private double interestRate;

    public Loan(double p, double rate) {
        this.principal = p;
        this.interestRate = rate;
    }

    public double getPrincipal() {
        return principal;
    }

    public double getInterestRate() {
        return interestRate;
    }

    public double calculateTotalInterest(int years) {
        return principal * interestRate * years;
    }
}

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

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

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

int loanDuration = scanner.nextInt();

if (carPrice <= 0 || annualInterestRate <= 0 || loanDuration <= 0) {
    System.out.println("Invalid input values!");
    return;
}

Loan carLoan = new Loan(carPrice, annualInterestRate);
double totalInterest = carLoan.calculateTotalInterest(loanDuration);

System.out.printf("Total interest paid: Rs.%2f%n", totalInterest);
}
}
```

**Status :** Correct

**Marks :** 10/10