

Note:

- The assignment is designed to practice class, fields, and methods only.
- Create a separate project for each question.
- Do not use getter/setter methods or constructors for these assignments.
- Define two classes: one class to implement the logic and another class to test it.

1. Loan Amortization Calculator

Implement a system to calculate and display the monthly payments for a mortgage loan. The system should:

1. Accept the principal amount (loan amount), annual interest rate, and loan term (in years) from the user.
2. Calculate the monthly payment using the standard mortgage formula:
 - **Monthly Payment Calculation:**
 - $\text{monthlyPayment} = \text{principal} * (\text{monthlyInterestRate} * (1 + \text{monthlyInterestRate})^{\text{numberOfMonths}}) / ((1 + \text{monthlyInterestRate})^{\text{numberOfMonths}} - 1)$
 - Where $\text{monthlyInterestRate} = \text{annualInterestRate} / 12 / 100$ and $\text{numberOfMonths} = \text{loanTerm} * 12$
 - Note: Here ^ means power and to find it you can use `Math.pow()` method
3. Display the monthly payment and the total amount paid over the life of the loan, in Indian Rupees (₹).

Define class `LoanAmortizationCalculator` with methods `acceptRecord`, `calculateMonthlyPayment` & `printRecord` and test the functionality in main method.

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

```
public class MortgageCalculator {
```

```
    public static void main(String[] args) {
```

```
        Scanner scanner = new Scanner(System.in);
```

```
        System.out.print("Enter the principal amount (loan amount) in ₹: ");
```

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

```
        System.out.print("Enter the annual interest rate (in %): ");
```

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

```
System.out.print("Enter the loan term (in years): ");
```

```
int loanTerm = scanner.nextInt();
```

```
double monthlyInterestRate = annualInterestRate / 12 / 100;
```

```
int numberOfMonths = loanTerm * 12;
```

```
double monthlyPayment = principal * (monthlyInterestRate * Math.pow(1 +  
monthlyInterestRate, numberOfMonths)) / (Math.pow(1 + monthlyInterestRate,  
numberOfMonths) - 1);
```

```
double totalAmountPaid = monthlyPayment * numberOfMonths;
```

```
System.out.printf("Monthly payment: ₹%.2f\n", monthlyPayment);
```

```
System.out.printf("Total amount paid over the life of the loan: ₹%.2f\n",  
totalAmountPaid);
```

```
}
```

```
}
```

2. Compound Interest Calculator for Investment

Develop a system to compute the future value of an investment with compound interest. The system should:

1. Accept the initial investment amount, annual interest rate, number of times the interest is compounded per year, and investment duration (in years) from the user.
2. Calculate the future value of the investment using the formula:
 - **Future Value Calculation:**
 - $$\text{futureValue} = \text{principal} * (1 + \text{annualInterestRate} / \text{numberOfCompounds})^{(\text{numberOfCompounds} * \text{years})}$$
 - **Total Interest Earned:**
$$\text{totalInterest} = \text{futureValue} - \text{principal}$$
3. Display the future value and the total interest earned, in Indian Rupees (₹).

ASSIGNMENT NO.3

Define class CompoundInterestCalculator with methods acceptRecord , calculateFutureValue, printRecord and test the functionality in main method.

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

```
public class CompoundInterestCalculator {
```

```
    private double principal;
```

```
    private double annualInterestRate;
```

```
    private int numberOfCompounds;
```

```
    private int years;
```

```
    private double futureValue;
```

```
    public void acceptRecord() {
```

```
        Scanner scanner = new Scanner(System.in);
```

```
        System.out.print("Enter the initial investment amount (principal) in ₹: ");
```

```
        principal = scanner.nextDouble();
```

```
        System.out.print("Enter the annual interest rate (in %): ");
```

```
        annualInterestRate = scanner.nextDouble() / 100;
```

```
        System.out.print("Enter the number of times the interest is compounded per year: ");
```

```
        numberOfCompounds = scanner.nextInt();
```

```
System.out.print("Enter the investment duration (in years): ");
```

```
years = scanner.nextInt();
```

```
}
```

```
public void calculateFutureValue() {
```

```
    futureValue = principal * Math.pow((1 + annualInterestRate /  
numberOfCompounds), (numberOfCompounds * years));
```

```
}
```

```
public void printRecord() {
```

```
    double totalInterest = futureValue - principal;
```

```
    System.out.printf("Future value of the investment: ₹%.2f%n",  
futureValue);
```

```
    System.out.printf("Total interest earned: ₹%.2f%n", totalInterest);
```

```
}
```

```
public static void main(String[] args) {
```

```
    CompoundInterestCalculator calculator = new  
CompoundInterestCalculator();
```

```
    calculator.acceptRecord();
```

```
    calculator.calculateFutureValue();
```

```
    calculator.printRecord();
```

```
}
```

```
}
```

3. BMI (Body Mass Index) Tracker

Create a system to calculate and classify Body Mass Index (BMI). The system should:

1. Accept weight (in kilograms) and height (in meters) from the user.
2. Calculate the BMI using the formula:
 - **BMI Calculation:** $BMI = \text{weight} / (\text{height} * \text{height})$
3. Classify the BMI into one of the following categories:
 - Underweight: $BMI < 18.5$
 - Normal weight: $18.5 \leq BMI < 24.9$
 - Overweight: $25 \leq BMI < 29.9$
 - Obese: $BMI \geq 30$
4. Display the BMI value and its classification.

Define class BMITracker with methods acceptRecord, calculateBMI, classifyBMI & printRecord and test the functionality in main method.

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

```
public class BMITracker {
    private double weight;
    private double height;
    private double bmi;
    private String classification;
```

```
    public void acceptRecord() {
        Scanner scanner = new Scanner(System.in);
```

```
        System.out.print("Enter your weight (in kilograms): ");
        weight = scanner.nextDouble();
```

```
        System.out.print("Enter your height (in meters): ");
        height = scanner.nextDouble();
    }
```

```
    public void calculateBMI() {
        bmi = weight / (height * height);
    }
```

```
    public void classifyBMI() {
        if (bmi < 18.5) {
            classification = "Underweight";
```

```

    } else if (bmi < 24.9) {
        classification = "Normal weight";
    } else if (bmi < 29.9) {
        classification = "Overweight";
    } else {
        classification = "Obese";
    }
}

public void printRecord() {
    System.out.printf("Your BMI is: %.2f%n", bmi);
    System.out.println("Your BMI classification is: " + classification);
}

public static void main(String[] args) {
    BMITracker tracker = new BMITracker();

    tracker.acceptRecord();
    tracker.calculateBMI();
    tracker.classifyBMI();
    tracker.printRecord();
}
}

```

4. Discount Calculation for Retail Sales

Design a system to calculate the final price of an item after applying a discount. The system should:

1. Accept the original price of an item and the discount percentage from the user.
2. Calculate the discount amount and the final price using the following formulas:
 - **Discount Amount Calculation:** `discountAmount = originalPrice * (discountRate / 100)`
 - **Final Price Calculation:** `finalPrice = originalPrice - discountAmount`
3. Display the discount amount and the final price of the item, in Indian Rupees (₹).

Define class DiscountCalculator with methods acceptRecord, calculateDiscount & printRecord and test the functionality in main method.

```

import java.util.Scanner;

public class DiscountCalculator {
    private double originalPrice;
    private double discountRate;

```

```

private double discountAmount;
private double finalPrice;

public void acceptRecord() {
    Scanner scanner = new Scanner(System.in);

    System.out.print("Enter the original price of the item in ₹: ");
    originalPrice = scanner.nextDouble();

    System.out.print("Enter the discount percentage (%): ");
    discountRate = scanner.nextDouble();
}

public void calculateDiscount() {
    discountAmount = originalPrice * (discountRate / 100);
    finalPrice = originalPrice - discountAmount;
}

public void printRecord() {
    System.out.printf("Discount amount: ₹%.2f\n", discountAmount);
    System.out.printf("Final price of the item: ₹%.2f\n", finalPrice);
}

public static void main(String[] args) {
    DiscountCalculator calculator = new DiscountCalculator();

    calculator.acceptRecord();
    calculator.calculateDiscount();
    calculator.printRecord();
}

```

5. Toll Booth Revenue Management

Develop a system to simulate a toll booth for collecting revenue. The system should:

1. Allow the user to set toll rates for different vehicle types: Car, Truck, and Motorcycle.
2. Accept the number of vehicles of each type passing through the toll booth.
3. Calculate the total revenue based on the toll rates and number of vehicles.
4. Display the total number of vehicles and the total revenue collected, in Indian Rupees (₹).

- **Toll Rate Examples:**

- Car: ₹50.00
- Truck: ₹100.00
- Motorcycle: ₹30.00

ASSIGNMENT NO.3

Define class TollBoothRevenueManager with methods acceptRecord, setTollRates, calculateRevenue & printRecord and test the functionality in main method.

```
import java.util.Scanner;

public class TollBoothRevenueManager {
    private double carTollRate;
    private double truckTollRate;
    private double motorcycleTollRate;
    private int numCars;
    private int numTrucks;
    private int numMotorcycles;
    private double totalRevenue;

    public void setTollRates() {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the toll rate for Car (in ₹): ");
        carTollRate = scanner.nextDouble();

        System.out.print("Enter the toll rate for Truck (in ₹): ");
        truckTollRate = scanner.nextDouble();

        System.out.print("Enter the toll rate for Motorcycle (in ₹): ");
        motorcycleTollRate = scanner.nextDouble();
    }

    public void acceptRecord() {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the number of Cars: ");
        numCars = scanner.nextInt();

        System.out.print("Enter the number of Trucks: ");
        numTrucks = scanner.nextInt();

        System.out.print("Enter the number of Motorcycles: ");
        numMotorcycles = scanner.nextInt();
    }

    public void calculateRevenue() {
        totalRevenue = (numCars * carTollRate) + (numTrucks * truckTollRate) +
            (numMotorcycles * motorcycleTollRate);
    }

    public void printRecord() {
```


ASSIGNMENT NO.3

```
int totalVehicles = numCars + numTrucks + numMotorcycles;
System.out.println("Total number of vehicles: " + totalVehicles);
System.out.printf("Total revenue collected: ₹%.2f%n", totalRevenue);
}

public static void main(String[] args) {
    TollBoothRevenueManager manager = new TollBoothRevenueManager();

    manager.setTollRates();
    manager.acceptRecord();
    manager.calculateRevenue();
    manager.printRecord();
}
}
```