**CDAC MUMBAI**

**MODULE 2 OOPJ**

**ASSIGNMENT 3 ANSWER**

**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:**
     + monthlyPayment = principal \* (monthlyInterestRate \* (1 + monthlyInterestRate)^(numberOfMonths)) / ((1 + monthlyInterestRate)^(numberOfMonths) - 1)
     + Where monthlyInterestRate = annualInterestRate / 12 / 100 and numberOfMonths = 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.

**PROGRAM :**

package org.example;

import java.util.Scanner;

import java.math.\*;

//CLASS LoanAmortizationCalculator

class LoanAmortizationCalculator {

// FIELDS OF CLASS NON STATIC FILED

double Principle;

double AnnIntrestRate;

double LoanYear;

double monthlyPayment;

double totalPayment;

// METHOD DEFINATION

void acceptRecord() {

Scanner sc = new Scanner(System.in);

System.out.print("Enter Principle Amount :");

this.Principle = sc.nextDouble();

System.out.print("Enter Annual Interest Rate :");

this.AnnIntrestRate = sc.nextDouble();

System.out.print("Enter Loan Year :");

this.LoanYear = sc.nextDouble();

}

void calculateMonthlyPayment() {

double monthlyInterestRate = AnnIntrestRate / (12 \* 100);

double numberOfMonths = LoanYear \* 12;

monthlyPayment = (Principle \* ((monthlyInterestRate \* (Math.pow(1 + monthlyInterestRate, numberOfMonths)))/ ((Math.pow(1 + monthlyInterestRate, numberOfMonths) - 1))));

totalPayment = (monthlyPayment \* numberOfMonths);

}

void printRecord() {

System.out.printf("Monthly Payment : %.2f", this.monthlyPayment);

System.out.printf("\nTotal Payment : %.2f", this.totalPayment);

;

}

}

public class LoanAmortization {

public static void main(String[] args) {

LoanAmortizationCalculator lac = new LoanAmortizationCalculator(); // INSTANTIATION

lac.acceptRecord(); // CALL METHOD BY CLASS...MESSAGE PASSING

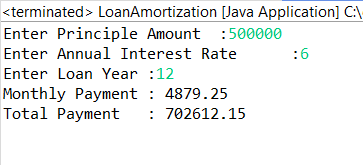
lac.calculateMonthlyPayment();

lac.printRecord();

}

}

OUTPUT:



**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:**
     + futureValue = principal \* (1 + annualInterestRate / numberOfCompounds)^(numberOfCompounds \* years)
   * **Total Interest Earned:** totalInterest = futureValue - principal
3. Display the future value and the total interest earned, in Indian Rupees (₹).

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

**Program:**

**package** org.example;

**import** java.util.Scanner;

**import** java.math.\*;

**class** CompoundInterestCalculator {

/\*

\* 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.

\*/

**private** **double** principal;

**private** **double** annualInterestRate;

**private** **int** numberOfCompounds;

**private** **int** years;

**private** **double** totalInterest;

**private** **double** futureValue;

// acceptRecord , calculateFutureValue, printRecord

**public** **void** acceptRecord() {

Scanner sc = **new** Scanner(System.***in***);

System.***out***.print("Enter Initial investment amount : ");

**this**.principal = sc.nextDouble();

System.***out***.print("Enter Annual Interest Rate : ");

**this**.annualInterestRate = sc.nextDouble() / 100;

System.***out***.print("Enter Number of Compounds : ");

**this**.numberOfCompounds = sc.nextInt();

System.***out***.print("Enter Investment Duration :");

**this**.years = sc.nextInt();

}

**public** **void** calculateFutureValue() {

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

totalInterest = (futureValue - principal);

}

**public** **void** printRecord() {

// 3. Display the future value and the total interest earned, in Indian Rupees

// (₹).

System.***out***.printf("Future Value :%.2f ", **this**.futureValue);

System.***out***.printf("\n Future totalInterest : %.2f ", **this**.totalInterest);

}

}

**public** **class** CompoundIntrest {

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

CompoundInterestCalculator CIC = **new** CompoundInterestCalculator();

CIC.acceptRecord();

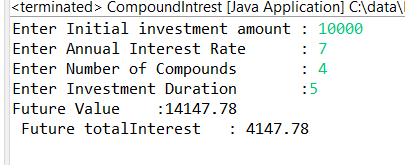
CIC.calculateFutureValue();

CIC.printRecord();

}

}

**Output:**



**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 = weight / (height \* height)
3. Classify the BMI into one of the following categories:
   * Underweight: BMI < 18.5
   * Normal weight: 18.5 ≤ BMI < 24.9
   * Overweight: 25 ≤ BMI < 29.9
   * Obese: BMI ≥ 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.

**Program:**

**package** org.example;

**import** java.util.Scanner;

**class** BMITracker {

**float** Height;

**float** Weight;

**float** BMIIndex;

// acceptRecord, calculateBMI, classifyBMI & printRecord

**void** acceptRecord() {

Scanner sc = **new** Scanner(System.***in***);

System.***out***.print("Enter your Weight (in KG) :");

**this**.Weight = sc.nextFloat();

System.***out***.print("Enter your Height (in Meter) :");

**this**.Height = sc.nextFloat();

}

**void** calculateBMI() {

BMIIndex = Weight / (Height \* Height);

}

**void** classifyBMI() {

**if** (BMIIndex < 18.5) {

System.***out***.println("UnderWeight");

} **else** **if** (BMIIndex >= 18.5 && BMIIndex < 25) {

System.***out***.println("Normal Weight");

} **else** **if** (BMIIndex >= 25 && BMIIndex < 30) {

System.***out***.println("o Overweight");

} **else** **if** (BMIIndex >= 30) {

System.***out***.println("Obese");

}

}

**void** printRecord() {

System.***out***.printf("BMI Index is : %.2f", **this**.BMIIndex);

System.***out***.println();

}

}

**public** **class** BMI {

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

BMITracker bmi = **new** BMITracker();

bmi.acceptRecord();

bmi.calculateBMI();

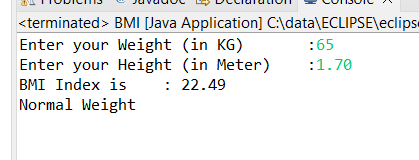
bmi.printRecord();

bmi.classifyBMI();

}

}

Output:

****

**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.

**Program:**

**package** org.example;

**import** java.util.Scanner;

**class** DiscountCalculator {

**float** Price;

**float** DisPercentage;

**float** discountAmount;

**float** finalPrice;

//acceptRecord, calculateDiscount & printRecord

**void** acceptRecord() {

Scanner sc= **new** Scanner(System.***in***);

System.***out***.print("Enter Price of Product :");

**this**.Price=sc.nextFloat();

System.***out***.print("Enter Discount Percentage :");

**this**.DisPercentage=sc.nextFloat();

}

**void** calculateDiscount() {

/\* Discount Amount Calculation: discountAmount = originalPrice \* (discountRate / 100)

Final Price Calculation: finalPrice = originalPrice - discountAmount \*/

discountAmount = Price \* (DisPercentage / 100);

finalPrice = Price - discountAmount;

}

**void** printRecord() {

System.***out***.printf("Discount Amount is : %.2f",**this**.discountAmount);

System.***out***.printf("\nFinal Price of Product :%.2f",**this**.finalPrice);

}

}

**public** **class** DiscountCalculation {

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

DiscountCalculator dc=**new** DiscountCalculator();

dc.acceptRecord();

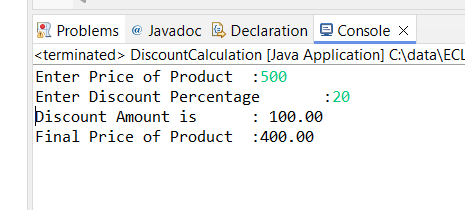
dc.calculateDiscount();

dc.printRecord();

}

}

**Output:**



**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

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

**Program:**

**package** org.example;

**import** java.util.Scanner;

**class** TollBoothRevenueManager {

Scanner sc = **new** Scanner(System.***in***);

**private** **float** carRate;

**private** **float** truckRate;

**private** **float** mCycleRate;

**private** **int** carCount;

**private** **int** truckCount;

**private** **int** mCycleCount;

// acceptRecord, setTollRates, calculateRevenue & printRecord

**public** **void** acceptRecord() {

System.***out***.print("Enter Car Count :");

**this**.carCount = sc.nextInt();

System.***out***.print("Enter Truck Count :");

**this**.truckCount = sc.nextInt();

System.***out***.print("Enter MotorCycle Count :");

**this**.mCycleCount = sc.nextInt();

}

**public** **void** setTollRates() {

System.***out***.print("Enter Car Rate :");

**this**.carRate = sc.nextFloat();

System.***out***.print("Enter Truck Rate :");

**this**.truckRate = sc.nextFloat();

System.***out***.print("Enter MotorCycle Rate :");

**this**.mCycleRate = sc.nextFloat();

}

**public** **float** calculateRevenue() {

**float** totalRevenue = ((carCount \* carRate) + (truckCount \* truckRate) + (mCycleCount \* mCycleRate));

**return** totalRevenue;

}

**public** **void** printRecord() {

System.***out***.println("Total Count of Vehicle :" + (carCount + truckCount + mCycleCount));

**float** totalRevenue = calculateRevenue();

System.***out***.println("Total Revenue :" + totalRevenue);

}

}

**public** **class** TollRate {

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

TollBoothRevenueManager tbm = **new** TollBoothRevenueManager();

tbm.setTollRates();

tbm.acceptRecord();

tbm.printRecord();

}

}

**Output:**

