**Method overriding and overloading**

1. Create a Java class named Calculator with two methods:  
i) multiply method that takes two integers and returns their product.

ii) multiply method overload that takes three doubles and returns their product.

Write a simple program to demonstrate the use of method overloading by calling both versions of the multiply method and printing the results.

**CODE:**

import java.util.Scanner;

public class Calculator {

public int multiply(int num1, int num2) {

return num1 \* num2;

}

public double multiply(double num1, double num2, double num3) {

return num1 \* num2 \* num3;

}

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

Calculator calculator = new Calculator();

System.out.print("Enter the first integer: ");

int int1 = scanner.nextInt();

System.out.print("Enter the second integer: ");

int int2 = scanner.nextInt();

int result1 = calculator.multiply(int1, int2);

System.out.println("Result of multiplying two integers: " + result1);

System.out.print("Enter the first double: ");

double double1 = scanner.nextDouble();

System.out.print("Enter the second double: ");

double double2 = scanner.nextDouble();

System.out.print("Enter the third double: ");

double double3 = scanner.nextDouble();

double result2 = calculator.multiply(double1, double2, double3);

System.out.println("Result of multiplying three doubles: " + result2);

scanner.close();

}

}

2.  Create a class hierarchy representing different types of employees in a company. Design a base class**Employee** with fields for the employee's name, employee ID, and a method named calculateSalary() that returns the basic salary. Implement two subclasses: **Manager and Developer.**

Manager class should have an additional field for the bonus percentage. Developer class should have an additional field for the programming language.

Override the calculateSalary() method in both the Manager and Developer classes to include the bonus for managers and an extra allowance for developers. The basic salary for all employees is $50,000.

Write a program to create instances of managers and developers, call the calculateSalary method on each, and print the details.

**CODE:**

import java.util.Scanner;

class Employee {

private String name;

private int employeeID;

private static final int BASIC\_SALARY = 50000;

public Employee(String name, int employeeID) {

this.name = name;

this.employeeID = employeeID;

}

public String getName() {

return name;

}

public int getEmployeeID() {

return employeeID;

}

public int calculateSalary() {

return BASIC\_SALARY;

}

}

class Manager extends Employee {

private double bonusPercentage;

public Manager(String name, int employeeID, double bonusPercentage) {

super(name, employeeID);

this.bonusPercentage = bonusPercentage;

}

public int calculateSalary() {

int basicSalary = super.calculateSalary();

int bonus = (int) (basicSalary \* (bonusPercentage / 100));

return basicSalary + bonus;

}

}

class Developer extends Employee {

private String programmingLanguage;

public Developer(String name, int employeeID, String programmingLanguage) {

super(name, employeeID);

this.programmingLanguage = programmingLanguage;

}

public int calculateSalary() {

int basicSalary = super.calculateSalary();

int allowance = 2000; // Example allowance for developers

return basicSalary + allowance;

}

}

public class CompanyApp {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.println("Enter Manager details:");

System.out.print("Name: ");

String managerName = scanner.nextLine();

System.out.print("Employee ID: ");

int managerEmployeeID = scanner.nextInt();

System.out.print("Bonus Percentage: ");

double managerBonusPercentage = scanner.nextDouble();

Manager manager = new Manager(managerName, managerEmployeeID, managerBonusPercentage);

System.out.println("\nEnter Developer details:");

System.out.println("Name: ");

String developerName = scanner.nextLine();

System.out.println("Employee ID: ");

int developerEmployeeID = scanner.nextInt();

System.out.println("Programming Language: ");

String programmingLanguage = scanner.nextLine();

Developer developer = new Developer(developerName, developerEmployeeID, programmingLanguage);

scanner.close();

System.out.println("\nManager Details:");

System.out.println("Name: " + manager.getName());

System.out.println("Employee ID: " + manager.getEmployeeID());

System.out.println("Calculated Salary: $" + manager.calculateSalary());

System.out.println("\nDeveloper Details:");

System.out.println("Name: " + developer.getName());

System.out.println("Employee ID: " + developer.getEmployeeID());

System.out.println("Calculated Salary: $" + developer.calculateSalary());

}

}

3. Implement a class hierarchy with a base class**Vehicle**and two derived classes **Car and Motorcycle**.

The Vehicle class should have a method named calculateSpeed() that returns the speed of the vehicle. Override it in other two classes, where**the speed is calculated as the product of the vehicle's speed and the number of passengers or wheels.**

Note:

a) Car class should have an additional field for the number of passengers.

b) Motorcycle class should have an additional field for the number of wheels.

Write a program to create instances of car and motorcycle, call the calculateSpeed method on each, and determine the vehicle with the highest effective speed.

**CODE:**

import java.util.Scanner;

class Vehicle {

private double speed;

public Vehicle(double speed) {

this.speed = speed;

}

public double calculateSpeed() {

return speed;

}

}

class Car extends Vehicle {

private int numPassengers;

public Car(double speed, int numPassengers) {

super(speed);

this.numPassengers = numPassengers;

}

public double calculateSpeed() {

return super.calculateSpeed() \* numPassengers;

}

}

class Motorcycle extends Vehicle {

private int numWheels;

public Motorcycle(double speed, int numWheels) {

super(speed);

this.numWheels = numWheels;

}

public double calculateSpeed() {

return super.calculateSpeed() \* numWheels;

}

}

public class Speed {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter speed for Car: ");

double carSpeed = scanner.nextDouble();

System.out.print("Enter number of passengers for Car: ");

int numPassengers = scanner.nextInt();

System.out.print("Enter speed for Motorcycle: ");

double motorcycleSpeed = scanner.nextDouble();

System.out.print("Enter number of Passengers for Motorcycle: ");

int numWheels = scanner.nextInt();

Car car = new Car(carSpeed, numPassengers);

Motorcycle motorcycle = new Motorcycle(motorcycleSpeed, numWheels);

double carEffectiveSpeed = car.calculateSpeed();

double motorcycleEffectiveSpeed = motorcycle.calculateSpeed();

System.out.println("Car speed: " + carEffectiveSpeed);

System.out.println("Motorcycle speed: " + motorcycleEffectiveSpeed);

if (carEffectiveSpeed > motorcycleEffectiveSpeed) {

System.out.println("Car has the highest effective speed.");

} else if (motorcycleEffectiveSpeed > carEffectiveSpeed) {

System.out.println("Motorcycle has the highest effective speed.");

} else {

System.out.println("Both have the same effective speed.");

}

scanner.close();

}

}