

# Rajalakshmi Engineering College

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

### 2028\_REC\_OOPS using Java\_Week 6\_Q1

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

Elsa subscribes to a premium service with a base monthly cost, a service tax and an extra feature cost. Assist her in writing an inheritance program that takes input for these values and calculates the total monthly cost.

Refer to the below class diagram:

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

The first line of input consists of a double value, representing the base monthly cost.

The second line consists of a double value, representing the service tax.

The third line consists of a double value, representing the extra feature cost.

### ***Output Format***

The output prints "Rs. X" where X is a double value, rounded off to two decimal places.

Refer to the sample output for formatting specifications.

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

Input: 10.0

2.5

5.0

Output: Rs. 17.50

### ***Answer***

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

```
// You are using Java
```

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

```
class Subscription {  
    protected double baseMonthlyCost;  
  
    public Subscription(double baseMonthlyCost) {  
        this.baseMonthlyCost = baseMonthlyCost;  
    }  
  
    public double getBaseMonthlyCost() {  
        return baseMonthlyCost;  
    }  
}
```

```
class PremiumSubscription extends Subscription {  
    private double serviceTax;  
    private double extraFeatureCost;  
  
    public PremiumSubscription(double baseMonthlyCost, double serviceTax,  
double extraFeatureCost) {  
        super(baseMonthlyCost);  
        this.serviceTax = serviceTax;  
        this.extraFeatureCost = extraFeatureCost;  
    }  
}
```

```
    public double calculateMonthlyCost() {  
        return baseMonthlyCost + serviceTax + extraFeatureCost;  
    }  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        double baseMonthlyCost = scanner.nextDouble();  
        double serviceTax = scanner.nextDouble();  
        double extraFeatureCost = scanner.nextDouble();  
  
        PremiumSubscription premiumSubscription = new  
PremiumSubscription(baseMonthlyCost, serviceTax, extraFeatureCost);  
  
        double totalMonthlyCost = premiumSubscription.calculateMonthlyCost();  
  
        System.out.printf("Rs. %.2f%n", totalMonthlyCost);  
  
        scanner.close();  
    }  
}
```

**Status :** Correct

**Marks :** 10/10

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

### 2028\_REC\_OOPS using Java\_Week 6\_Q2

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

Alice is managing an online store and wants to implement a program using inheritance to calculate the selling price of products after applying discounts.

Guide her by following the instructions:

Create a base class called Product with a public double attribute price. Create a subclass called DiscountedProduct, which extends Product and includes a private double attribute discount rate. This subclass has a method called calculateSellingPrice() to determine the final selling price after applying the discount.

Formula: Discounted selling price = price \* (1 - discount rate)

***Input Format***

The first line of input consists of a double value p, the initial price of the product.

The second line consists of a double value d, the discount rate.

### ***Output Format***

The output prints "Rs. X", where X is a double value, representing the calculated discounted selling price, rounded off to two decimal places.

If the discount rate is greater than 1, print "Not applicable".

Refer to the sample output for formatting specifications.

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

Input: 50.00

0.20

Output: Rs. 40.00

### ***Answer***

```
import java.util.Scanner;

// You are using Java
import java.util.Scanner;
class Product {
    public double price;

    public Product(double price) {
        this.price = price;
    }
}
class DiscountedProduct extends Product {
    private double discountRate;

    public DiscountedProduct(double price, double discountRate) {
        super(price);
        this.discountRate = discountRate;
    }
    public double calculateSellingPrice() {
        if (discountRate > 1.0) {
            return -1; // Indicates "Not applicable"
```

```

    }
    return price * (1 - discountRate);
}
}
class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        double initialPrice = scanner.nextDouble();
        double discountRate = scanner.nextDouble();

        DiscountedProduct discountedProduct = new
DiscountedProduct(initialPrice, discountRate);
        double sellingPrice = discountedProduct.calculateSellingPrice();

        if (sellingPrice >= 0) {
            System.out.printf("Rs. %.2f%n", sellingPrice);
        } else {
            System.out.println("Not applicable");
        }
        scanner.close();
    }
}

```

```

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

        double initialPrice = scanner.nextDouble();
        double discountRate = scanner.nextDouble();
        DiscountedProduct discountedProduct = new
DiscountedProduct(initialPrice, discountRate);
        double sellingPrice = discountedProduct.calculateSellingPrice();

        if (sellingPrice >= 0) {
            System.out.printf("Rs. %.2f%n", sellingPrice);
        } else {
            System.out.println("Not applicable");
        }
        scanner.close();
    }
}

```

**Status :** Correct

**Marks :** 10/10

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

### 2028\_REC\_OOPS using Java\_Week 6\_Q3

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

Preethi is working on a project to automate sales tax calculations for items in a store. She wants to create a program that takes the price of an item and the sales tax rate as input and calculates the final price of the item after applying the sales tax.

Write a program using the class SalesTaxCalculator, which contains an overloaded method named calculateFinalPrice to handle both integer and double inputs. The program should also include a Main class that takes user input, calls the appropriate method from SalesTaxCalculator, and prints the final price of the item.

Formula Used: Final price = price + ((price \* sales tax rate) / 100)

***Input Format***



The first line of input consists of an integer price (the price of the item for integer inputs).

The second line of input consists of an integer taxRate (the sales tax rate for integer inputs).

The third line of input consists of a double price (the price of the item for double inputs).

The fourth line of input consists of a double taxRate (the sales tax rate for double inputs).

### ***Output Format***

The first line of output prints an integer, representing the final price of the item after applying the sales tax for integer inputs (a and b).

The second line prints a double value, representing the final price of the item after applying the sales tax for double-value inputs (m and n), rounded to two decimal places.

Refer to the sample output for formatting specifications.

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

Input: 100

10

100.0

5.0

Output: 110

105.00

### ***Answer***

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

```
// You are using Java
```

```
class SalesTaxCalculator {
```

```
    // Overloaded method for integer inputs
```

```
    public static int calculateFinalPrice(int price, int taxRate) {  
        return price + (price * taxRate / 100);  
    }
```

```

    }

    // Overloaded method for double inputs
    public static double calculateFinalPrice(double price, double taxRate) {
        return price + ((price * taxRate) / 100);
    }
}

class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int intPrice = scanner.nextInt();
        int intTaxRate = scanner.nextInt();
        double doublePrice = scanner.nextDouble();
        double doubleTaxRate = scanner.nextDouble();

        int finalPriceInt = SalesTaxCalculator.calculateFinalPrice(intPrice,
intTaxRate);
        double finalPriceDouble =
SalesTaxCalculator.calculateFinalPrice(doublePrice, doubleTaxRate);

        System.out.println(finalPriceInt);
        System.out.format("%.2f", finalPriceDouble);
    }
}

```

**Status :** Correct

**Marks :** 10/10

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

### 2028\_REC\_OOPS using Java\_Week 6\_Q4

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

Mr.Kapoor wants to create a program to calculate the volume of a Cuboid and a Cube using method overriding.

Implements a base class Cuboid with attributes for length, width, and height. Include a method calculateVolume() that computes the volume of the cuboid.

Extends the base class with a subclass Cube representing a cube, where all sides are equal. Override the calculateVolume() method in the Cube class to compute the volume of the cube.

The program should take user input for the dimensions of the cuboid and the side length of the cube and display the calculated volumes with two decimal places.

### ***Input Format***

The first line of input consists of 3 space-separated double values, representing the cuboid length, width, and height, respectively.

The second line consists of a double value, representing the side length of the cube.

### ***Output Format***

The first line of output prints the volume of the cuboid, rounded off to two decimal places.

The second line prints the volume of the cube, rounded off to two decimal places.

Refer to the sample output for formatting specifications.

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

Input: 60.0 60.0 60.0  
50.0

Output: Volume of Cuboid: 216000.00  
Volume of Cube: 125000.00

### ***Answer***

```
import java.util.Scanner;

// You are using Java
class Cuboid {
    protected double length;
    protected double width;
    protected double height;

    public Cuboid(double length, double width, double height) {
        this.length = length;
        this.width = width;
        this.height = height;
    }

    public double calculateVolume() {
```

```

        return length * width * height;
    }
}
class Cube extends Cuboid {

    public Cube(double side) {
        super(side, side, side); // All sides are equal in a cube
    }
    @Override
    public double calculateVolume() {
        return length * length * length; // Cube volume = side³
    }
}

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

        double cuboidLength = scanner.nextDouble();
        double cuboidWidth = scanner.nextDouble();
        double cuboidHeight = scanner.nextDouble();

        // Regular object instantiation for Cuboid
        Cuboid cuboid = new Cuboid(cuboidLength, cuboidWidth, cuboidHeight);
        System.out.printf("Volume of Cuboid: %.2f\n", cuboid.calculateVolume());

        double cubeSide = scanner.nextDouble();

        // Upcasting - Using superclass reference for subclass object (DMD)
        Cuboid cube = new Cube(cubeSide); // Upcasting
        System.out.printf("Volume of Cube: %.2f", cube.calculateVolume()); // Calls
        Cube's method dynamically

        scanner.close();
    }
}

```

**Status :** Correct

**Marks :** 10/10

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

### 2028\_REC\_OOPS using Java\_Week 6\_Q5

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem statement:

Tim was tasked with developing a grocery shopping app. You have a class hierarchy that includes Item, Produce, and OrganicProduce. Your goal is to calculate the total cost of a shopping list, which may contain a mix of regular produce and organic produce items. Additionally, you need to apply discounts to organic items. Apply a 10% discount on organic produce items

Class Hierarchy:

Item: Base class for all items.

Produce: Subclass of Item for regular produce items.

OrganicProduce: Subclass of Produce for organic produce items.

### ***Input Format***

The first line of input consists of an integer, 'n'.

For each 'n' item, the user will provide:

- A string 'type' representing the item type ('Regular' or 'Organic').
- A string 'name' represents the item name.
- A double 'price' represents the item price.

### ***Output Format***

The output will display the total cost of the shopping list, including discounts on organic items.

Refer to the sample output for format specifications.

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

Input: 1

Regular Banana 1.99

Output: 1.99

### ***Answer***

```
import java.util.Scanner;

// You are using Java
abstract class Item {
    protected String name;
    protected double price;

    public Item(String name, double price) {
        this.name = name;
        this.price = price;
    }

    public abstract double calculateCost();
}
class Produce extends Item {

    public Produce(String name, double price) {
```

```

        super(name, price);
    }

    @Override
    public double calculateCost() {
        return price;
    }
}

class OrganicProduce extends Produce {

    public OrganicProduce(String name, double price) {
        super(name, price);
    }

    @Override
    public double calculateCost() {
        return price * 0.90;
    }
}

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

        int n = sc.nextInt();
        sc.nextLine(); // Consume newline

        double totalCost = 0.0;

        for (int i = 0; i < n; i++) {
            String type = sc.next();
            String name = sc.next();
            double price = sc.nextDouble();

            if (type.equals("Regular")) {
                Item item = new Produce(name, price);
                totalCost += item.calculateCost();
            } else if (type.equals("Organic")) {
                Item item = new OrganicProduce(name, price);
                totalCost += item.calculateCost();
            }
        }
    }
}

```



```
        System.out.printf("%.2f%n", totalCost);  
    }  
}
```

**Status :** Correct

**Marks :** 10/10

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

### REC\_2028\_OOPS using Java\_Week 6\_PAH

Attempt : 1  
Total Mark : 40  
Marks Obtained : 40

#### Section 1 : Coding

##### 1. Problem Statement

In a company, each manager has a unique employee ID and a monthly salary. You are required to design a program that will calculate and display the annual(12 months) salary of a manager based on the input details provided by the user.

Implement the solution using a single inheritance approach.

Employee: The base class with attributes name and employeeID.

Manager: The derived class inheriting from Employee, with an additional attribute salary.

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

The first line of input consists of a string name, representing the manager's name.

The second line of input consists of an integer employeeID, representing the manager's employee ID.

The third line of input consists of a double salary, representing the manager's monthly salary.

### ***Output Format***

The first line of output prints: Name: <name>

The second line of output prints: Annual Salary: Rs. <annual\_salary> (rounded to two decimal places).

Refer to the sample output for formatting specifications.

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

Input: Davis

234

28750.75

Output: Name: Davis

Annual Salary: Rs. 345009.00

### ***Answer***

```
import java.util.Scanner;
import java.text.DecimalFormat;

// You are using Java
class Employee{
    String name;
    int employeeID;
    Employee(String name,int EmployeeID){
        this.name=name;
        this.employeeID = employeeID;
    }
}
class Manager extends Employee{
    double salary;
    Manager(String name,int employeeID,double salary){
        super(name, employeeID);
```

```

        this.salary = salary;
    }
    double calculateAnnualSalary(){
        return salary * 12;
    }
}

class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        DecimalFormat df = new DecimalFormat("0.00");

        String name = scanner.nextLine();
        int employeeID = scanner.nextInt();
        double salary = scanner.nextDouble();

        Manager manager = new Manager(name, employeeID, salary);

        System.out.println("Name: " + manager.name);
        System.out.println("Annual Salary: Rs. " +
df.format(manager.calculateAnnualSalary()));

        scanner.close();
    }
}

```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

John is planning a long road trip and wants to calculate the distance his car can travel based on its speed and fuel capacity. As John knows that different cars have different fuel efficiencies, he wants a program that can help him estimate the travel distance for any given car.

To do this, you are tasked with creating a program that calculates the travel distance of a car based on its speed and fuel capacity. The calculation is simple and follows the formula:

Travel Distance = Speed \* Fuel Capacity

You need to model this system using a Vehicle class and a Car class. The Vehicle class will have attributes for the speed and fuel capacity, while the Car class will inherit from the Vehicle class and include a method to calculate the travel distance.

### ***Input Format***

The first line of input consists of a double value representing the speed of the car in km/h.

The second line of input consists of a double value representing the fuel capacity of the car in liters.

### ***Output Format***

The first line should print "Speed: X km/h", where X is the speed of the car, rounded to two decimal places.

The second line should print "Fuel Capacity: Y liters", where Y is the fuel capacity of the car, rounded to two decimal places.

The third line should print "Travel Distance: Z km", where Z is the total travel distance the car can cover, rounded to two decimal places.

Refer to the sample output for formatting specifications.

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

Input: 10.0  
1.0

Output: Speed: 10.00 km/h  
Fuel Capacity: 1.00 liters  
Travel Distance: 10.00 km

### ***Answer***

```
import java.util.Scanner;

class Vehicle {
    protected double speed;
    protected double fuelCapacity;
```

```
    public Vehicle(double speed, double fuelCapacity) {  
        this.speed = speed;  
        this.fuelCapacity = fuelCapacity;  
    }  
}
```

```
class Car extends Vehicle {  
    public Car(double speed, double fuelCapacity) {  
        super(speed, fuelCapacity);  
    }  
  
    public double calculateTravelDistance() {  
        return speed * fuelCapacity;  
    }  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        double speed = scanner.nextDouble();  
        double fuelCapacity = scanner.nextDouble();  
  
        Car car = new Car(speed, fuelCapacity);  
  
        System.out.println("Speed: " + String.format("%.2f", car.speed) + " km/h");  
        System.out.println("Fuel Capacity: " + String.format("%.2f", car.fuelCapacity)  
+ " liters");  
        System.out.println("Travel Distance: " + String.format("%.2f",  
car.calculateTravelDistance()) + " km");  
  
        scanner.close();  
    }  
}
```

**Status :** Correct

**Marks :** 10/10

### 3. Problem Statement

Ram is designing a program to calculate the Body Mass Index (BMI). Your task is to assist him by following the given specifications.

Create a base class BMIcalculator with a method calculateBMI() to compute BMI using the formula  $\text{weight} / (\text{height} * \text{height})$ .

Extend the class with a subclass CustomBMIcalculator that overrides the method calculateBMI() to calculate BMI based on custom criteria, assigning categories such as "Underweight," "Normal Weight," "Overweight," or "Obese."

BMI < 18.5, category = "Underweight"  
BMI >= 18.5 & < 24.9, category = "Normal Weight"  
BMI >= 25 & < 29.9, category = "Overweight"  
else category = "Obese"

Implement user input for weight and height and display both the standard and custom BMI calculations.

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

The first line of input consists of a double value, representing the weight in kgs.

The second line consists of a double value, representing the height in meters.

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

The first line of output prints: "Standard BMI Calculation:"

The second line of output prints: "BMI: " followed by the calculated BMI value (to two decimal places).

The third line of output prints: "Custom BMI Calculation:"

The fourth line of output prints: "Category: " followed by the BMI category.

Refer to the sample output for formatting specifications.

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

Input: 69.7

2.6

Output: Standard BMI Calculation:

BMI: 10.31

Custom BMI Calculation:

Category: Underweight

### **Answer**

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

```
// You are using Java
```

```
class BMICalculator {
```

```
    protected double weight;
```

```
    protected double height;
```

```
    public BMICalculator(double weight, double height) {
```

```
        this.weight = weight;
```

```
        this.height = height;
```

```
    }
```

```
    public double calculateBMI() {
```

```
        return weight / (height * height);
```

```
    }
```

```
    public void displayBMI() {
```

```
        double bmi = calculateBMI();
```

```
        System.out.printf("BMI: %.2f%n", bmi);
```

```
    }
```

```
}
```

```
class CustomBMICalculator extends BMICalculator {
```

```
    public CustomBMICalculator(double weight, double height) {
```

```
        super(weight, height);
```

```
    }
```

```
    @Override
```

```
    public double calculateBMI() {
```

```
        return super.calculateBMI();
```

```
    }
```

```
    public void displayCustomBMI() {
```



```

        double bmi = calculateBMI();
        String category;
        if (bmi < 18.5) {
            category = "Underweight";
        } else if (bmi < 24.9) {
            category = "Normal Weight";
        } else if (bmi < 29.9) {
            category = "Overweight";
        } else {
            category = "Obese";
        }
        System.out.println("Category: " + category);
    }
}

```

```

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

        double weight = scanner.nextDouble();
        double height = scanner.nextDouble();

        BMIcalculator bmiCalculator = new BMIcalculator(weight, height);
        System.out.println("Standard BMI Calculation:");
        bmiCalculator.displayBMI();

        CustomBMIcalculator customBMIcalculator = new
CustomBMIcalculator(weight, height);
        System.out.println("Custom BMI Calculation:");
        customBMIcalculator.displayCustomBMI();

        scanner.close();
    }
}

```

**Status :** Correct

**Marks :** 10/10

#### 4. Problem Statement

Sharon, a software developer, is working on a project to automate velocity calculations for various objects. She wants to create a class named VelocityCalculator with overloaded methods calculateVelocity to calculate the velocity. One method will accept distance in meters and time in seconds as integers, while another will accept distance and time as doubles.

Help her in completing the project.

Formula:  $\text{Velocity} = \text{distance} / \text{time}$

### ***Input Format***

The first line of input consists of an integer, representing the distance in meters (for the integer method).

The second line consists of an integer, representing the time in seconds (for the integer method).

The third line consists of a double value, representing the distance in meters (for the double method).

The fourth line consists of a double value, representing the time in seconds (for the double method).

### ***Output Format***

The first line prints the velocity calculated using the integer inputs in the format:

Velocity with integer inputs: <velocity> m/s

The second line prints the velocity calculated using the double inputs in the format:

Velocity with double inputs: <velocity> m/s

Note:

The velocity for the double inputs should be printed with two decimal places.

Refer to the sample output for formatting specifications.

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

Input: 100

10

100.5

10.2

Output: Velocity with integer inputs: 10 m/s

Velocity with double inputs: 9.85 m/s

### ***Answer***

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

```
class VelocityCalculator {
```

```
    public static int calculateVelocity(int distance, int time) {  
        return distance / time;  
    }
```

```
    public static double calculateVelocity(double distance, double time) {  
        return distance / time;  
    }  
}
```

```
public class Main {
```

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

```
        int distanceInt = scanner.nextInt();  
        int timeInt = scanner.nextInt();
```

```
        double distanceDouble = scanner.nextDouble();  
        double timeDouble = scanner.nextDouble();
```

```
        int velocityInt = VelocityCalculator.calculateVelocity(distanceInt, timeInt);  
        double velocityDouble =  
        VelocityCalculator.calculateVelocity(distanceDouble, timeDouble);
```

```
System.out.println("Velocity with integer inputs: " + velocityInt + " m/s");  
System.out.printf("Velocity with double inputs: %.2f m/s", velocityDouble);  
  
    scanner.close();  
}  
}
```

**Status :** Correct

**Marks :** 10/10

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

### REC\_2028\_OOPS using Java\_Week 6\_CY

Attempt : 1  
Total Mark : 40  
Marks Obtained : 40

#### Section 1 : Coding

##### 1. Problem Statement

A painter needs to determine the cost to paint different shapes based on their surface area. The program should be designed to handle the area of a sphere and calculate the total painting cost using the following formulas:

Area of sphere:  $\text{Area} = 4 * \pi * r^2$  where  $\pi = 3.14$   
Total painting cost:  $\text{Cost} = \text{cost per square meter} * \text{area of sphere}$

The program will consist of three classes:

Shape class: This class should set the shape type and radius.  
Area class: This class should extend Shape to calculate the area.  
Cost class: This class should extend Area to calculate the total painting cost.

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

The input consists of a string representing the shape type, a double value

representing the radius, and another double value representing the cost per square meter on each line.

### ***Output Format***

For a valid shape type of "Sphere":

- The first line prints: "Area of Sphere is: <calculated\_area>" rounded to two decimal places.
- The second line prints: "Cost to paint the shape is: <total\_painting\_cost>" rounded to two decimal places.

For any other shape types, print: "Invalid type".

Refer to the sample output for formatting specifications.

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

Input: Sphere

3.4

5.8

Output: Area of Sphere is: 145.19

Cost to paint the shape is: 842.12

### ***Answer***

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

```
// You are using Java
```

```
class Shape {
```

```
    protected String shapeType;
```

```
    protected double radius;
```

```
    public void setShape(String shapeType, Scanner scanner) {
```

```
        this.shapeType = shapeType;
```

```
        if (shapeType.equals("Sphere")) {
```

```
            this.radius = scanner.nextDouble();
```

```
        }
```

```
    }
```

```
}
```

```
class Area extends Shape {
```

```

protected double area;

public void calculateArea() {
    if (shapeType.equals("Sphere")) {
        area = 4 * 3.14 * radius * radius;
        System.out.printf("Area of Sphere is: %.2f%n", area);
    } else {
        System.out.println("Invalid type");
    }
}
}

class Cost extends Area {
    private double costPerSquareMeter;

    public void setCost(double costPerSquareMeter) {
        this.costPerSquareMeter = costPerSquareMeter;
    }

    public void calculateCost() {
        if (shapeType.equals("Sphere")) {
            double totalCost = costPerSquareMeter * area;
            System.out.printf("Cost to paint the shape is: %.2f%n", totalCost);
        }
    }
}

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        String s = scanner.next();
        Cost shape = new Cost();
        shape.setShape(s, scanner);
        double costToPaint = scanner.nextDouble();
        shape.calculateArea();
        shape.setCost(costToPaint);
        shape.calculateCost();
    }
}

```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

Bob has been tasked with creating a program using CircleUtils class to calculate and display the circumference and area of the circle.

The program should allow Bob to input the radius of a circle as both an integer and a double and compute both the circumference and area of the circle using separate overloaded methods:

calculateCircumference- To calculate the circumference using the formula  $2 * 3.14 * \text{radius}$

calculateArea- To calculate the area  $3.14 * \text{radius} * \text{radius}$

Write a program to help Bob.

### ***Input Format***

The first line of input consists of an integer m, representing the radius of the circle as a whole number.

The second line consists of a double value n, representing the radius of the circle as a decimal number.

### ***Output Format***

The first line of output displays two space-separated double values, rounded to two decimal places, representing the circumference of the circle with the integer radius and the double radius, respectively.

The second line displays two space-separated double values, rounded to two decimal places, representing the area of the circle with the integer radius and the double radius, respectively.

Refer to the sample output for formatting specifications.

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

Input: 5

3.50

Output: 31.40 21.98

78.50 38.47

### ***Answer***



```

import java.util.Scanner;

// You are using Java
class CircleUtils {
    // Overloaded method for integer radius
    public double calculateCircumference(int radius) {
        return 2 * 3.14 * radius;
    }

    // Overloaded method for double radius
    public double calculateCircumference(double radius) {
        return 2 * 3.14 * radius;
    }

    // Overloaded method for integer radius
    public double calculateArea(int radius) {
        return 3.14 * radius * radius;
    }

    // Overloaded method for double radius
    public double calculateArea(double radius) {
        return 3.14 * radius * radius;
    }
}

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

        int radiusInt = scanner.nextInt();
        double radiusDouble = scanner.nextDouble();

        CircleUtils circleUtils = new CircleUtils();

        double circumferenceInt = circleUtils.calculateCircumference(radiusInt);
        double circumferenceDouble =
circleUtils.calculateCircumference(radiusDouble);
        double areaInt = circleUtils.calculateArea(radiusInt);
        double areaDouble = circleUtils.calculateArea(radiusDouble);

        System.out.format("%.2f %.2f\n", circumferenceInt, circumferenceDouble);
        System.out.format("%.2f %.2f", areaInt, areaDouble);
    }
}

```

```
        scanner.close();
    }
}
```

**Status :** Correct

**Marks :** 10/10

### 3. Problem Statement

Arun wants to calculate the age gap between the grandfather and the son and determine the father's age after 5 years.

Your task is to assist him in developing a program using three classes: GrandFather, Father, and Son, where the GrandFather stores the grandfather's age, the Father extends GrandFather to include the father's age and calculates his age after 5 years, and Son extends Father to include the son's age and calculate the age difference between the grandfather and the son.

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

The input consists of three integers representing the ages of the grandfather, father, and son, one per line.

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

The first line of output prints "Grandfather and son's age gap:" followed by an integer representing the age gap between the grandfather and the son, ending with "years".

The second line prints "Father's Age:" followed by an integer representing the father's age after 5 years, ending with "years".

Refer to the sample output for formatting specifications.

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

Input: 50  
30

3

Output: Grandfather and son's age gap: 47 years

Father's Age: 35 years

**Answer**

```
import java.util.Scanner;

// You are using Java
class GrandFather {
    protected int grandfatherAge;

    public void setGrandfatherAge(int age) {
        this.grandfatherAge = age;
    }
}

class Father extends GrandFather {
    protected int fatherAge;

    public void setFatherAge(int age) {
        this.fatherAge = age;
    }

    public int calculateFatherAgeAfter5Years() {
        return fatherAge + 5;
    }
}

class Son extends Father {
    private int sonAge;

    public void setSonAge(int age) {
        this.sonAge = age;
    }

    public int calculateGrandfatherSonAgeDifference() {
        return grandfatherAge - sonAge;
    }
}

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

```

Scanner scanner = new Scanner(System.in);
Son son = new Son();

int grandfatherAge = scanner.nextInt();
son.setGrandfatherAge(grandfatherAge);

int fatherAge = scanner.nextInt();
son.setFatherAge(fatherAge);

int sonAge = scanner.nextInt();
son.setSonAge(sonAge);

System.out.println("Grandfather and son's age gap: "+
son.calculateGrandfatherSonAgeDifference() + " years");

int fatherAgeAfter5Years = son.calculateFatherAgeAfter5Years();
System.out.println("Father's Age: " + fatherAgeAfter5Years + " years");
}
}

```

**Status :** Correct

**Marks :** 10/10

#### 4. Problem Statement

Teena's retail store has implemented a Loyalty Points System to reward customers based on their spending. The program calculates and displays the loyalty points based on whether the customer is a regular or a premium customer.

For regular customers (class Customer), the loyalty points are calculated as:

Loyalty points = amount spent / 10

For premium customers (class PremiumCustomer, which inherits from Customer), the loyalty points are calculated as:

Loyalty points = 2 \* (amount spent / 10)

The program should use method overriding for premium customers to calculate their loyalty points. The method that needs to be overridden is calculateLoyaltyPoints in the Customer class.

### ***Input Format***

The first line of input consists of an integer representing the amount spent by the customer.

The second line consists of a string representing the premium customer status:

- "yes" if the customer is a premium customer.
- "no" if the customer is not a premium customer.

### ***Output Format***

The output should display the loyalty points earned based on the amount spent and the customer type.

Refer to the sample output for formatting specifications.

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

Input: 50

yes

Output: 10

### ***Answer***

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

```
// You are using Java
```

```
// Base class: Customer
```

```
class Customer {  
    // Method to calculate loyalty points for regular customers  
    public int calculateLoyaltyPoints(int amountSpent) {  
        return amountSpent / 10;  
    }  
}
```

```
// Derived class: PremiumCustomer (inherits from Customer)
```

```
class PremiumCustomer extends Customer {  
    // Overriding the method for premium customers  
    @Override
```

```
public int calculateLoyaltyPoints(int amountSpent) {  
    return 2 * (amountSpent / 10);  
}  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        int amountSpent = scanner.nextInt();  
  
        String isPremium = scanner.next().toLowerCase();  
  
        Customer customer;  
  
        if (isPremium.equals("yes")) {  
            customer = new PremiumCustomer();  
        } else {  
            customer = new Customer();  
        }  
  
        int loyaltyPoints = customer.calculateLoyaltyPoints(amountSpent);  
  
        System.out.println(loyaltyPoints);  
    }  
}
```

**Status :** Correct

**Marks :** 10/10