

# Rajalakshmi Engineering College

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

### REC\_2028\_OOPS using Java\_Week 7\_MCQ

Attempt : 1  
Total Mark : 15  
Marks Obtained : 15

#### Section 1 : MCQ

1. How do you call a static method from an interface MyInterface?

**Answer**

`MyInterface.staticMethod();`

**Status : Correct**

**Marks : 1/1**

2. Can a Java interface contain both default and static methods?

**Answer**

Yes, an interface can have both default and static methods.

**Status : Correct**

**Marks : 1/1**

3. Which of the following statements is true regarding default methods in Java interfaces?

**Answer**

A default method can be overridden in a class implementing the interface.

**Status :** Correct

**Marks :** 1/1

4. What is the primary purpose of static methods in Java interfaces?

**Answer**

They allow an interface to provide helper methods without requiring an implementing class.

**Status :** Correct

**Marks :** 1/1

5. What is the output of the following code?

```
interface MathOperations {  
    static int square(int x) {  
        return x * x;  
    }  
}  
  
public class Main {  
    public static void main(String[] args) {  
        System.out.println(MathOperations.square(5));  
    }  
}
```

**Answer**

25

**Status :** Correct

**Marks :** 1/1

6. What happens when an implementing class does not override a default method from an interface?

**Answer**

The default method's implementation from the interface will be used.

**Status :** Correct

**Marks :** 1/1

7. Consider a class implementing an interface and extending a class, both having a method with the same name. Which method gets called?

**Answer**

The method from the superclass

**Status :** Correct

**Marks :** 1/1

8. What is the output of the following code?

```
interface X {  
    default void show() {  
        System.out.println("X's Default Method");  
    }  
}
```

```
interface Y {  
    default void show() {  
        System.out.println("Y's Default Method");  
    }  
}
```

```
class Z implements X, Y {  
    public void show() {  
        System.out.println("Z's Method");  
    }  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        Z obj = new Z();  
        obj.show();  
    }  
}
```

```
}  
}
```

**Answer**

Z's Method

**Status :** Correct

**Marks :** 1/1

9. How can a class explicitly call a default method from an interface if there is a naming conflict?

**Answer**

Using InterfaceName.super.methodName();

**Status :** Correct

**Marks :** 1/1

10. Which of the following is the correct way to declare an interface in Java?

**Answer**

```
interface Vehicle { void start();}
```

**Status :** Correct

**Marks :** 1/1

11. If a class implements two interfaces that have the same default method, what must the class do?

**Answer**

The class must override the method to resolve ambiguity.

**Status :** Correct

**Marks :** 1/1

12. What is the output of the following code?

```
interface A {  
    static void display() {  
        System.out.println("Static method in A");  
    }  
}
```

```
}  
}  
}  
class B implements A {  
    static void display() {  
        System.out.println("Static method in B");  
    }  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        B.display();  
    }  
}
```

**Answer**

Static method in B

**Status :** Correct

**Marks :** 1/1

13. What is the output of the following code?

```
interface A {  
    default void show() {  
        System.out.println("A's Default Method");  
    }  
}
```

```
interface B {  
    default void show() {  
        System.out.println("B's Default Method");  
    }  
}
```

```
class C implements A, B {  
    public void show() {  
        A.super.show();  
    }  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        C obj = new C();  
        obj.show();  
    }  
}
```

**Answer**

A's Default Method

**Status :** Correct

**Marks :** 1/1

14. What is the output of the following code?

```
interface A {  
    default void show() {  
        System.out.println("A's Default Method");  
    }  
}
```

```
class B {  
    public void show() {  
        System.out.println("B's Method");  
    }  
}
```

```
class C extends B implements A {  
}
```

```
public class Main {  
    public static void main(String[] args) {  
        C obj = new C();  
        obj.show();  
    }  
}
```

**Answer**

B's Method

**Status :** Correct

**Marks :** 1/1

15. Which of the following statements about Java interfaces is true?

**Answer**

A class can implement multiple interfaces.

**Status :** Correct

**Marks :** 1/1

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

### REC\_2028\_OOPS using Java\_Week 7\_PAH

Attempt : 1  
Total Mark : 40  
Marks Obtained : 40

#### Section 1 : Coding

##### 1. Problem Statement

Develop a program for managing employee information that caters to both full-time and part-time employees. The program should be capable of computing the salary for each category of employee and presenting their particulars. To achieve this, create two classes, FullTimeEmployee and PartTimeEmployee, that adhere to the Employee interface.

The program is expected to accept input data, including the name and monthly salary for full-time employees, as well as the name, hourly rate, and hours worked for part-time employees. Subsequently, it should calculate and exhibit the employee details and their respective salaries.

For Full-Time employees, the annual salary should be calculated as 12 times the monthly salary.



For Part-Time employees, the salary calculation should be based on the formula: hourly rate \* hours worked.

### ***Input Format***

The first line of input should be a string representing the name of a full-time employee.

The second line of input should be an integer representing the monthly salary of the full-time employee.

The third line of input should be a string representing the name of a part-time employee.

The fourth line of input should be an integer representing the hourly rate of the part-time employee.

The fifth line of input should be an integer representing the number of hours worked by the part-time employee.

### ***Output Format***

The output displays the following details:

Full-Time Employee Details:

Name: [Full-Time Employee Name] (string)

Monthly Salary: \$[Monthly Salary] (integer)

Annual Salary: \$[12 times Monthly Salary] (integer)

Part-Time Employee Details:

Name: [Part-Time Employee Name] (string)

Hourly Rate: \$[Hourly Rate] (integer)

Hours Worked: [Hours Worked] hours (integer)

Monthly Salary: \$[Calculated Monthly Salary] (integer)

Refer to the sample output for the formatting specifications.

### **Sample Test Case**

Input: John Smith

15000

Mary Johnson

100

100

Output: Full-Time Employee Details:

Name: John Smith

Monthly Salary: \$15000

Annual Salary: \$180000

Part-Time Employee Details:

Name: Mary Johnson

Hourly Rate: \$100

Hours Worked: 100 hours

Monthly Salary: \$10000

### **Answer**

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

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

```
interface Employee {  
    void displayDetails();  
    int calculateSalary();  
}
```

```
class FullTimeEmployee implements Employee {  
    private String name;  
    private int monthlySalary;
```

```
    public FullTimeEmployee(String name, int monthlySalary) {  
        this.name = name;
```

```

        this.monthlySalary = monthlySalary;
    }

    public int calculateSalary() {
        return monthlySalary * 12;
    }

    public void displayDetails() {
        System.out.println("Full-Time Employee Details:");
        System.out.println("Name: " + name);
        System.out.println("Monthly Salary: $" + monthlySalary);
        System.out.println("Annual Salary: $" + calculateSalary());
    }
}

class PartTimeEmployee implements Employee {
    private String name;
    private int hourlyRate;
    private int hoursWorked;

    public PartTimeEmployee(String name, int hourlyRate, int hoursWorked) {
        this.name = name;
        this.hourlyRate = hourlyRate;
        this.hoursWorked = hoursWorked;
    }

    public int calculateSalary() {
        return hourlyRate * hoursWorked;
    }

    public void displayDetails() {
        System.out.println("Part-Time Employee Details:");
        System.out.println("Name: " + name);
        System.out.println("Hourly Rate: $" + hourlyRate);
        System.out.println("Hours Worked: " + hoursWorked + " hours");
        System.out.println("Monthly Salary: $" + calculateSalary());
    }
}

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

```

```

        int fullTimeSalary = scanner.nextInt();
        scanner.nextLine();
        String partTimeName = scanner.nextLine();
        int hourlyRate = scanner.nextInt();
        int hoursWorked = scanner.nextInt();
        FullTimeEmployee fullTimeEmployee = new FullTimeEmployee(fullName,
fullTimeSalary);
        PartTimeEmployee partTimeEmployee = new
PartTimeEmployee(partTimeName, hourlyRate, hoursWorked);
        fullTimeEmployee.displayDetails();
        System.out.println();
        partTimeEmployee.displayDetails();
        scanner.close();
    }
}

```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

Oviya is fascinated by automorphic numbers and wants to create a program to determine whether a given number is an automorphic number or not.

An automorphic number is a number whose square ends with the same digits as the number itself. For example,  $25 = (25)^2 = 625$

Oviya has defined two interfaces: NumberInput for taking user input and AutomorphicChecker for checking if a given number is automorphic. The class AutomorphicNumber implements both interfaces.

Help her complete the task.

### ***Input Format***

The input consists of a single integer n.

### ***Output Format***

If the input number is an automorphic number, print "n is an automorphic number". Otherwise, print "n is not an automorphic number".

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 25

Output: 25 is an automorphic number

### **Answer**

```
import java.util.Scanner;

// You are using Java
interface NumberInput {
    int getInput();
}

interface AutomorphicChecker {
    boolean checkAutomorphic(int n);
}

class AutomorphicNumber implements NumberInput, AutomorphicChecker {
    public int getInput() {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        sc.close();
        return n;
    }

    public boolean checkAutomorphic(int n) {
        long square = (long) n * n;
        String s = String.valueOf(n);
        String sq = String.valueOf(square);
        return sq.endsWith(s);
    }
}

public class Main {
    public static void main(String[] args) {
        AutomorphicNumber automorphicNumber = new AutomorphicNumber();
        int inputNumber = automorphicNumber.getInput();
```

```

boolean isAutomorphic =
automorphicNumber.checkAutomorphic(inputNumber);

    if (isAutomorphic) {
        System.out.println(inputNumber+" is an automorphic number");
    } else {
        System.out.println(inputNumber+" is not an automorphic number");
    }
}
}
}

```

**Status :** Correct

**Marks :** 10/10

### 3. Problem Statement:

Alice has been tasked with implementing a simple calculator interface and a corresponding class for performing basic addition and subtraction operations. The task is to create an interface called Calculator with two methods: add and subtract. The add method should take two numbers as input and return their sum, while the subtract method should take two numbers as input and return their difference.

Implement a class called SimpleCalculator that implements the Calculator interface. This class should provide the functionality for adding and subtracting numbers. Write a code that satisfies the above requirements.

#### **Input Format**

The first line of input consists of a single integer, representing the choice

If the choice is 1 or 2, the next two lines consist of 2 double values, representing the numbers to do addition or subtraction.

#### **Output Format**

The output prints a float-value with one decimal value representing the sum of two number or difference of two number.

Refer to the sample output for format specification.

### **Sample Test Case**

Input: 1

5.5

3.5

Output: Result: 9.0

### **Answer**

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

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

```
interface Calculator {  
    double add(double a, double b);  
    double subtract(double a, double b);  
}
```

```
class SimpleCalculator implements Calculator {  
    public double add(double a, double b) {  
        return a + b;  
    }  
  
    public double subtract(double a, double b) {  
        return a - b;  
    }  
}
```

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

```
        SimpleCalculator calculator = new SimpleCalculator();
```

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

```
        if (choice == 1) {  
            double num1 = scanner.nextDouble();  
            double num2 = scanner.nextDouble();  
            double result = calculator.add(num1, num2);  
            System.out.println("Result: " + result);  
        } else if (choice == 2) {  
            double num1 = scanner.nextDouble();  
            double num2 = scanner.nextDouble();
```

```
        double result = calculator.subtract(num1, num2);
        System.out.println("Result: " + result);
    } else {
        System.out.println("Invalid choice. Please choose 1 for addition or 2 for
subtraction.");
    }

    scanner.close();
}
}
```

**Status :** Correct

**Marks :** 10/10

#### 4. Problem Statement

Sophia is developing a matrix analysis tool for a data analytics company. The tool needs to analyze square matrices and extract insights from the matrix diagonals.

To organize the code properly, Sophia creates an interface named Matrix that declares a method for finding the smallest and largest elements along the principal and secondary diagonals of the matrix.

Sophia then creates a class named MatrixAnalyzer that implements the Matrix interface. This class provides the logic to process a given square matrix and print:

The smallest and largest elements in the principal diagonal (from top-left to bottom-right). The smallest and largest elements in the secondary diagonal (from top-right to bottom-left).

Your task is to implement the Matrix interface and the MatrixAnalyzer class. The main driver program (in the class Main) will read the input matrix, create an instance of MatrixAnalyzer, and invoke its method to display the results.

#### **Input Format**

The first line contains an integer n, representing the size of the square matrix.



The next n lines each contain n integers separated by spaces, representing the elements of the matrix.

### **Output Format**

The output prints the four lines:

"Smallest Element - 1: <smallest element in the principal diagonal>" (integer)

"Largest Element - 1: <largest element in the principal diagonal>" (integer)

"Smallest Element - 2: <smallest element in the secondary diagonal>" (integer)

"Largest Element - 2: <largest element in the secondary diagonal>" (integer)

Refer to the sample output for the formatting specifications.

### **Sample Test Case**

Input: 5

7 8 9 0 1

2 3 4 5 6

5 4 2 0 8

23 5 6 8 9

12 5 6 7 32

Output: Smallest Element - 1: 2

Largest Element - 1: 32

Smallest Element - 2: 1

Largest Element - 2: 12

### **Answer**

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

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

```
interface Matrix {
```

```
    void diagonalsMinMax(int[][] matrix);
```

```
}
```

```
class MatrixAnalyzer implements Matrix {
```

```
    public void diagonalsMinMax(int[][] matrix) {
```

```
        int n = matrix.length;
```

```

// principal diagonal: positions (i, i)
int min1 = Integer.MAX_VALUE;
int max1 = Integer.MIN_VALUE;
// secondary diagonal: positions (i, n-1-i)
int min2 = Integer.MAX_VALUE;
int max2 = Integer.MIN_VALUE;

for (int i = 0; i < n; i++) {
    int v1 = matrix[i][i];
    if (v1 < min1) min1 = v1;
    if (v1 > max1) max1 = v1;

    int v2 = matrix[i][n - 1 - i];
    if (v2 < min2) min2 = v2;
    if (v2 > max2) max2 = v2;
}

System.out.println("Smallest Element - 1: " + min1);
System.out.println("Largest Element - 1: " + max1);
System.out.println("Smallest Element - 2: " + min2);
System.out.println("Largest Element - 2: " + max2);
}
}

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        int[][] matrix = new int[n][n];
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++) {
                matrix[i][j] = sc.nextInt();
            }
        }
        MatrixAnalyzer analyzer = new MatrixAnalyzer();
        analyzer.diagonalsMinMax(matrix);
    }
}

```

**Status :** Correct

**Marks :** 10/10

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

### 2028\_REC\_OOPS using Java\_Week 7\_Q1

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement:

Rajiv is analyzing the energy consumption in his household and wants to calculate the total cost based on the daily energy usage. He is given the rate per unit of electricity and the energy consumed for multiple days. To structure this calculation efficiently, he decides to use an interface-based approach.

Implement an interface CostCalculator with the necessary methods to retrieve energy details and compute the cost. The calculations should be handled in the EnergyConsumptionTracker class, while the EnergyConsumptionApp class should only handle input and output.

##### Formula

Energy Cost for one day = Energy Consumed per day \* Rate Per Unit

### ***Input Format***

The first line of input consists of the rate per unit as an 'R' (a double value).

The second line of input consists of the number of days 'N' (an integer).

The third line of input consists of the daily energy consumption values for each day 'D' (double values), separated by space.

### ***Output Format***

The first line of the output prints: "Day-wise Energy Cost:"

The next N lines of the output print the day-wise energy costs(double type) and the total energy cost (double type) in Indian Rupees in the following format: "Day [day\_number]: Rs. [energy\_cost]"

The last line of the output prints: "Total Energy Cost: Rs. [total\_cost]"

Note: energy\_cost and total\_cost are rounded off to two decimal points

Refer to the sample output for the formatting specifications.

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

Input: 0.01

3

10.0 20.0 30.0

Output: Day-wise Energy Cost:

Day 1: Rs. 0.10

Day 2: Rs. 0.20

Day 3: Rs. 0.30

Total Energy Cost: Rs. 0.60

### ***Answer***

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

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

```

interface CostCalculator {
    void getEnergyDetails(Scanner scanner);
    void calculateAndDisplayCost();
}

class EnergyConsumptionTracker implements CostCalculator {
    private double ratePerUnit;
    private int numDays;
    private double[] dailyConsumption;
    public EnergyConsumptionTracker(double ratePerUnit, int numDays) {
        this.ratePerUnit = ratePerUnit;
        this.numDays = numDays;
        this.dailyConsumption = new double[numDays];
    }
    public void getEnergyDetails(Scanner scanner) {
        for (int i = 0; i < numDays; i++) {
            dailyConsumption[i] = scanner.nextDouble();
        }
    }
    public void calculateAndDisplayCost() {
        System.out.println("Day-wise Energy Cost:");
        double totalCost = 0.0;
        for (int i = 0; i < numDays; i++) {
            double cost = dailyConsumption[i] * ratePerUnit;
            totalCost += cost;
            System.out.printf("Day %d: Rs. %.2f\n", i + 1, cost);
        }
        System.out.printf("Total Energy Cost: Rs. %.2f\n", totalCost);
    }
}

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

        double ratePerUnit = scanner.nextDouble();
        int numDays = scanner.nextInt();

        CostCalculator tracker = new EnergyConsumptionTracker(ratePerUnit,
numDays);

        tracker.getEnergyDetails(scanner);
        tracker.calculateAndDisplayCost();
    }
}

```

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

**Status :** Correct

**Marks :** 10/10

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

### 2028\_REC\_OOPS using Java\_Week 7\_Q2

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

Jaheer is working on a health monitoring system to help individuals calculate their Body Mass Index (BMI). He has implemented a basic BMI calculator and an interface called HealthCalculator. It should have a method called calculateBMI.

You are tasked with creating a program that takes weight and height as input, calculates the BMI using the BMICalculator class, and displays the result. If the height or weight is less than or equal to zero, then return -1.

Formula:  $BMI = \text{weight} / (\text{height} * \text{height})$

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

The first line of input consists of a double value W, the person's weight in kilograms.

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

### **Output Format**

The output displays "BMI: " followed by a double value, representing the calculated BMI, rounded off to two decimal places.

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 70.0

175

Output: BMI: 22.86

### **Answer**

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

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

```
interface HealthCalculator {
```

```
    double calculateBMI(double weight, double height);
```

```
}
```

```
class BMICalculator implements HealthCalculator {
```

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

```
        if (weight <= 0 || height <= 0) {
```

```
            return -1;
```

```
        }
```

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

```
    }
```

```
}
```

```
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();
```



```
double bmi = bmiCalculator.calculateBMI(weight, height);  
System.out.printf("BMI: %.2f\n", bmi);  
  
    scanner.close();  
}  
}
```

**Status :** Correct

**Marks :** 10/10

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

### 2028\_REC\_OOPS using Java\_Week 7\_Q3

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

A financial analyst, Alex, needs a program to calculate simple interest for various financial transactions. He requires a straightforward tool that takes in the principal amount, interest rate, and time in years and computes the interest.

The formula to be used is:  $\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time} / 100$

Implement this functionality using the InterestCalculator interface and the SimpleInterestCalculator class.

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

The first line of input consists of the principal amount P as a double value.

The second line of input consists of the annual interest rate  $r$  as a double value.

The third line of input consists of the number of years  $t$  as a positive integer, which is an integer value.

### ***Output Format***

The output displays the calculated simple interest in the following format: "Simple Interest: [interest\_value]", Here, [interest\_value] should be replaced with the actual interest value calculated by the program.

Refer to the sample output for the formatting specifications.

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

Input: 1000.00

5.00

2

Output: Simple Interest: 100.0

### ***Answer***

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

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

```
interface InterestCalculator {  
    double simpleInterest(double principal, double rate, int time);  
}
```

```
class SimpleInterestCalculator implements InterestCalculator {  
    public double simpleInterest(double principal, double rate, int time) {  
        return principal * rate * time / 100.0;  
    }  
}
```

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

```
int time = scanner.nextInt();  
InterestCalculator calculator = new SimpleInterestCalculator();  
double interest = calculator.simpleInterest(principal, rate, time);  
System.out.println("Simple Interest: " + interest);  
}  
}
```

**Status :** Correct

**Marks :** 10/10