

Rajalakshmi Engineering College

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Batch: 2028

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2024_28_III_OOPS Using Java Lab

REC_2028_OOPS using Java_Week 10_CY

Attempt : 1

Total Mark : 40

Marks Obtained : 40

Section 1 : COD

1. Problem Statement

Aryan is developing a voting system for a college election. Each vote is recorded as an entry in an array, where every student's vote is represented by a candidate's ID. Since it's a majority-rule election, the winner is the candidate who receives more than $n/2$ votes, where n is the total number of votes cast.

To quickly determine the winner, Aryan decides to use a HashMap to count the occurrences of each vote and identify the candidate who has received more than half of the total votes.

Example

Input

2 2 1 2 2 2 3

Output

2

Explanation

The votes are: 2, 2, 1, 2, 2, 3, 2

Count of each candidate:

2 appears 5 times
1 appears once
3 appears once

The majority element is the one that appears more than $N/2$ times. Since $7/2 = 3.5$, a number must appear at least 4 times to be the majority.

The number 2 appears 5 times, which is greater than 3.5, so the output is 2.

Input Format

The first line contains an integer N representing the number of votes cast.

The second line contains N space-separated integers representing the votes, where each integer corresponds to a candidate.

Output Format

The output prints an integer representing the majority element (the candidate who received more than $N/2$ votes).

If no such candidate exists, print -1.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 7

2 2 1 2 2 2 3

Output: 2

Answer

```
import java.util.HashMap;
```

```

import java.util.Scanner;

class MajorityElementFinder {
    public static int findMajorityElement(int[] arr) {
        HashMap<Integer, Integer> countMap = new HashMap<>();
        int n = arr.length;

        for (int num : arr) {
            countMap.put(num, countMap.getOrDefault(num, 0) + 1);
        }
        for (int key : countMap.keySet()) {
            if (countMap.get(key) > n / 2) {
                return key;
            }
        }
        return -1;
    }
}

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

        for (int i = 0; i < N; i++) {
            arr[i] = scanner.nextInt();
        }

        int result = MajorityElementFinder.findMajorityElement(arr);
        System.out.println(result);

        scanner.close();
    }
}

```

Status : Correct

Marks : 10/10

2. Problem Statement

Arjun is working on a program that checks if one set of numbers is a subset of another. If Set B is a subset of Set A, the program should print

"YES" followed by the sorted elements of Set B. If Set B is not a subset of Set A, the program should print "NO" followed by the average of all elements from both sets combined, rounded to two decimal places.

Implement a class Solution with the required method to perform the subset check using TreeSet in Java.

Input Format

The first line contains an integer n - the number of elements in Set A.

The second line contains n space-separated integers - the elements of Set A.

The third line contains an integer m - the number of elements in Set B.

The fourth line contains m space-separated integers - the elements of Set B.

Output Format

If Set B is a subset of Set A, print "YES" followed by the sorted values of Set B.

Otherwise, print "NO" followed by the average of all numbers in both sets (rounded to two decimal places).

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 5

1 2 3 4 5

3

2 3 5

Output: YES 2 3 5

Answer

```
import java.util.*;  
  
class Solution {  
    public static void checkSubset(TreeSet<Integer> setA, TreeSet<Integer> setB,  
        int totalElements, double sum) {  
        if (setA.containsAll(setB)) {
```

```

        System.out.print("YES ");
        for (int num : setB) {
            System.out.print(num + " ");
        }
        System.out.println();
    } else {
        double average = sum / totalElements;
        System.out.printf("NO %.2f%n", average);
    }
}
}

class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        TreeSet<Integer> setA = new TreeSet<>();
        long sum = 0;
        for (int i = 0; i < n; i++) {
            int num = sc.nextInt();
            setA.add(num);
            sum += num;
        }
        int m = sc.nextInt();
        TreeSet<Integer> setB = new TreeSet<>();
        for (int i = 0; i < m; i++) {
            int num = sc.nextInt();
            setB.add(num);
            sum += num;
        }
        Solution.checkSubset(setA, setB, n + m, sum);
        sc.close();
    }
}

```

Status : Correct

Marks : 10/10

3. Problem Statement

David is managing an employee database where each employee has a unique ID, name, and department. He wants to ensure that duplicate

employee IDs are not added to the system. Implement a Java program that allows adding employees to the system, displaying all employees, and checking if an employee exists based on the given ID.

Implement a class EmployeeDatabase that contains a HashSet to store employee records. The Employee class should be a user-defined object containing employee details. The main class should handle user operations and interact with the EmployeeDatabase class.

Input Format

The first line contains an integer n representing the number of employees to be added.

The next n lines follow, each containing:

1. An integer employee_id
2. A string name
3. A string department

The next line contains an integer m representing the number of queries.

The next m lines follow, each containing an employee ID to check for existence.

Output Format

The output prints a list of all employees added in the format:

"ID: <employee_id>, Name: <name>, Department: <department>"

For each query, output "Employee exists" if the ID is found, otherwise "Employee not found".

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 3
101 John IT
102 Alice HR
103 Bob Finance

2
101
104

Output: ID: 101, Name: John, Department: IT
ID: 102, Name: Alice, Department: HR
ID: 103, Name: Bob, Department: Finance
Employee exists
Employee not found

Answer

```
import java.util.*;  
  
class Employee {  
    int employeeId;  
    String name, department;  
  
    public Employee(int employeeId, String name, String department) {  
        this.employeeId = employeeId;  
        this.name = name;  
        this.department = department;  
    }  
  
    public int hashCode() {  
        return Objects.hash(employeeId);  
    }  
  
    public boolean equals(Object obj) {  
        if (this == obj) return true;  
        if (obj == null || getClass() != obj.getClass()) return false;  
        Employee e = (Employee) obj;  
        return this.employeeId == e.employeeId;  
    }  
  
    public String toString() {  
        return "ID: " + employeeId + ", Name: " + name + ", Department: " +  
            department;  
    }  
}  
  
class EmployeeDatabase {  
    HashSet<Employee> employees = new HashSet<>();
```

```
public void addEmployee(int id, String name, String department) {  
    employees.add(new Employee(id, name, department));  
}  
  
public void displayEmployees() {  
    for (Employee e : employees) {  
        System.out.println(e);  
    }  
}  
  
public boolean checkEmployee(int id) {  
    return employees.contains(new Employee(id, "", ""));  
}  
}  
  
class Main {  
    public static void main(String[] args) {  
        Scanner sc = new Scanner(System.in);  
        EmployeeDatabase db = new EmployeeDatabase();  
        int n = sc.nextInt();  
        for (int i = 0; i < n; i++) {  
            int id = sc.nextInt();  
            String name = sc.next();  
            String department = sc.next();  
            db.addEmployee(id, name, department);  
        }  
        db.displayEmployees();  
        int m = sc.nextInt();  
        for (int i = 0; i < m; i++) {  
            int id = sc.nextInt();  
            if (db.checkEmployee(id))  
                System.out.println("Employee exists");  
            else  
                System.out.println("Employee not found");  
        }  
        sc.close();  
    }  
}
```

Status : Correct

Marks : 10/10

4. Problem Statement

A college professor wants to keep track of students who attend classes. Each student has a unique roll number and their attendance count increases every time they attend a class. The system should allow adding a student, marking their attendance, and displaying all students with their total attendance.

Your task is to implement a Java program using TreeSet to maintain students in sorted order of roll numbers and track their attendance count.

Operations:

A roll_no name Add a student with roll number and name (if not already added).M roll_no Mark attendance for the student with the given roll number (increase their count by 1).D Display all students in ascending order of roll number along with their attendance count.

Input Format

The first line contains an integer N - the number of students.

The next N lines contain one of the following commands:

A roll_no name

M roll_no

D

- A (Add) Adds a new student with a unique roll number and name.
- M (Mark) Increases attendance count for the given roll number.
- D (Display) Prints all students in ascending order of roll number.

Output Format

For D, output prints each student's roll number, name, and attendance count in ascending order of roll number.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 5
A 101 Alice
A 102 Bob
M 101
M 101
D

Output: 101 Alice 2
102 Bob 0

Answer

```
import java.util.*;  
class Student implements Comparable<Student> {  
    int rollNo;  
    String name;  
    int attendance;  
  
    public Student(int rollNo, String name) {  
        this.rollNo = rollNo;  
        this.name = name;  
        this.attendance = 0;  
    }  
  
    public void markAttendance() {  
        this.attendance++;  
    }  
  
    public int compareTo(Student s) {  
        return Integer.compare(this.rollNo, s.rollNo);  
    }  
  
    public boolean equals(Object obj) {  
        if (this == obj) return true;  
        if (obj == null || getClass() != obj.getClass()) return false;  
        Student student = (Student) obj;  
        return rollNo == student.rollNo;  
    }  
  
    public int hashCode() {  
        return Objects.hash(rollNo);  
    }
```

```
public String toString() {
    return rollNo + " " + name + " " + attendance;
}
}

class AttendanceTracker {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        sc.nextLine();
        TreeSet<Student> students = new TreeSet<>();
        for (int i = 0; i < n; i++) {
            String[] command = sc.nextLine().split(" ");
            String operation = command[0];

            if (operation.equals("A")) {
                int rollNo = Integer.parseInt(command[1]);
                String name = command[2];
                students.add(new Student(rollNo, name));
            }
            else if (operation.equals("M")) {
                int rollNo = Integer.parseInt(command[1]);
                for (Student s : students) {
                    if (s.rollNo == rollNo) {
                        s.markAttendance();
                        break;
                    }
                }
            }
            else if (operation.equals("D")) {
                for (Student s : students) {
                    System.out.println(s);
                }
            }
        }
        sc.close();
    }
}
```

Status : Correct

Marks : 10/10