

Week-3:

TASK1:

Aim: To find the lexicographically smallest and largest substrings of length k from a given string.

Algorithm:

1. Start.
2. Read the input string s and integer k.
3. Initialize smallest and largest with the first substring of length k.
4. Loop from index 1 to (length of string – k):
5. Extract substring sub of length k.
6. Compare sub with smallest:
7. If sub is smaller, update smallest.
8. Compare sub with largest:
9. If sub is larger, update largest.
10. After checking all substrings, return smallest and largest.
11. Print the result.
12. Stop.

Program:

```
import java.util.Scanner;

public class Solution {

    public static String getSmallestAndLargest(String s, int k) {

        String smallest = s.substring(0, k);

        String largest = s.substring(0, k);

        for (int i = 1; i <= s.length() - k; i++) {

            String sub = s.substring(i, i + k);

            if (sub.compareTo(smallest) < 0)

                smallest = sub;

            if (sub.compareTo(largest) > 0)

                largest = sub;

        }

    }

}
```

```

        return smallest + "\n" + largest;
    }

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

        String s = scan.next();
        int k = scan.nextInt();

        scan.close();

        System.out.println(getSmallestAndLargest(s, k));
    }
}

```

Output:

Congratulations!

You have passed the sample test cases. Click the submit button to run your code against all the test cases.

Sample Test case 0

Input (stdin)

```

1  welcometojava
2  3

```

Your Output (stdout)

```

1  ava
2  wel

```

Expected Output

```

1  ava
2  wel

```

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Result: The program successfully identifies and displays the smallest and largest substrings of length k from the given string using lexicographical comparison.

Task-2:

Aim: To sort Player objects in descending order based on score and, when scores are equal, in ascending alphabetical order based on name.

This ensures proper ranking with clear tie-breaking using player names.

Algorithm:

1. Start.
2. Receive two Player objects: a and b.
3. Compare their scores:
4. If a.score is not equal to b.score, return (b.score – a.score) to sort in descending order.
5. If scores are equal:
6. Compare a.name and b.name using compareTo() to sort alphabetically (ascending).
7. Return the comparison result.
8. Stop.

Program:

```
class Checker implements Comparator<Player> {  
    public int compare(Player a, Player b){  
        if(a.score != b.score){  
            return b.score - a.score;  
        }  
        return a.name.compareTo(b.name);  
    }  
}
```

Output:

Congratulations!

You have passed the sample test cases. Click the submit button to run your code against all the test cases.

✓ Sample Test case 0

Input (stdin)

```
1 5
2 amy 100
3 david 100
4 heraldo 50
5 aakansha 75
6 aleksa 150
```

Your Output (stdout)

```
1 aleksa 150
2 amy 100
3 david 100
4 aakansha 75
```

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Result:

Thus, to sort Player objects in descending order based on score and, when scores are equal, in ascending alphabetical order based on name was executed successfully.

Task3:

Aim: To sort a list of students based on CGPA in descending order, first name in ascending alphabetical order, and ID in ascending order when previous values are equal.

Algorithm:

1. Start the program.
2. Read the number of test cases (students).
3. For each student:
 - a. Read ID, first name, and CGPA.
 - b. Create a Student object and add it to the list.
4. Use Collections.sort() with a custom Comparator to sort students by:
 - a. CGPA (descending order).
 - b. First name (ascending order) if CGPA is same.
 - c. ID (ascending order) if both CGPA and name are same.
5. Display the sorted student names.
6. Stop.

Program:

```
import java.util.*;

class Student {

    int id;

    String fname;

    double cgpa;

    public Student(int id, String fname, double cgpa) {

        this.id = id;

        this.fname = fname;

        this.cgpa = cgpa;

    }

    public int getId() {

        return id;

    }

    public String getFname() {
```

```

        return fname;
    }

    public double getCgpa() {
        return cgpa;
    }
}

class Solution {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        int testCases = Integer.parseInt(in.nextLine());
        List<Student> studentList = new ArrayList<Student>();
        while(testCases > 0){
            int id = in.nextInt();
            String fname = in.next();
            double cgpa = in.nextDouble();
            Student st = new Student(id, fname, cgpa);
            studentList.add(st);
            testCases--;
        }
        Collections.sort(studentList, new Comparator<Student>() {
            public int compare(Student s1, Student s2) {
                if(s1.cgpa != s2.cgpa){
                    return Double.compare(s2.cgpa, s1.cgpa);
                }
                if(!s1.fname.equals(s2.fname)){
                    return s1.fname.compareTo(s2.fname);
                }
            }
        });
    }
}

```

```

        return s1.id - s2.id;
    }
});
for(Student st: studentList){
    System.out.println(st.getFname());
}
}
}

```

Output:

Congratulations!

You have passed the sample test cases. Click the submit button to run your code against all the test cases.

Sample Test case 0

Input (stdin)

```

1 5
2 33 Rumpa 3.68
3 85 Ashis 3.85
4 56 Samiha 3.75
5 19 Samara 3.75
6 22 Fahim 3.76

```

Your Output (stdout)

```

1 Ashis
2 Fahim
3 Samara
4 Samiha

```

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Result: Thus ,the program successfully sorts all student records according to the given priority rules and prints the students' first names in the correct ranked order was executed successfully.

Task4:

Aim: To sort people's names based on their heights in descending order, so that the tallest person appears first.

Algorithm:

1. Start.
2. Accept two arrays: names[] and heights[].
3. Find the length of the heights array and store it in n.
4. Use Bubble Sort to arrange heights in descending order:
 - Compare each height with the remaining heights.
 - If the current height is smaller, swap both heights.
 - At the same time, swap the corresponding names to maintain mapping.
5. Repeat until all elements are sorted.
6. Return the sorted names array.
7. Stop.

Program:

```
class Solution {  
  
    public String[] sortPeople(String[] names, int[] heights) {  
        int n = heights.length;  
        for(int i = 0; i < n - 1; i++){  
            for(int j = i + 1; j < n; j++){  
                if(heights[i] < heights[j]){  
                    int tempH = heights[i];  
                    heights[i] = heights[j];  
                    heights[j] = tempH;  
                    String tempN = names[i];  
                    names[i] = names[j];  
                    names[j] = tempN;  
                }  
            }  
        }  
    }  
}
```



```

    }

    }

    }

    return names;

}

}

```

Output:

2418. Sort the People

Easy Topics Companies Hint

You are given an array of strings `names`, and an array `heights` that consists of **distinct** positive integers. Both arrays are of length `n`.

For each index `i`, `names[i]` and `heights[i]` denote the name and height of the `i`th person.

Return `names` sorted in **descending** order by the people's heights.

Example 1:

Input: `names = ["Mary","John","Emma"], heights = [180,165,170]`
Output: `["Mary","Emma","John"]`
Explanation: Mary is the tallest, followed by Emma and John.

Example 2:

Input: `names = ["Alice","Bob","Bob"], heights = [155,185,150]`
Output: `["Bob","Alice","Bob"]`
Explanation: The first Bob is the tallest, followed by Alice and the second Bob.

Constraints:

- `n == names.length == heights.length`

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```

1 class Solution {
2     public String[] sortPeople(String[] names, int[] heights) {
3
4         int n = heights.length;
5
6         // Bubble sort based on heights (descending)
7         for (int i = 0; i < n - 1; i++) {
8             for (int j = i + 1; j < n; j++) {
9                 if (heights[i] < heights[j]) {
10
11                     // swap heights

```

Saved Ln 1, Col 1

Testcase Test Result

heights =
[180,165,170]

Output
["Mary","Emma","John"]

Expected
["Mary","Emma","John"]

Contribute a testcase

Result: The program successfully sorts the people according to their heights in descending order and returns the names in the correct order, with the tallest person listed first.

Task 6:

Aim: To find the Nth prime number using a Java program.

Algorithm:

1. Start with count = 0 and num = 1.
2. Increment num by 1.
3. Check whether num is a prime number.
4. If num is prime, increment count.
5. Repeat steps 2–4 until count equals the given input (input1).
6. Return num as the Nth prime number.

Program:

```
class UserMainCode
```

```
{
```

```
    public int NthPrime(int input1){
```

```
        int count = 0;
```

```
        int num = 1;
```

```
        while(count < input1){
```

```
            num++;
```

```
            if(isPrime(num)){
```

```
                count++;
```

```
            }
```

```
        }
```

```
        return num;
```

```
    }
```

```

private boolean isPrime(int n){

    if(n < 2) return false;

    for(int i = 2; i * i <= n; i++){
        if(n % i == 0)
            return false;
    }

    return true;
}
}

```

Output:

The screenshot shows a programming problem interface. On the left, under 'Question 1', the problem is titled 'pyNth Prime' and asks to write a function that finds and returns the Nth prime number. It includes an assumption that $1 \leq N \leq 1000$ and provides examples: for N=10, the 10th prime is 29; for N=13, the 13th prime is 41. On the right, the 'Default 2' test case is shown with an input of 15 and an expected output of 47. The actual output is also 47, indicating a successful test. The interface also shows execution details: Time: 201 ms and Memory: 57688 kb.

Result: The program successfully returns the Nth prime number.

Task 8:

Aim: To find the lexicographically smallest and largest substrings of length k from a given string.

Algorithm:

1. Take the first substring of length k as both smallest and largest.
2. Loop from index 1 to length of string – k.
3. Extract each substring of length k.
4. Compare the substring with smallest and largest using compareTo().
5. Update smallest if substring is smaller.
6. Update largest if substring is larger.
7. Print the smallest and largest substrings.

Program:

```
import java.util.Scanner;

public class Solution {

    public static String getSmallestAndLargest(String s, int k) {

        String smallest = s.substring(0, k);

        String largest = s.substring(0, k);

        for (int i = 1; i <= s.length() - k; i++) {

            String sub = s.substring(i, i + k);

            if (sub.compareTo(smallest) < 0)

                smallest = sub;

            if (sub.compareTo(largest) > 0)

                largest = sub;

        }

    }

}
```

```
        return smallest + "\n" + largest;
    }
}
```

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

    Scanner scan = new Scanner(System.in);

    String s = scan.next();

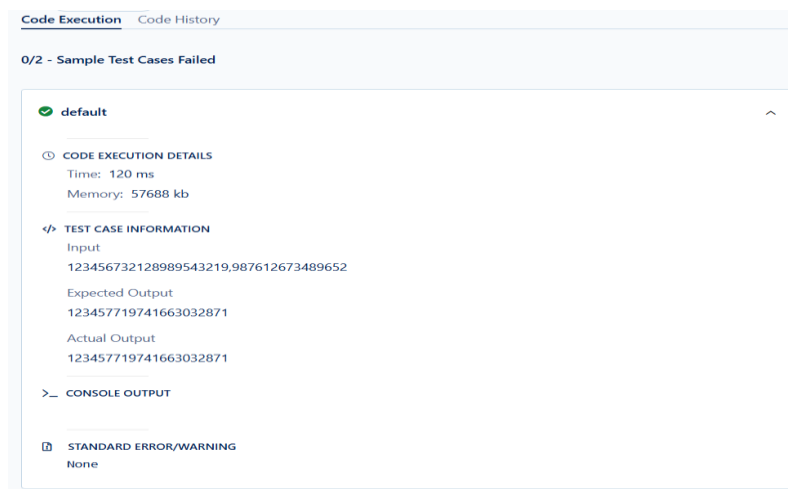
    int k = scan.nextInt();

    scan.close();

    System.out.println(getSmallestAndLargest(s, k));

}
}
```

Output:



The screenshot displays a 'Code Execution' window with a tab for 'Code History'. Below the tab, it states '0/2 - Sample Test Cases Failed'. A green checkmark icon and the word 'default' are visible. The 'CODE EXECUTION DETAILS' section shows 'Time: 120 ms' and 'Memory: 57688 kb'. The 'TEST CASE INFORMATION' section shows 'Input: 123456732128989543219,987612673489652', 'Expected Output: 123457719741663032871', and 'Actual Output: 123457719741663032871'. The 'CONSOLE OUTPUT' section is empty, and the 'STANDARD ERROR/WARNING' section shows 'None'.

Result: The programs was successfully find the lexicographically smallest and largest substrings of length k from a given string.

Task 9:

Aim: To compute a result by performing **addition and subtraction on numbers from N to 1** based on the selected option.

Algorithm:

1. Read the value of N and the option opt.
2. Initialize result to 0 and a boolean variable add to control addition/subtraction.
3. Loop from N down to 1.
4. If opt == 1:
5. If opt == 2:
6. Update the result in each iteration.
7. Return the final computed value.

Program:

```
class UserMainCode

{

    public int AddSub(int input1, int input2){

        int N = input1;

        int opt = input2;

        int result = 0;

        boolean add = true;

        if(opt == 1){

            add = true; // start with +

        }else{

            add = true; // opt2 also starts with +

        }

    }

}
```

```
for(int i = N; i >= 1; i--){
```

```
    if(opt == 1){
```

```
        // Pattern: + - + - ...
```

```
        if(add)
```

```
            result += i;
```

```
        else
```

```
            result -= i;
```

```
        add = !add;
```

```
    }
```

```
    else{
```

```
        // Pattern: + + - + - ...
```

```
        if(i == N || i == N-1){
```

```
            result += i;
```

```
        }
```

```
    else{
```

```
        if(add)
```

```
            result -= i;
```

```
        else
```

```
            result += i;
```

```
        add = !add;
```

```

    }

    }

}

return result;

}

}

```

Output:

The screenshot shows a programming IDE interface. On the left, under 'Question 1', the problem is described: 'Find result after alternate add_sub on N:'. It specifies that given a number N (1 ≤ N ≤ 10000) and an option opt=1 or 2, the result is calculated based on two rules. For opt=1, the result is N - (N-1) + (N-2) - (N-3) + (N-4) ... till 1. For opt=2, the result is N + (N-1) - (N-2) + (N-3) - (N-4) ... till 1. Two examples are provided: Example1 (N=6, opt=1) results in 3, and Example2 (N=6, opt=2) results in 9. The function prototype is given as 'int AddSub(int N, int opt);'. On the right, the 'CODE EXECUTION DETAILS' panel shows that the code ran successfully on the 'default' test case. The execution time was 260 ms and memory usage was 57820 kb. The test case information shows an input of 10000,2, an expected output of 15000, and an actual output of 15000. The console output is currently empty.

Result: The program successfully calculates the final value by applying the specified addition and subtraction pattern to the numbers from N to 1 based on the given option.