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Subject: Project Based Learning in Java
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Lab Based Complex Coding Problems

Problem 1.

Consider a function **public String matchFound(String input 1, String input 2),** where

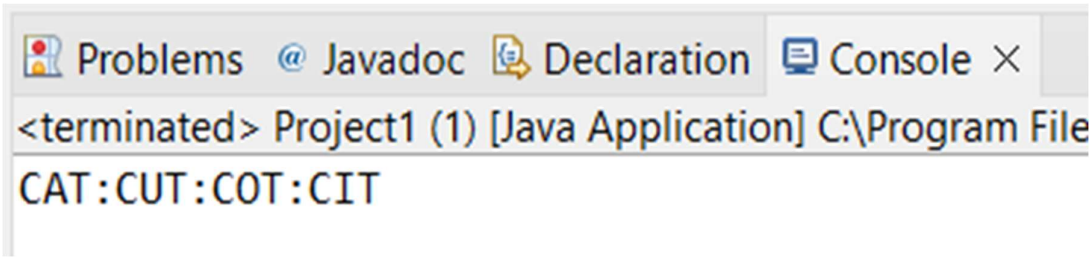
- **input1** will contain only a single word with only 1 character replaces by an underscore '_'
- **input2** will contain a series of words separated by colons and no space character in between
- **input2** will not contain any other special character other than underscore and alphabetic characters.

The methods should return output in a String type variable **"output1"** which contains all the words from input2 separated by colon which matches with input 1. All words in output1 should be in uppercase.

Code:

```
public class Project1 {
   public static void main(String[] args) {
      String input1 = "c_t";
      String input2 = "cat:bat:cut:cot:cit:mat:rat";
      String output1 = matchFound(input1, input2);
      System.out.println(output1);
   }
   public static String matchFound(String input1, String input2) {
      String[] words = input2.split(":");
      StringBuilder result = new StringBuilder();
      int underscoreIndex = input1.indexOf('_');
      for (String word : words) {
         if (word.length() == input1.length()) {
            boolean match = true;
            for (int i = 0; i < word.length(); i++) {
               if (i != underscoreIndex && input1.charAt(i) != word.charAt(i)) {
                  match = false;
                  break;}}
            if (match) {
               if (result.length() > 0) {
                  result.append(":");
               }
               result.append(word.toUpperCase());
            }
         }
      }
      return result.toString();
}
}
```

Output:



Problem 3:

Given a String (In Uppercase alphabets or Lowercase alphabets), new alphabets is to be appended with following rule:

(i) If the alphabet is present in the input string, use the numeric value of that alphabet. E.g. a or A numeric value is 1 and so on. New alphabet to be appended between 2 alphabets:

(a) If (sum of numeric value of 2 alphabets) %26 is 0, then append 0. E.g. string is ay. Numeric value of a is 1, y is 25. Sum is 26. Remainder is 0, the new string will be a0y.

(b) Otherwise (sum of numeric value of 2 alphabets) %26 numeric value alphabet is to be appended. E.g. ac is string. Numeric value of a is 1, c is 3, sum is 4. Remainder with 26 is 4. Alphabet to be appended is d. output will be adc.

(ii) If a digit is present, it will be the same in the output string. E.g. string is 12, output string is 12.

(iii) If only a single alphabet is present, it will be the same in the output string. E.g. input string is 1a, output will be 1a.

(iv) If space is present, it will be the same in the output string. E.g. string is ac 12a, output will be adc 12a.

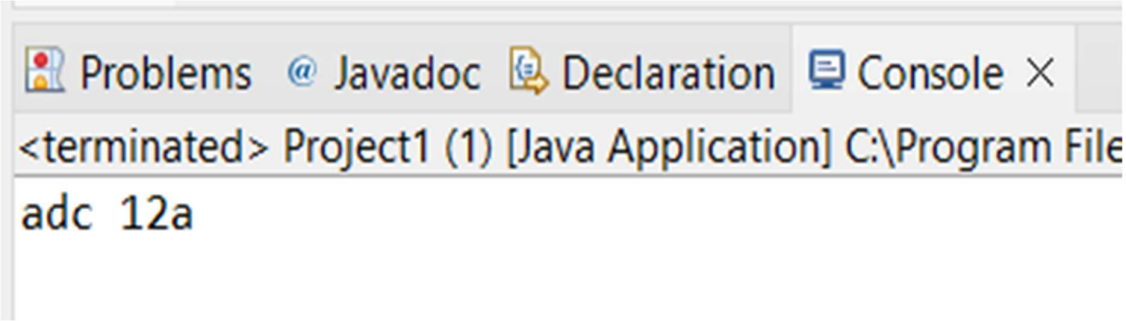
Constraint: Whether string alphabets are In Uppercase or Lowercase, appended alphabets must be in lower case. Output string must also be in lowercase.

Code:

```
public class Project1 {
   public static void main(String[] args) {
      String input = "ac 12a";
      String output = buildNewString(input);
      System.out.println(output);
   }
   public static String buildNewString(String input) {
      StringBuilder result = new StringBuilder();
      int n = input.length();
     for (int i = 0; i < n; i++) {
         char current = input.charAt(i);
         result.append(Character.toLowerCase(current));
         if (i < n - 1) {
            char next = input.charAt(i + 1);
            if (Character.isLetter(current) && Character.isLetter(next)) {
```

```
                int val1 = Character.toLowerCase(current) - 'a' + 1;
                int val2 = Character.toLowerCase(next) - 'a' + 1;
                int sum = (val1 + val2) % 26;
                if (sum == 0) {
                    result.append("0");
                } else {
                    result.append((char) ('a' + sum - 1));
                }
            }
        }
    }
    return result.toString();
  }
}
```

Output:



Problem 5:

The next greater element of some element x in an array is the first greater element that is to the right of x in the same array.
You are given two distinct 0-indexed integer arrays nums1 and nums2, where nums1 is a subset of nums2.
For each 0 <= i < nums1.length, find the index j such that nums1[i] == nums2[j] and determine the next greater element of nums2[j] in nums2. If there is no next greater element, then the answer for this query is -1.
Return an array ans of length nums1.length such that ans[i] is the next greater element as described above.

Hint:

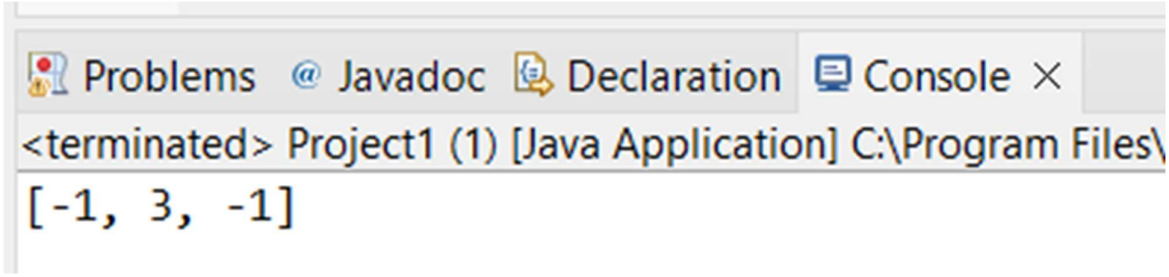
Input: nums1 = [4,1,2], nums2 = [1,3,4,2] Output: [-1,3,-1]
Explanation: The next greater element for each value of nums1 is as follows:
- 4 is underlined in nums2 = [1,3,4,2]. There is no next greater element, so the answer is -1.
- 1 is underlined in nums2 = [1,3,4,2]. The next greater element is 3.
- 2 is underlined in nums2 = [1,3,4,2]. There is no next greater element, so the answer is -1.

Code:

```
import java.util.*;
public class Project1 {
   public static void main(String[] args) {
      int[] nums1 = {4, 1, 2};
```

```
        int[] nums2 = {1, 3, 4, 2};
        int[] result = nextGreaterElement(nums1, nums2);
        System.out.println(Arrays.toString(result));
    }
    public static int[] nextGreaterElement(int[] nums1, int[] nums2) {
        Map<Integer, Integer> nextGreaterMap = new HashMap<>();
        Stack<Integer> stack = new Stack<>();
        for (int num : nums2) {
            while (!stack.isEmpty() && num > stack.peek()) {
                nextGreaterMap.put(stack.pop(), num);
            }
            stack.push(num);
        }
        while (!stack.isEmpty()) {
            nextGreaterMap.put(stack.pop(), -1);
        }
        int[] result = new int[nums1.length];
        for (int i = 0; i < nums1.length; i++) {
            result[i] = nextGreaterMap.get(nums1[i]);
        }
        return result;
    }
}
```

Output:



Problem 7:

Comparators are used to compare two objects. In this challenge, you'll create a comparator and use it to sort an array.
The Player class has fields: a String and a integer.
Given an array of Player objects, write a comparator that sorts them in order of decreasing score; if or more players have the same score, sort those players alphabetically by name.

To do this, you must create a Checker class that implements the Comparator interface, then write an int compare(Player a, Player b) method implementing the Comparator.compare(T o1, T o2) method.

Input Format

The first line contains an integer, denoting the number of players. Each of the subsequent lines contains a player's and , respectively.

Constraints

- players can have the same name.
- Player names consist of lowercase English letters.

Sample Input

5
amy 100
david 100
heraldo 50
aakansha 75
aleksa 150

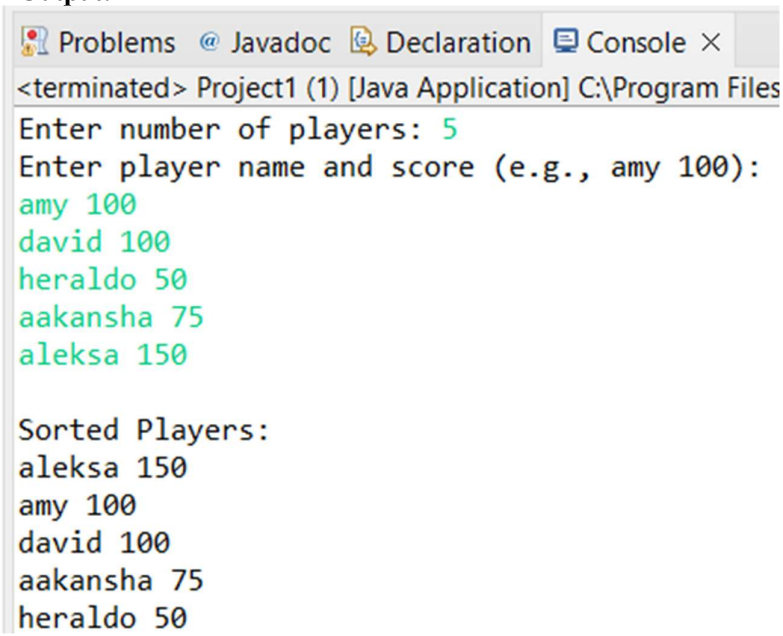
Sample Output

aleksa 150
amy 100
david 100
aakansha 75
heraldo 50

Code:

```
import java.util.*;
class Player {
   String name;
   int score;
   Player(String name, int score) {
      this.name = name;
      this.score = score;
   }
}
class Checker implements Comparator<Player> {
   public int compare(Player a, Player b) {
      if (a.score != b.score) {
         return b.score - a.score;
      } else {
         return a.name.compareTo(b.name);
      }
   }
}
public class Project1 {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter number of players: ");
      int n = sc.nextInt();
      sc.nextLine();
      Player[] players = new Player[n];
      System.out.println("Enter player name and score (e.g., amy 100):");
      for (int i = 0; i < n; i++) {
         String line = sc.nextLine();
         String[] parts = line.split(" ");
         String name = parts[0];
         int score = Integer.parseInt(parts[1]);
         players[i] = new Player(name, score);
      }
      Arrays.sort(players, new Checker());
      System.out.println("\nSorted Players:");
      for (Player p : players) {
         System.out.println(p.name + " " + p.score);
      }
      sc.close();
   }
}
```

Output:



Problem 9:

Given an input string (s) and a pattern (p), implement wildcard pattern matching with support for '?' and '*' where:

- '?' Matches any single character.
- '*' Matches any sequence of characters (including the empty sequence).

The matching should cover the entire input string (not partial).

Example 1:
Input: s = "aa", p = "a"
Output: false
Explanation: "a" does not match the entire string "aa".

Constraints:

- 0 <= s.length, p.length <= 2000
- s contains only lowercase English letters.
- p contains only lowercase English letters, '?' or '*'.

Code:

```
public class Project1 {
   public static void main(String[] args) {
      String s = "aa";
      String p = "a";
      boolean result = isMatch(s, p);
      System.out.println(result);
   }
   public static boolean isMatch(String s, String p) {
      int m = s.length();
      int n = p.length();
      boolean[][] dp = new boolean[m + 1][n + 1];
```

```
        dp[0][0] = true;
        for (int j = 1; j <= n; j++) {
            if (p.charAt(j - 1) == '*')
                dp[0][j] = dp[0][j - 1];
        }
        for (int i = 1; i <= m; i++) {
            for (int j = 1; j <= n; j++) {
                char pc = p.charAt(j - 1);
                char sc = s.charAt(i - 1);
                if (pc == '*') {
                    dp[i][j] = dp[i][j - 1] || dp[i - 1][j];
                } else if (pc == '?' || pc == sc) {
                    dp[i][j] = dp[i - 1][j - 1];
                }
            }
        }
        return dp[m][n];
    }
}
```

Output: