Practical 5

Task A & B

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Task A

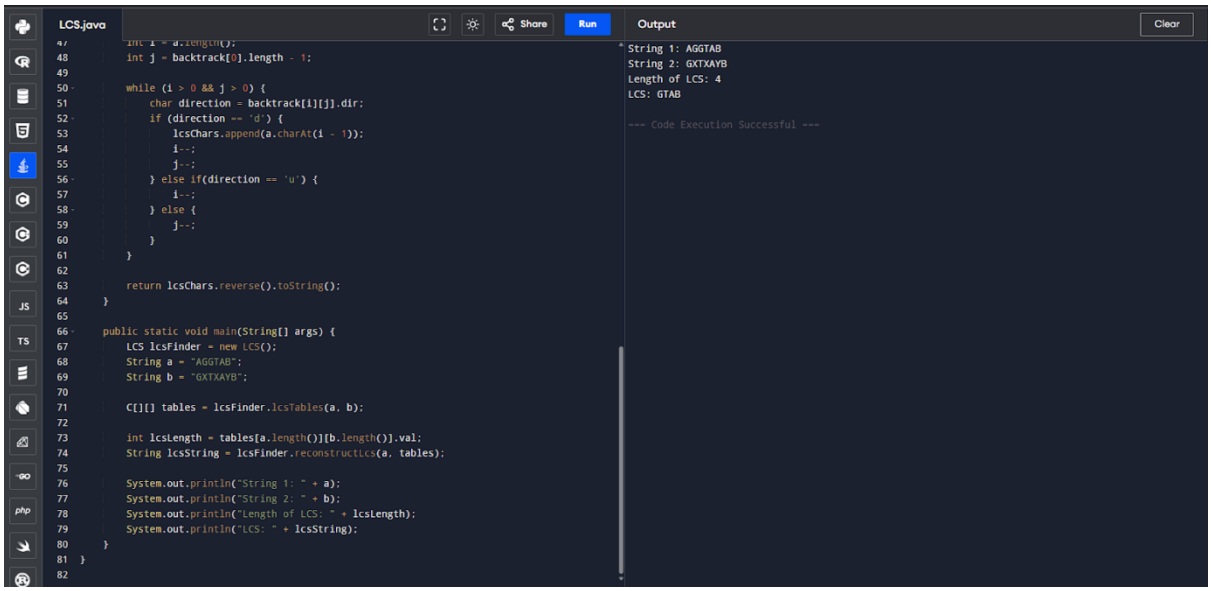
Code:

```
 import java.util.Arrays;
import java.util.Collections;

public class LCS {

    static class C {
        int val;
        char dir;

        public C(int val, char dir) {
            this.val = val;
            this.dir = dir;
        }
    }

    public C[][] lcsTables(String a, String b) {
        int m = a.length();
        int n = b.length();

        C[][] c = new C[m + 1][n + 1];

        for (int i = 0; i <= m; i++) {
            c[i][0] = new C(0, 'h');
        }
        for (int j = 0; j <= n; j++) {
            c[0][j] = new C(0, 'h');
        }

        for (int i = 1; i <= m; i++) {
            for (int j = 1; j <= n; j++) {
                if (a.charAt(i - 1) == b.charAt(j - 1)) {
                    c[i][j] = new C(c[i - 1][j - 1].val + 1, 'd');
```

```
            else {
                if (c[i - 1][j].val >= c[i][j - 1].val) {
                    c[i][j] = new C(c[i - 1][j].val, 'u');
                }
                else {
                    c[i][j] = new C(c[i][j - 1].val, 'l');
                }
            }
        }
    }
    return c;
}

public String reconstructLcs(String a, C[][] backtrack) {
    StringBuilder lcsChars = new StringBuilder();
    int i = a.length();
    int j = backtrack[0].length - 1;

    while (i > 0 && j > 0) {
        char direction = backtrack[i][j].dir;
        if (direction == 'd') {
            lcsChars.append(a.charAt(i - 1));
            i--;
            j--;
        }
        else if(direction == 'u') {
            i--;
        }
        else {
            j--;
        }
    }

    return lcsChars.reverse().toString();
}

public static void main(String[] args) {
    LCS lcsFinder = new LCS();
    String a = "AGGTAB";
    String b = "GXTXAYB";

    C[][] tables = lcsFinder.lcsTables(a, b);

    int lcsLength = tables[a.length()][b.length()].val;
    String lcsString = lcsFinder.reconstructLcs(a, tables);

    System.out.println("String 1: " + a);
    System.out.println("String 2: " + b);
    System.out.println("Length of LCS: " + lcsLength);
    System.out.println("LCS: " + lcsString);
```

```
    }
}
```

Screenshot:



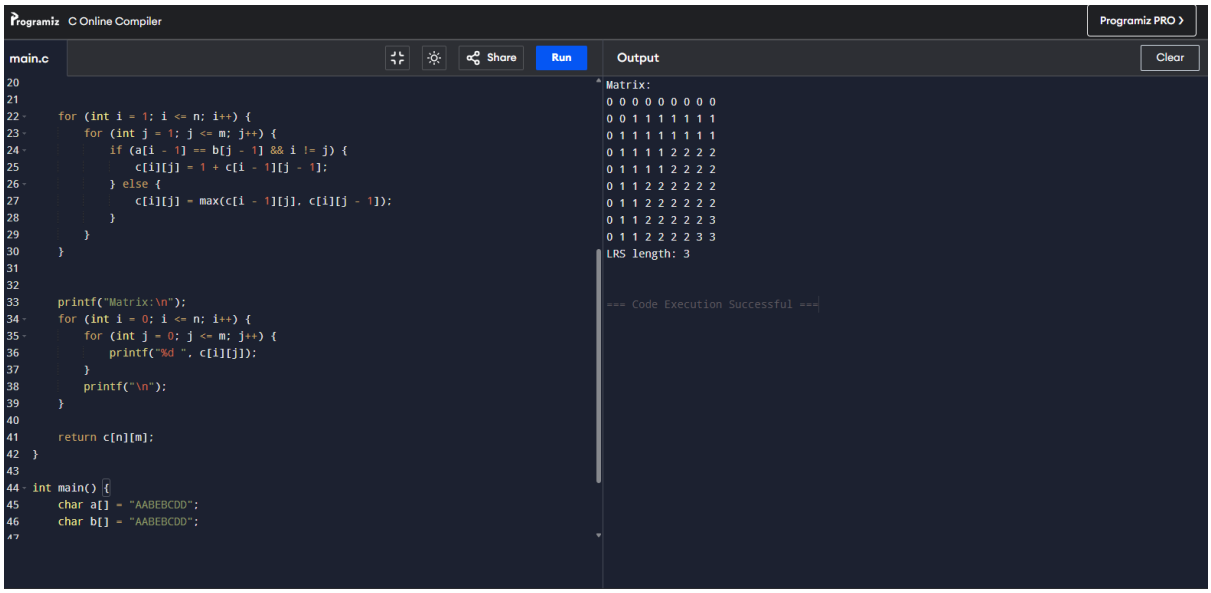
Task B

Code:

```
#include <stdio.h>
#include <string.h>

int max(int a, int b) {
    return (a > b) ? a : b;
}

int LRS(char* a, char* b) {
    int n = strlen(a);
    int m = strlen(b);

    int c[n + 1][m + 1];


    for (int i = 0; i <= n; i++) {
        for (int j = 0; j <= m; j++) {
            c[i][j] = 0;
        }
    }


    for (int i = 1; i <= n; i++) {
        for (int j = 1; j <= m; j++) {
```

```
            if (a[i - 1] == b[j - 1] && i != j) {
                c[i][j] = 1 + c[i - 1][j - 1];
            } else {
                c[i][j] = max(c[i - 1][j], c[i][j - 1]);
            }
        }
    }


    printf("Matrix:\n");
    for (int i = 0; i <= n; i++) {
        for (int j = 0; j <= m; j++) {
            printf("%d ", c[i][j]);
        }
        printf("\n");
    }

    return c[n][m];
}

int main() {
    char a[] = "AABEBCDD";
    char b[] = "AABEBCDD";

    int result = LRS(a, b);
    printf("LRS length: %d\n", result);

    return 0;
}
```

Output:

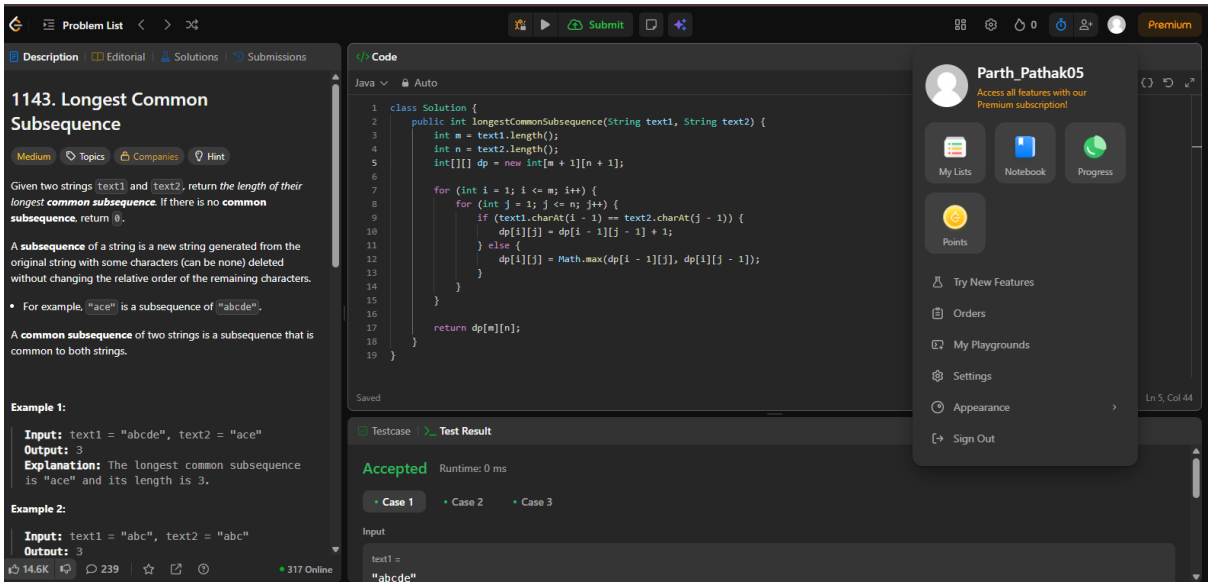


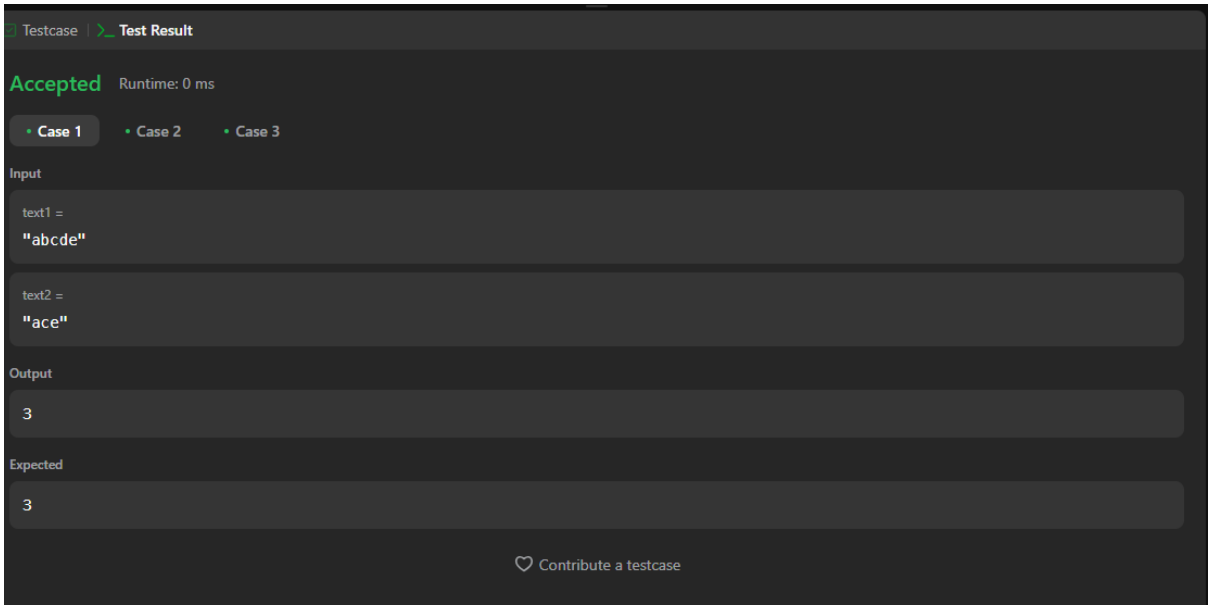
LeetCode

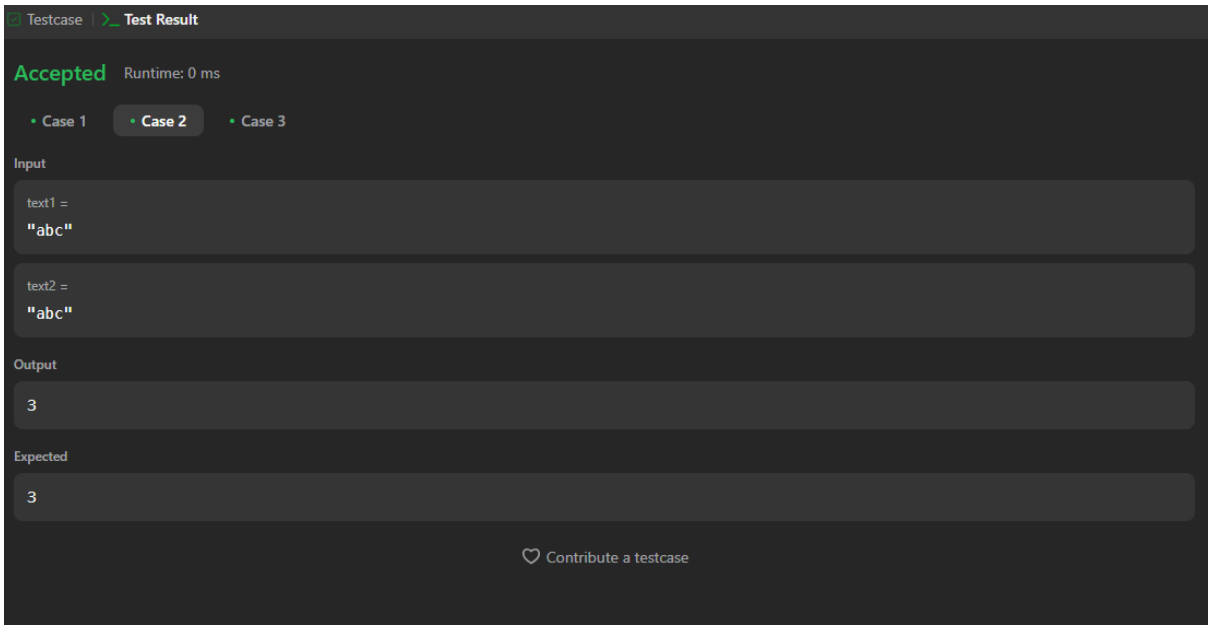
Code:

```java
class Solution {
    public int longestCommonSubsequence(String text1, String text2) {
        int m = text1.length();
        int n = text2.length();
        int[][] dp = new int[m + 1][n + 1];

        for (int i = 1; i <= m; i++) {
            for (int j = 1; j <= n; j++) {
                if (text1.charAt(i - 1) == text2.charAt(j - 1)) {
                    dp[i][j] = dp[i - 1][j - 1] + 1;
                } else {
                    dp[i][j] = Math.max(dp[i - 1][j], dp[i][j - 1]);
                }
            }
        }

        return dp[m][n];
    }
}
```

Output:




Testcase
Test Result
Accepted
Runtime: 0 ms
Case 1
Case 2
Case 3
Input
text1 =
"abcde"
text2 =
"ace"
Output
3
Expected
3
Contribute a testcase


Testcase
Test Result
Accepted
Runtime: 0 ms
Case 1
Case 2
Case 3
Input
text1 =
"abc"
text2 =
"abc"
Output
3
Expected
3
Contribute a testcase


Testcase
Test Result
Accepted
Runtime: 0 ms
Case 1
Case 2
Case 3
Input
text1 =
"abc"
text2 =
"def"
Output
0
Expected
0
Contribute a testcase