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Daa prac 5

Aim:- Implement a dynamic algorithm for Longest Common Subsequence (LCS) to find the length and LCS for DNA sequences.

Problem Statement:
(i) DNA sequences can be viewed as strings of A, C, G, and T characters, which represent nucleotides. Finding the similarities between two DNA sequences are an important computation performed in bioinformatics.

Code:- lcs

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

#define MAX 100

void printLCS(char* X, char* Y, int m, int n, int L[MAX][MAX]) {
    int index = L[m][n];
    char lcs[index+1];
    lcs[index] = '\0';
    int i = m, j = n;
    while (i > 0 && j > 0) {
        if (X[i-1] == Y[j-1]) {
            lcs[index-1] = X[i-1];
            i--; j--; index--;
        } else if (L[i-1][j] > L[i][j-1]) {
            i--;
        } else {
            j--;
        }
    }
    printf("Longest Common Subsequence: %s\n", lcs);
}

int main() {
    char X[] = "XAGCCCTAAGGGCTACCTAGCTT";
    char Y[] = "GACAGCCTACAAGCGTTAGCTTG";
    int m = strlen(X);
    int n = strlen(Y);
    int L[MAX][MAX];
    for (int i = 0; i <= m; i++) {
        for (int j = 0; j <= n; j++) {
            if (i == 0 || j == 0)
                L[i][j] = 0;
            else if (X[i-1] == Y[j-1])
                L[i][j] = L[i-1][j-1] + 1;
            else
                L[i][j] = (L[i-1][j] > L[i][j-1])? L[i-1][j] : L[i][j-1];
        }
    }

    printf("Length of LCS: %d\n", L[m][n]);
    printLCS(X, Y, m, n, L);

    return 0;
}
```

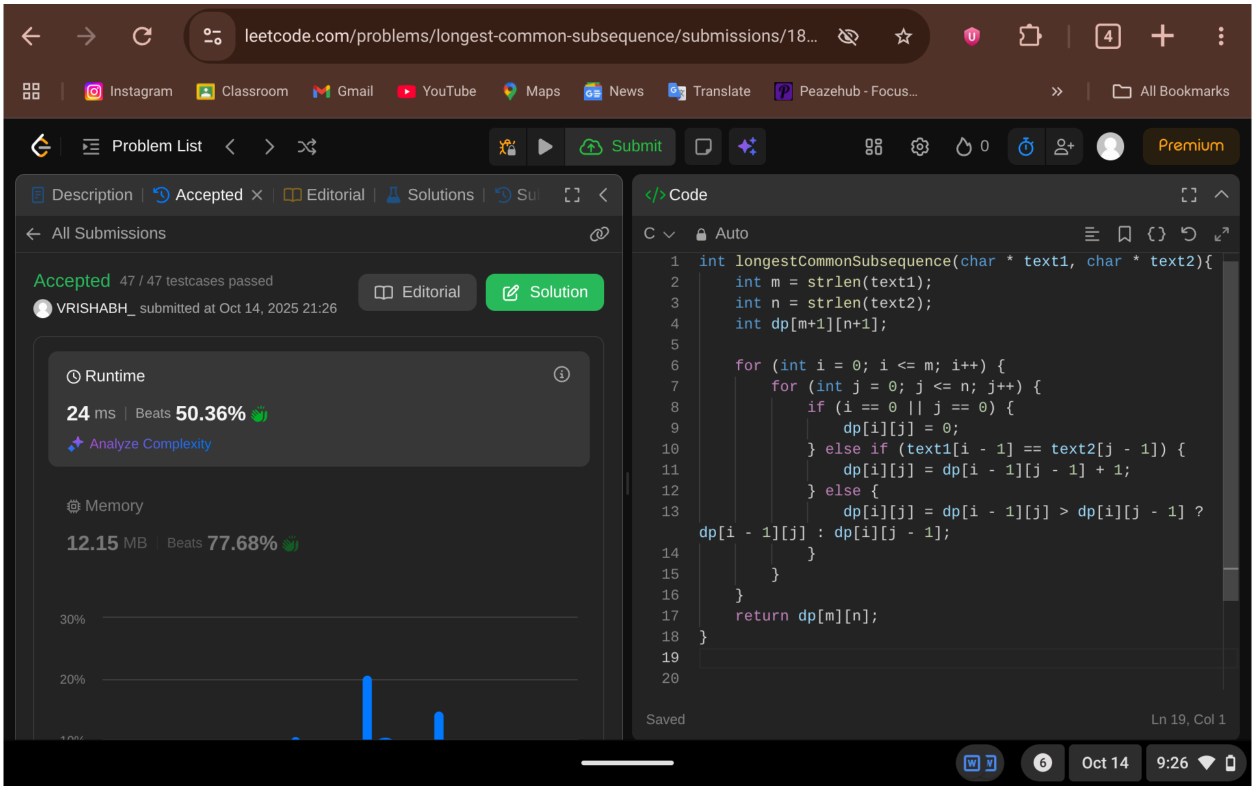
Code:- lrs

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

#define MAX 100

void printLRS(char* str, int n, int L[MAX][MAX]) {
    int index = L[n][n];
    char lrs[index+1];
    lrs[index] = '\0';
    int i = n, j = n;
    while (i > 0 && j > 0) {
        if (str[i-1] == str[j-1] && i != j) {
            lrs[index-1] = str[i-1];
            i--; j--; index--;
        } else if (L[i-1][j] > L[i][j-1]) {
            i--;
        } else {
            j--;
        }
    }
    printf("Longest Repeating Subsequence: %s\n", lrs);
}

int main() {
    char str[] = "AABCBDC";
    int n = strlen(str);
    int L[MAX][MAX];

    for (int i = 0; i <= n; i++) {
        for (int j = 0; j <= n; j++) {
            if (i == 0 || j == 0)
                L[i][j] = 0;
            else if (str[i-1] == str[j-1] && i != j)
                L[i][j] = 1 + L[i-1][j-1];
            else
                L[i][j] = (L[i-1][j] > L[i][j-1])? L[i-1][j] : L[i][j-1];
        }
    }

    printf("Length of LRS: %d\n", L[n][n]);
    printLRS(str, n, L);

    return 0;
}
```

output

Parameter	Value
X (Sequence 1)	XAGCCCTAAGGGCTACCTAGCTT
Y (Sequence 2)	GACAGCCTACAAGCGTTAGCTTG
LCS Length	16
LCS Sequence Example	A G C C C T A A G C T T A G C T T

Parameter	Value
S (Input String)	AABCBDC
LRS Length	3
LRS Sequence Example	ABC or ABD



Accepted 47 / 47 testcases passed

VRISHABH_ submitted at Oct 14, 2025 21:26

Runtime

24 ms | Beats 50.36%

Memory

12.15 MB | Beats 77.68%

```c
int longestCommonSubsequence(char * text1, char * text2){
    int m = strlen(text1);
    int n = strlen(text2);
    int dp[m+1][n+1];

    for (int i = 0; i <= m; i++) {
        for (int j = 0; j <= n; j++) {
            if (i == 0 || j == 0) {
                dp[i][j] = 0;
            } else if (text1[i - 1] == text2[j - 1]) {
                dp[i][j] = dp[i - 1][j - 1] + 1;
            } else {
                dp[i][j] = dp[i - 1][j] > dp[i][j - 1] ? dp[i - 1][j] : dp[i][j - 1];
            }
        }
    }
    return dp[m][n];
}
```