

**Playing with Numbers:**

Ram and Sita are playing with numbers by giving puzzles to each other. Now it was Ram's turn, so he gave Sita a positive integer 'n' and two numbers 1 and 3. He asked her to find the possible ways by which the number n can be represented using 1 and 3. Write any efficient algorithm to find the possible ways.

**Example 1:****Input:** 6**Output:** 6

**Explanation:** There are 6 ways to represent the number with 1 and 3

```
1+1+1+1+1+1
3+3
1+1+1+3
1+1+3+1
1+3+1+1
3+1+1+1
```

**Input Format**

First Line contains the number n

**Output Format**

**Print:** The number of possible ways 'n' can be represented using 1 and 3

**Sample Input**

6

**Sample Output**

6

**Answer:** (penalty regime: 0 %)

```
1 #include <stdio.h>
2 int main() {
3     int n;
4     scanf("%d", &n);
5     long long dp[n + 1];
6     for (int i = 0; i <= n; i++) {
7         dp[i] = 0;
8     }
9     dp[0] = 1;
10    for (int i = 1; i <= n; i++) {
11        dp[i] += dp[i - 1];
12        if (i >= 3) {
13            dp[i] += dp[i - 3];
14        }
15    }
16    printf("%lld\n", dp[n]);
17 }
```

|   | Input | Expected          | Got               |   |
|---|-------|-------------------|-------------------|---|
| ✓ | 6     | 6                 | 6                 | ✓ |
| ✓ | 25    | 8641              | 8641              | ✓ |
| ✓ | 100   | 24382819596721629 | 24382819596721629 | ✓ |

Passed all tests! ✓

Correct

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[Back to Course](#)

**Playing with Chessboard:**

Ram is given with an  $n \times n$  chessboard with each cell with a monetary value. Ram stands at the  $(0,0)$ , that the position of the top left white rook. He is been given a task to reach the bottom right black rook position  $(n-1, n-1)$  constrained that he needs to reach the position by traveling the maximum monetary path under the condition that he can only travel one step right or one step down the board. Help ram to achieve it by providing an efficient DP algorithm.

**Example:****Input**

```
3
1 2 4
2 3 4
8 7 1
```

**Output:**

```
19
```

**Explanation:**

Totally there will be 6 paths among that the optimal is

Optimal path value:  $1+2+8+7+1=19$

**Input Format**

First Line contains the integer  $n$

The next  $n$  lines contain the  $n \times n$  chessboard values

**Output Format**

Print Maximum monetary value of the path

**Answer:** (penalty regime: 0 %)

```
1 #include <stdio.h>
2 #define MAX 100
3 int main() {
4     int n;
5     scanf("%d", &n);
6     int board[MAX][MAX];
7     int dp[MAX][MAX];
8     for (int i = 0; i < n; i++) {
9         for (int j = 0; j < n; j++) {
10            scanf("%d", &board[i][j]);
11        }
12    }
13    dp[0][0] = board[0][0];
14    for (int j = 1; j < n; j++) {
15        dp[0][j] = dp[0][j - 1] + board[0][j];
16    }
17    for (int i = 1; i < n; i++) {
18        dp[i][0] = dp[i - 1][0] + board[i][0];
19    }
20    for (int i = 1; i < n; i++) {
21        for (int j = 1; j < n; j++) {
22            dp[i][j] = board[i][j] + (dp[i - 1][j] > dp[i][j - 1] ? dp[i - 1][j] : dp[i][j - 1]);
23        }
24    }
25    printf("%d\n", dp[n - 1][n - 1]);
26}
```

|   | <b>Input</b>                                  | <b>Expected</b> | <b>Got</b> |   |
|---|---|-----------------|------------|---|
| ✓ | 3<br>1 2 4<br>2 3 4<br>8 7 1                  | 19              | 19         | ✓ |
| ✓ | 3<br>1 3 1<br>1 5 1<br>4 2 1                  | 12              | 12         | ✓ |
| ✓ | 4<br>1 1 3 4<br>1 5 7 8<br>2 3 4 6<br>1 6 9 0 | 28              | 28         | ✓ |

Passed all tests! ✓

**Correct**

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[Back to Course](#)

Given two strings find the length of the common longest subsequence(need not be contiguous) between the two.

Example:

s1: ggtabe

s2: tgasasb

|    |          |   |          |          |   |   |
|----|----------|---|----------|----------|---|---|
| s1 | a        | g | <b>g</b> | <b>t</b> | a | b |
| s2 | <b>g</b> | x | <b>t</b> | x        | a | y |

**The length is 4**

Solving it using Dynamic Programming

For example:

| Input | Result |
|-------|--------|
| aab   | 2      |
| azb   |        |

**Answer:** (penalty regime: 0 %)

```

1 #include <stdio.h>
2 #include <string.h>
3 int main() {
4     char s1[1000], s2[1000];
5     scanf("%s", s1);
6     scanf("%s", s2);
7     int len1 = strlen(s1);
8     int len2 = strlen(s2);
9     int dp[1000][1000];
10    for (int i = 0; i <= len1; i++) {
11        for (int j = 0; j <= len2; j++) {
12            if (i == 0 || j == 0)
13                dp[i][j] = 0;
14            else if (s1[i - 1] == s2[j - 1])
15                dp[i][j] = dp[i - 1][j - 1] + 1;
16            else
17                dp[i][j] = dp[i - 1][j] > dp[i][j - 1] ? dp[i - 1][j] : dp[i][j - 1];
18        }
19    }
20    printf("%d\n", dp[len1][len2]);
21    return 0;
22}
23
24

```

|   | Input        | Expected | Got |   |
|---|--------------|----------|-----|---|
| ✓ | aab<br>azb   | 2        | 2   | ✓ |
| ✓ | ABCD<br>ABCD | 4        | 4   | ✓ |

Passed all tests! ✓

Problem statement:

Find the length of the Longest Non-decreasing Subsequence in a given Sequence.

Eg:

Input:9

Sequence:[-1,3,4,5,2,2,2,2,3]

the subsequence is [-1,2,2,2,2,3]

Output:6

**Answer:** (penalty regime: 0 %)

```

1 #include <stdio.h>
2 int main() {
3     int n;
4     scanf("%d", &n);
5     int a[1000], dp[1000];
6     for (int i = 0; i < n; i++) {
7         scanf("%d", &a[i]);
8         dp[i] = 1;
9     }
10    for (int i = 1; i < n; i++) {
11        for (int j = 0; j < i; j++) {
12            if (a[i] >= a[j] && dp[i] < dp[j] + 1)
13                dp[i] = dp[j] + 1;
14        }
15    }
16    int max = dp[0];
17    for (int i = 1; i < n; i++) {
18        if (dp[i] > max)
19            max = dp[i];
20    }
21    printf("%d\n", max);
22 }
23

```

|   | Input                   | Expected | Got |   |
|---|-------------------------|----------|-----|---|
| ✓ | 9<br>-1 3 4 5 2 2 2 2 3 | 6        | 6   | ✓ |
| ✓ | 7<br>1 2 2 4 5 7 6      | 6        | 6   | ✓ |

Passed all tests! ✓

Correct

Marks for this submission: 1.00/1.00.

[Back to Course](#)