

Q.1

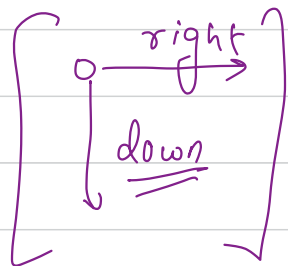
src

15	6	X0	3	0
9	6	3	3	X0
3	3	X0	3	1
X0	3	3	2	1
0	X0	1	1	1

dest

$n \times m$

max



if $src == dest$
 \rightarrow # of ways $\rightarrow \underline{\underline{1}}$

$T \rightarrow O(mn)$

$SC \rightarrow O(n)$

$(i, j) \rightarrow (n-1, m-1)$

if first move is R

$\left[\begin{array}{l} R \left[0, 0, 0, 1 \right] \\ R \left[0, R, 0, 0 \right] \\ R \left[0, 0, R, 0 \right] \end{array} \right] \rightarrow (i, j+1) \rightarrow (n-1, m-1)$

$$f(i, j, n-1, m-1) = f(i, j+1, n-1, m-1) + f(i+1, j, n-1, m-1)$$

TC \rightarrow (Time reqd for an x # of states)
state

funcⁿ returns # of
ways to reach (n-1, m-1)
from (i, j) with

right/down as the

move

if (grid[i][j] is blocked)

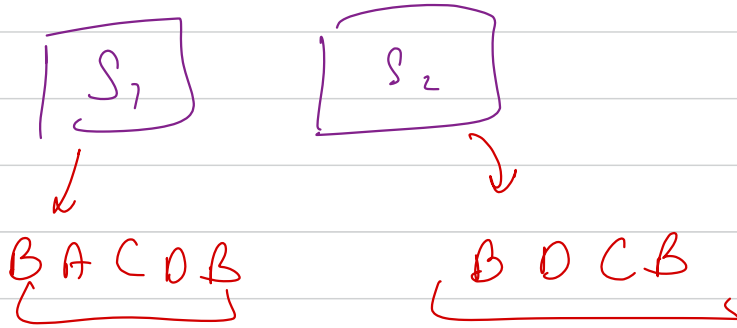
return 0;

DP \rightarrow $O(mn)$

$$f(i, j) = f(i+1, j) + f(i, j+1)$$

maximum \rightarrow 2D dp

Q.27 LCS You are given 2 strings, & you need to find the longest common subsequence.

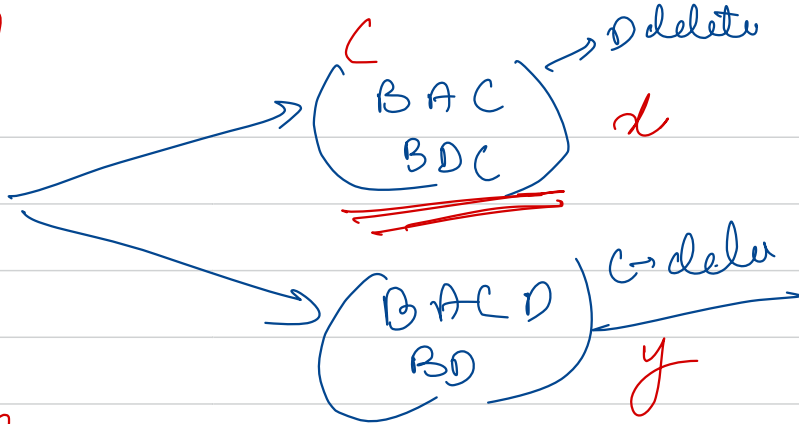


ans \rightarrow

3

max(x, y)

$\begin{matrix} \circ & & \circ \\ \text{B A C D} \\ \circ & & \circ \end{matrix}$



TD

$f(i, j)$

$$= 1 + f(i-1, j-1)$$

if $s_1[i] = s_2[j]$

func to calc LCS
 of $s_1[0..i]$ and
 $s_2[0..j]$

$$\max \left(f(i-1, j), f(i, j-1) \right) \quad \text{else}$$

$(BACDB^d, BDCB^d)$



$(BACD, BDC)$

to find C later

↑
 (BAC, BDC)

to find
D later

$(BACD, BD)$

TD

$f(i, j)$

func to calc LCS
of $S_1[0, i]$ and
 $S_2[0, j]$

$$= 1 + f(i-1, j-1)$$

if $s_1[i] == s_2[j]$

$$\max(f(i-1, j), f(i, j-1))$$

else

$$f(i, j-1)$$

BACDB

BDCB

			B	D	C	B	
			0	1	2	3	4
	B	1	0	0	0	0	0
	A	2	0	1	1	1	1
→	C	3	0	1	1	2	2
→	D	4	0	1	2	2	2
	B	5	0	1	2	2	3

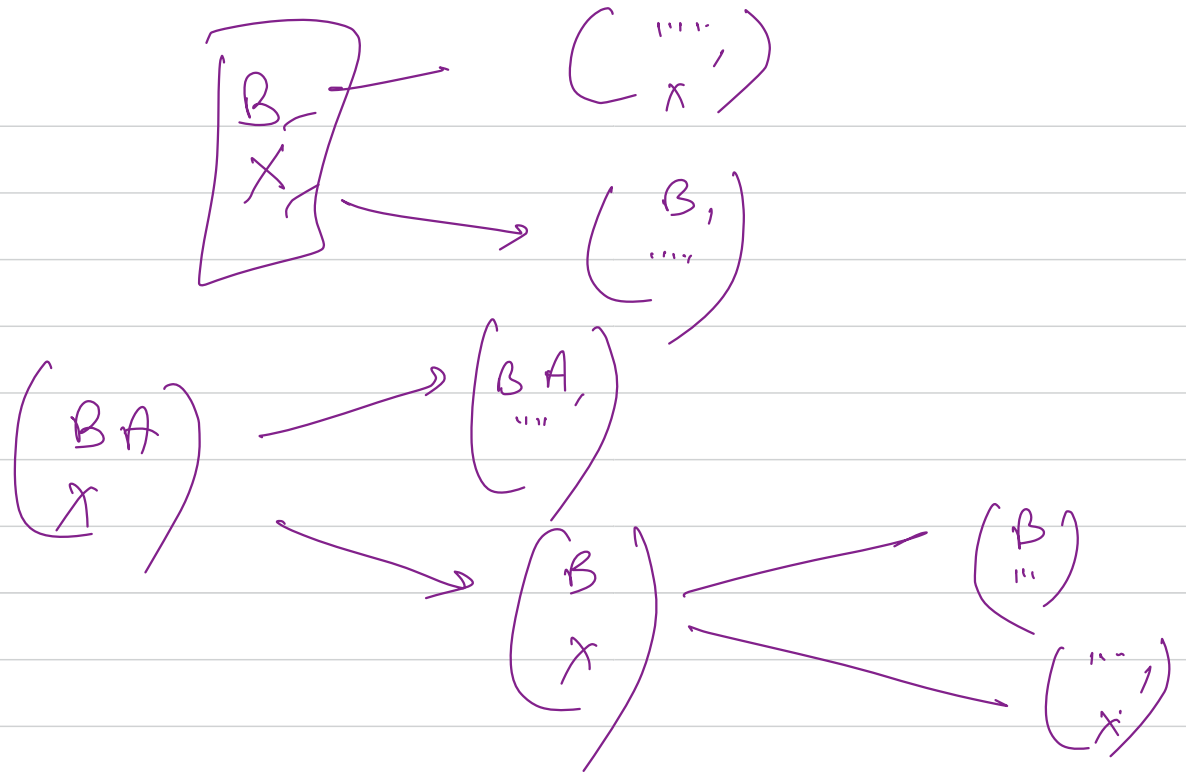
$(m+1) \times (n+1)$

$T \rightarrow O(mn)$

$SC \rightarrow (m)$

dp[m][m]
→ find ans

Print LCS



$dp(i, j) \rightarrow \text{LCS of } s_1[0, i] \text{ and } \underline{s_2[0, j]}$

Point
25

		0	1	2	3	4
0	0	0	0	0	0	0
1	0	1	1	1	1	1
2	0	1	1	1	1	1
3	0	1	1	2	2	2
4	0	1	2	2	2	2
5	0	1	2	2	3	3

$O(nm)$

BCB

start from bottom right

ans += "B"

ans += "C"

ans += B

Qⁿ Given 2 strings, find the largest common

Substrig-

\downarrow
 B D C B \rightarrow 2
 B A C B B \rightarrow CB

$$\forall f(i, j) = 1 + f(i-1, j-1) \quad \text{if } s_1[i] == s_2[j]$$

\rightarrow $s_1[0, i]$
 $s_2[0, j]$
max

$= 0$

else

20 dp

		B	A	C	B	B
B	0	0	0	0	0	0
D	0	0	0	0	0	0
C	0	0	0	1	0	0
B'	0	1	0	0	2	1

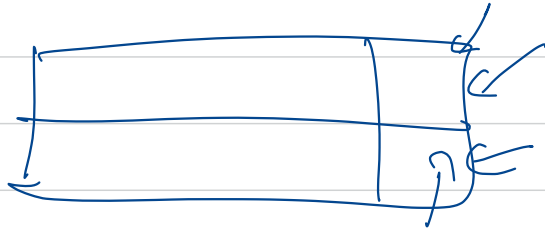
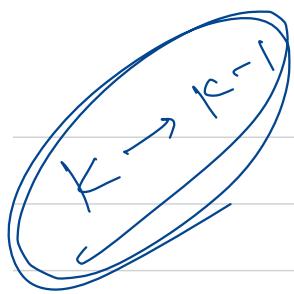
max of the grid is ans

$$f(i, j) = 1 + f(i-1, j-1)$$

0

$$\text{if } s_1(i) = s_2(j)$$

else



$$\underline{f(i, j, K)} = 1 + f(i-1, j-1, K) \quad \text{if } s_1[i] = s_2[j]$$

$$\max(f(i-1, j, K), f(i, j-1, K), 1 + f(i-1, j-1, K))$$

K > 0

Q → Given an array find the longest inc subsequence

1, 7 dp → 1 2 2 3 3 4 5 1 LIS

1	7	2	8	3	4	9	-1
0	1	2	3	4	5	6	7

{1, 2, 3, 4}

→ {5}

{1, 2, 3, 4}

max
 $f(i)$

lis, ending at
 i^{th} index element.

$$V_j < V_i$$

$$dp[i] = 1 + dp[j]$$

is ending at index 1, it will be copy
from the index < 1