$s_1 = "\quad"$ $s_2 = "\quad"$

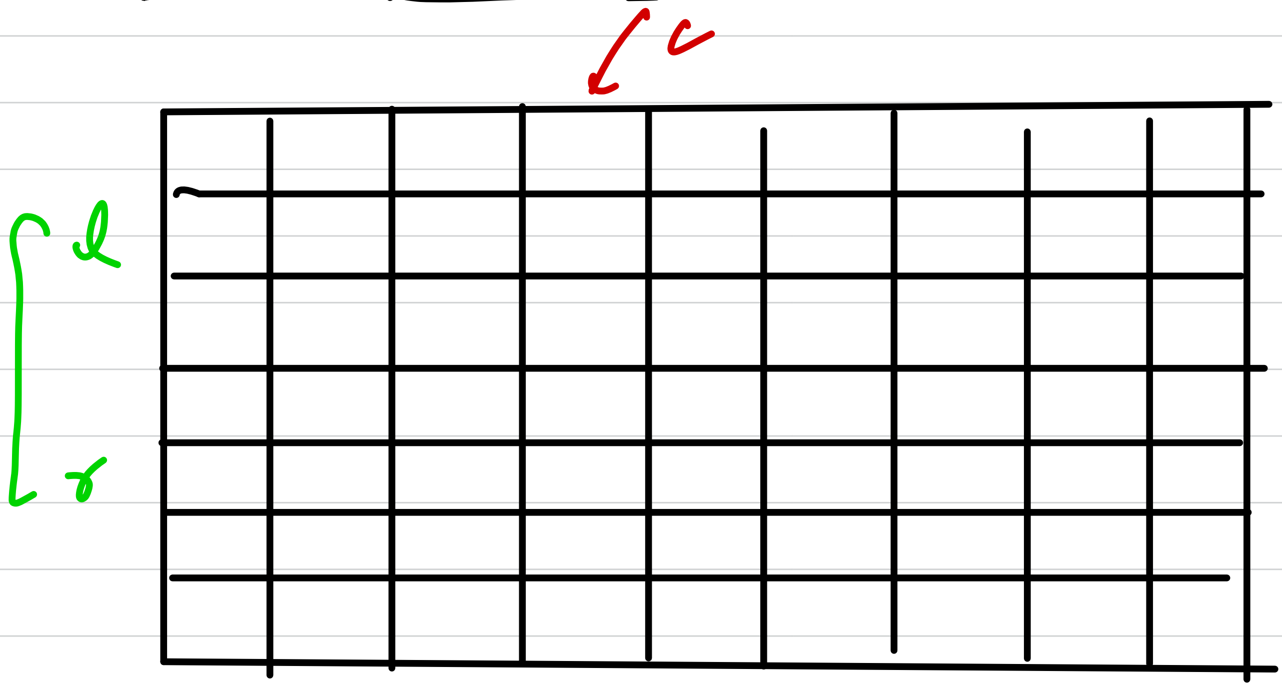
K

$s_1[i] \longrightarrow$ transfer

$$
f(i,j,k) = \begin{cases} 1 + f(i-1, j-1, k) & \text{if } \underline{s_1[i] == s_2[j]} \\ 1 + f(i-1, j-1, k-1) & \text{else if } \underline{k > 0} \\ \max\big(f(i-1, j, k), \\ \quad f(i, j-1, k)\big) & \text{else} \end{cases}
$$

Bruteforce

alyona and spreadsheet



$f(i, j)$ returns the starting row x from which $arr[x][j] - arr[i][j]$ is sorted

$$f(i,j) = \begin{cases} f(i-1, j) & \text{if } arr[i-1][j] < arr[i][j] \\ i & \text{else} \end{cases}$$

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

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

$O(nm + k)$ ✓

l, r

if any column has all value <= l

6

1 1	0	0	→	yes
2 5	1	4	→	NO
4 5	3	4	→	yes
3 5	2	4	→	yes
1 3	0	2	→	yes
1 5	0	4	→	NO

$O(1)$

2

0	1	2	3	4
0	0	0	0	2

$\min[r] \le l$

Q. Longest Palindromic Subsequence

"bbbab"

ans → 4

bbbb →

isPalindrome

$i \quad j$

BBABCBCAB

$$f(i,j) = \begin{cases} 1 & \text{if } (i == j) \\ 2 & \text{if } (s[i] == s[j] \text{ and } (j-i+1) == 2) \\ f(i+1, j-1) + 2 & \text{if } (s[i] == s[j]) \\ \max(f(i+1, j), f(i, j-1)) & \text{else} \end{cases}$$

Bottom up

f(i, j)

B B A B C B C A B

	B	B	A	B	C	B	C	A	B
B	1	2	2	3	3	5	5	5	7
B		1	1	3	3	3	3	5	7
A			1	1	1	3	3	5	5
B				1	1	3	3	3	5
C					1	1	3	3	3
B						1	1	1	3
C							1	1	1
A								1	1
B									1

wasted

ans → dp(0, n-1)

dp(i, j) → starting from s[i] and ending at s[j] what is my lps isPalindrome

$g(i, j)$ → returns $s[i, j]$ is a palindrome or not

$$g(i,j) = \begin{cases} \text{true} & (j - i + 1) == 1 \\ \text{true} & s[i] == s[j] \text{ and } (j - i + 1) == 2 \\ \underline{\underline{g(i+1, j-1)}} & s[i] == s[j] \end{cases}$$

$$f(i,j) = \begin{cases} 0 & g(i,j) == \text{true} \\ \min\left(f(i,k) + f(k+1,j) + 1\right) & \forall k \in [i, j-1] \end{cases}$$

min cuts for palindrome partition $S[i,j]$