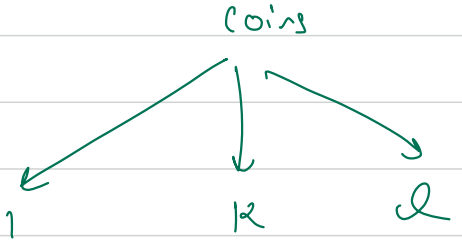
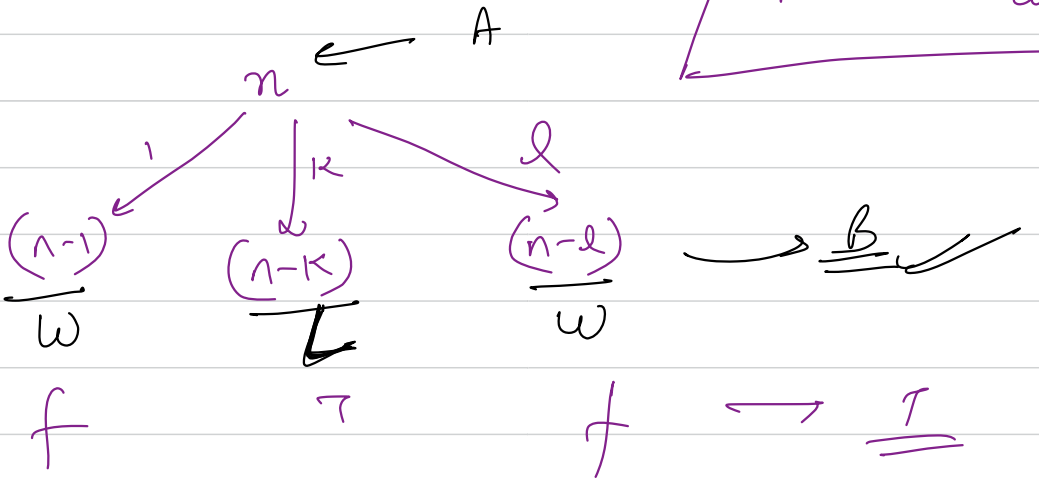
Q:1 Mcoins SPOJ → n → no. of coins (A, B)

A starts first



if (n==1) → A wins always



$f(n)$ ← correctly guess

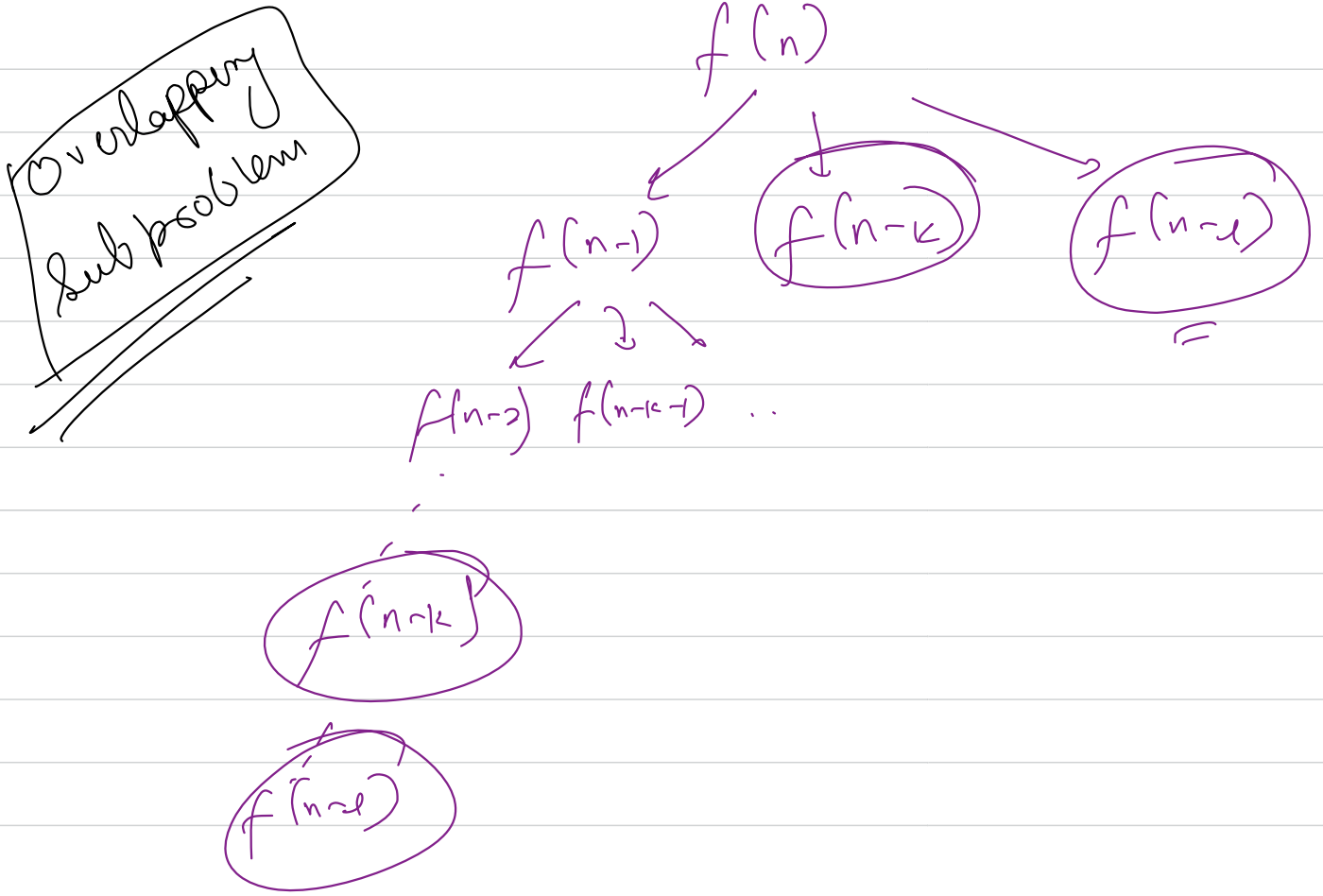
$=$

for given n coins who will win

$f(1) \longrightarrow A$

$$\begin{cases} f(n-1) \longrightarrow f \\ \text{or} \\ f(n-k) \longrightarrow T & n-k \geq 1 \\ \text{or} \\ f(n-l) \longrightarrow f & n-l \geq 1 \end{cases}$$

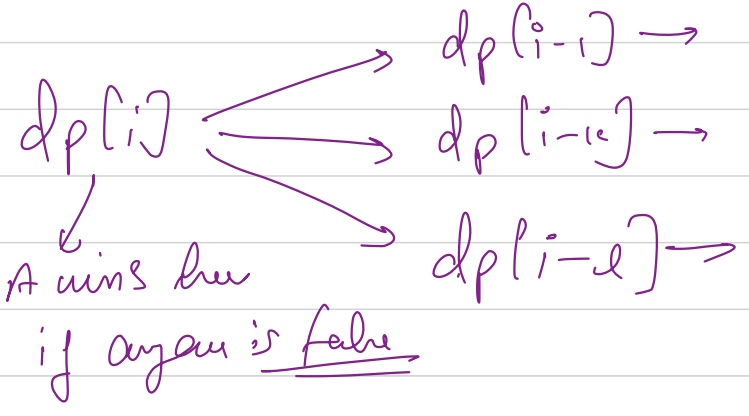
we say if A wins so that boolean True & if B wins that's a boolean False


Overlapping
subproblem
f(n)
f(n-1)
f(n-k)
f(n-1)
f(n-2)
f(n-k-1)
f(n-k)
f(n-1)

Bu → dp[i] → 1 → A wins

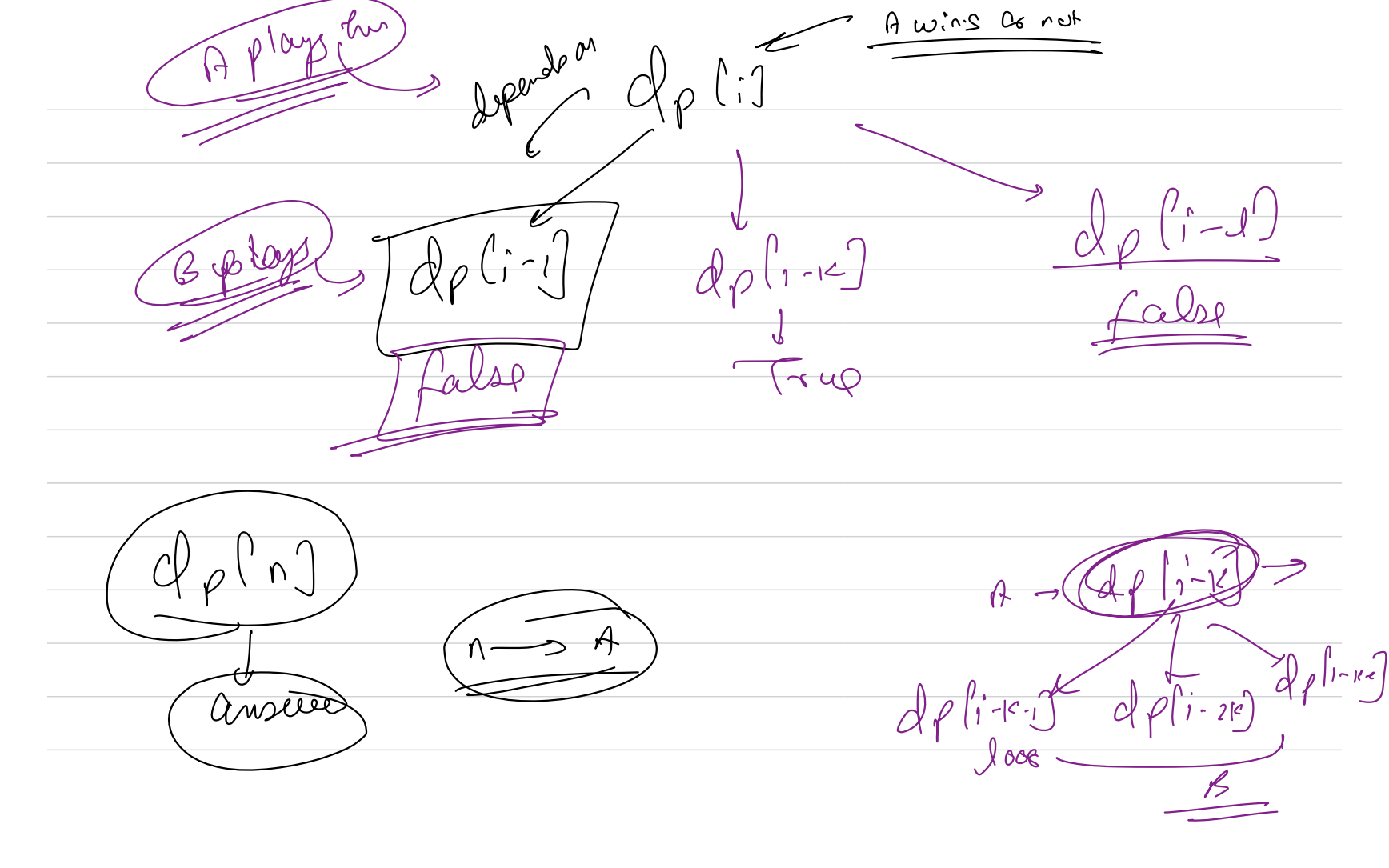
f(1) → 1 → True

0 → false



State of dp

dp[i] → if we get to a state i (i = no. of coins) then whether any players wins or not by convey to (n = c)


A plays this
A wins or not
dependon
dp[i]
B plays
dp[i-1]
False
dp[i-k]
True
dp[i-d]
False
dp[n]
answer
n → A
A
dp[i-k]
dp[i-k-1]
dp[i-2k]
dp[i-k-k]
lose
B

dp[i] ← if any player comes to this state it will win or not

Q:→ You are given a 2D grid of $n \times m$ dimension filled with integers. find a rectangle / subgrid with maximum sum of elements.

Imp Interview

1	2	-1	-4	-20
-8	-3	4	2	1
3	8	10	1	3
-4	-1	1	7	-6

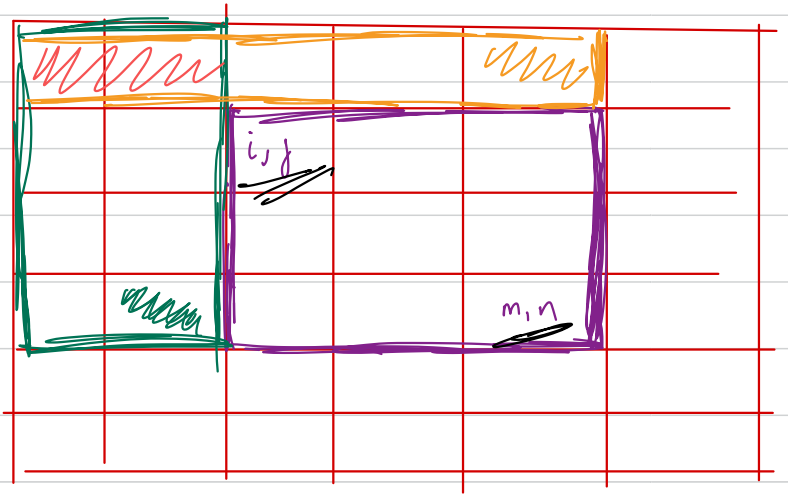
→ ans

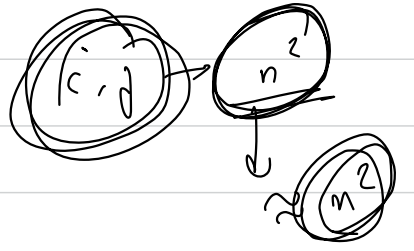
Kadane's algorithm

↓

max sum subarray in a 1D array

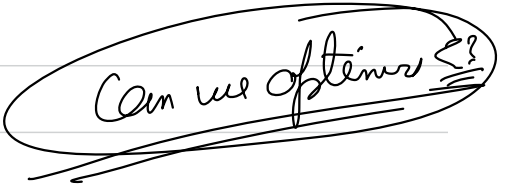
$O(n^2)$





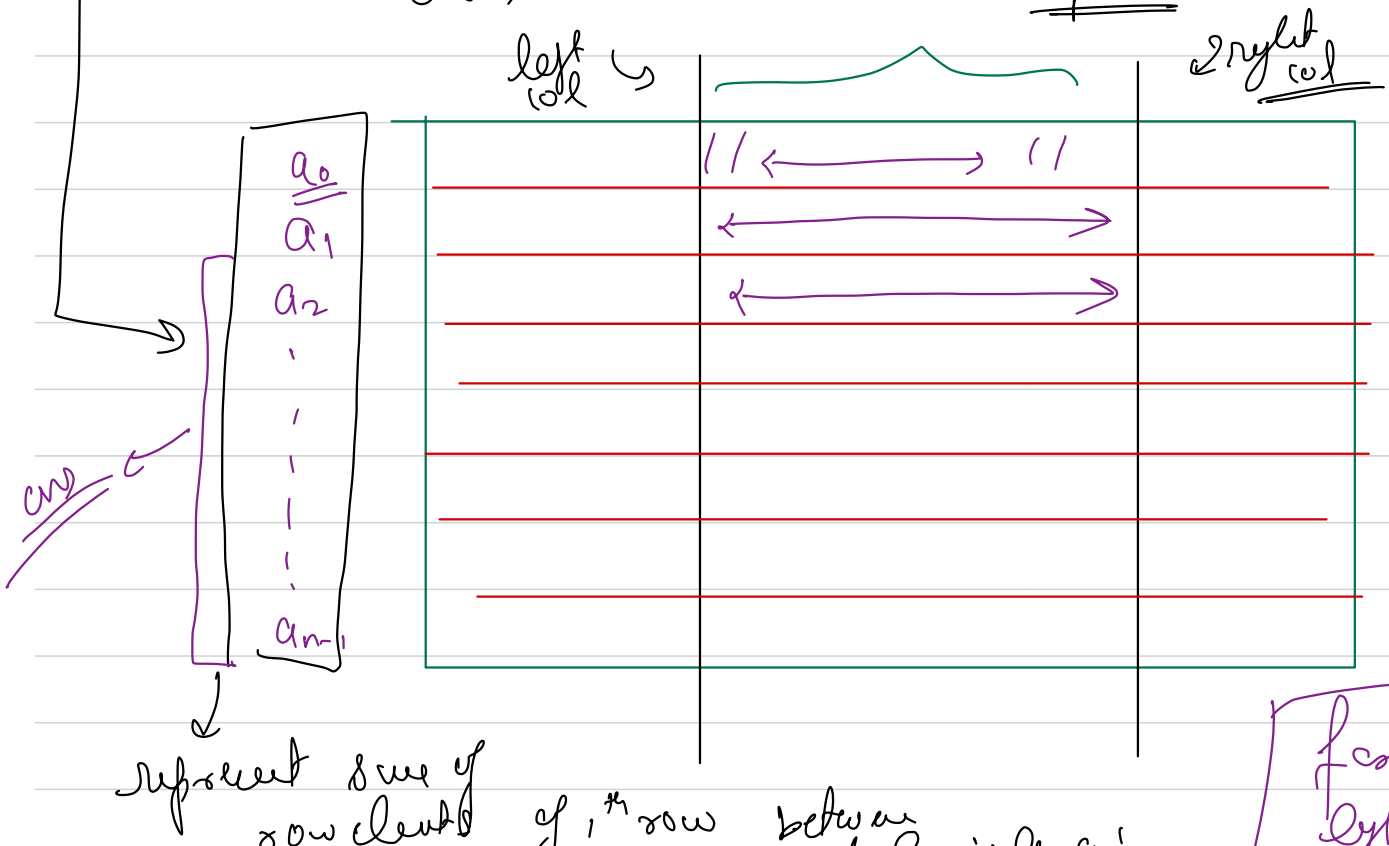
Sum rectangle - green - yellow + orange

prefix sum grid → $O(n^2)$



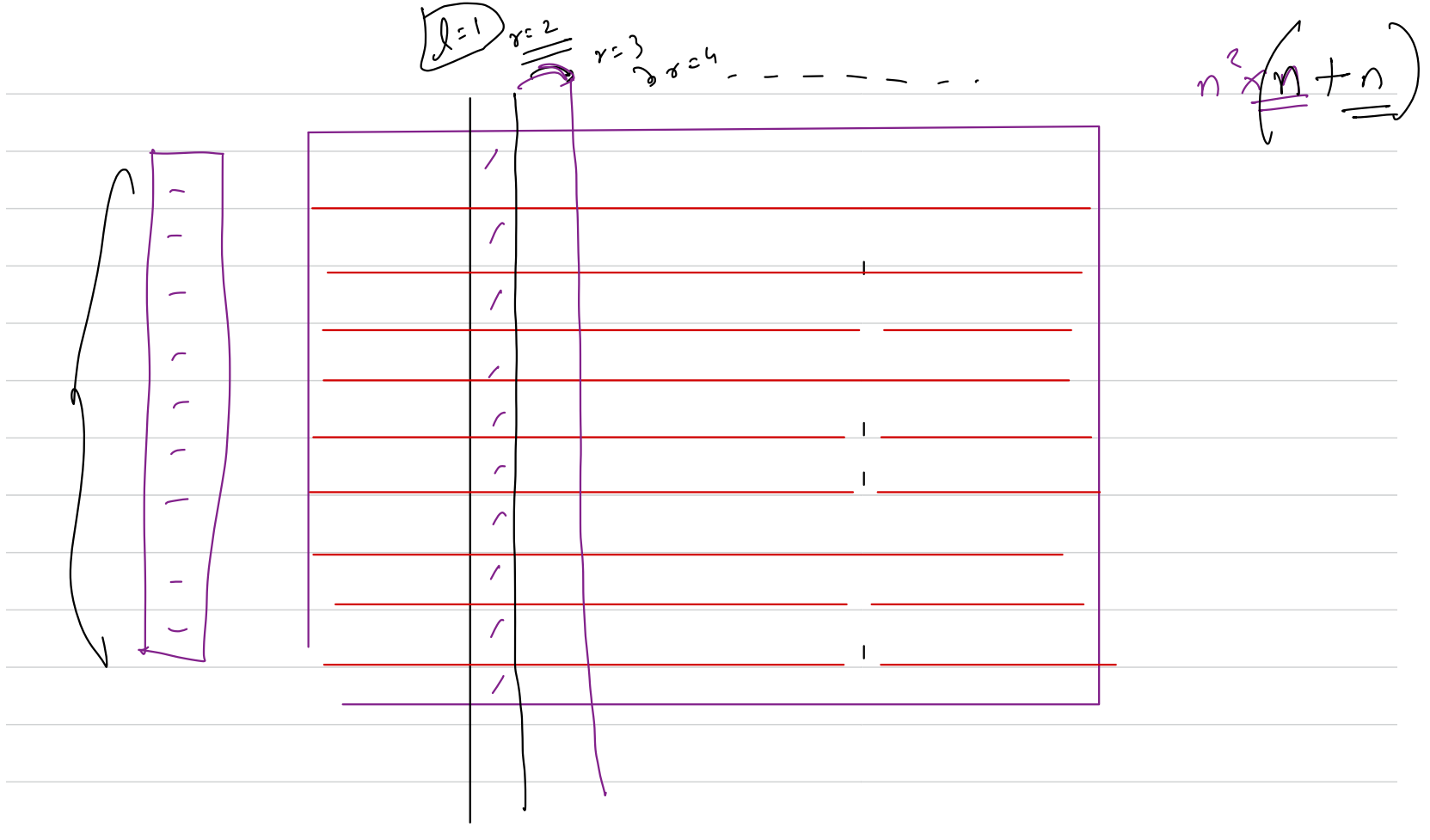
Kadane's algo → maximum Sum Subarray in a 1D array

O(n) time O(1) space

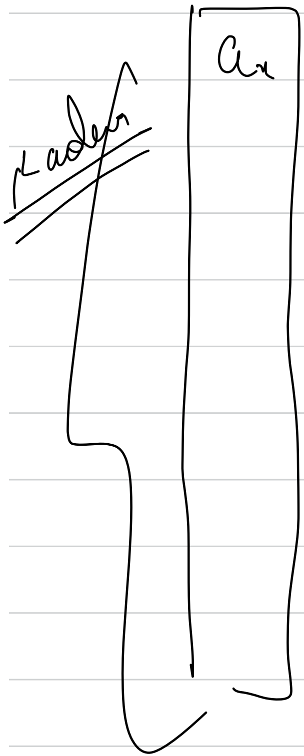


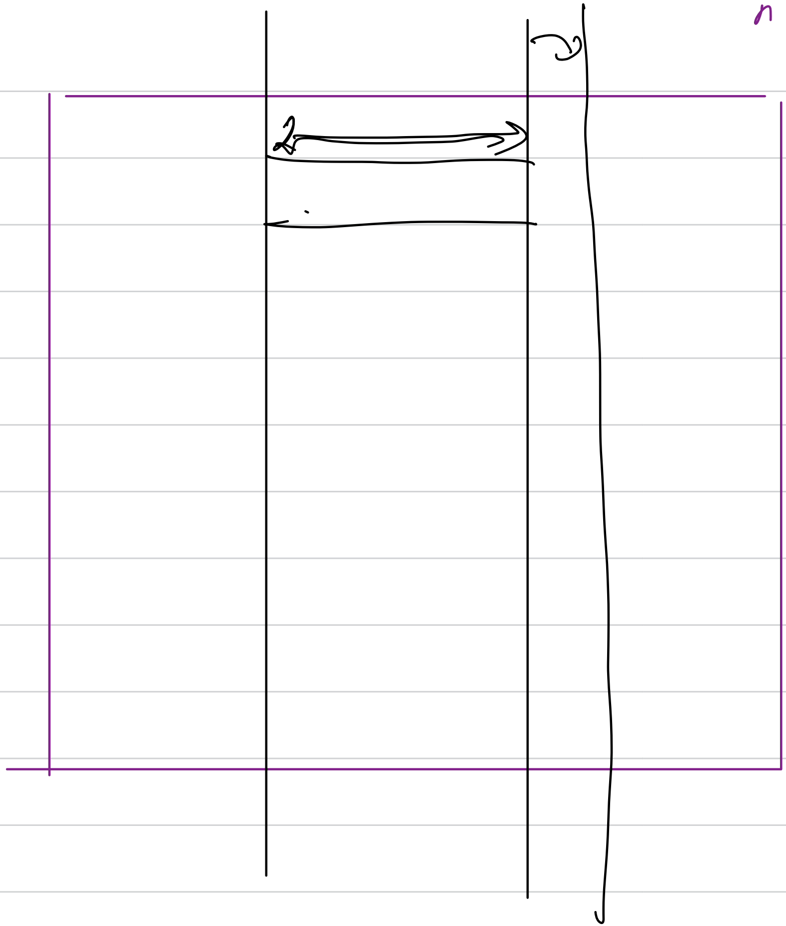
n^2 pairs of colms

for all pairs of left & right colms


l=1
r=2
r=3
r=4
n²(n+n)

$n^6 \rightarrow n^4 \rightarrow n^3$





n^3

$n^2(n + n)$

graph
Colum
Pcen

$O(n^3)$