



# Greedy Algorithms - 1

Dev Karan Singh (devkaran1231)  
**Expert** at codeforces (1817)  
**5 star** at codechef (2040)

# Today's plan :

$Q \rightarrow \left[ \begin{array}{l} \text{max sum subarray} \\ \text{in circular array} \end{array} \right]$

✓ • What are Greedy Algorithms?

✓ • Kadane's Algorithm

✓ • Questions :

✓ ○ Jump Game 1

○ Jump Game 2

➔ ✓ • Pair trick in Priority Queue and Set + [google interview que](#)

✓ • Greedy on strings (lexicographically minimum/maximum)

✓ • Greedy involving ranges

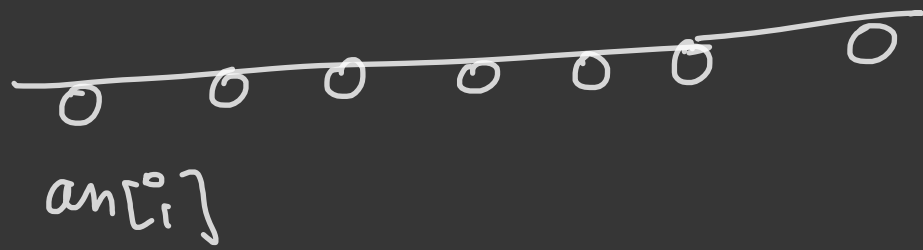
○ N meetings in 1 room

# greedy

→ choosing the most optimal option at every step

○  $n$  coins

Eg:



○  $n$   
value is  
—————  
max

0      0      0      0       $\dots$        $x^{\text{th}}$   
1<sup>st</sup>   2<sup>nd</sup>   3<sup>rd</sup>   4<sup>th</sup>   -    $x$

## (#) Kadane's Algo.

→ you are given an array, pick a subarray with largest sum.

Eg:  $an \rightarrow [2, 4, -1, \overset{\checkmark}{4}, \overset{\checkmark}{3}, \overset{\checkmark}{-2}, \overset{\checkmark}{-1}, \overset{\checkmark}{5}, -1]$

$sum = 8 \times$

$max = 9$

$9$

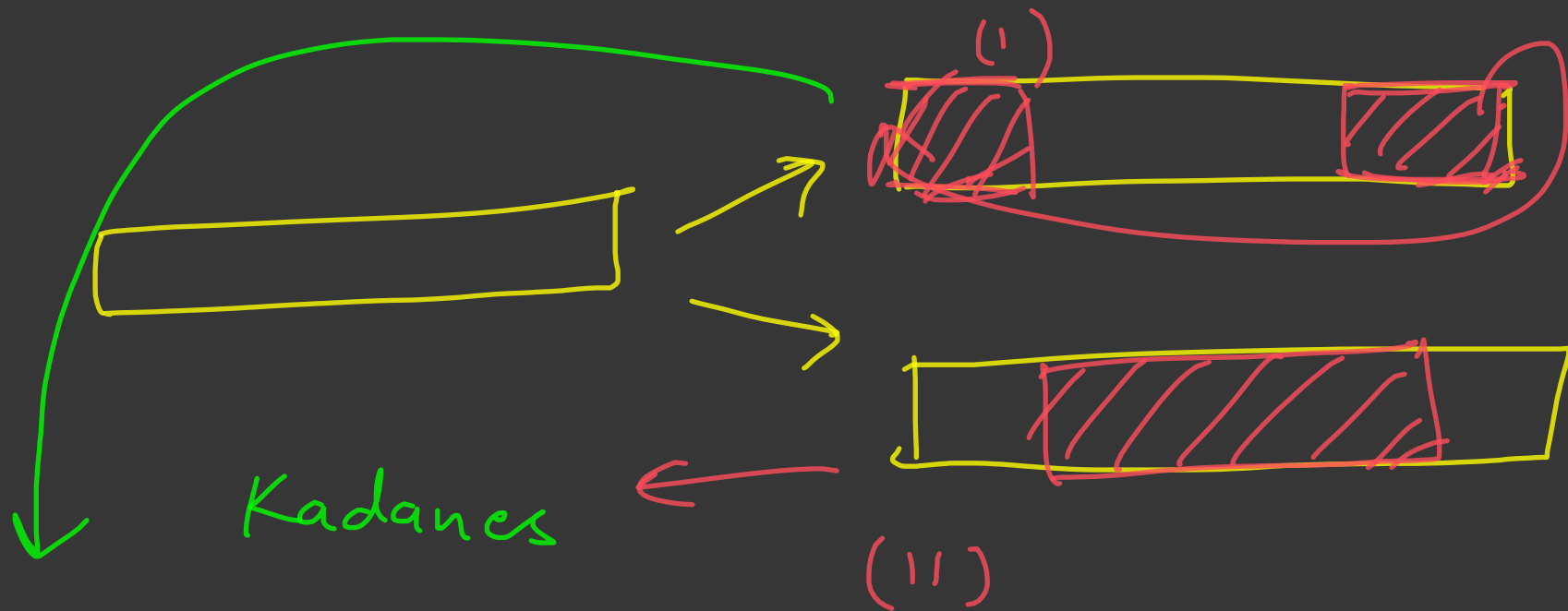
$sum \rightarrow 0$

$max \rightarrow 6$

$an \rightarrow [2, 4, -1]$

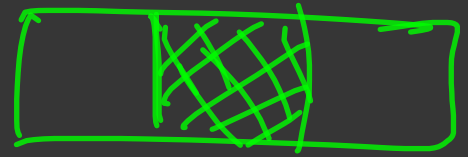
Q

arr  $\rightarrow [8, -8, 9, -9, 10, -11, 12]$





whole  
array



min sum  
subarray.

total = 0 [2, 3, 5] → min → 0  
    ↘ total





arr  $\rightarrow$   $[2, 3, 1, 1, 4]$

Indices: 0, 1, 2, 3, 4

Arrows:  $\uparrow \rightarrow \uparrow \rightarrow \uparrow \rightarrow \uparrow$

$1+3$

max = 8

$i$

nums[i]

$8 \geq 4 \rightarrow \underline{\text{Yes}}$

eg  $\rightarrow$   $[3, 2, 1, 0, 4]$

0 1 2 3 4

Diagram illustrating an array  $[3, 2, 1, 0, 4]$  with indices 0 to 4 below. A white arrow points to index 0 (value 3). A yellow arrow points to index 3 (value 0). The element at index 4 (value 4) is circled in green and crossed out with a green 'X'.

max = 3

(No) X

# pair trick while sorting:

→ { {1, 3}, {2, 1}, {1, 1}, {-1, 100} }  
an

sorted  
array → { [-1, 100] [1, 1] [1, 3] [2, 1] }

condition

→ sort in descending order of first  
but if there is a draw

use lowest value of second or  
priority.

→  $\{2, 3\}, \{2, 1\}, \{1, 1\}, \{-1, 100\}$

an  
→  $[-1, 3], [-2, 1], [-1, 1], [1, 100]$

$[-2, 1], [-1, 1], [-1, 3], [1, 100]$

$\rightarrow [2, 1], [1, 1], [1, 3], [-1, 100]$

$\rightarrow [-1, -3], [-2, -1], [-1, -1], [1, -100]$

$\rightarrow [-1, 100], [1, 3], [1, 1], [2, 1]$

priority\_queue <pair<int, int>> pq;

10

an  $\rightarrow$  [2, 7, 6, 12, 9, 18]

$\hookrightarrow$  [~~2~~, ~~7~~, ~~6~~, ~~9~~, ~~12~~, ~~18~~]

{2, 6, 9}  $\hookrightarrow$  yes no  $\rightarrow$  { }

Ⓐ greedy on string →

Ⓝ                       $tc \rightarrow O(n) \times 26 \rightarrow \underline{O(n)}$   
↑  
a b c d e - - - x y z

longer  
abc  
↑



smaller  
aac  
↑

abaa }  
↑

smaller  
aa <

aa aa  
↑

larger  
aaa

aaaaaa < b

aaaaa < z



# # greedy on ranges:

