Most Important Topics w.r.t Interviews :

codechef
nodes

- Graphs (BFS, DFS, Topological sort, Shortest path)
- DP (1D, 2D) & (Digit DP)
- 2 pointer
- Trees, Binary Search

2-3 days

> 1 yrs

DFS

nodes → red / blue / no color

coloring

min. edge

Medium - Hard

Qn Given an integer array, return the K^{th} smallest distance among all the possible pairs.

The distance of a pair (A, B) is defined as absolute difference between A and B.

n^2

Ex [1, 3, 1] $K=1$

(1, 3) → $|1-3| = 2$

(1, 1) → $|1-1| = 0$

(3, 1) → $|3-1| = 2$

ans → 0

constraints

n - length of array

$n < 10^4$

$0 \le A[i] \le 10^6$

$K \le (n \times (n-1))/2$

len → array → 10^4 → $\approx 10^{8}$ → k^n

k^{n}

↳ heaps → 2 elem → dis

$n \log n$

find

→ Binary Search

What is the smallest possible distance we can have → 0

What is the largest possible distance we can have 10^6

Our K^{th} smallest distance will lie below $\boxed{0 - 10^6}$

We have any candidate $\in [0, 10^6]$

→ this can be our K^{th} smallest dist ?

This will be true if & only if there are K or more pair with dist less than or equal to candidate

Binary Search

$p_1 \quad p_2 \quad p_3 \quad - - - - - - - - \quad p_{n^2}$

$0 - 10^6$

$\geq K$

$p_{cand} \to$ distance

$\hookrightarrow$ K^{th} smallest dist

ccount

2^{nd} small

$(1) \quad (1) \quad (1) \quad (2)$

$3 \geq 2$

Q

Given a dist, find count of pair having dist $\le$ candidate dist

How we can solve??

Search space $\rightarrow$ $0 - 10^6$

To calculate how many pair might exist such that

their distance is $\leq$ mid

2 pointers

10^8

sort

$[1, 3, 1] \Rightarrow [1, 1, 3]$

i

j^{th} in

for array $\rightarrow a_1 < a_2 \leq a_3 - - a_j - - - a_n$

we choose any j index, find the smallest i

$(i < j)$ such that

$arr[j] - arr[i] \leq mid$

int i = 0

for (int j=0; j<n; j++){

while (arr[j] - arr[i] > mid) i++;

ans += (j - i)

log A(i)

O(n)

j

$a_j - a_i$

O(n)

$a_1 < a_2 < a_3 < \cdots \cdots a_i < \cdots\cdots\cdots a_j < a_{j+1} < \cdots\cdots a_n$

arise sorted

$\leq m$

TC $\rightarrow$ $N \log N + N \log A[i]$

$\rightarrow O\left(N\left(\log N + \log A[i]\right)\right)$

Space $\rightarrow$ $O(1)$

Hard

B S ⟵ Minimum Problem

Q. You have a network with n junctions & m unidirectional paths where every path connects a lower number junction to a higher no. junc^n.
Each path has a no. associated with it.
You need to find a path from junction 1 to junction n, consisting of atmost d edges/path, on which the maximum of the no.'s is minimum possible.

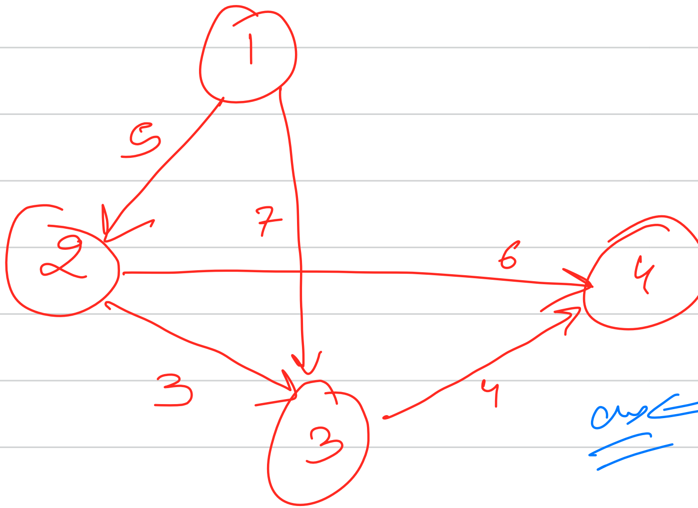
$0 \le$ no on edg $\le 10^9$

$2 \le n \le 10^5$

$1 \le m \le 10^5$

$1 \le d \le 10^5$

4 junctn 5 paths $d = 2$



$1 \to 2 \to 4$

$\cancel{1 \to 2 \to 3 \to 4}$

$1 \to 3 \to 4$

ans $1 \xrightarrow{5} 2 \xrightarrow{6} 4$

$1 \xrightarrow{7} 3 \xrightarrow{4} 4$

ans

$\boxed{\begin{matrix} 2 \\ 1 \quad 2 \quad 4 \end{matrix}}$

lower_lim → min_cut ⇒ minimum cut of all edges

upper_limit → max_cut → maximum cut of all edges

minimize the max cut

lo

hi

(BS)

mini

2

candidate (mid) → if this can be our ans

2

[find a path from 1 – n with atmost d edges
such that the cut ≤ mid]

→ cut of edge

BFS

$(V+E)$

(10^9)

(b)

$$\boxed{O(\log(\text{max edge wt})(n+m))}$$

Space

overflow

l

$(l+h)/2$

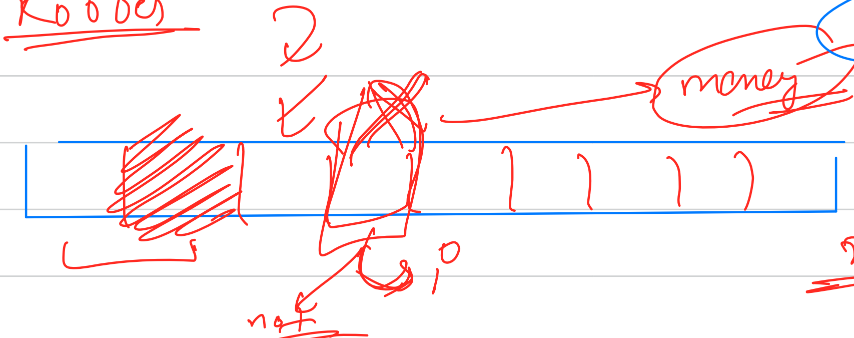
$$= \frac{l+h}{2} \Rightarrow \frac{l+h+l-l}{2}$$

$$\Rightarrow \frac{2l+h-l}{2} \Rightarrow l + \frac{h-l}{2}$$

Easy

Robber

House robber



n houses

if at any point of time he robs 2 adjacent house polio alarm will start.

Max money he can rob??

$n \le 10^3$

[1, 2, 3, 1]

→ 4

$f(i) = \max\left(f(i-2) + A[i],\ f(i-1) \right)$

max profit by looking till i^{th} house

recur → dp

1D - DP

$O(n)$