



Binary Search Problems - II

Foundation Course on Data Structures & Algorithm - Part I

→ Binary Search

→ derived

→ 2D Array

→ Search Space

↙ Reduction



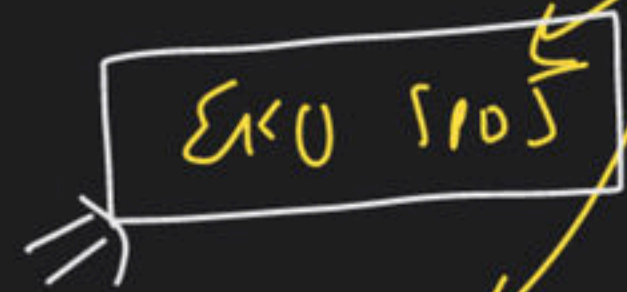
Ex ->

↳ Book Allocation Problem

↳ sqrt (BS)

↳ Agg. Cow

↳ Painter Partition

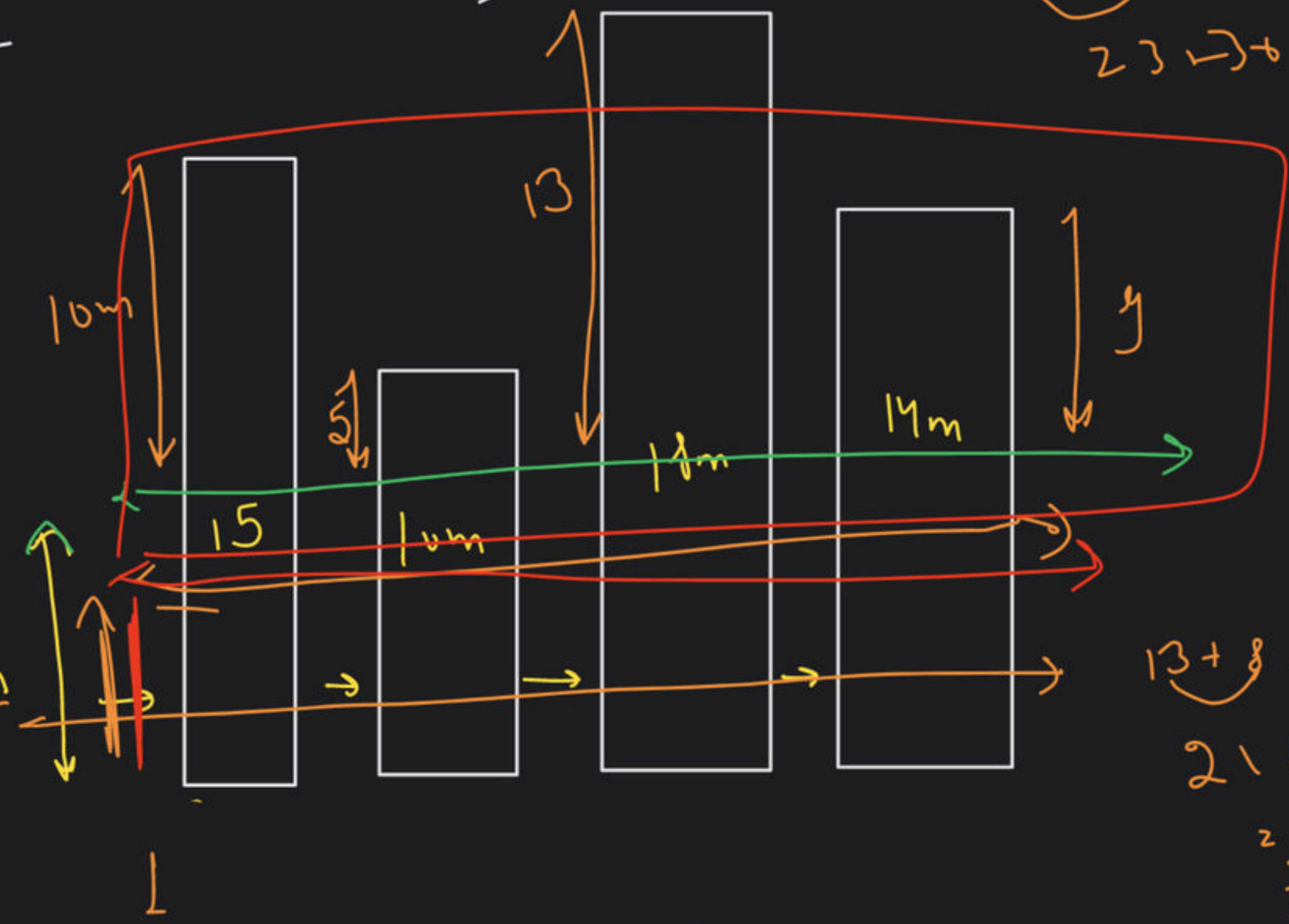
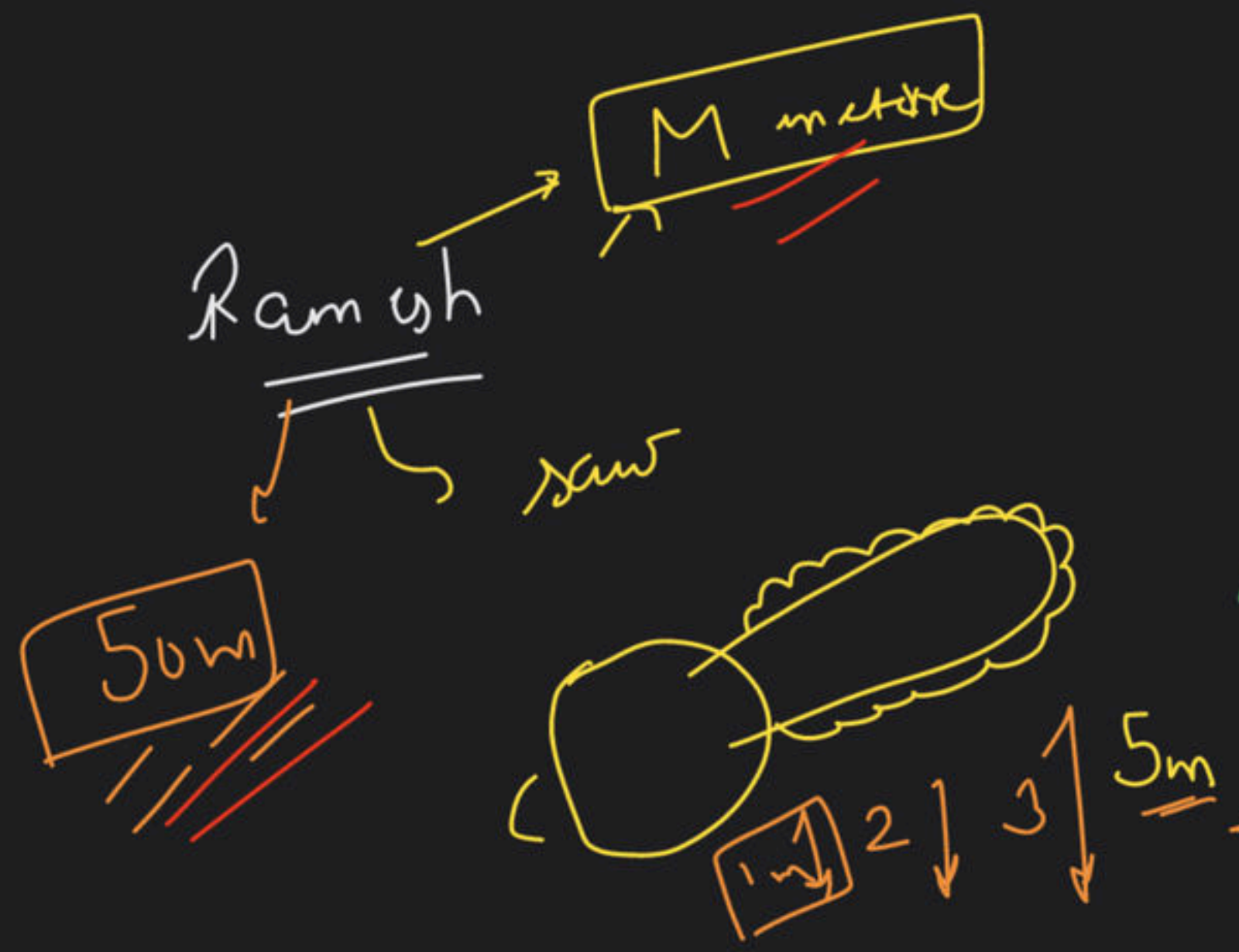


ROT1
PLATA

→ EKU SPOJ → [Link in Discord]

$$14 + 5 + 17 + 13$$

$$23 \rightarrow 2 \times 53$$



$$13 + 8 + 16 + 12$$

$$21 + 21$$

$$2 \times 21 = 42$$

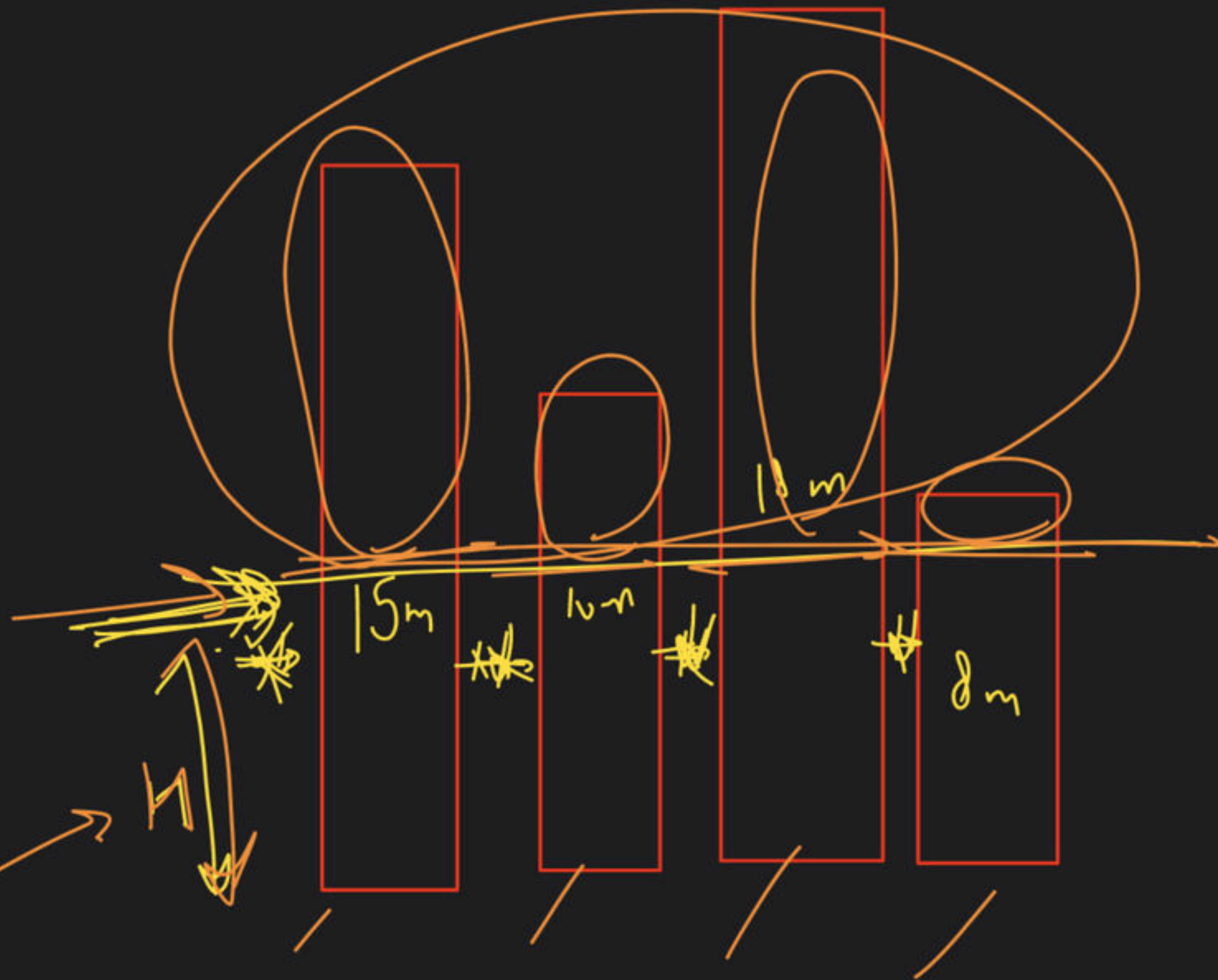
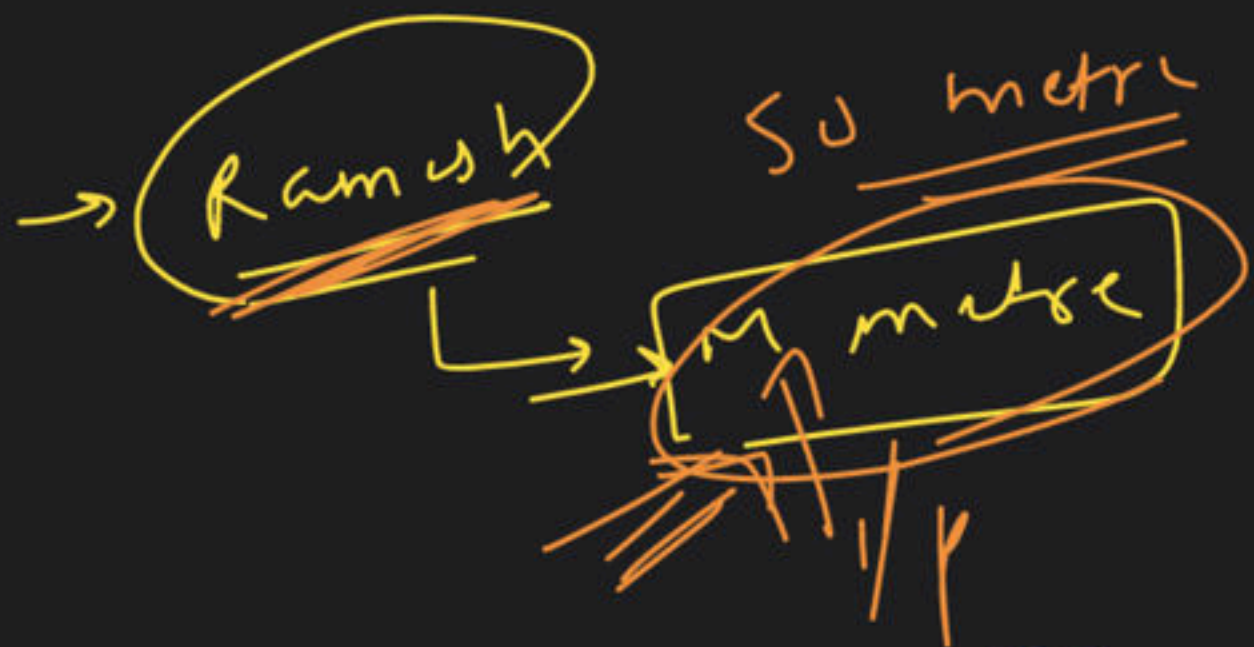
$$12 + 7 + 15 + 11$$

$$15 + 26 = 41$$

$$10 + 5 + 13 + 9$$

$$215 + 22 = 237$$

$$237 \text{ m}$$



maxⁿ height

- hukaya
rahi

JN

#1 Brute force (1) Max \downarrow

(1) $h=0 \rightarrow 50$

$h=1 \rightarrow$

$h=2$

$h=3 \rightarrow 50$

$h=4$

$h=5$

$h=6$

$h=7$

$h=8$

$h=9$

$h=10$

$h=11$

$h=12$

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$h=278$

$h=279$

$h=280$

$h=281$

$h=282$

#2 Approach
optimization

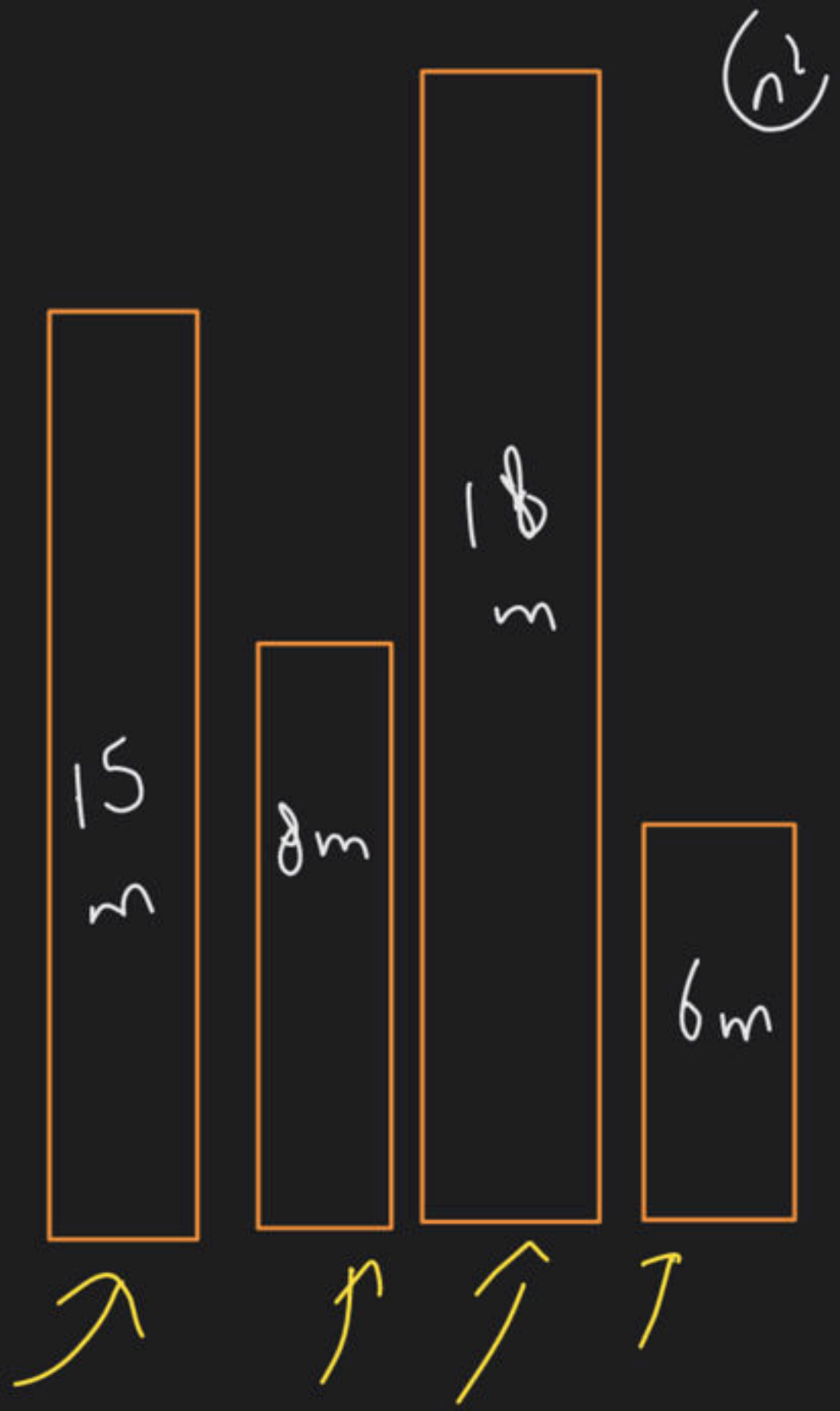
answer has
a range

0 → 18

ans

18 →

0 →



200 to INT_MAX

TLE

Time Limit
Exceeded

→ Question

Sol/A

n time

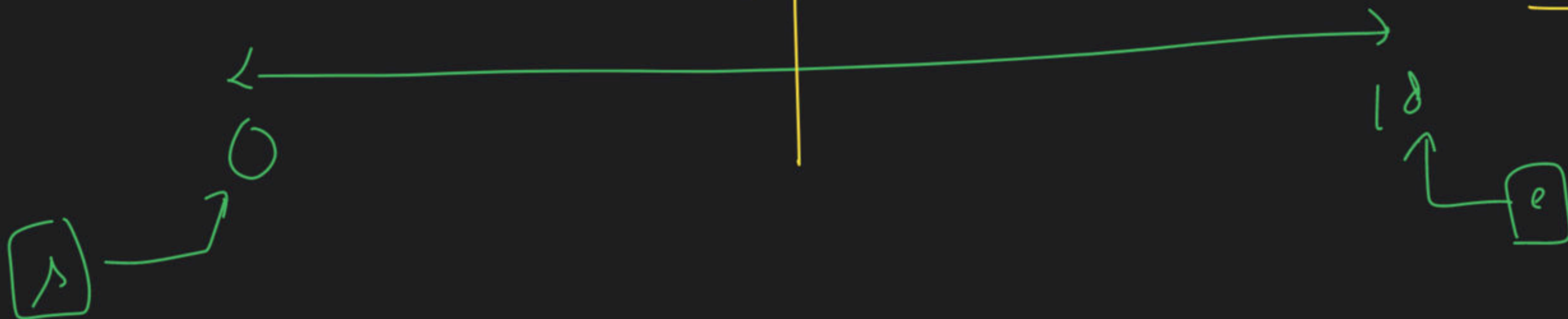
> n

TLE

test cases
pass

answer search span

mid = 9



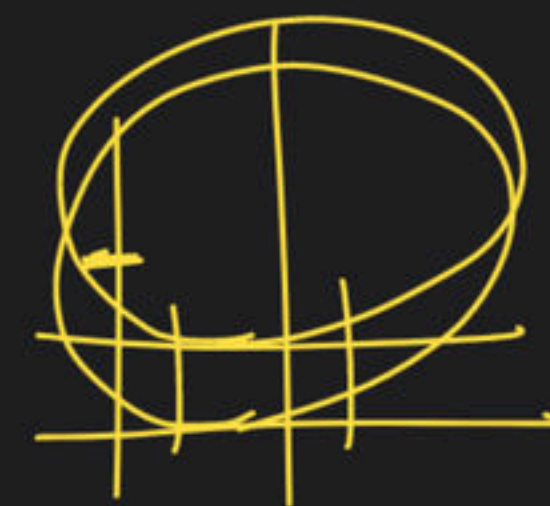
mid → possible solution → Yes
No

Yes

Right

No

Left



$s = 0$

$c = \text{Max}(\text{arr})$

while ($s \leq c$)
{

$\text{mid} = (s + c) / 2$

 if (isPossibleSol(mid))

 {
 ans = mid;

$s = \text{mid} + 1;$

 }
 ans
 $c = \text{mid} - 1;$
}

function

→ as store

Right

why? \uparrow
L

why? \rightarrow 9
R

target = 45

$s = 0$
 $c = 18$

ans = ∞

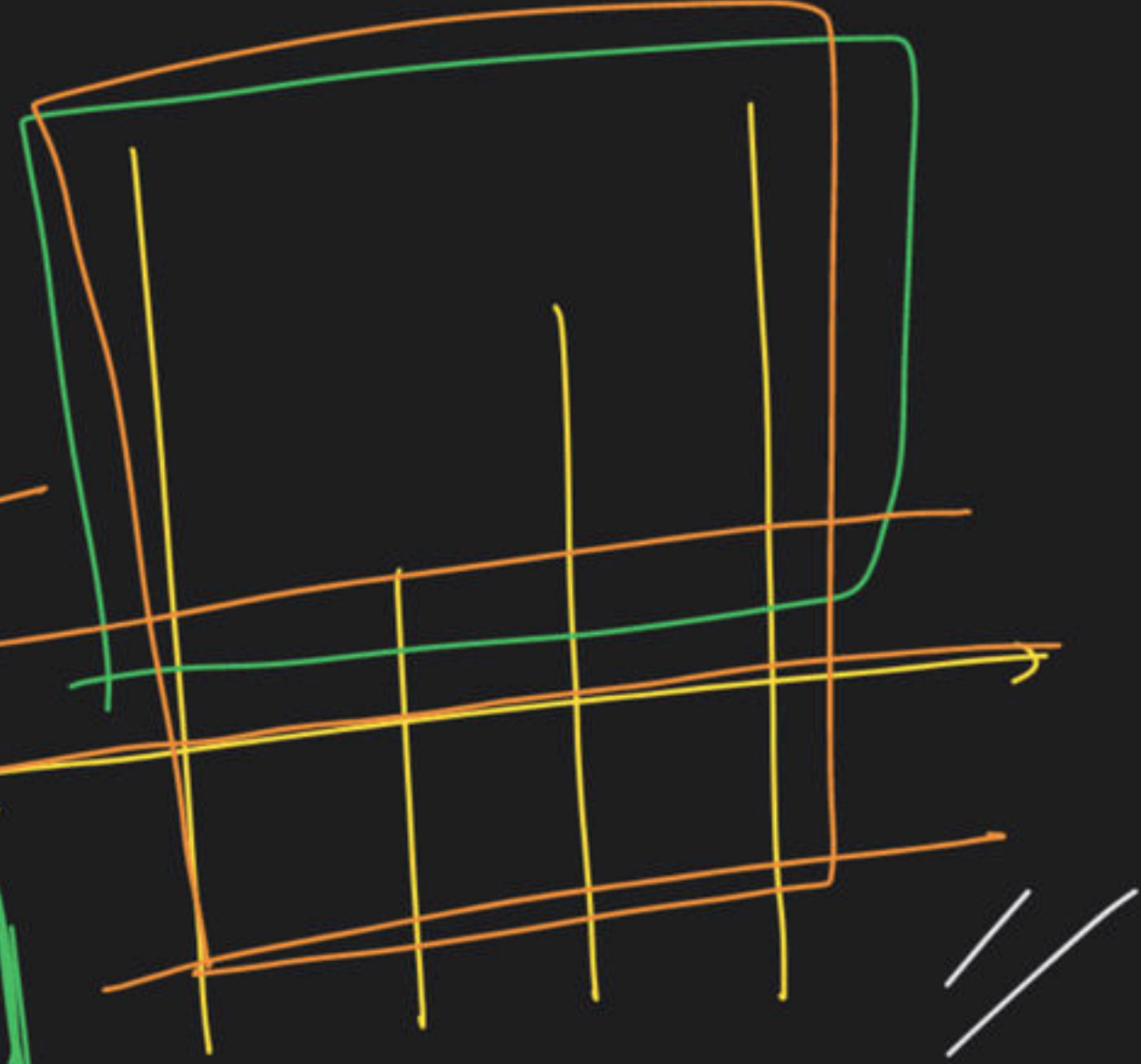
m



sum

m

Log



Kiya =

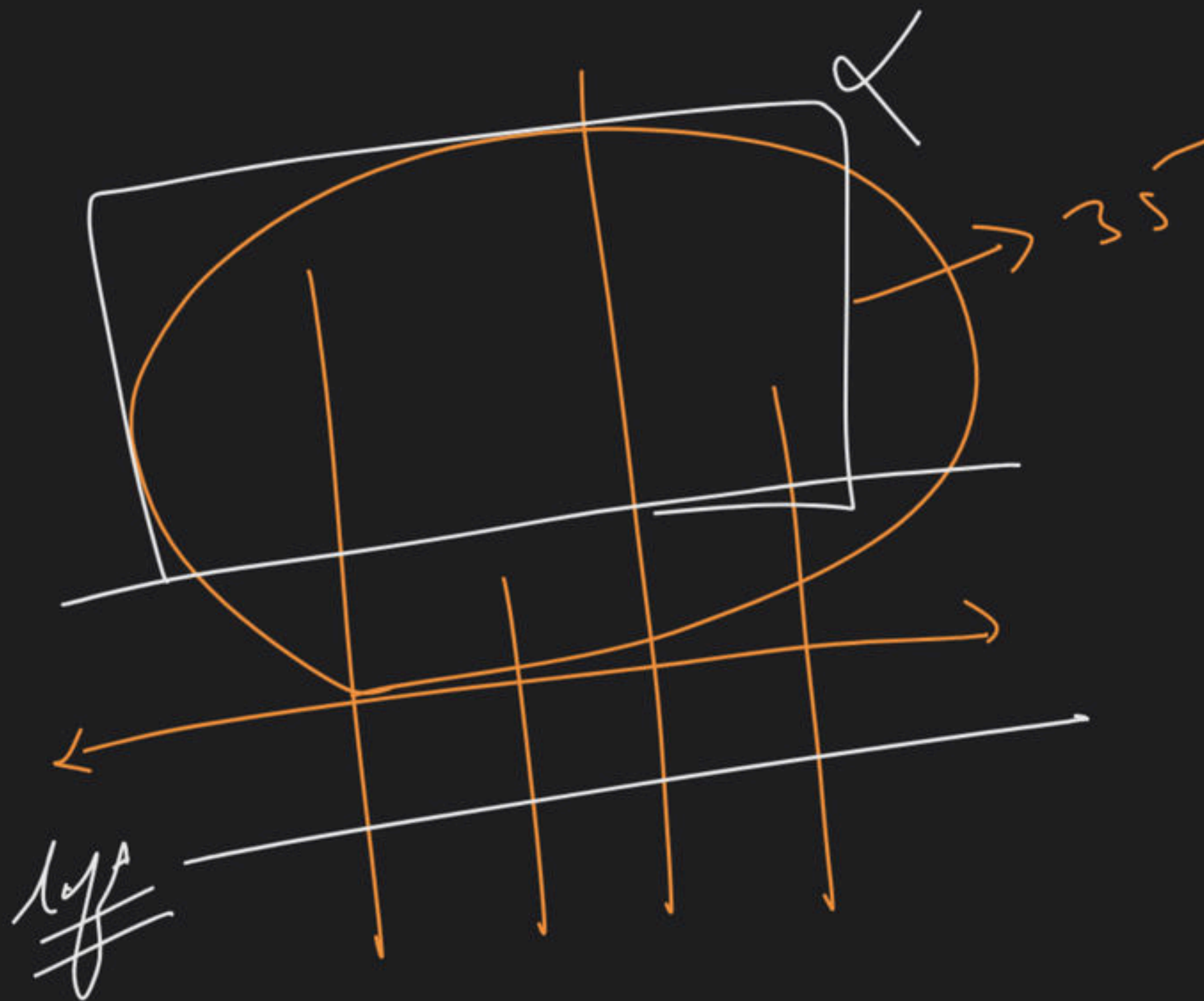
Nani =

DRY RUN

Examples

try:-

Sum



bool isPossibleSolution (int mid int arr[] int target) B.S

Bata
↓
need
n
yon
nah.

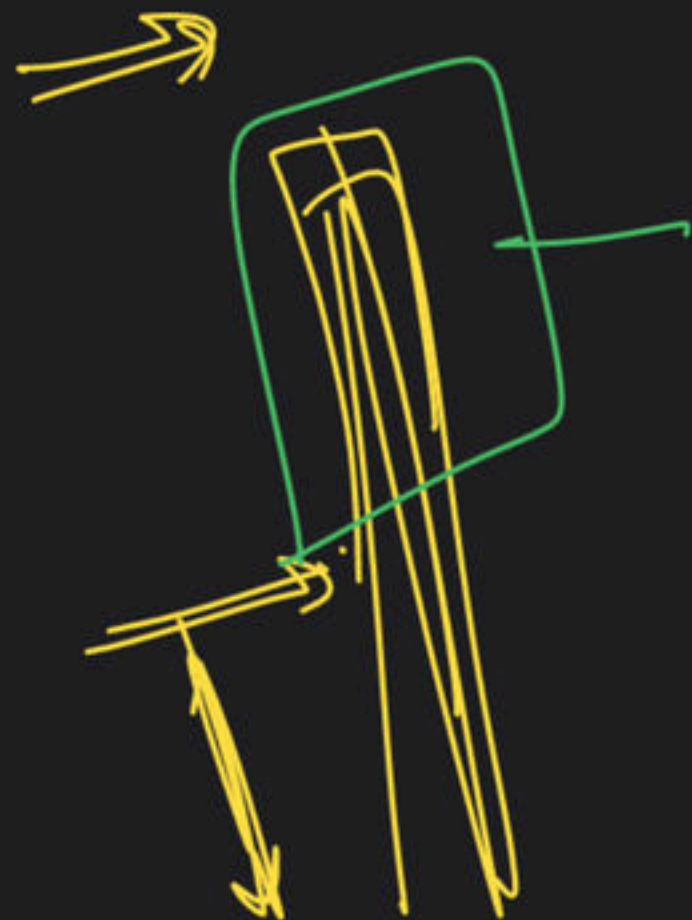
{
for (sum = 0;
 i → 0 → < n) ← har tree p^v
 traverse karo

{
 int diff = 0;

 if (arr[i] > mid)

diff = arr[i] - mid;

sum = sum + diff;
 }



if (sum >= target)
 return true

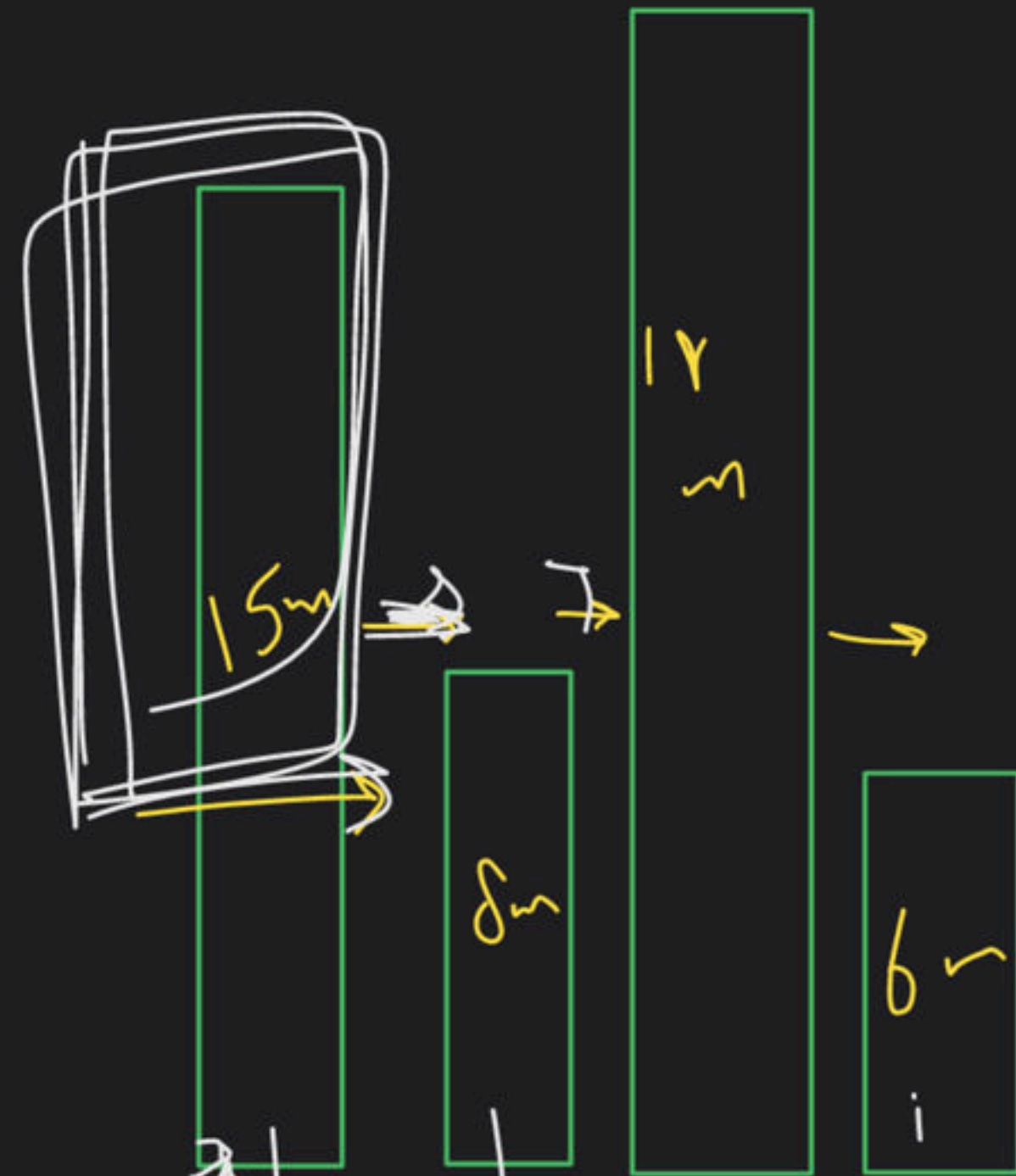
else
 return false;

$r = 0$
 $l = 18$

$mid = 9$

$\frac{B + S}{2}$

$0 \rightarrow 18$



target = 30

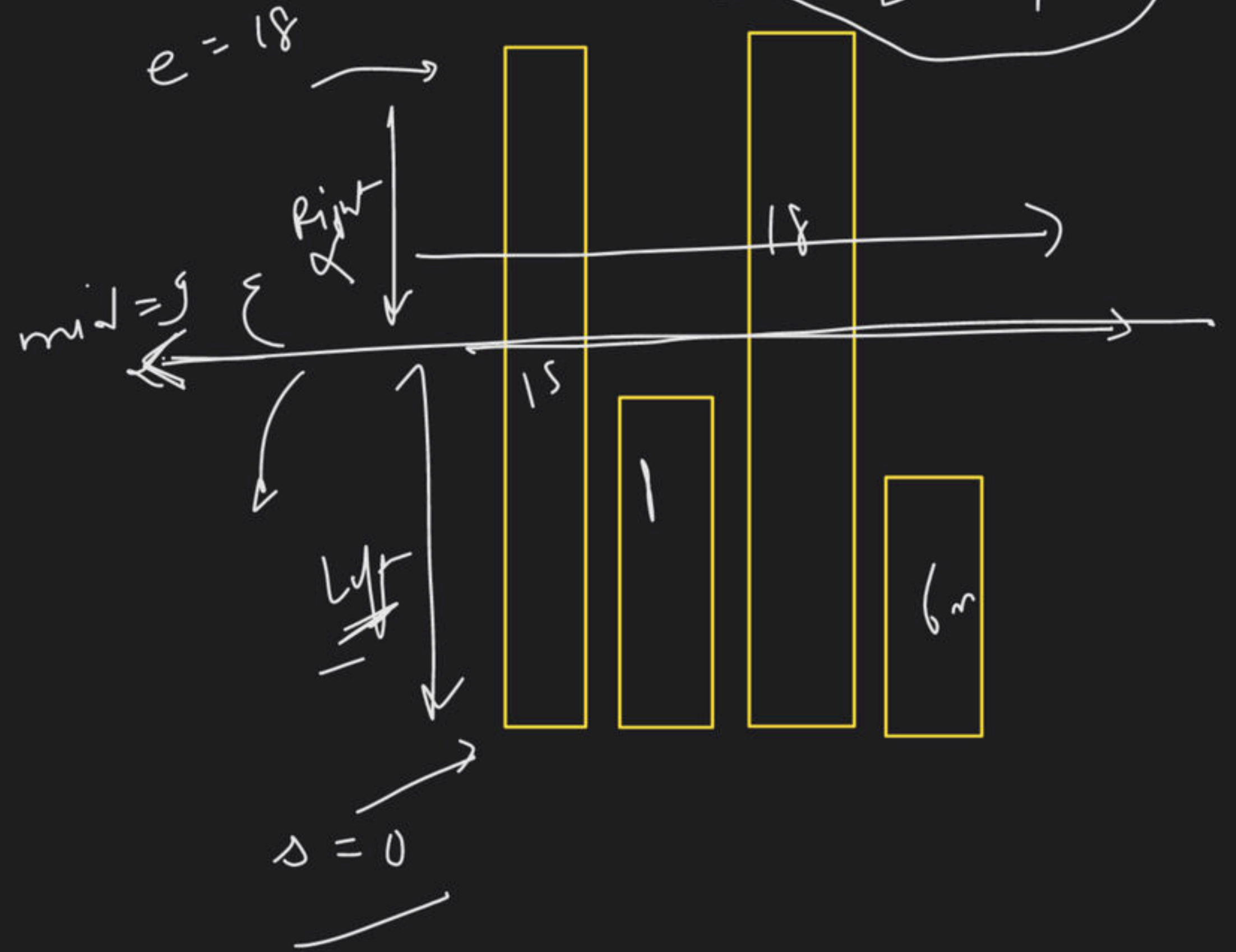
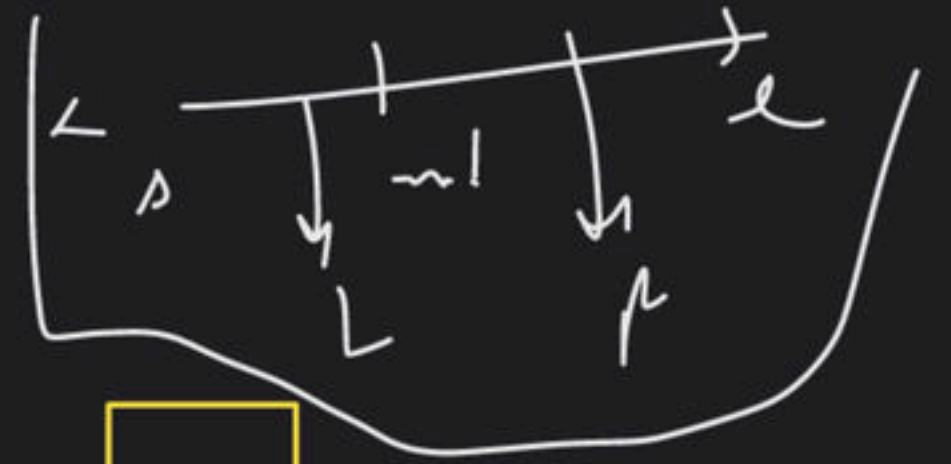
$6 + 0 + 9 + 0$

$= 15$

if (sum >= target)
return true

else return false

$$e = \text{mid} - 1$$



$$l = 0, r = 18$$

$$mid = \frac{(0 + 18)}{2} = 9$$

$$sum = 1 + 0 + 9 + 0 = \boxed{15}$$

$$c = mid - 1$$

$$= 9 - 1 = 8$$

$$mid = \frac{(0 + 8)}{2} = 4$$

$$mid = 4$$

$$sum = 11 + 4 + 14 + 2$$

$$= 18 + 18 = \boxed{36}$$

$$l = mid + 1 = 4 + 1 = 5$$

$$c = \cancel{18}$$

$$mid = 9$$

$$c = 8$$

$$mid = 1$$

$$mid = 1$$

$$l = 0 \rightarrow$$

$$l = 5, c = 8$$

$$mid = \frac{(5 + 8)}{2} = \boxed{6}$$

$$\text{target} = 30$$

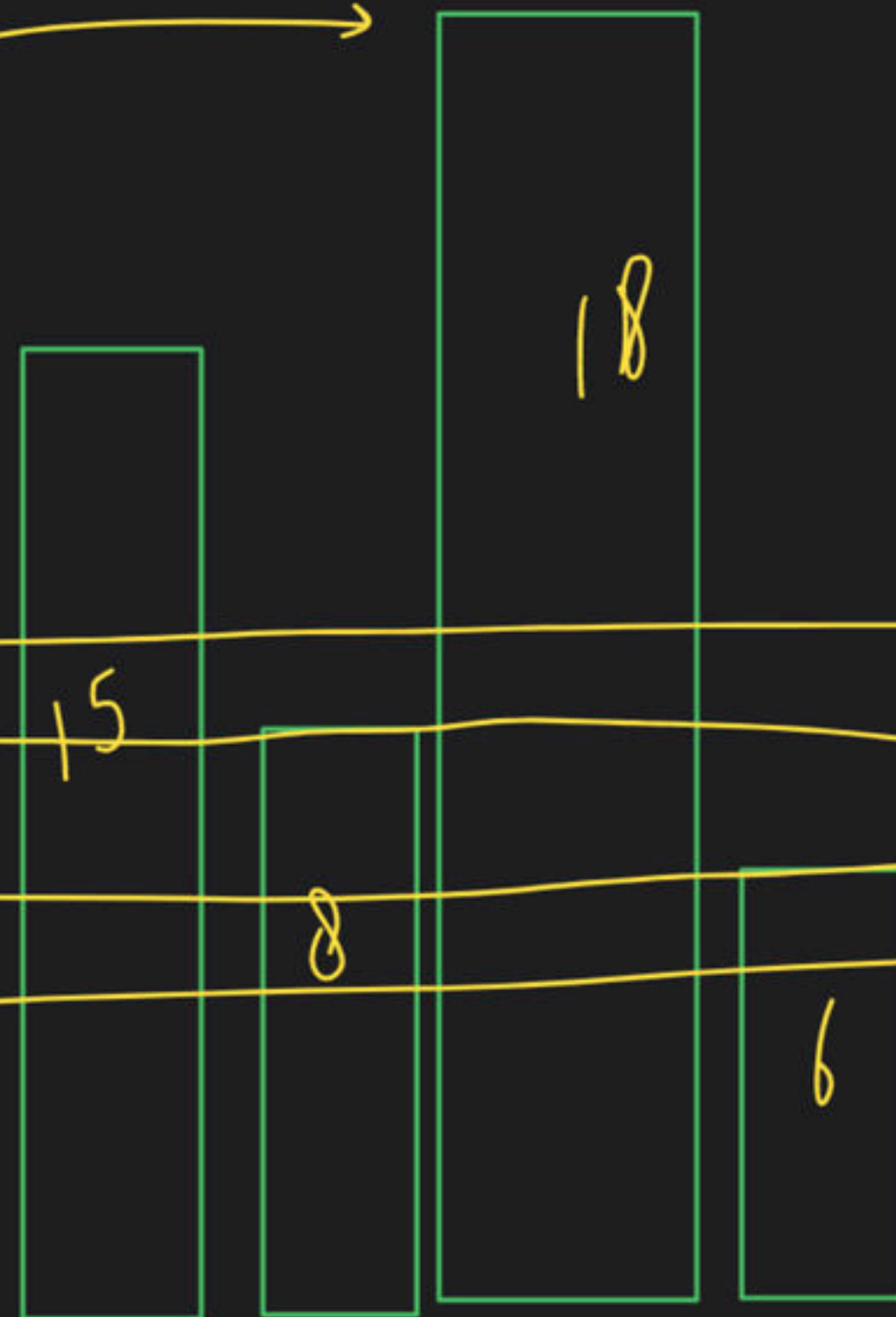
$$ans = 4$$

$$mid = 6$$

$$sum = 5 + 2 + 12 + 0$$

$$= 11 + 12$$

$$= 23$$

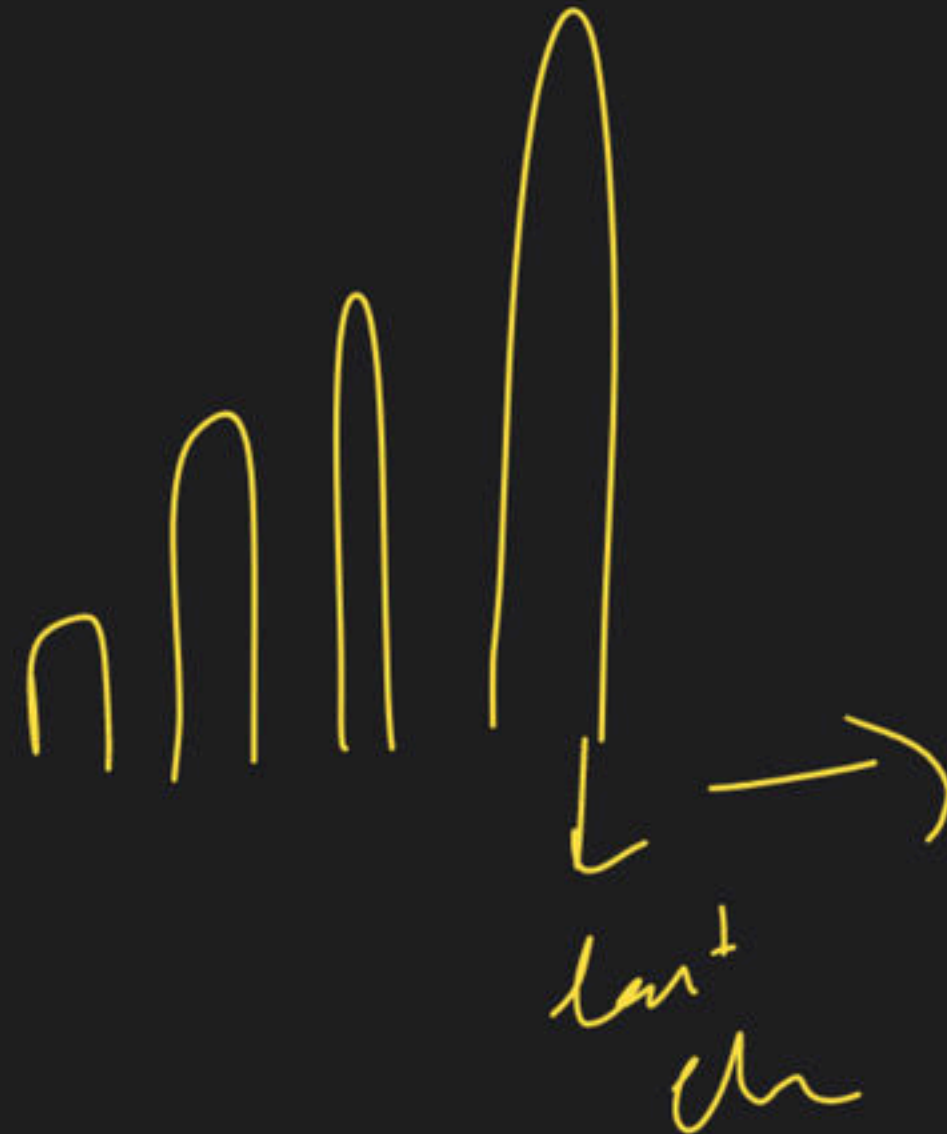


sort

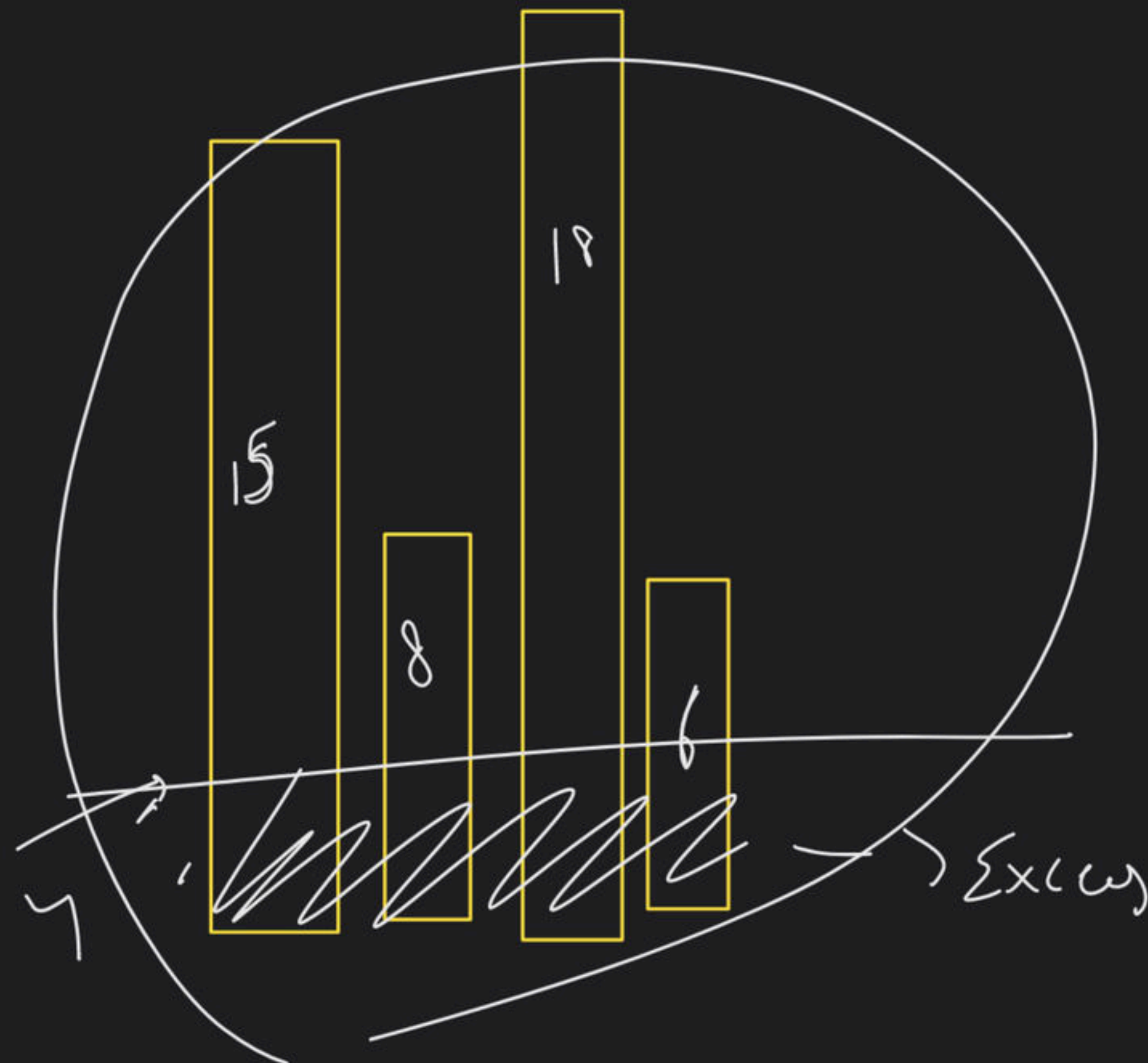
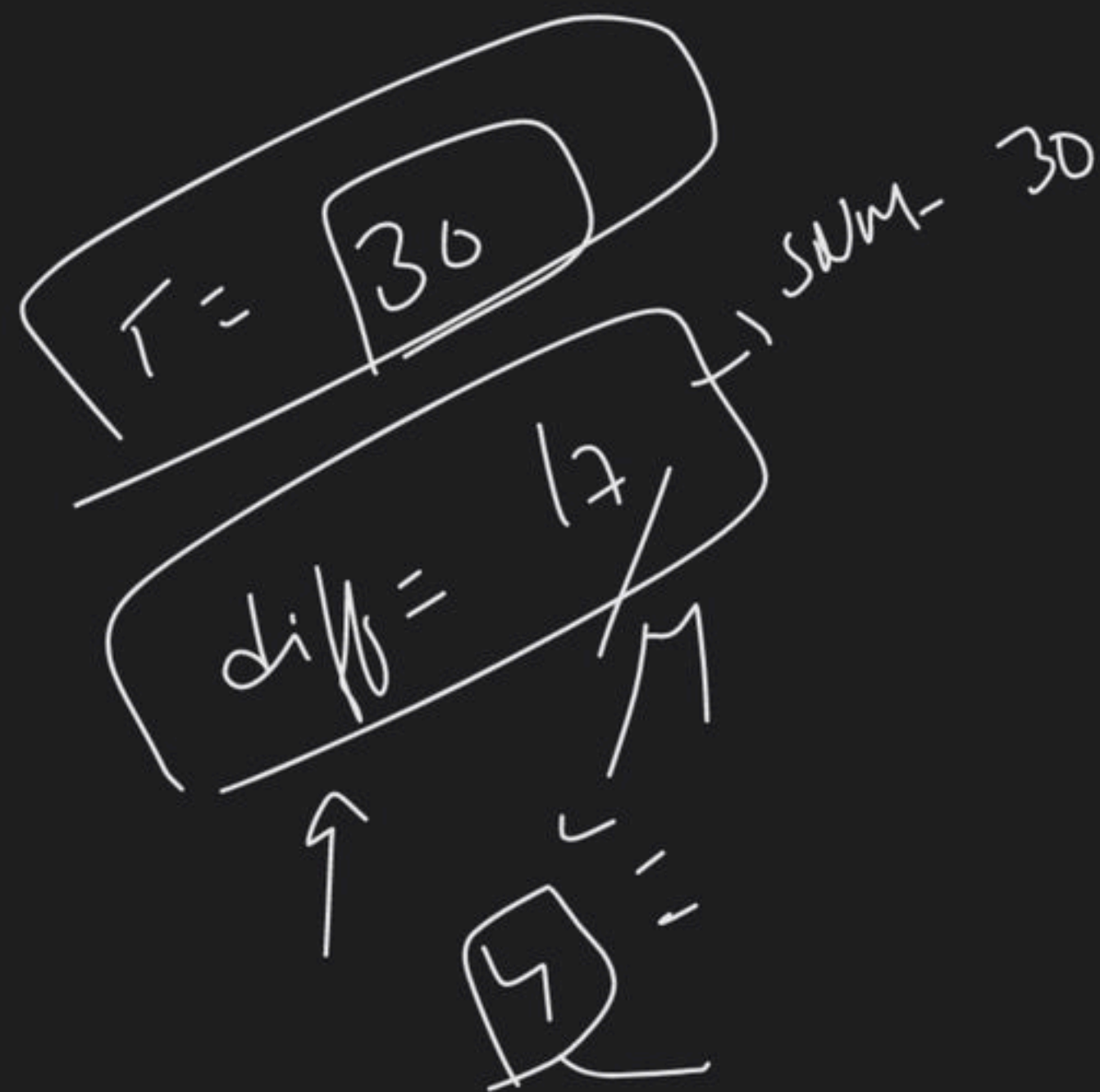
$\Delta = 0$

$e = \max(arr)$

for (\rightarrow)



→ Approach #3



TOTAL = 47

$$T = 7$$

$$2 \times 1 \boxed{55}$$

$$\boxed{15}$$

$$\boxed{13}$$



Maze
angya //

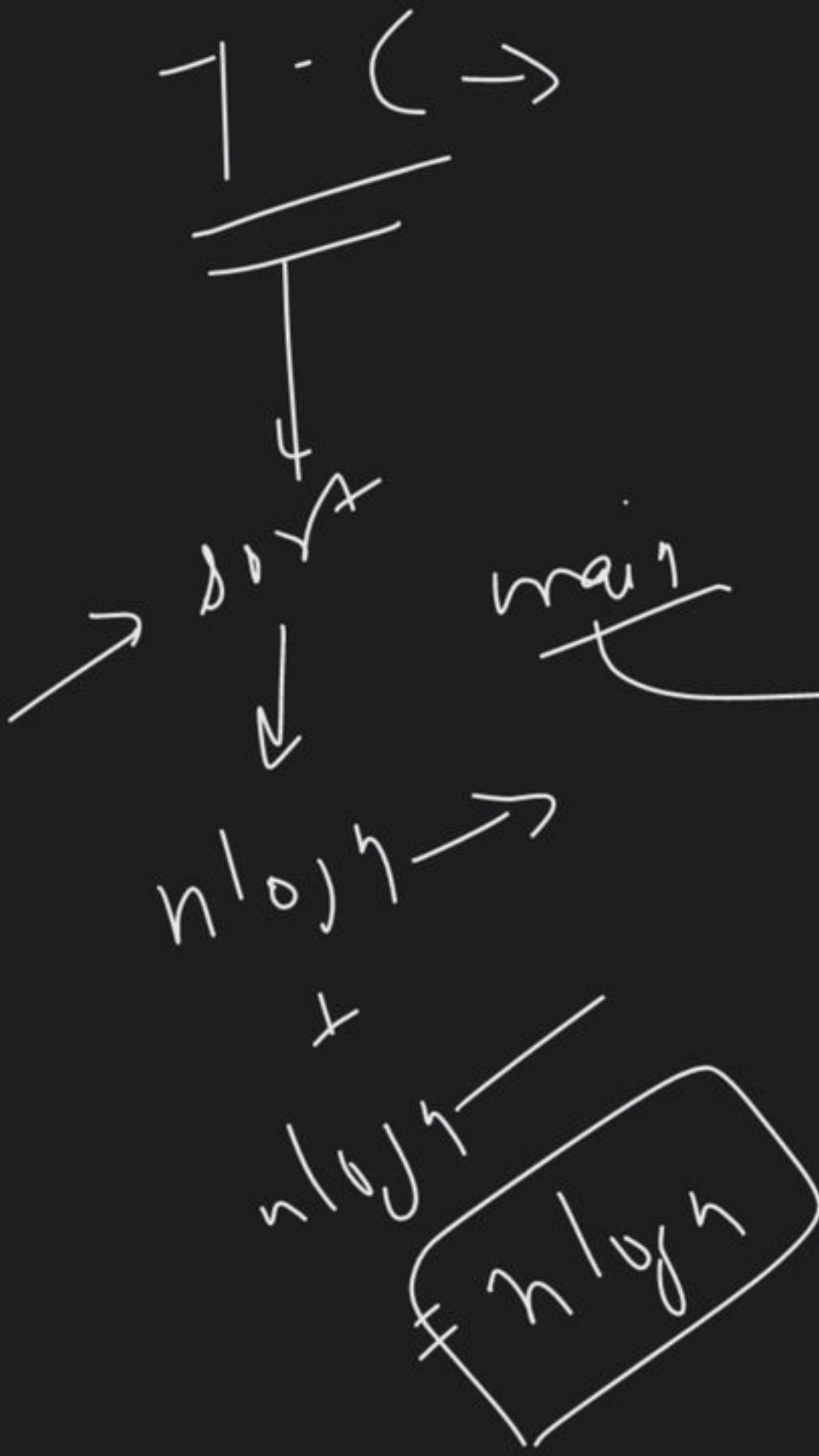
$$20 \quad 15 \quad 10 \quad 17$$

$$T = \boxed{12}$$

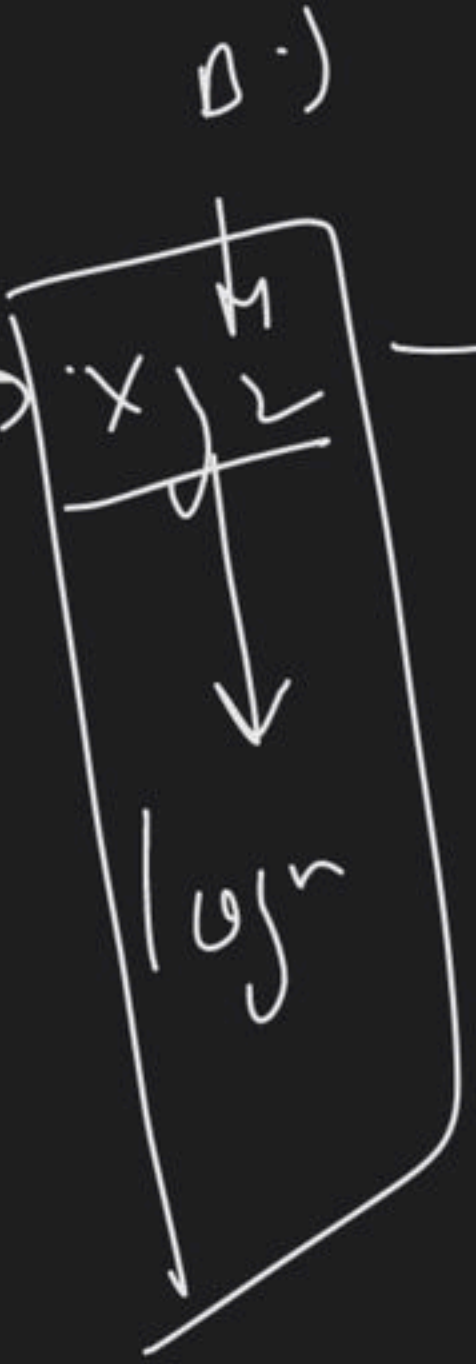
Respect ++

S.C \rightarrow $O(1)$

B.S



main



impossible soln



$\beta - 1$

$x d^2$

$d < e$
mid

while ($a \leq e$)

{ if (impossibleSol(mid))
ans = sum

$\sqrt{L/n}$

}
do { $\sqrt{L/n}$ }


Brute force

Problem

Search space
solutions

W/W:-




Book Allocation 

B.1-1 100


→ Sqrt (B.5) 

→ Painter's Partition problem 

W/W

→ EKO SPT 

→ ROT 1 PRATA 

 why?

→ Ago  A

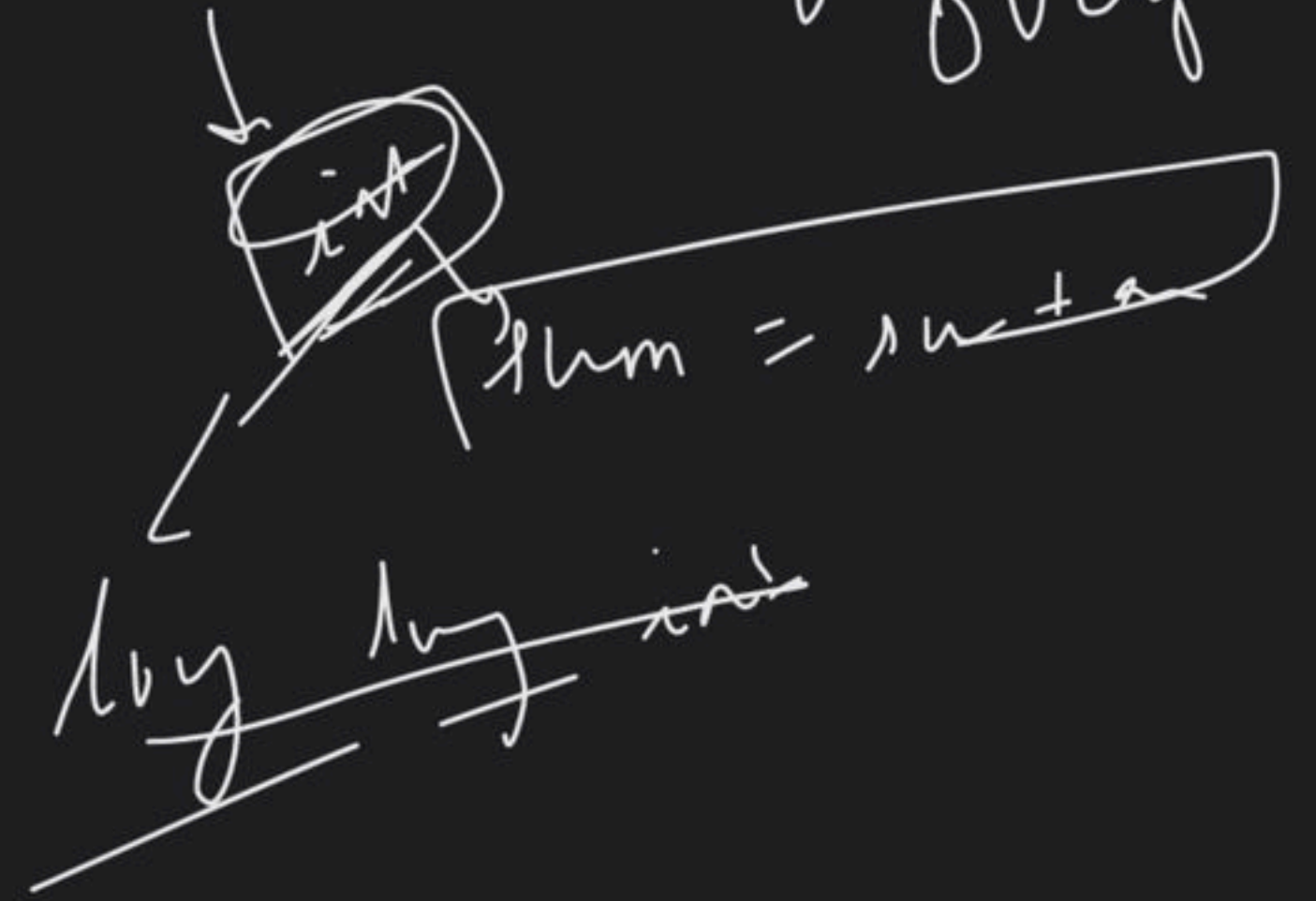
DSA-1 (aid -) X

→ Cofk

LP → =

→ Advanced Problems

integer
overflow



→ P → Parantha

→ L → Cook

→ Rank → R

LAP → B.S

Cook

→ 1st cook → R min
→ 2nd → 2R min
→ 3rd → 3R min

→ find minimum time to get order done?

✓ 4 Look

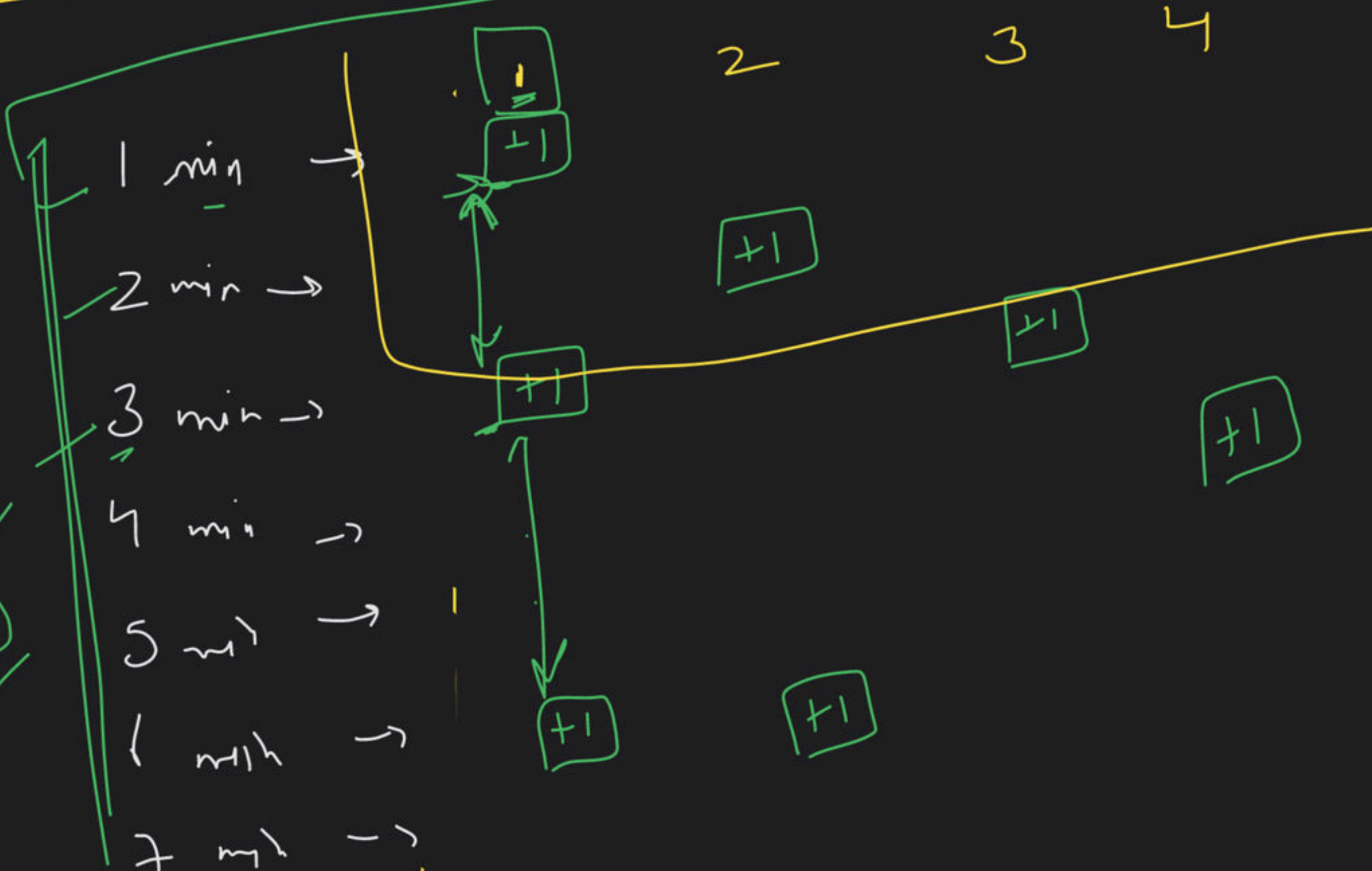
Rank → 1, 2, 3, 4
 Parents → 10

2x2 = 1

1 approach

Rank = 1

1st → 1 min
 2nd → 2R → 2x1 = 2 min
 3rd → 3R → 3x1 = 3 min

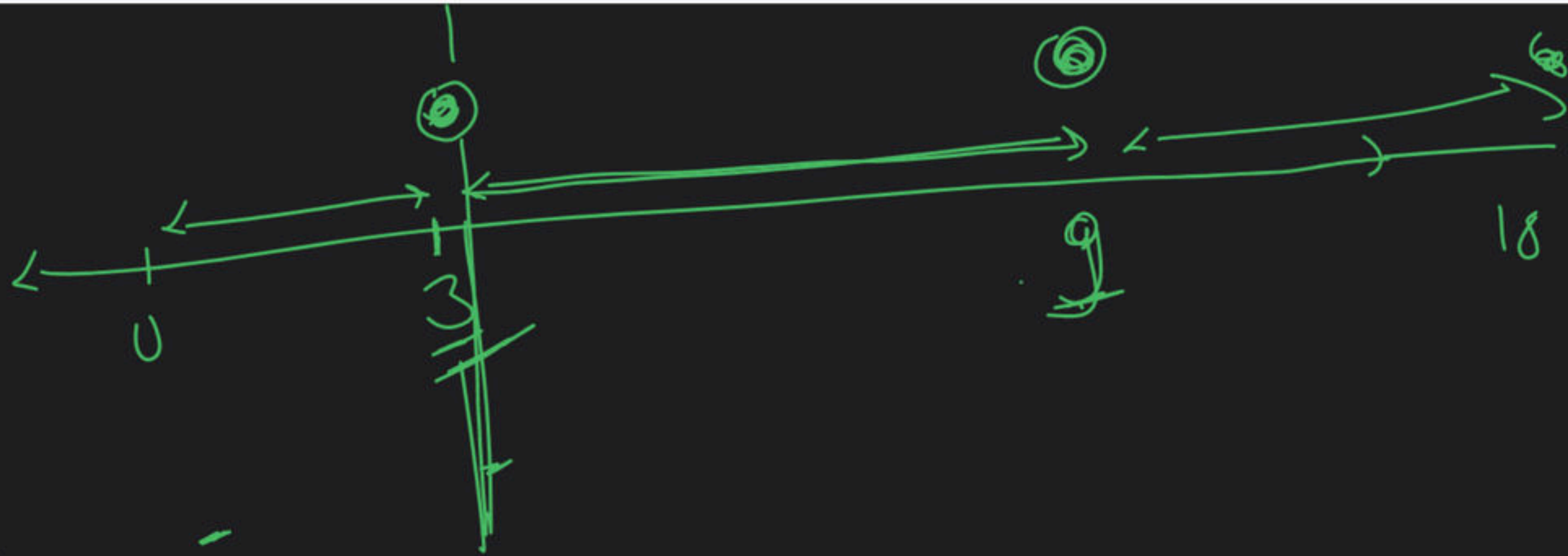


Rank $\rightarrow R=3$

1st para $\rightarrow 3 \text{ mi}$

2nd $\rightarrow 2R \rightarrow 2 \times 3$
 $= 6 \text{ min}$

3rd $\rightarrow 3R = 3 \times 3$
 $= 9$



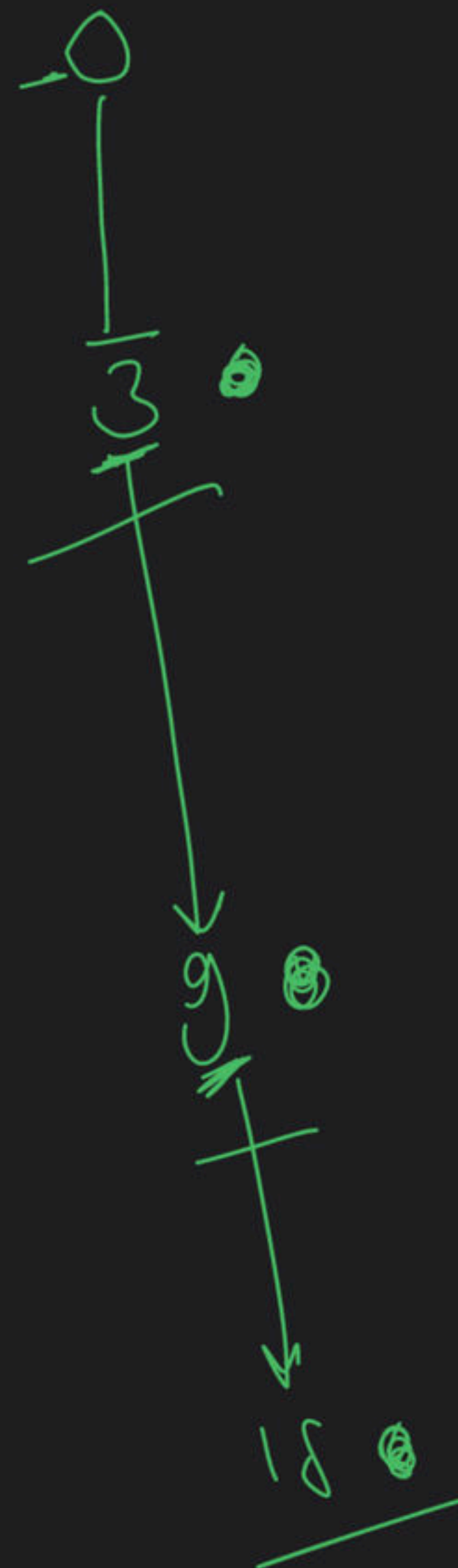
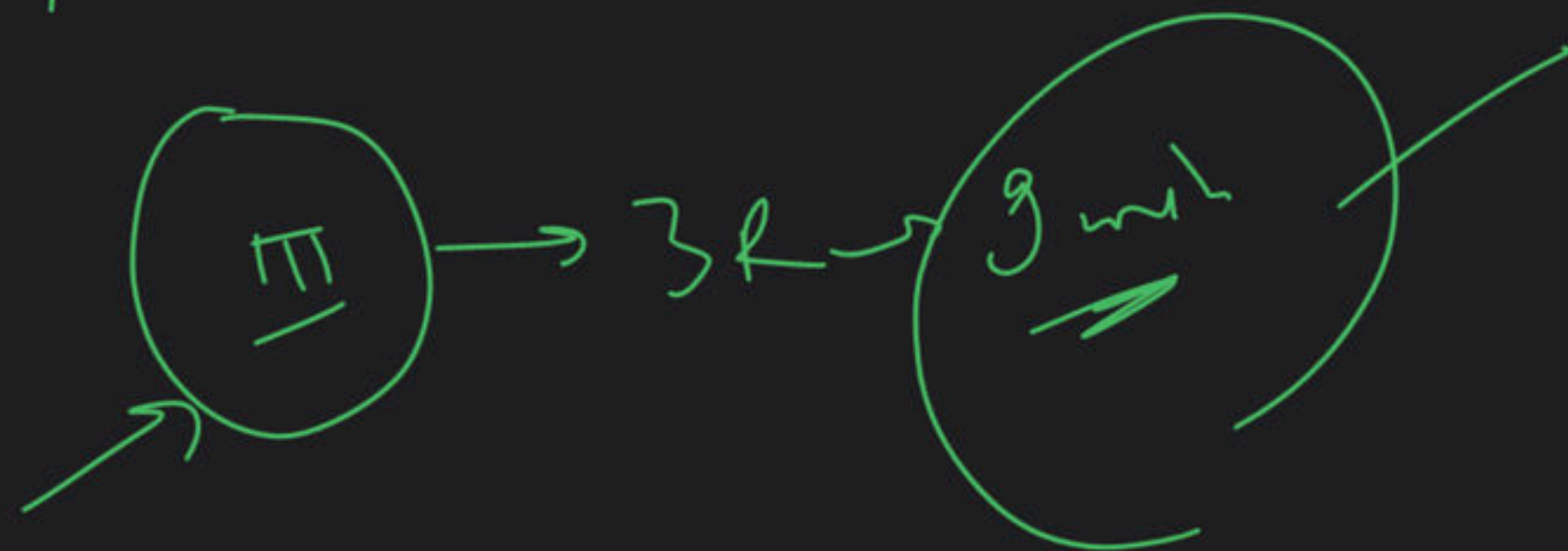
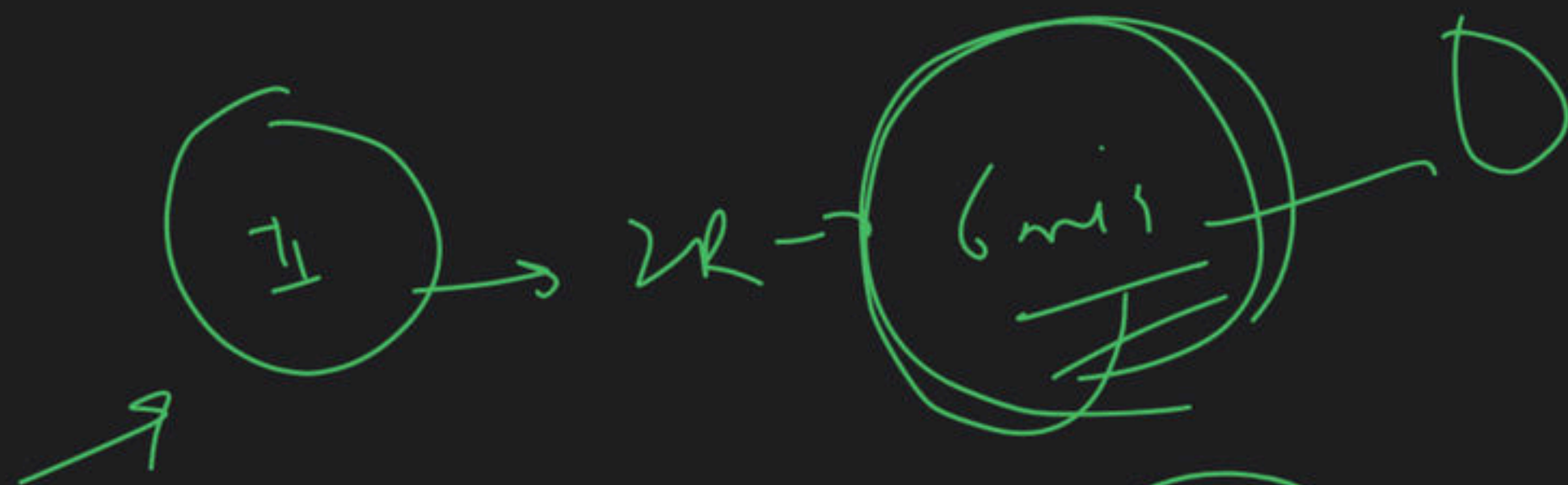
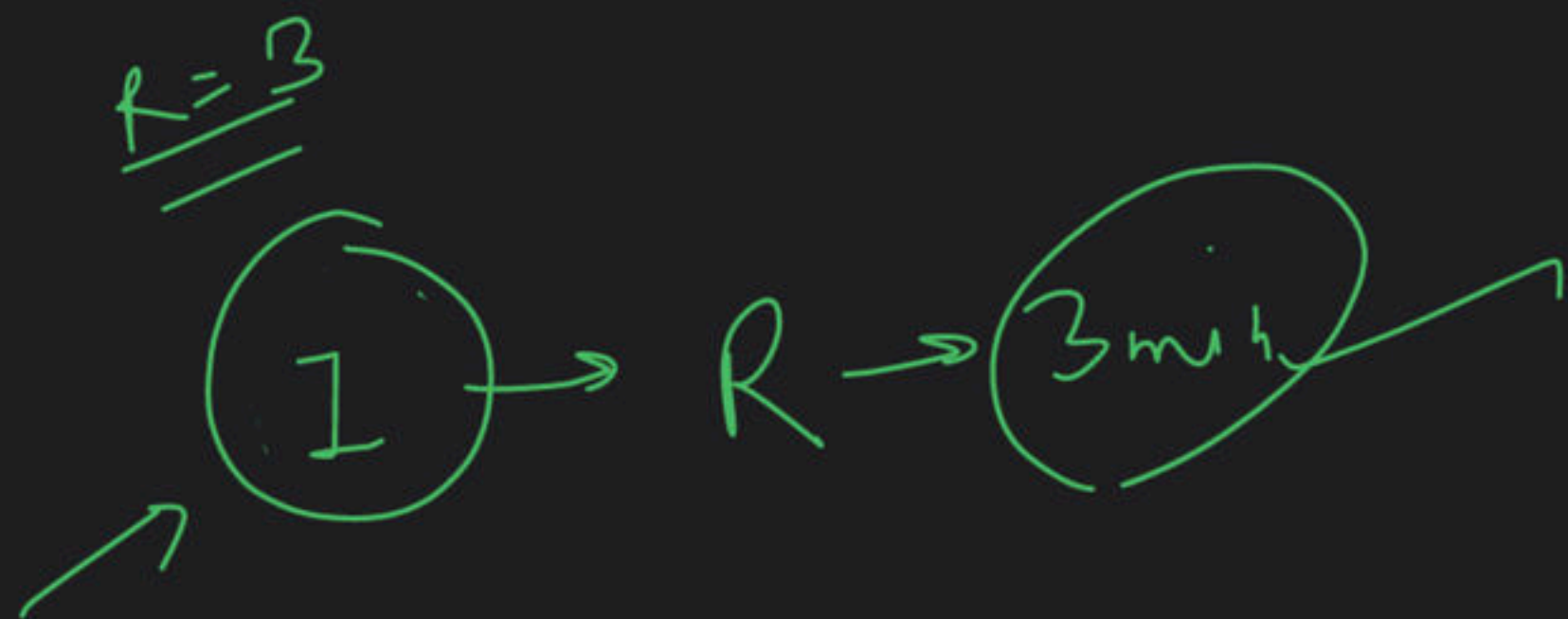
18

6:10

6:16

8
1
16
11
12

10 para



Rank $\rightarrow 1$

1st $\rightarrow R \rightarrow$ 1 min

2nd $\rightarrow 2R \rightarrow$ 2 min

3rd $\rightarrow 3R \rightarrow$ 3 min

4th $\rightarrow 4R \rightarrow$ 4 min

5th $\rightarrow 5R \rightarrow$ 5 min

1 min

2 min

3 min

4 min

5 min

6 min

7 min

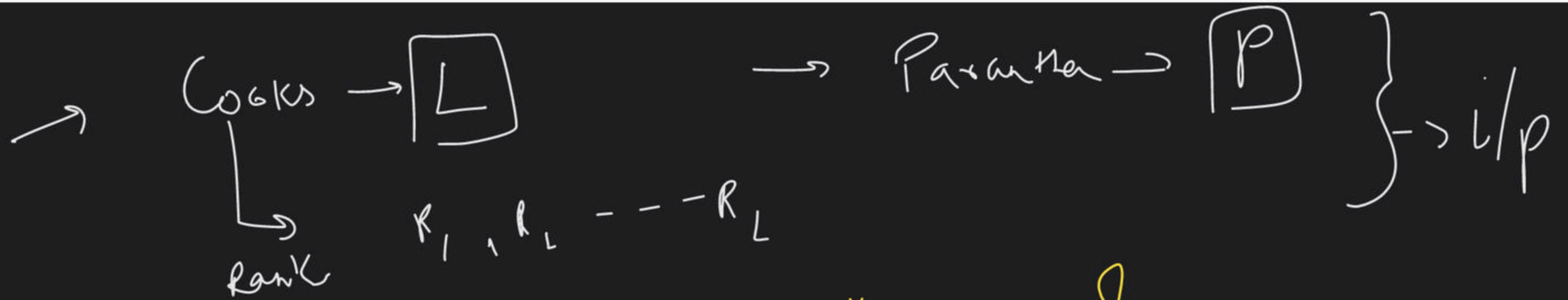
8 min

9 min

10 min

11 min





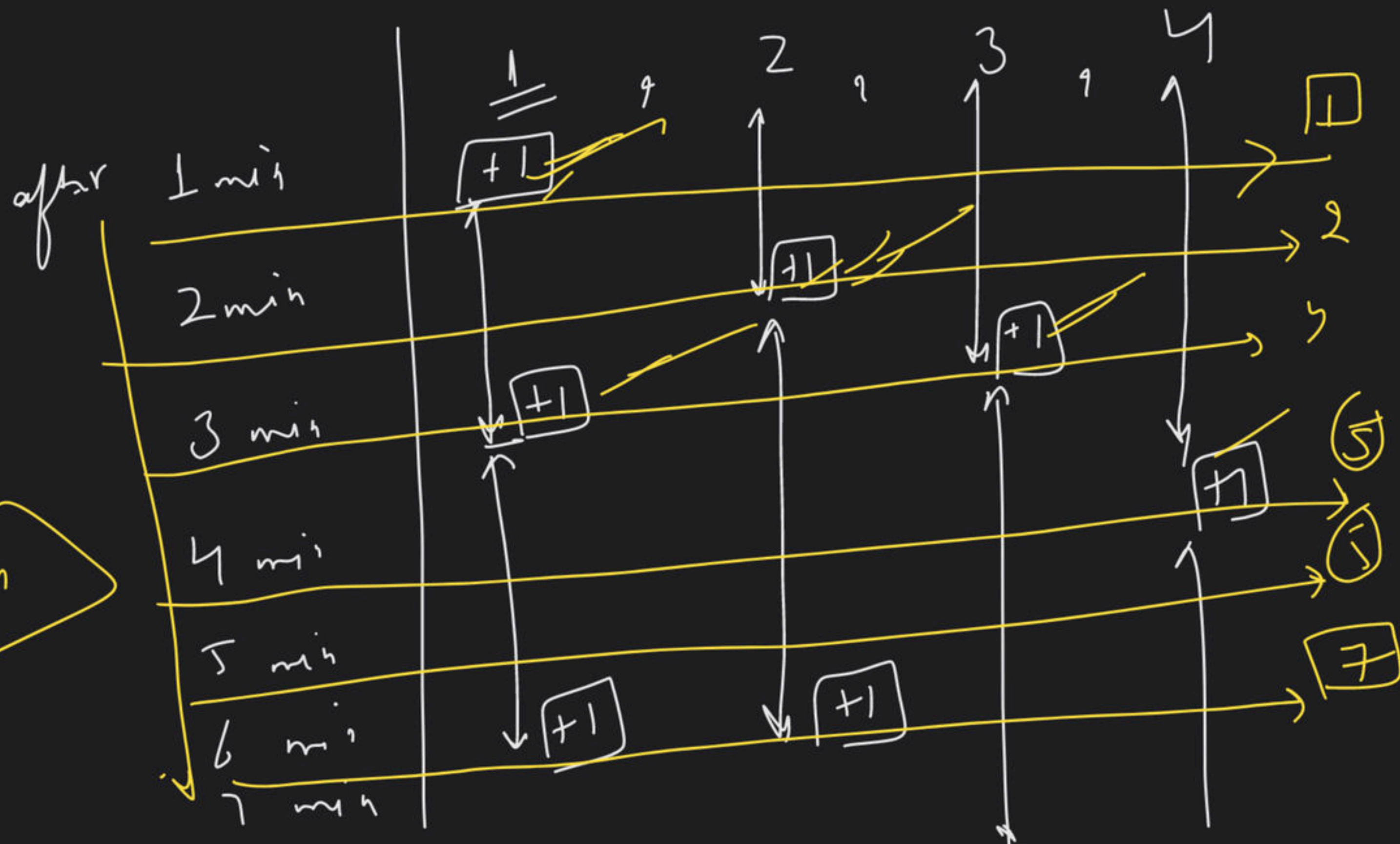
→ min time to complete $\sim p$ "parameter"

→ Cools → 4 cools

↳ Rank → 1, 2, 3, 4

Rank → 6 ← i/p

Rank ↓ Cools



1

= 4

= 4

5x?

2x = 2x

min = 6 min
time

min time

min time $\rightarrow 0$

$$\Delta = 0$$

1, 2, 3, 4

$$1 + \left(\frac{\log 11}{2} \right)$$

= 55

DOA (Rank, Rank + L)

max func = ?

first look *
last look L

no. of
param

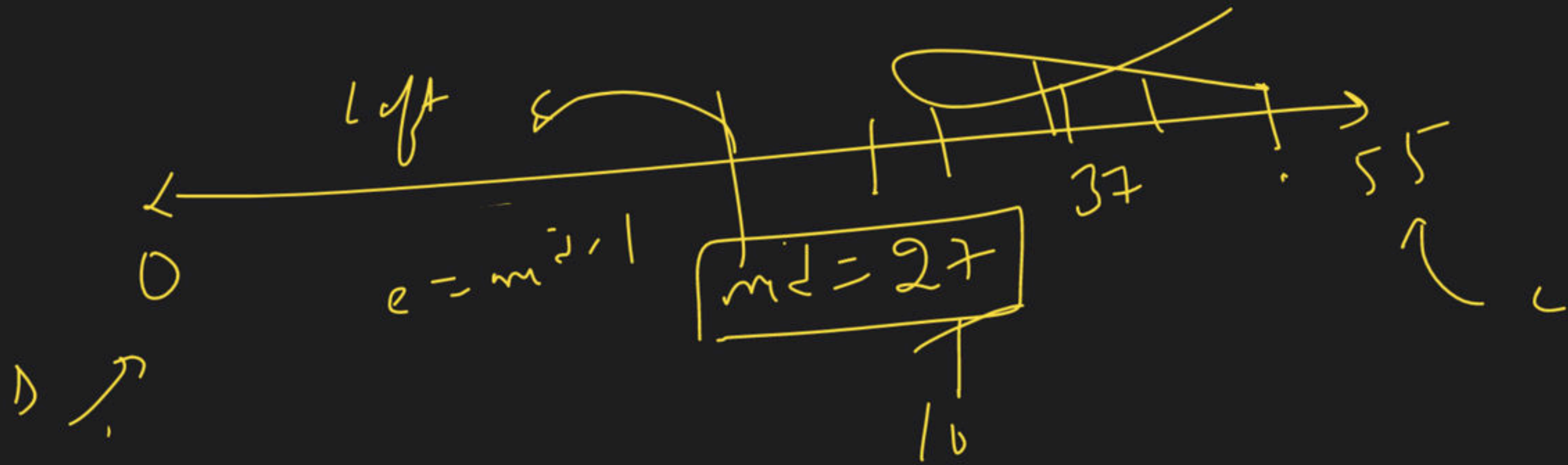
INT_MAX

R, 20, 30, 40, 50, ...

R [1, 2, 3, 7, ...]

RA (no (n+)
2

no. of param $\rightarrow 10$

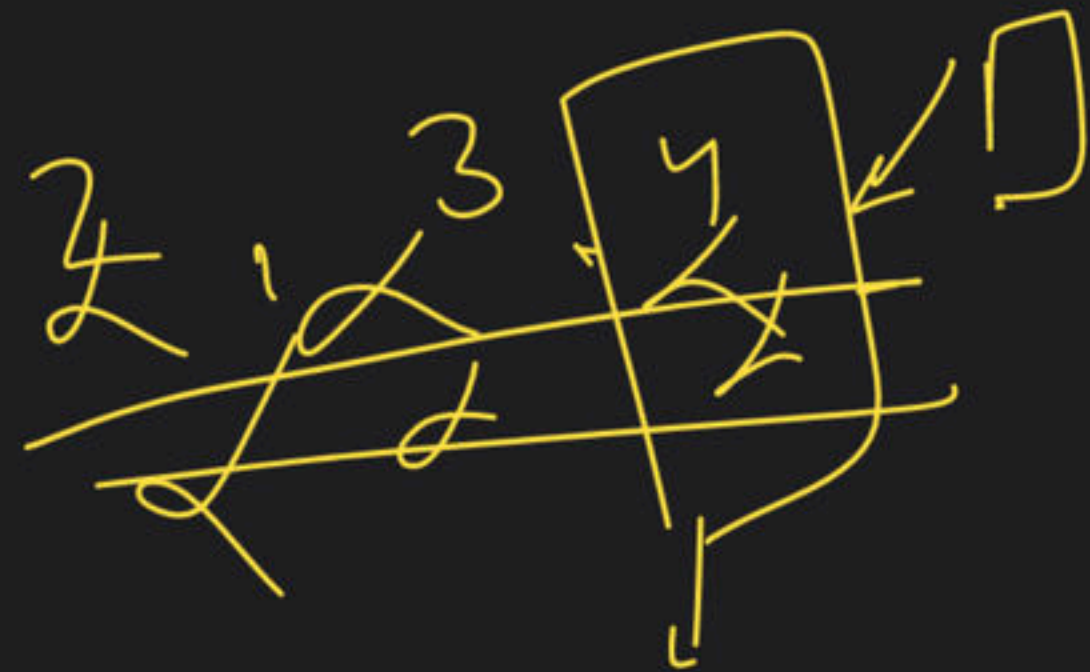


isPrimeSol = (27)

code
share



1, 2, 3, 1



also
by
an
mini
array



$$\Delta = 0$$

$$C = R \cdot \left(\frac{n \cdot (n+1)}{2} \right) \rightarrow$$

arr
 $\rightarrow \text{I}^{th} 100K \rightarrow$ sare parent
 bare rek

$$R, 2R, 3R, 4R, \dots$$

$$R \left[1, 2, 3, 4, \dots \right]$$

$$R \cdot \left[\frac{n \cdot (n+1)}{2} \right]$$

$$R = 1$$

no. of
 parent

$$\leftarrow n = 10$$

=

$$1 \cdot \left(\frac{10 \times 11}{2} \right) =$$

$$(55)$$

do it ways

int s = 0

arr[0]
c = arr[n/2] (n+1)

while (s <= c)

{ int mid = (s + c) / 2;


if (isPossibleSolution (mid, 1, 1))

ans = mid

c = mid - 1 → left → why?

} else { int mid = (s + c) / 2; → right → why?

}

```
bool isPossibleSolution ( int mid )
{
    int count = 0;
    for ( int i = 0 ; i < L )
    {
        int time = mid;
        while ( time > 0 )
        {
            // 
            // 2 or 3 pairs
        }
        count++;
    }
}
```

~~if~~