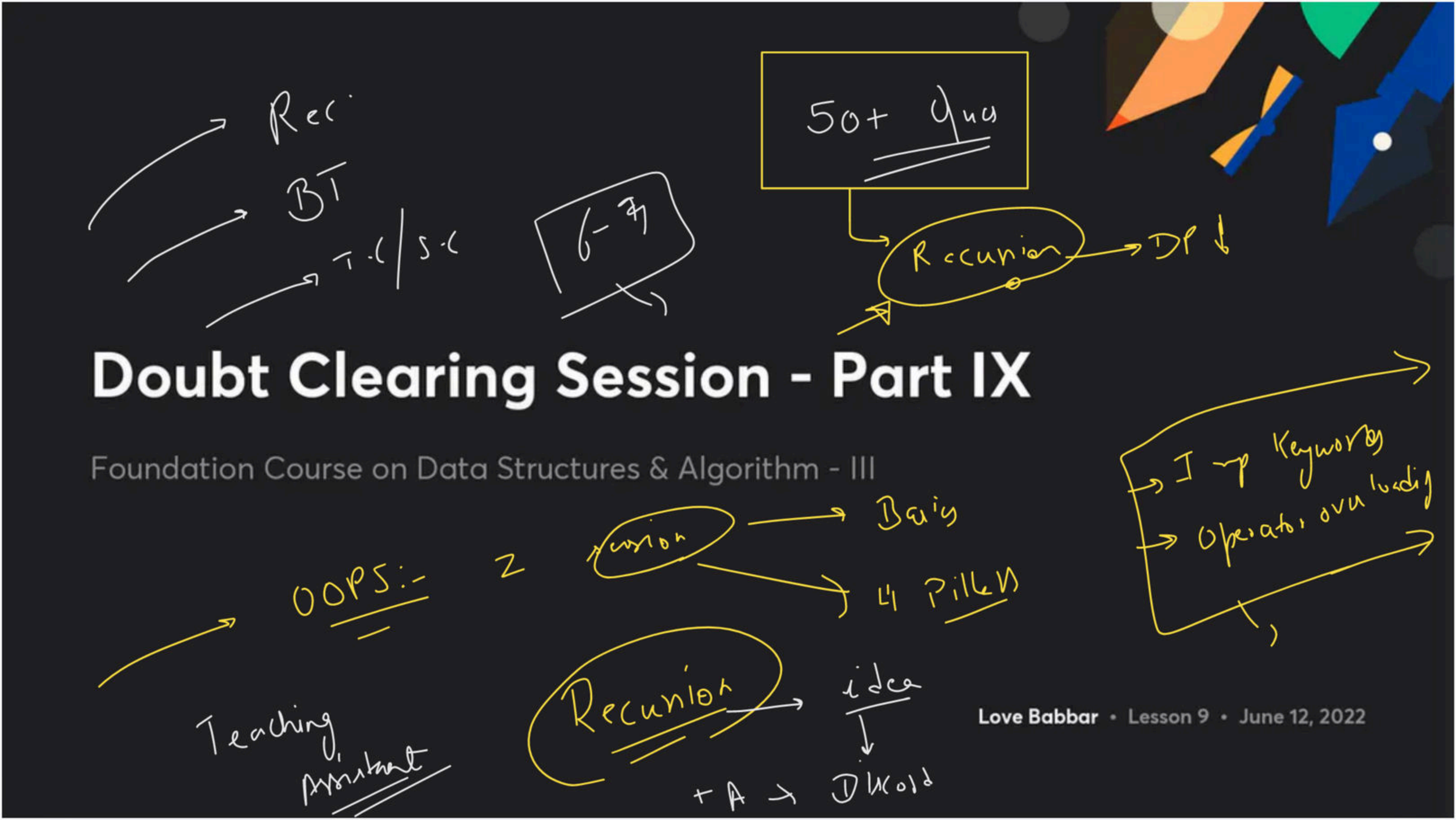
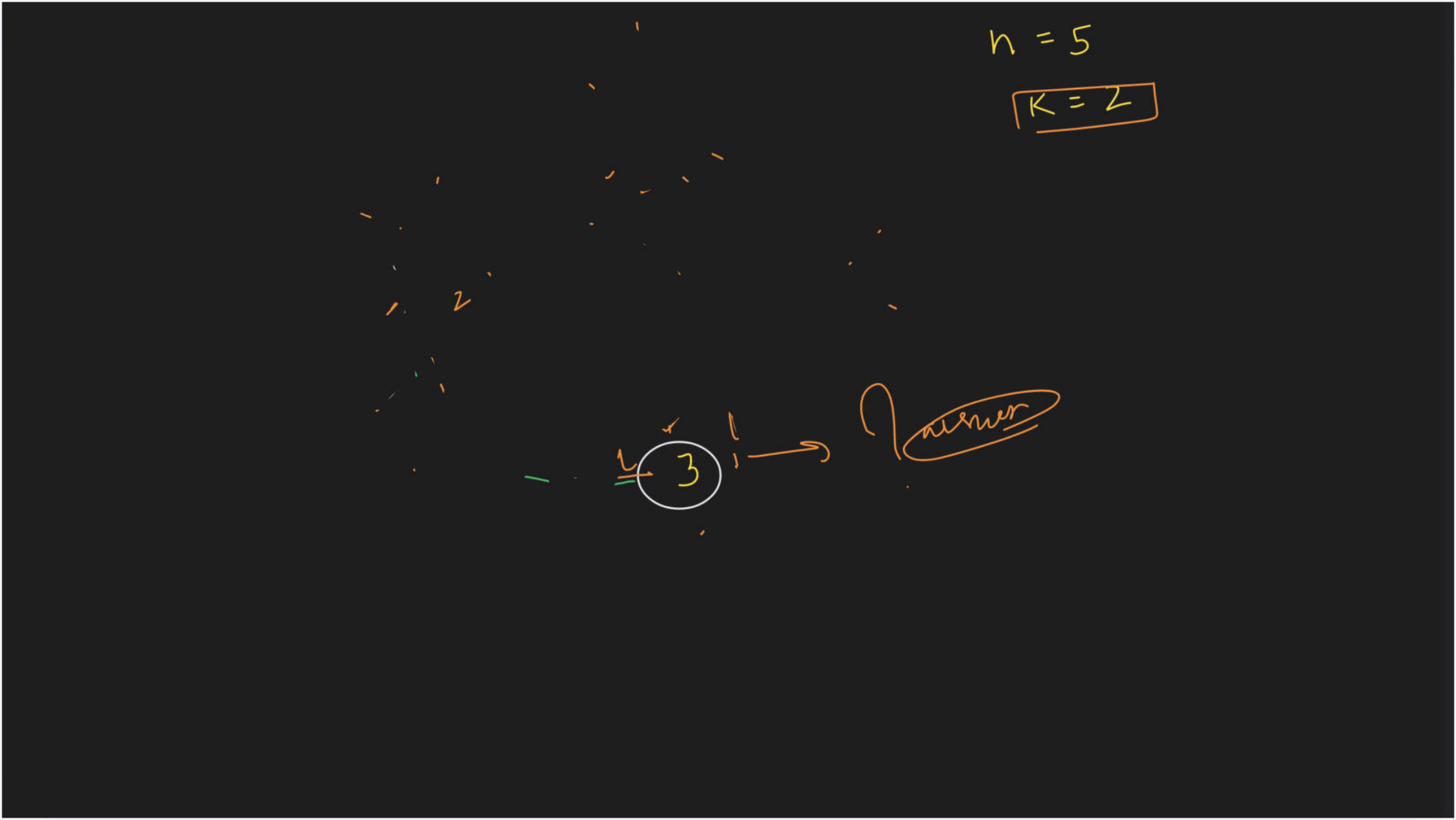
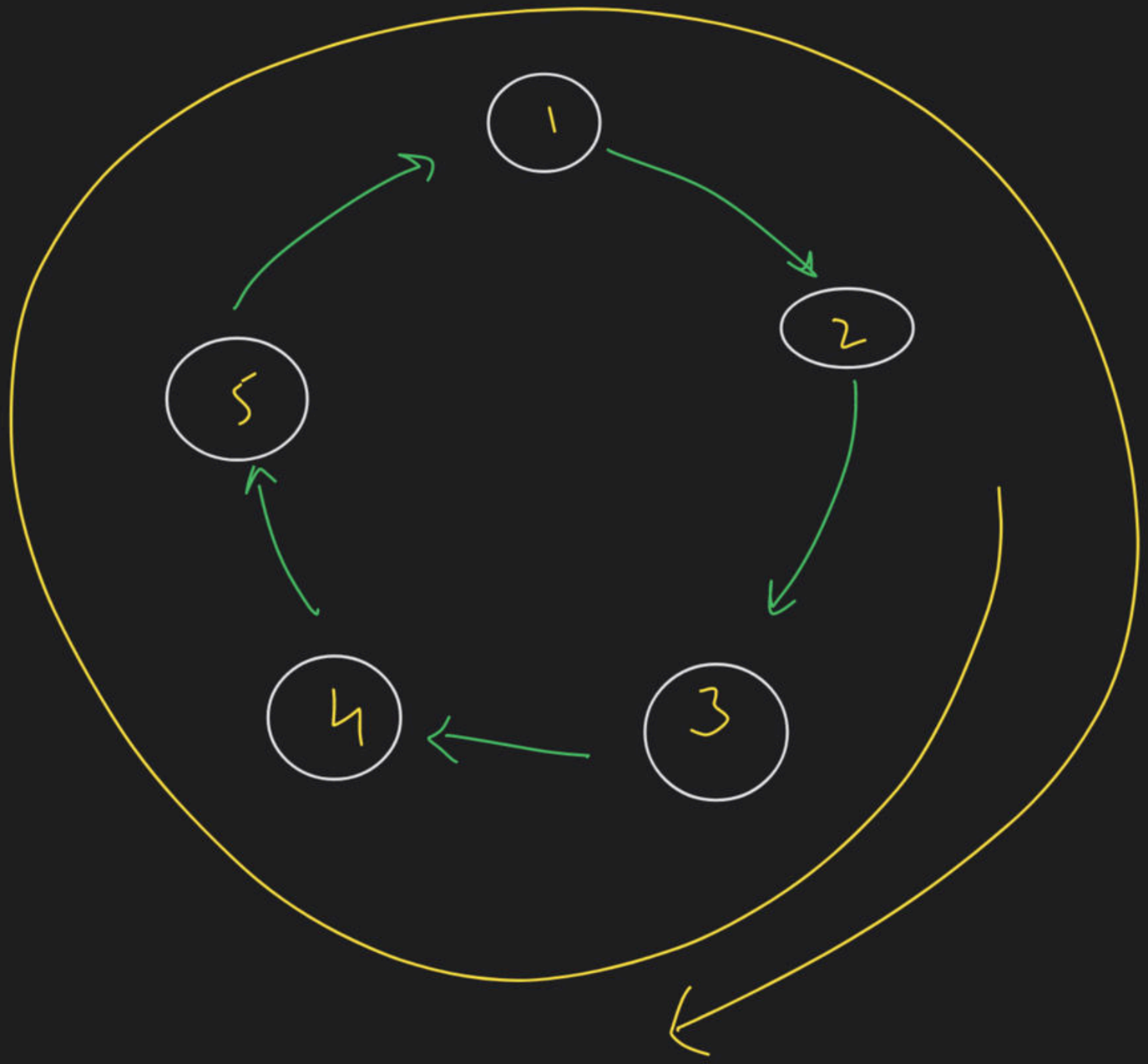

Rec
BT
T.C/S.C
6-7
50+ Qus
Recursion
DP
Doubt Clearing Session - Part IX
Foundation Course on Data Structures & Algorithm - III
OOPS:-
Recursion
Basics
4 Pillers
Imp Keywords
Operator overloading
Teaching Assistant
Recursion
idea
+A
Love Babbar • Lesson 9 • June 12, 2022

→ Joined discord server ?

→ Circular game → ?

↳ Done → ?


n = 5
K = 2
2
3
winner

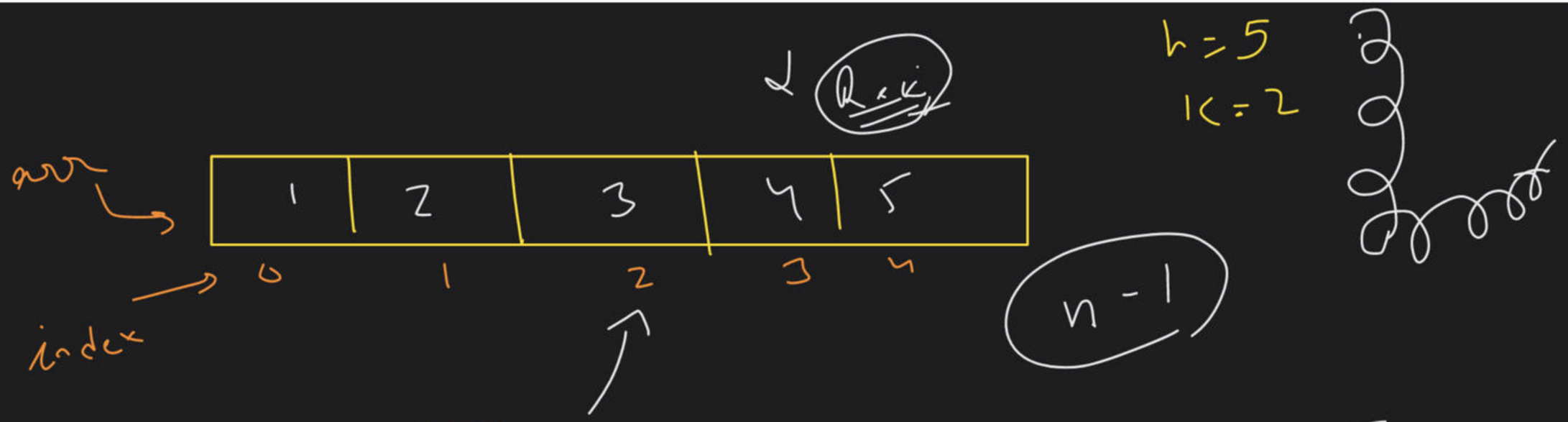


1 2 3 4 5

% n

+ k

n-1

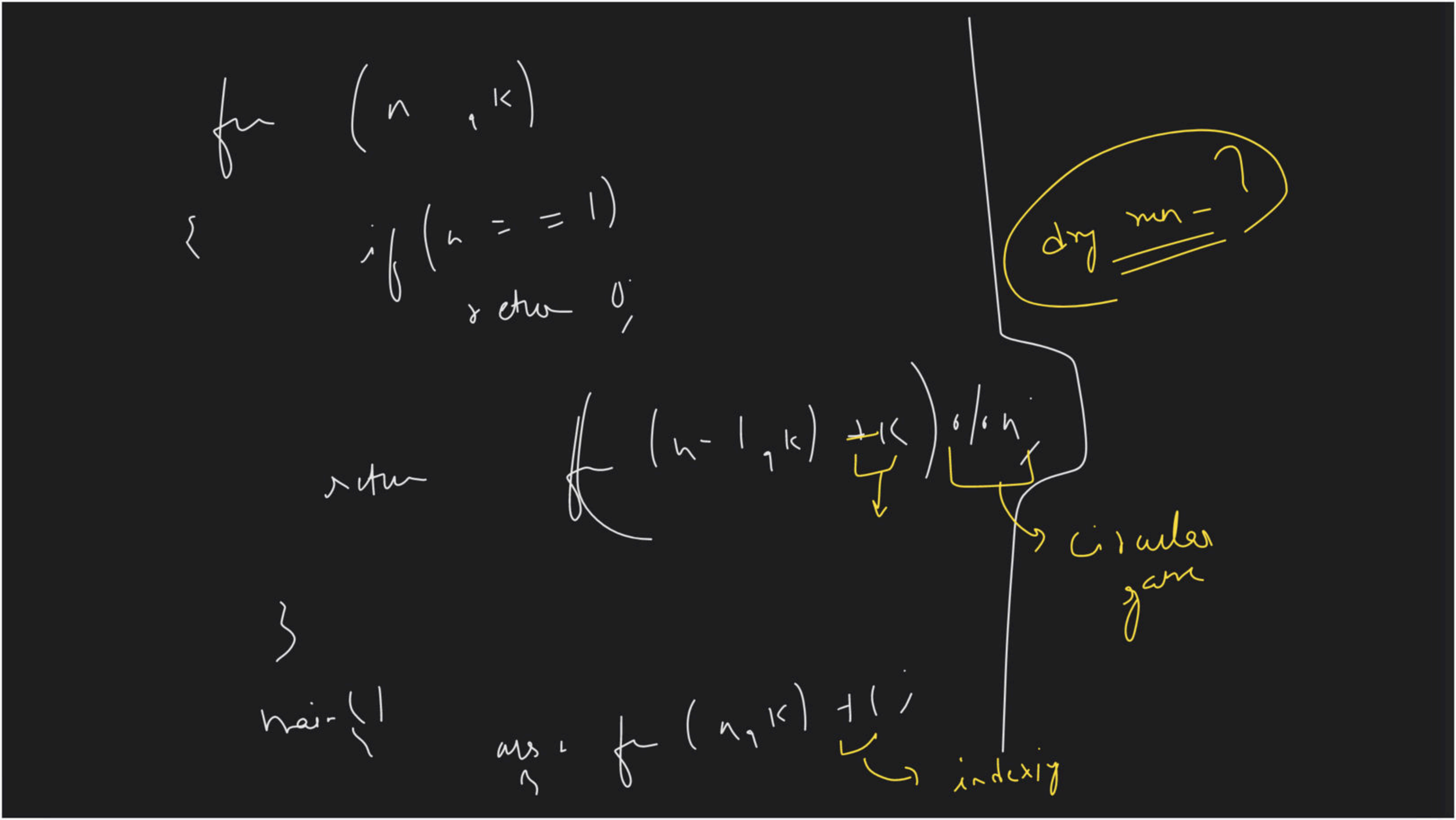


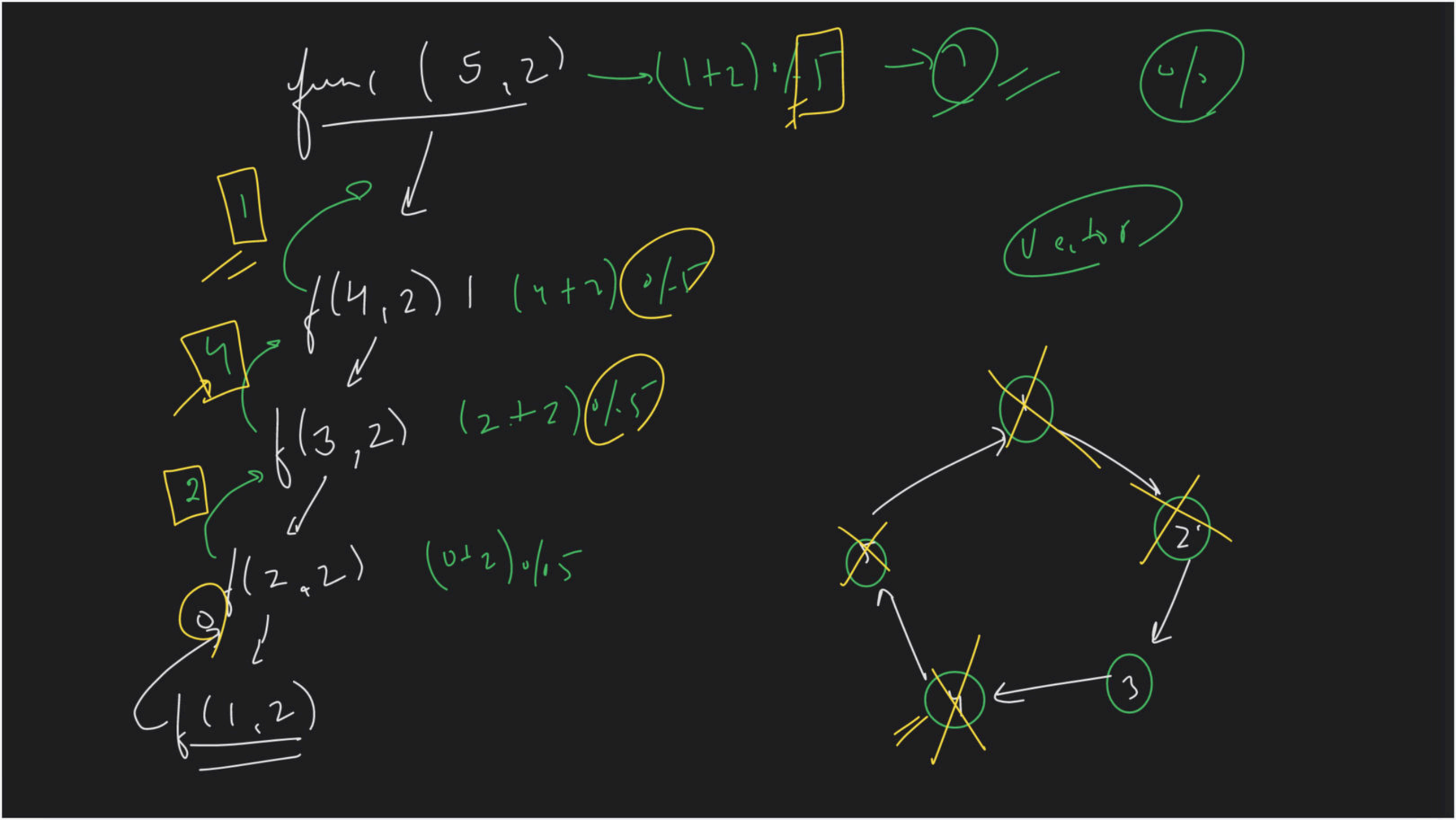
currK = 0

for (n, k)

→ (f(n-1, k) + k) % n;

```
solve ( vector, K, currK)
{
if ( vector.size() == 1)
return vector[0];
currK += (K-1) % vector.size()
vector.erase(currK)
```

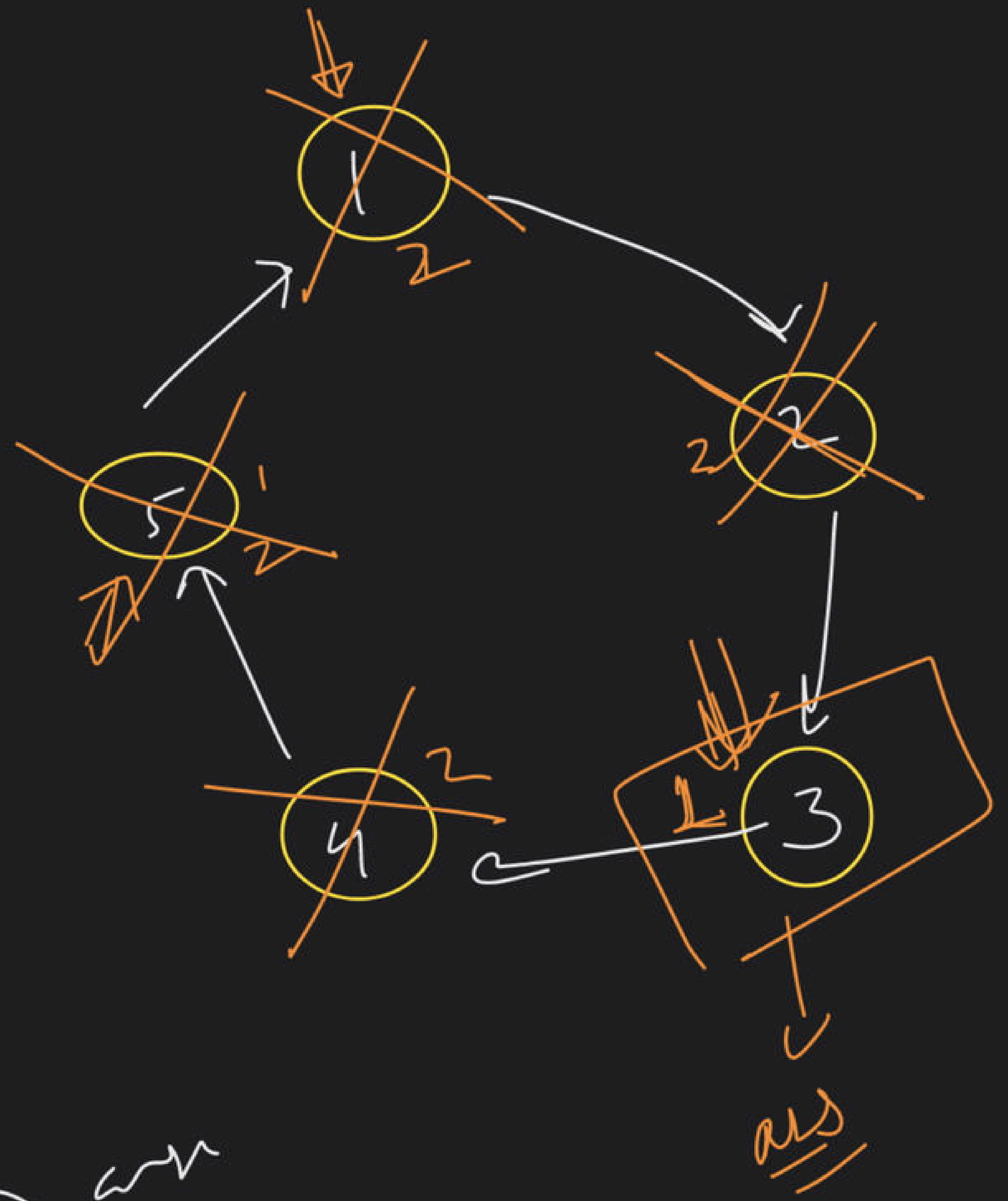

fun (n, k)
{
if (n == 1)
return 0;
return (f(n-1, k) + k) % n;
}
main()
{
printf("%d", fun(n, k) + 1);
}
dry run
circular game
indexing


func(5 , 2)
(1+2)
1
4
2
f(4,2)
(4+2)
f(3,2)
(2+2)
f(2,2)
(0+2)
0
f(1,2)
Vector
1
2
3
4

fun(n, K)

f(n-1, K)

f(4, 2) → ans



n = 5, K = 2

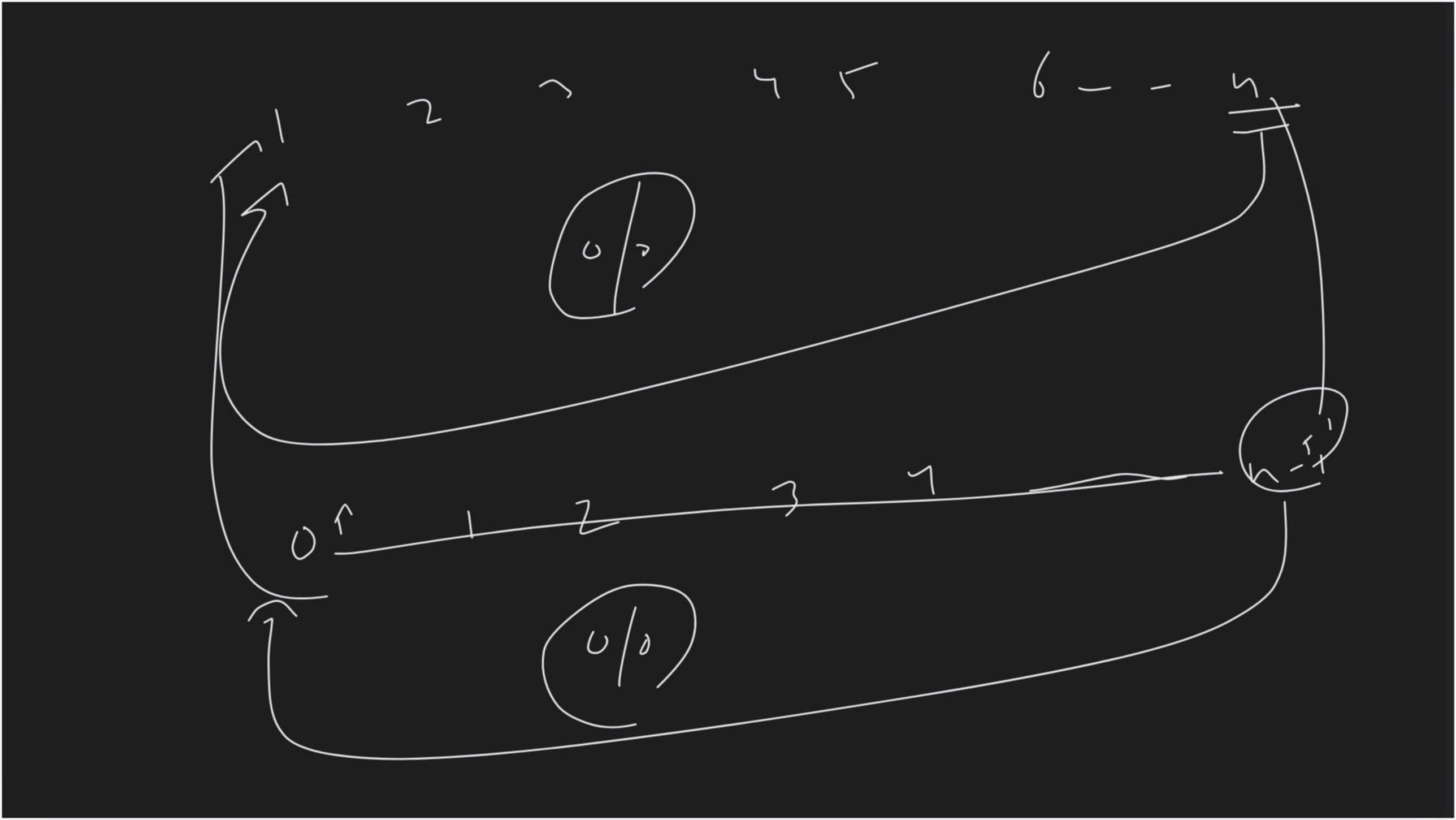
% n

0, 1 → 0, 1, 2, ..., n-1

range

[0 +1, n-1 +1]

[1, n]



[0, 4]

1%5 → 1

2%5 → 2

3%5 → 3

4%5 → 4

5%5 → 0

6%5 → 1

7%5 → 2

8%5 → 3

9%5 → 4

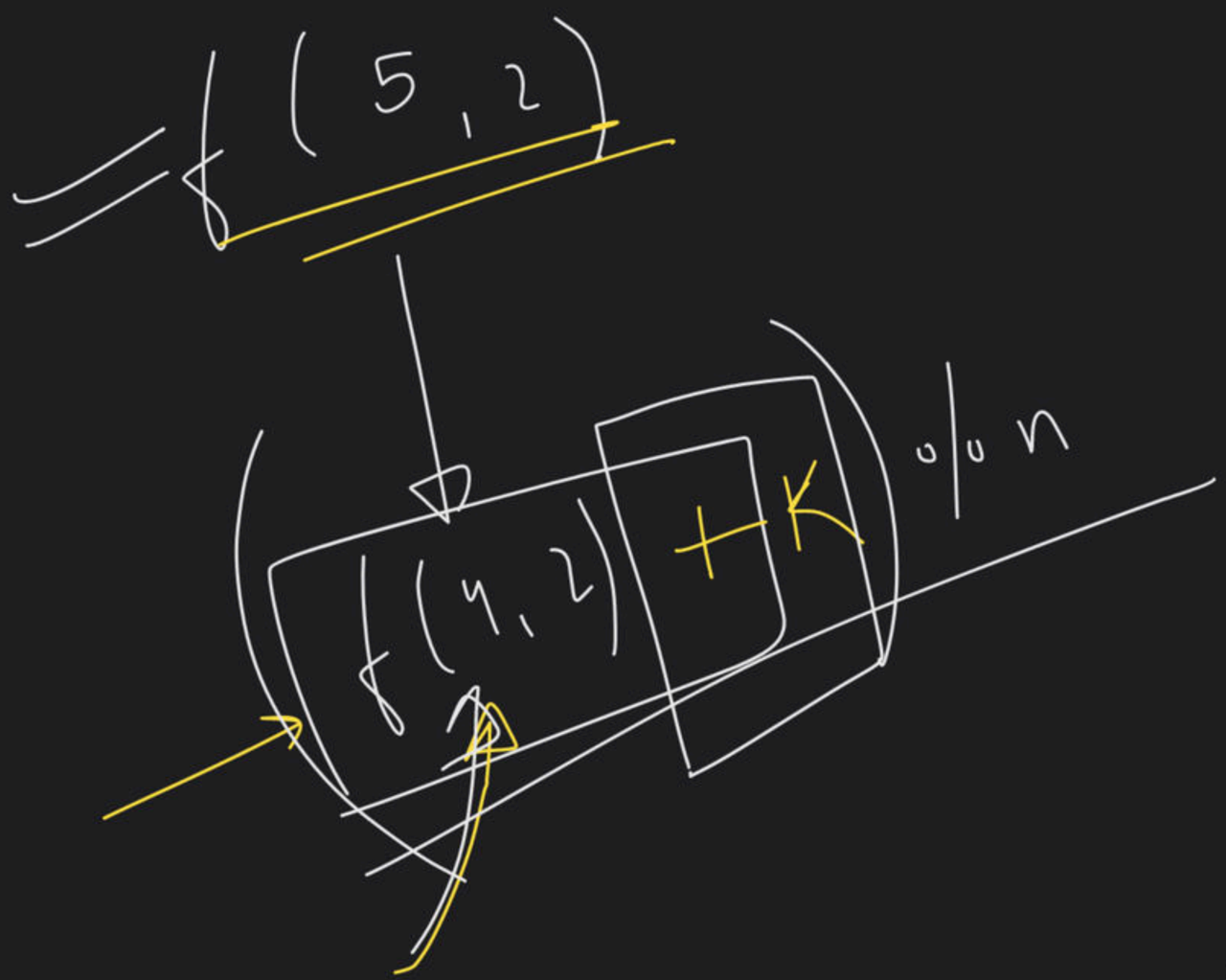
10%5 → 0

11%5 → 1

12%5 → 2

13%5 → 3

14%5 → 4



f(n,K)

f(n-1,K)

Base Case

1

1

Calm

Offset

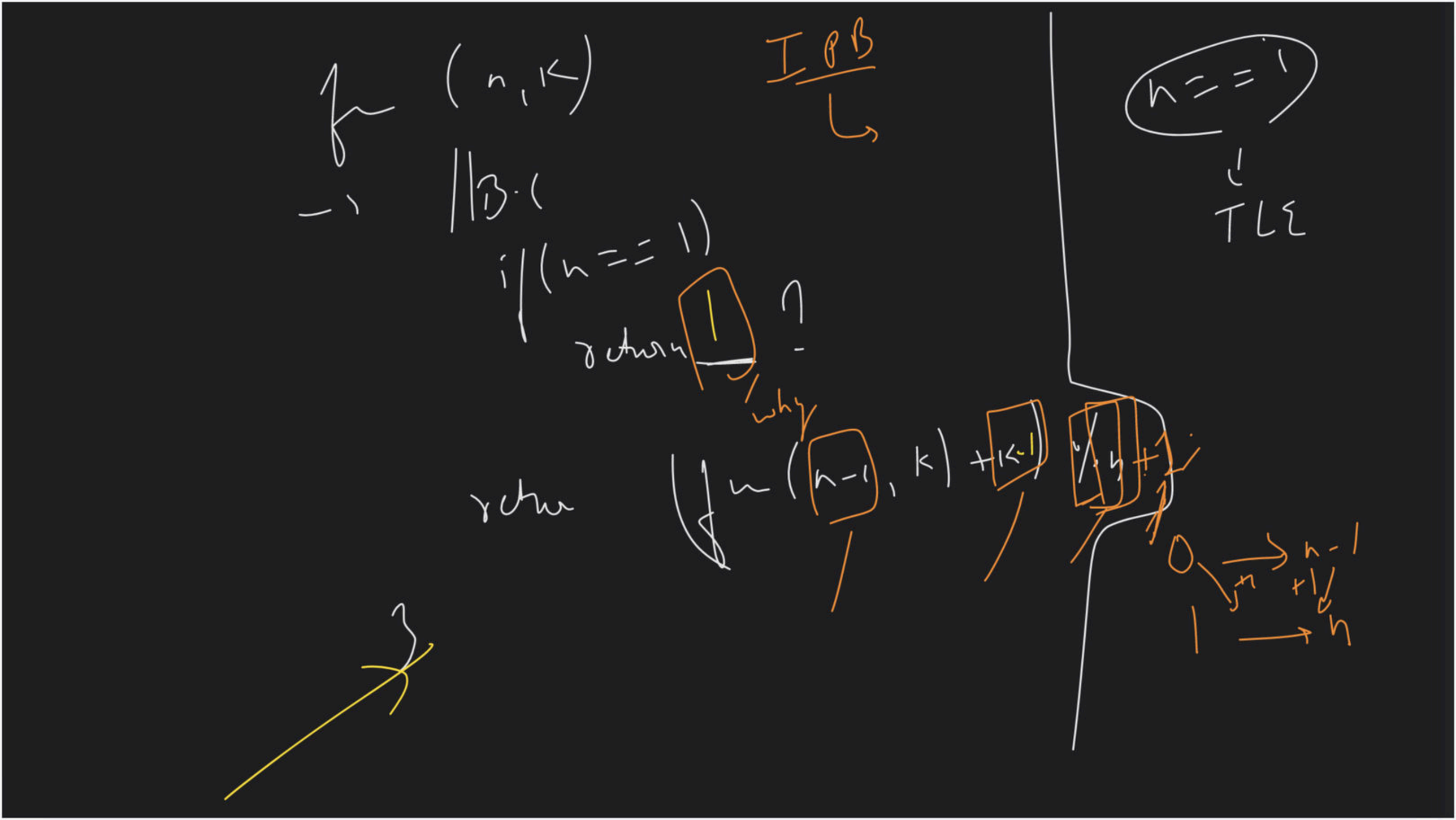
feedback

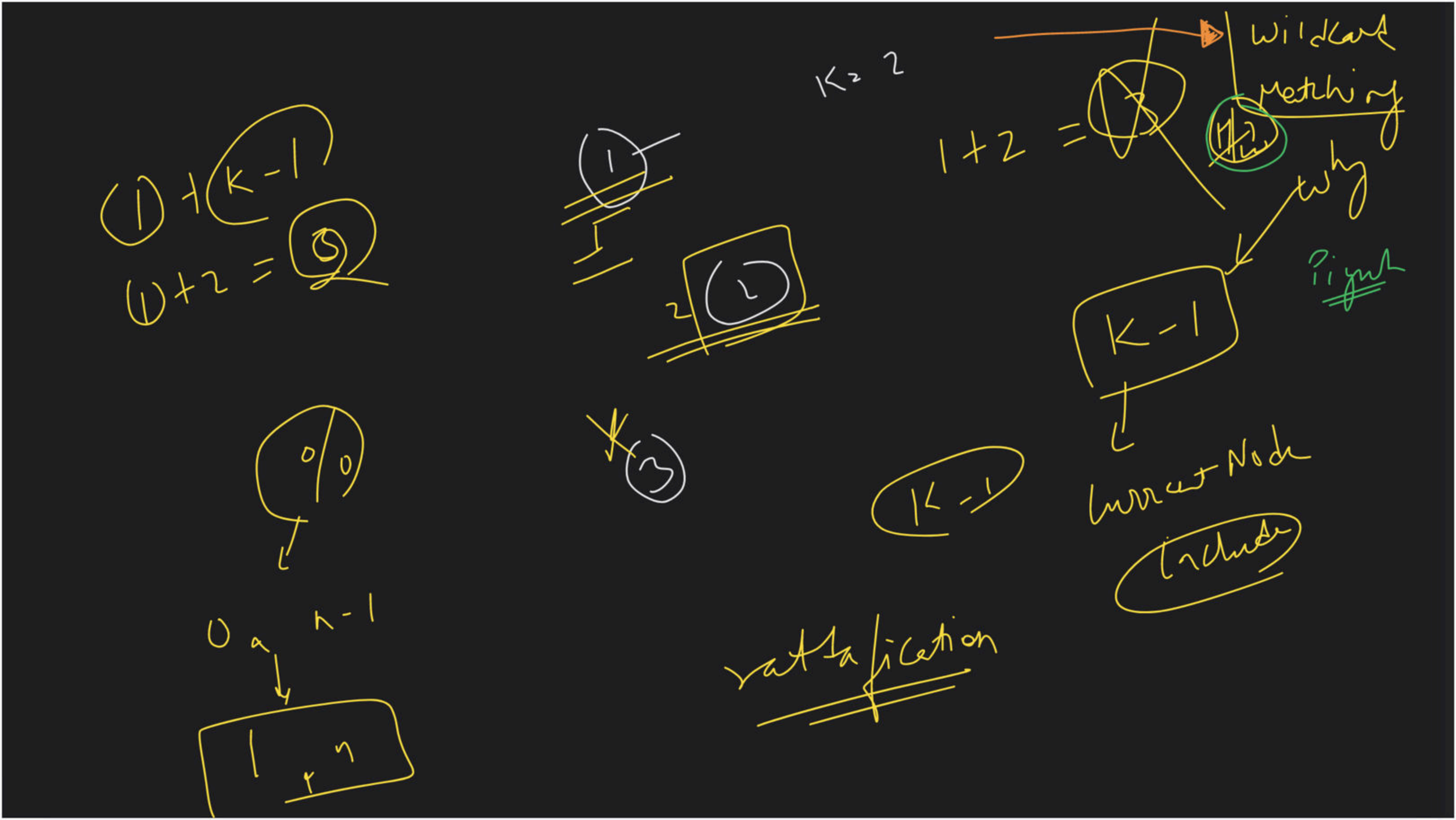
$K = 1$

$K > 2$

$K = 10$

$1 < K < 1000$


f(n,k)
IPB
if(n==1)
return 1 ?
why
return f(n-1,k)+k-1
n==1
TLE
0
n-1
n+1
n


K = 2
Wildcard
matching
1 + 2 =
why
Right
K - 1
Current Node
Include
K - 1
Satisfication
1 + K - 1
1 + 2 =
0 a n - 1
1 n

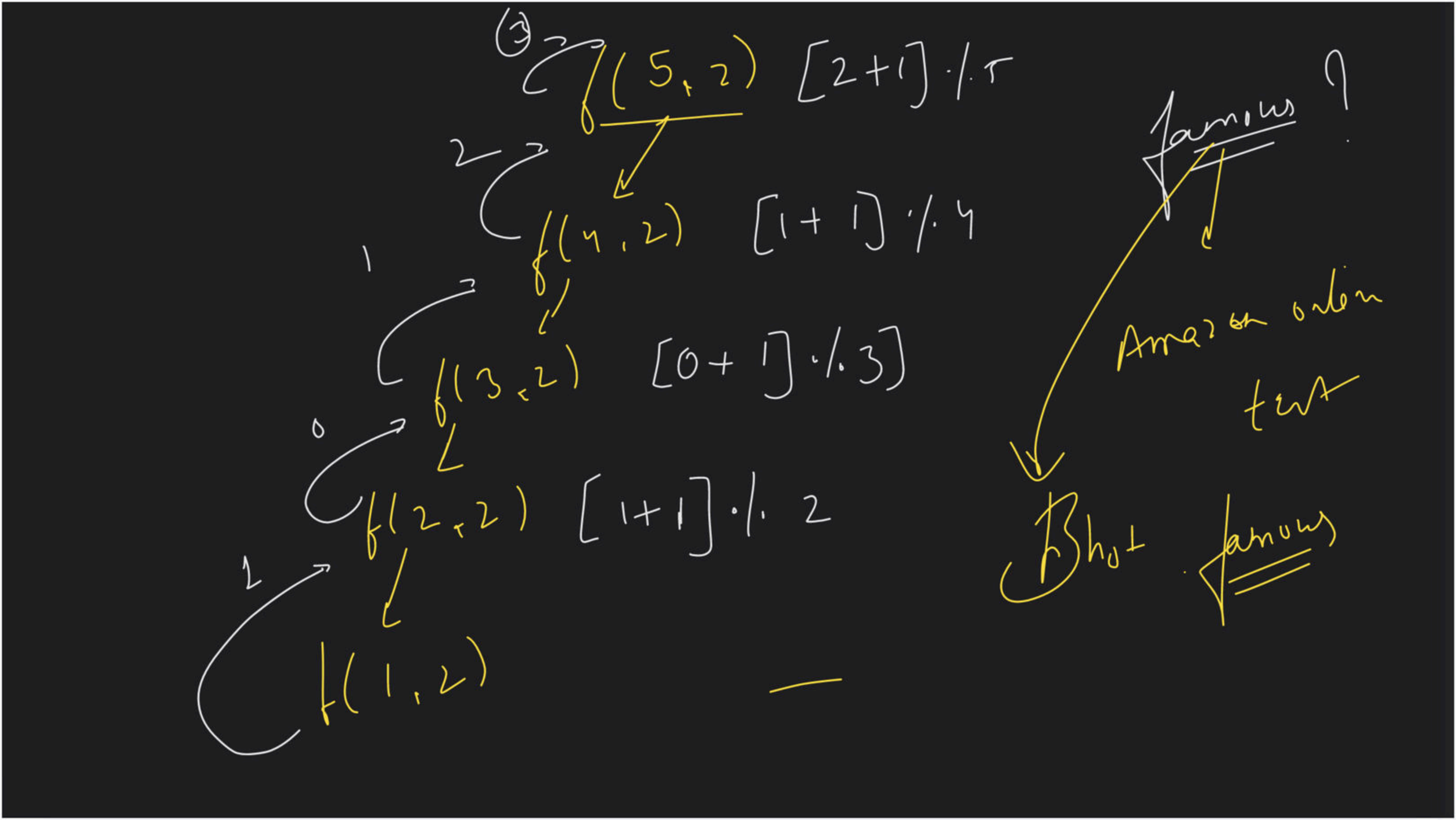
→ Decode String → Recursion

shir

i/p → 3[a] 2[bc]

o/p → aaabcbc

!!


f(5,2) [2+1] % 3
f(4,2) [1+1] % 4
f(3,2) [0+1] % 3
f(2,2) [1+1] % 2
f(1,2)
famous ?
Amazon online test
Bhut famous

3[a]2[bc]

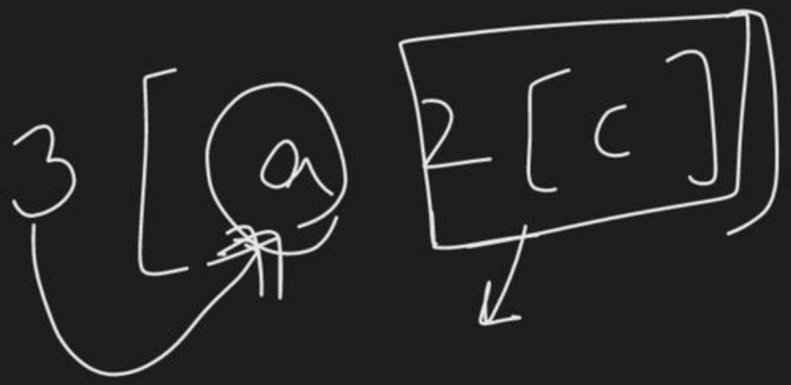
aaabcbc

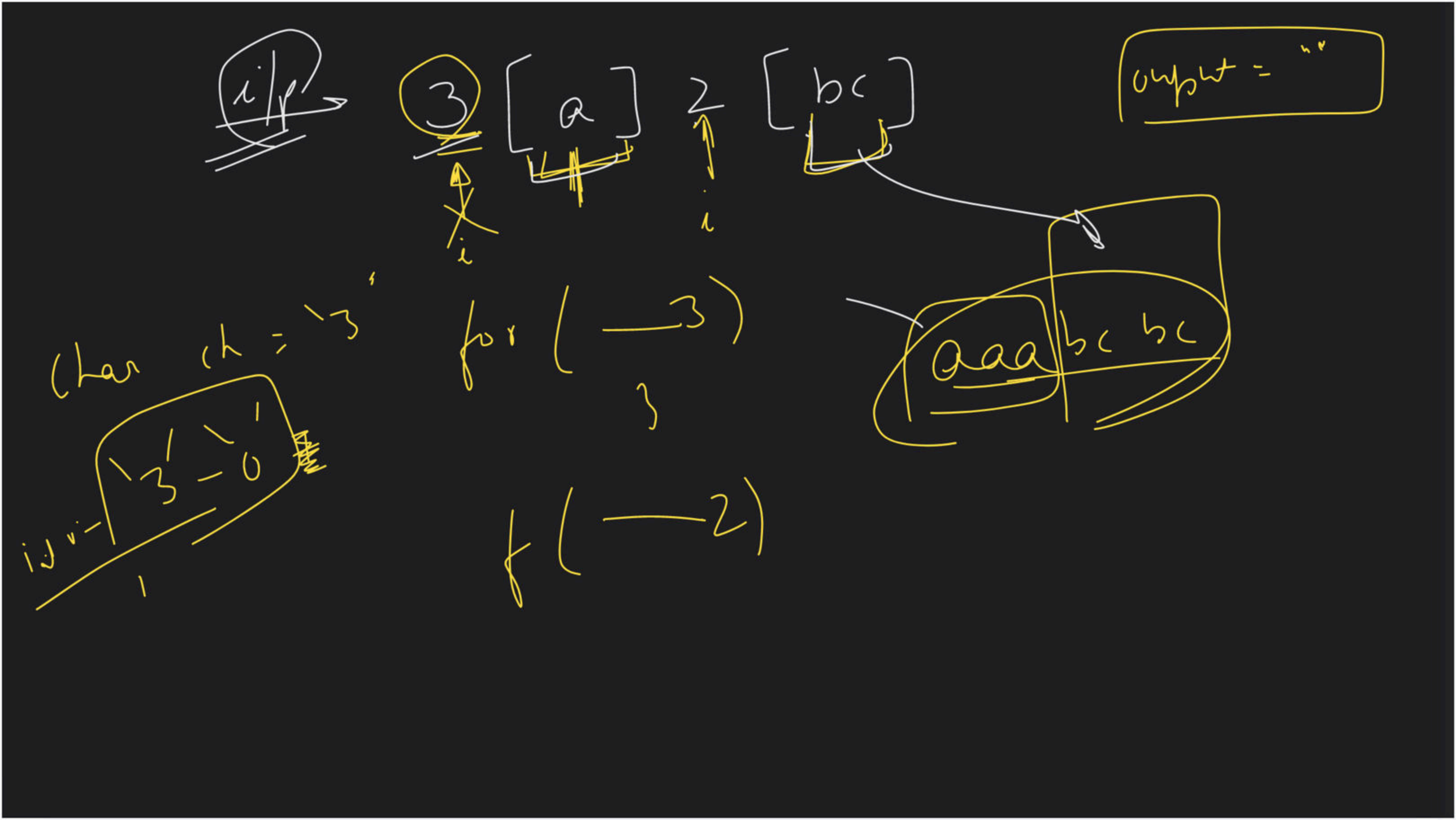
T.C

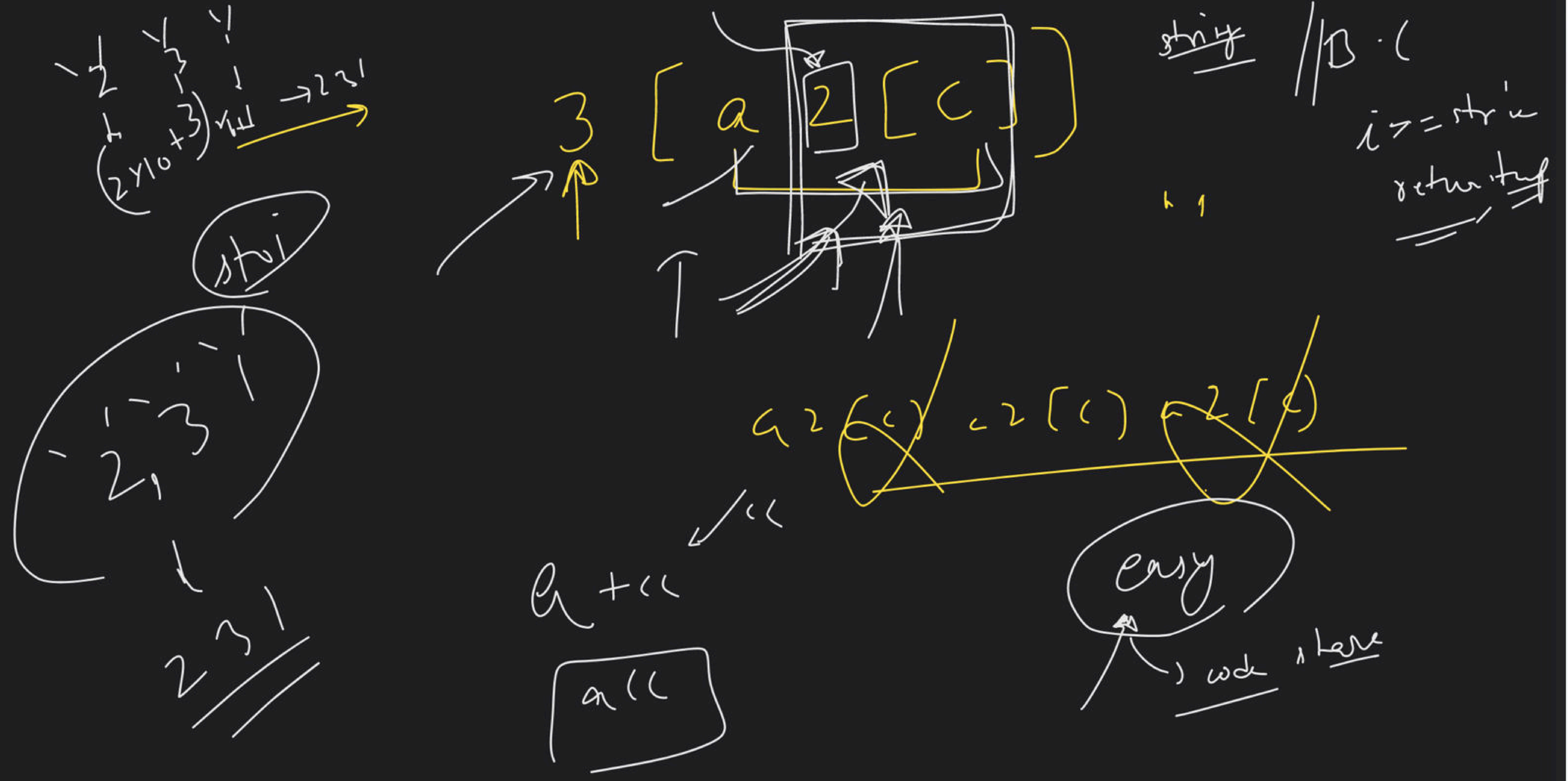
?

O

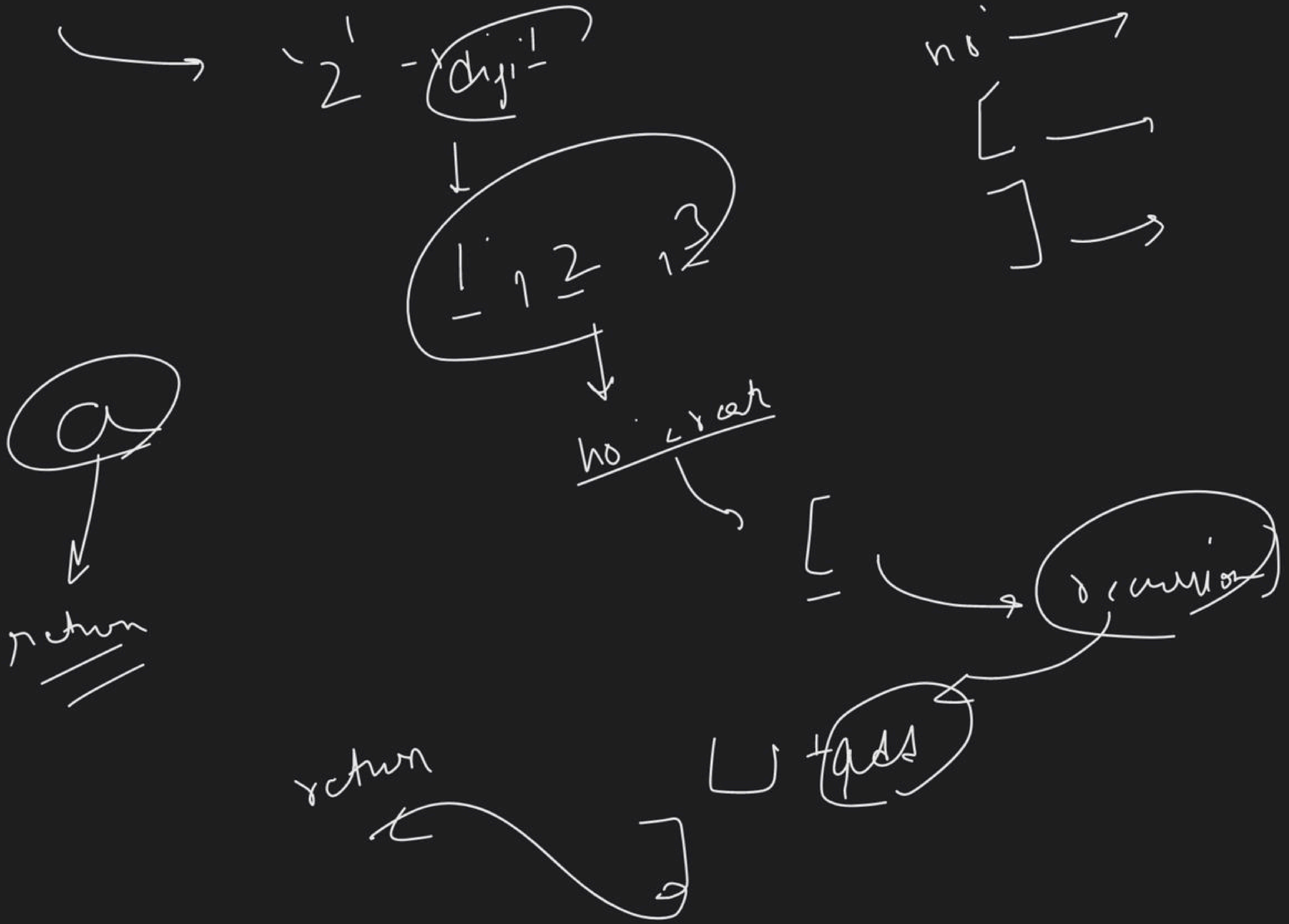
||B.|C

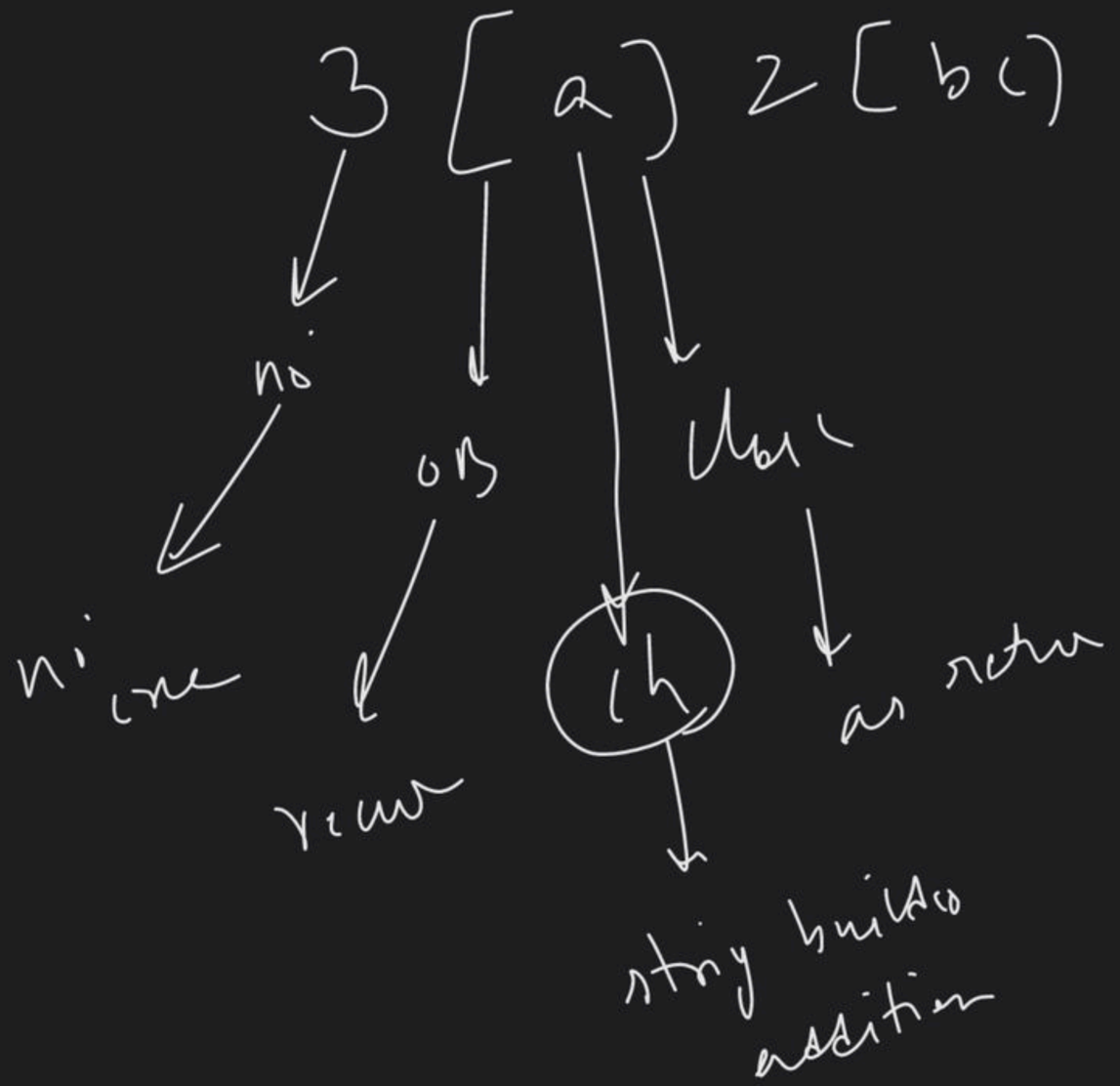



i/p
3
[a]
2
[bc]
output =
aaa bc bc
for (—3)
3
f(—2)
(char ch = '3'
3 - 0
1



stoi
231
3[a2[c]]
a+cc
acc
easy
string

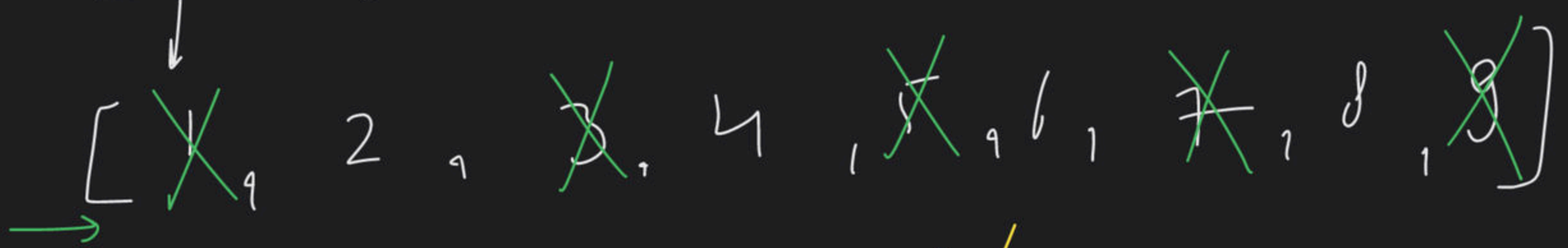

return
return

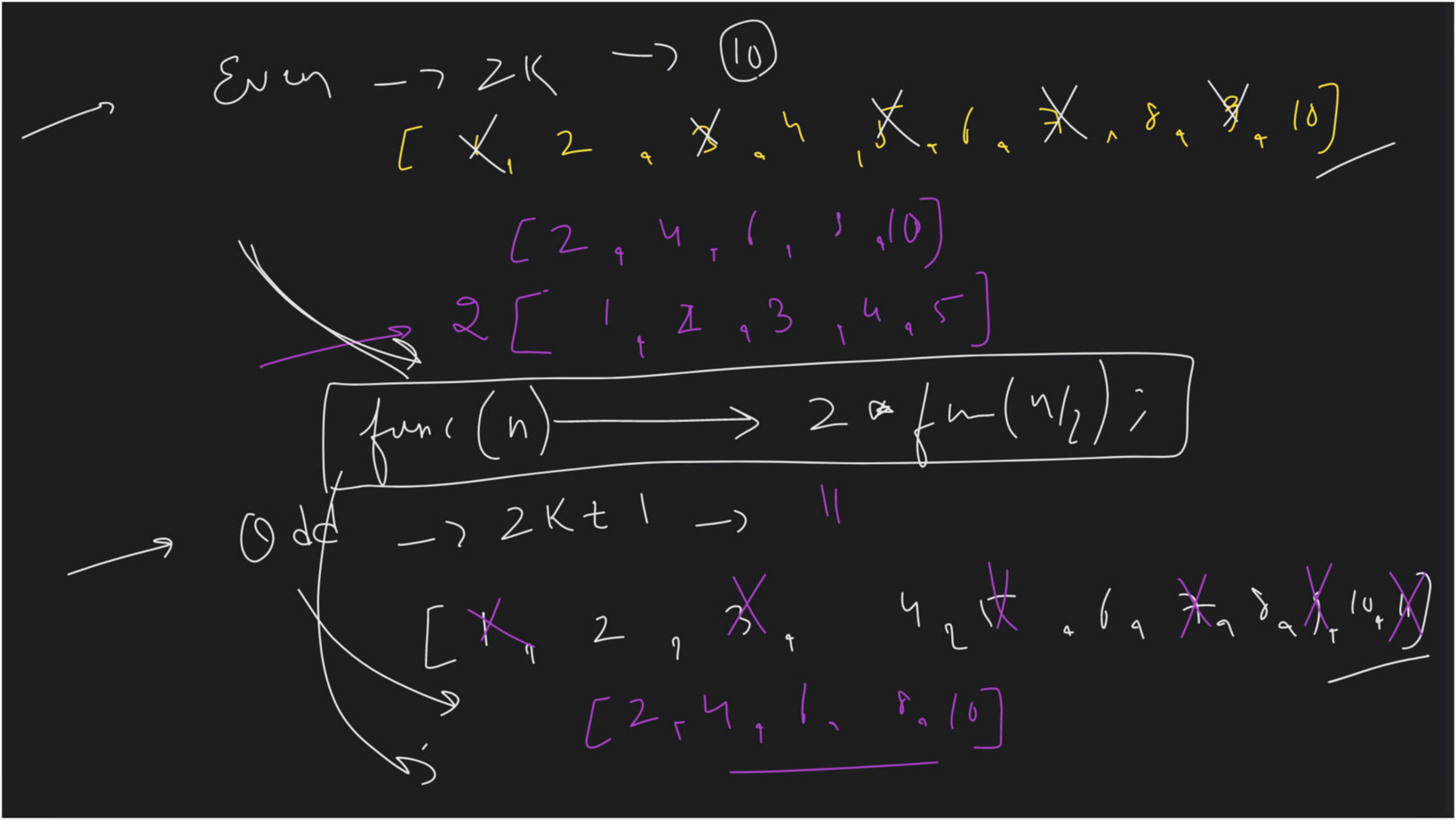

3[a]2[bc]

Ques:- Elimination Game

approach → ?

n = 9




Even -> 2K -> 10
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
[2, 4, 6, 8, 10]
2[1, 2, 3, 4, 5]
fun(n) -> 2*fun(n/2);
Odd -> 2K+1 -> 11
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
[2, 4, 6, 8, 10]

formula

[1, 2, 3, 4, 5, 6]

K = ?

[2, 4, 6]

left(n) - 1 = n - right(n);

[4]

right(n) = n - left(n) + 1

4 - 1

[1, 2, 3, 4, 5, 6]

left(n) = n - right(4) + 1

[1, 3, 5]

[3]

fun(n) = 2 * f(n/2)

↳ fun(n) = 2 * (n - 1 + f(n) + n)

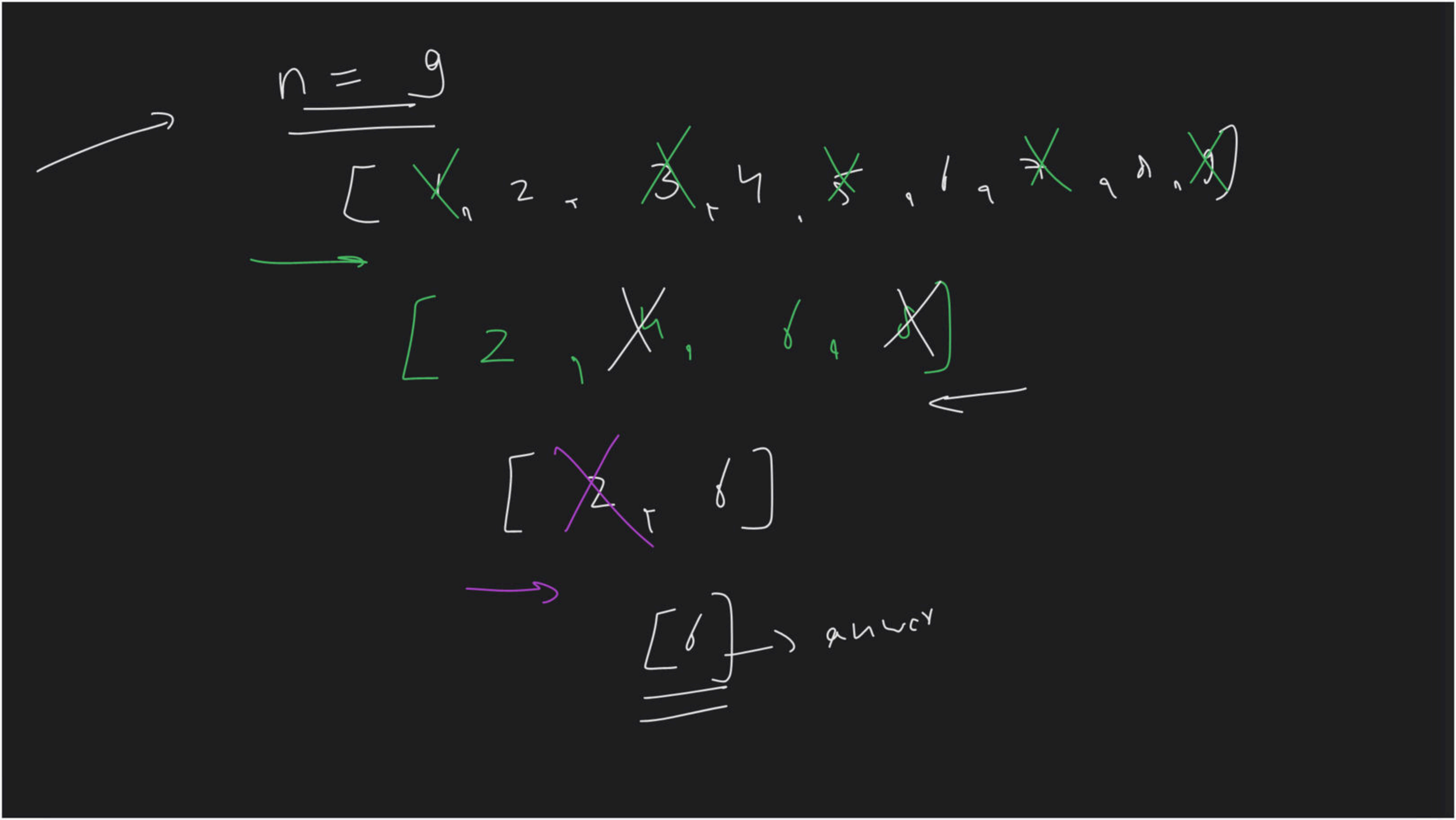
T.C

log n

[1]

$2 * \left(\frac{n}{2} - k(n/2)\right)$?

devang


n = 9
[1, 2, 3, 4, 5, 6, 7, 8, 9]
[2, 4, 6, 8]
[2, 6]
[6]
answer

even

→ [1, 2, 3, 4, 5, 6] → f(1)

[2, 4, 6]

2 * [1, 2, 3] → f(3)

f(6) → 2 * f(3)

right →?

f(n) → 2 * f(n/2)

L→R

R→L

clean

go!!

odd

$[X, 2, X, 4, X, 6, X) \rightarrow f(7)$

$[2, 4, 6]$

$2\ [1, 2, 3) \rightarrow f(3)$

$f(7) = 2 * f(3)$

$f(n) = 2 * f(n/2)$

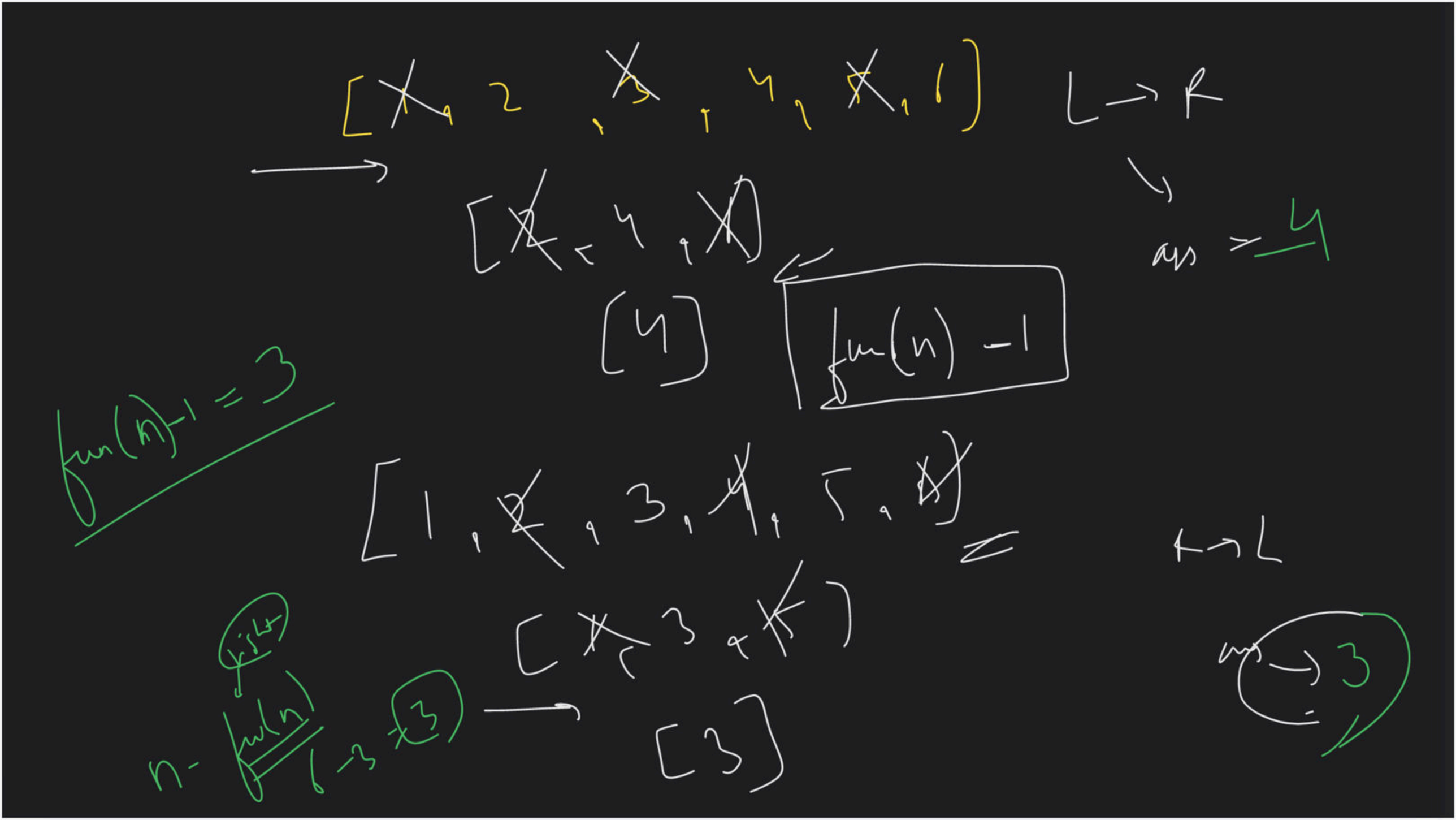
// B.Cas

if (n == 1)

return 1;

1 + n/2 - f(n/2)

graph


[X, 2, X, 4, X, 1]
L → R
ans = 4
[X, 4, X]
[4]
fun(n) -1
fun(n) -1 = 3
[1, X, 3, 4, 5, X]
n - fun(n)
(-3 -3)
[X, 3, X]
[3]
L → L
3

L → R

R → L

HARD

3

fun(n) - 1
L-R

=

h - fun(n)
R →

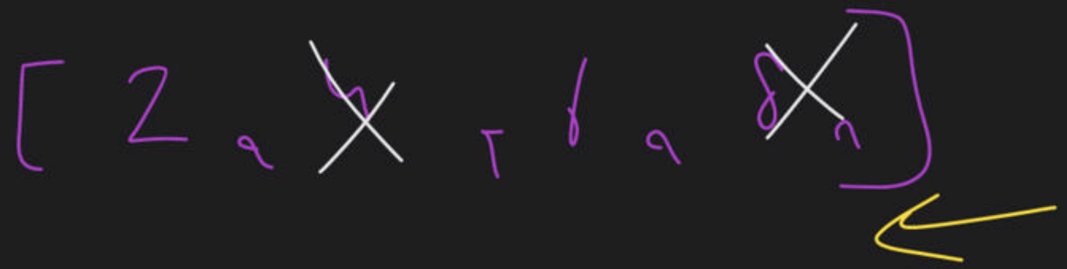
fun(n) - 1 - n = - fun(n)
L->R R-L

n + 1 - fun(n) = fun
L->R R->L

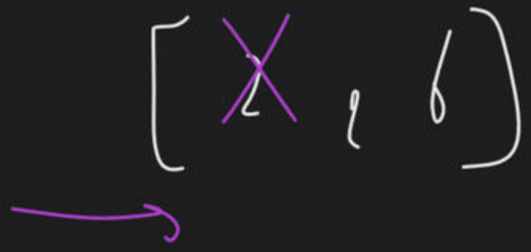
mazatt

n = 9

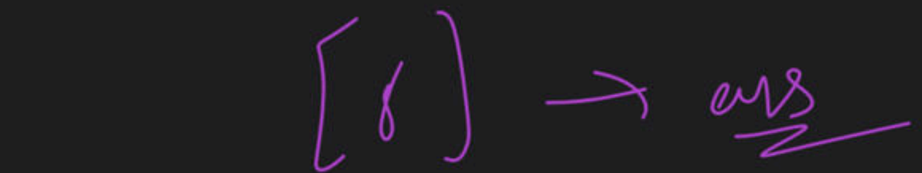
fun(n)
R->L



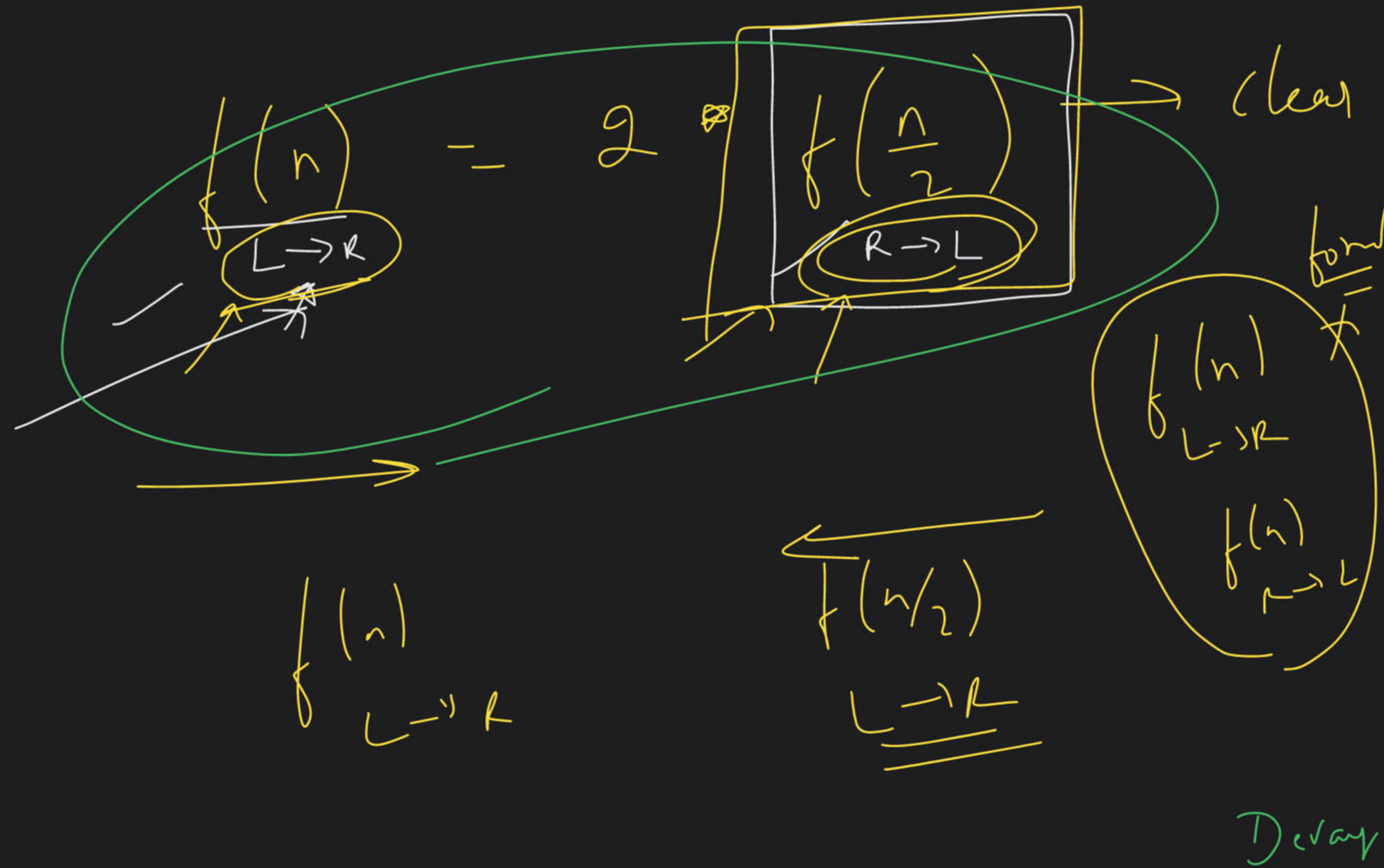
fun(n)
L->R

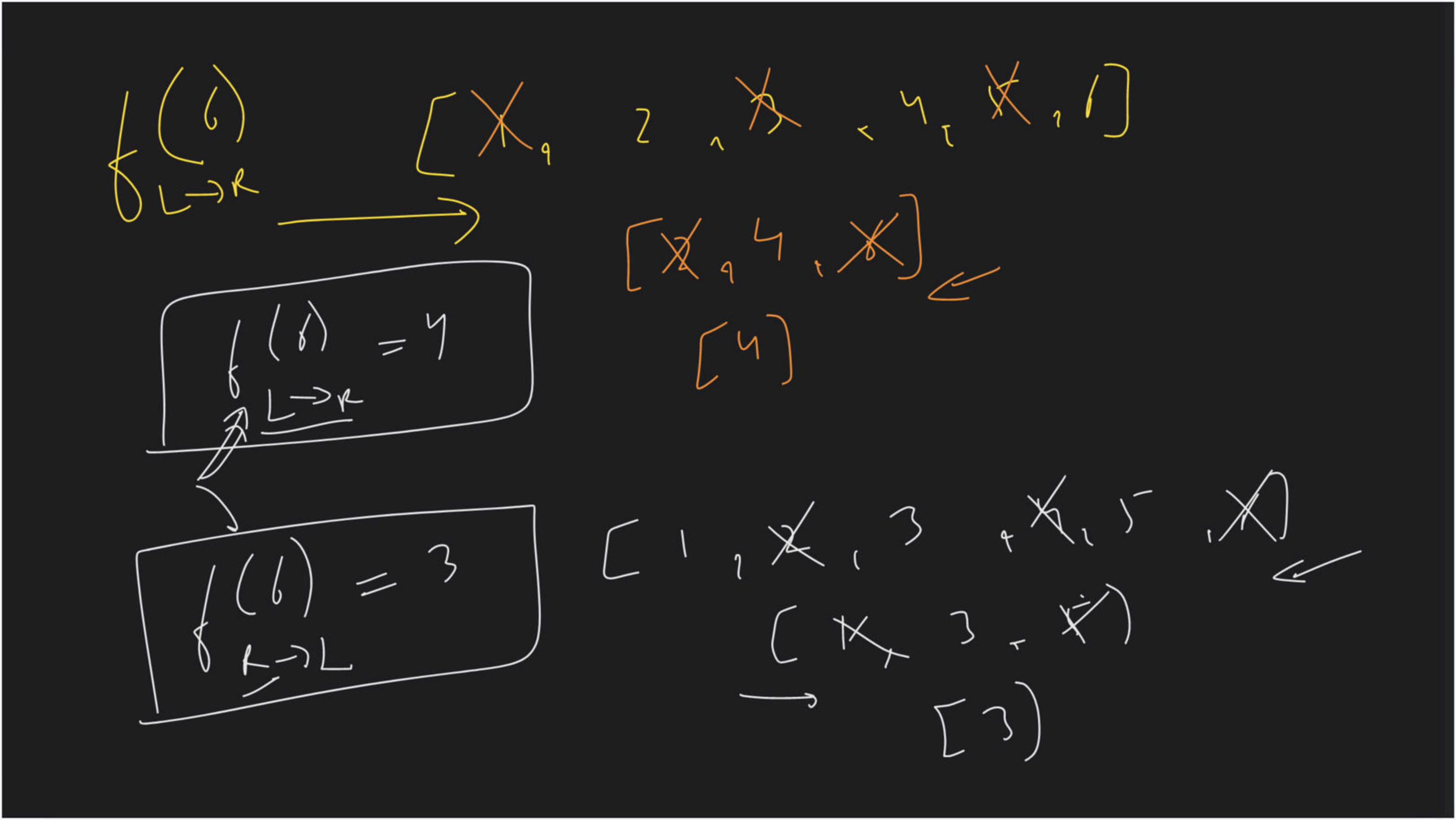


solve(n)

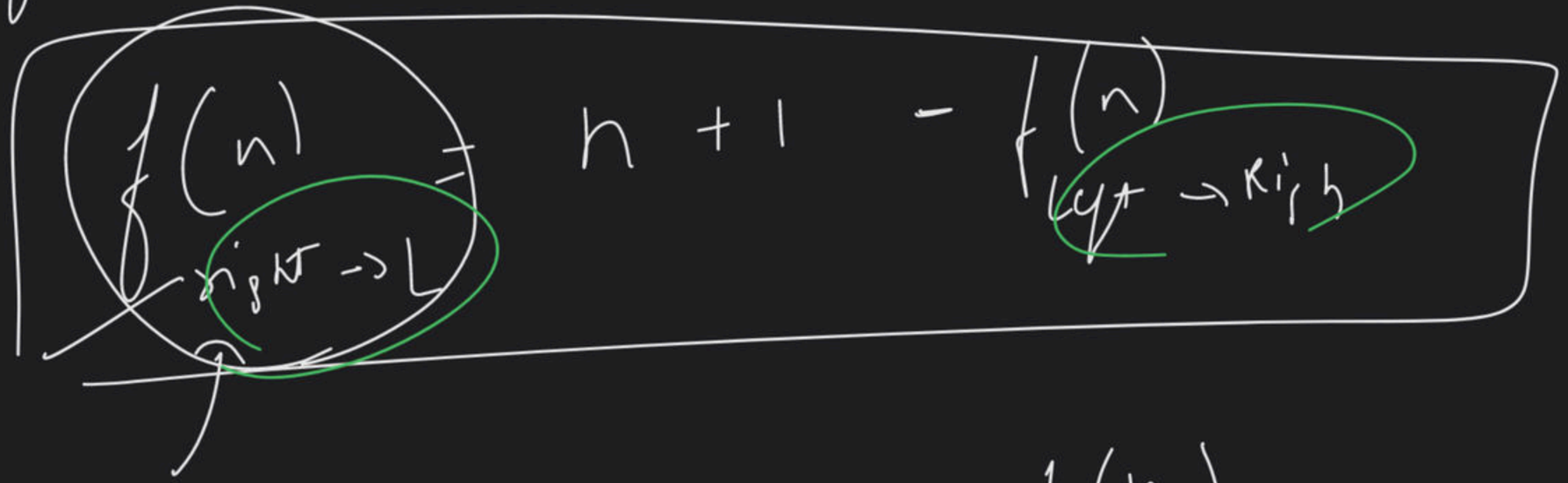


9-2
= 7


f(n)
=
2
f(n/2)
L→R
R→L
clear
formula
f(n)
L→R
f(n)
R→L
f(n)
L→R
f(n/2)
L→R
Dewang


f(6)
L→R
f(6) = 4
L→R
f(6) = 3
R→L

$f(n)_{Left} - 1 = n - f(n)_{Right}$



$f\left(\frac{n}{2}\right) = \frac{n}{2} + 1 - f\left(\frac{n}{2}\right)$
$\hookrightarrow R$

$f(n) = 2 \cdot f(n/2)$

$L \to R$ $\quad$ $R \to L$

$f(n) = 2 \cdot [\frac{n}{2} + 1 - f(n/2)]$

$L \to R$ $\quad$ $L \to R$

select

fun (n)

{

// 3 : (

if (n == 1)

return 1;

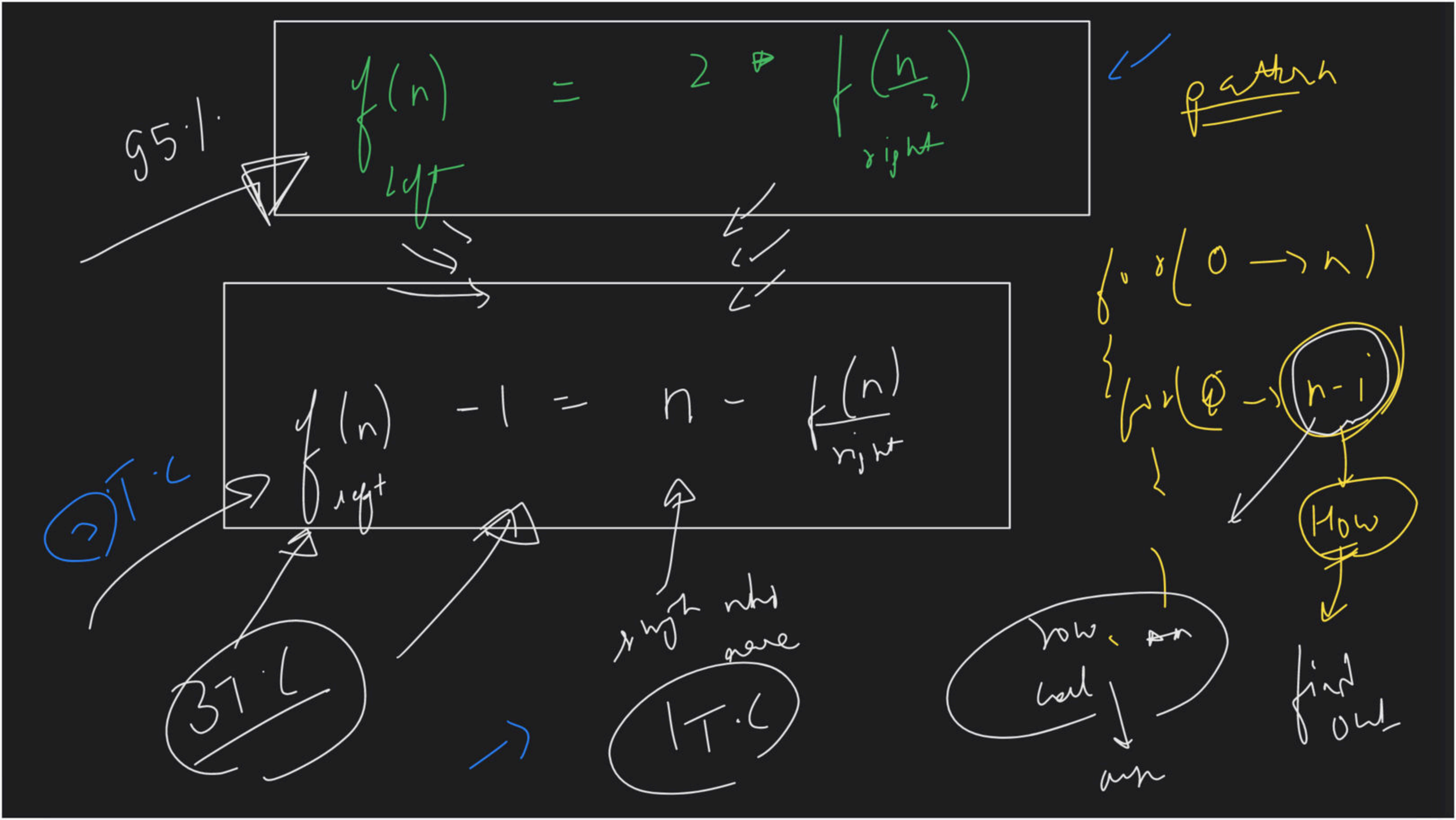
return 2 * (n/2 + 1 - fun(n/2));

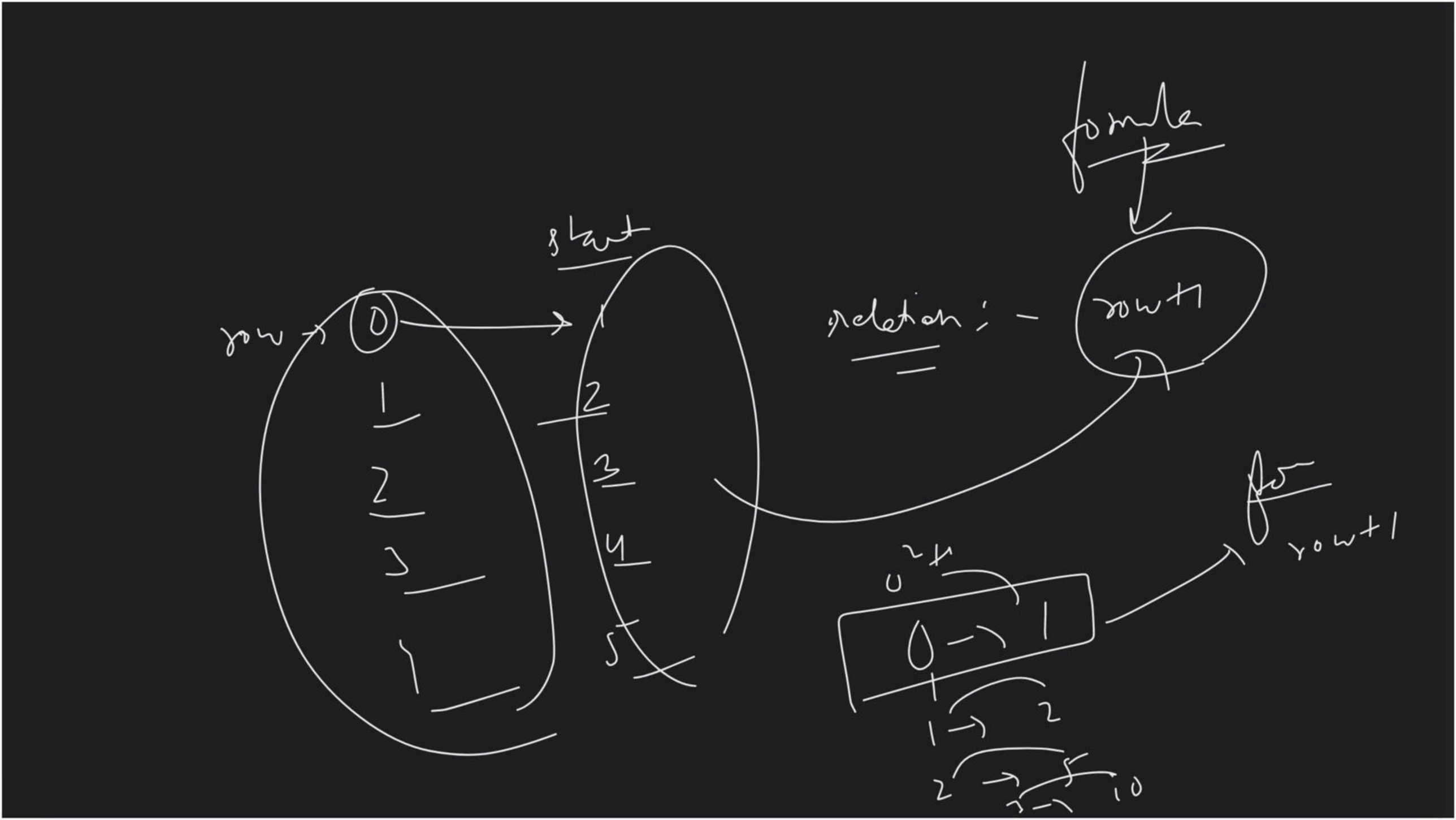
}

2 hr +

repeat

Chotta


$f(n) = 2 * f(\frac{n}{2})$
left
right
$f(n) - 1 = n - f(\frac{n}{2})$
left
right
3T.C
1T.C
$f: 0 \to n$
$0 \to n-1$
n-1
How
find out


formula
start
row
0
1
2
3
1
2
3
4
5
relation :-
row+1
0^2+1
0 -> 1
1 -> 2
2 -> 3 -> 5 -> 10
for
row+1

Thanks → Succesful 2 month completion

KHALI