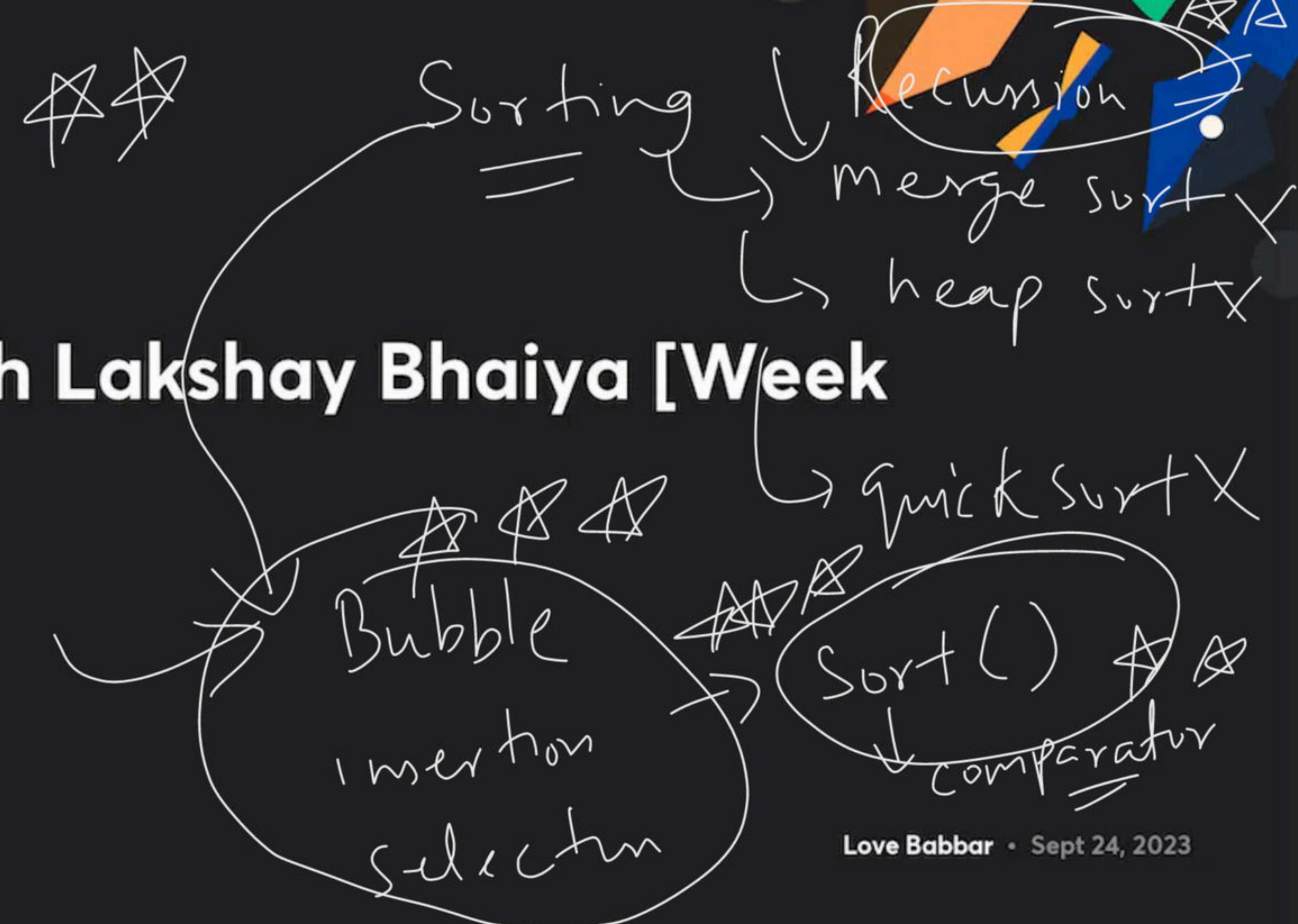
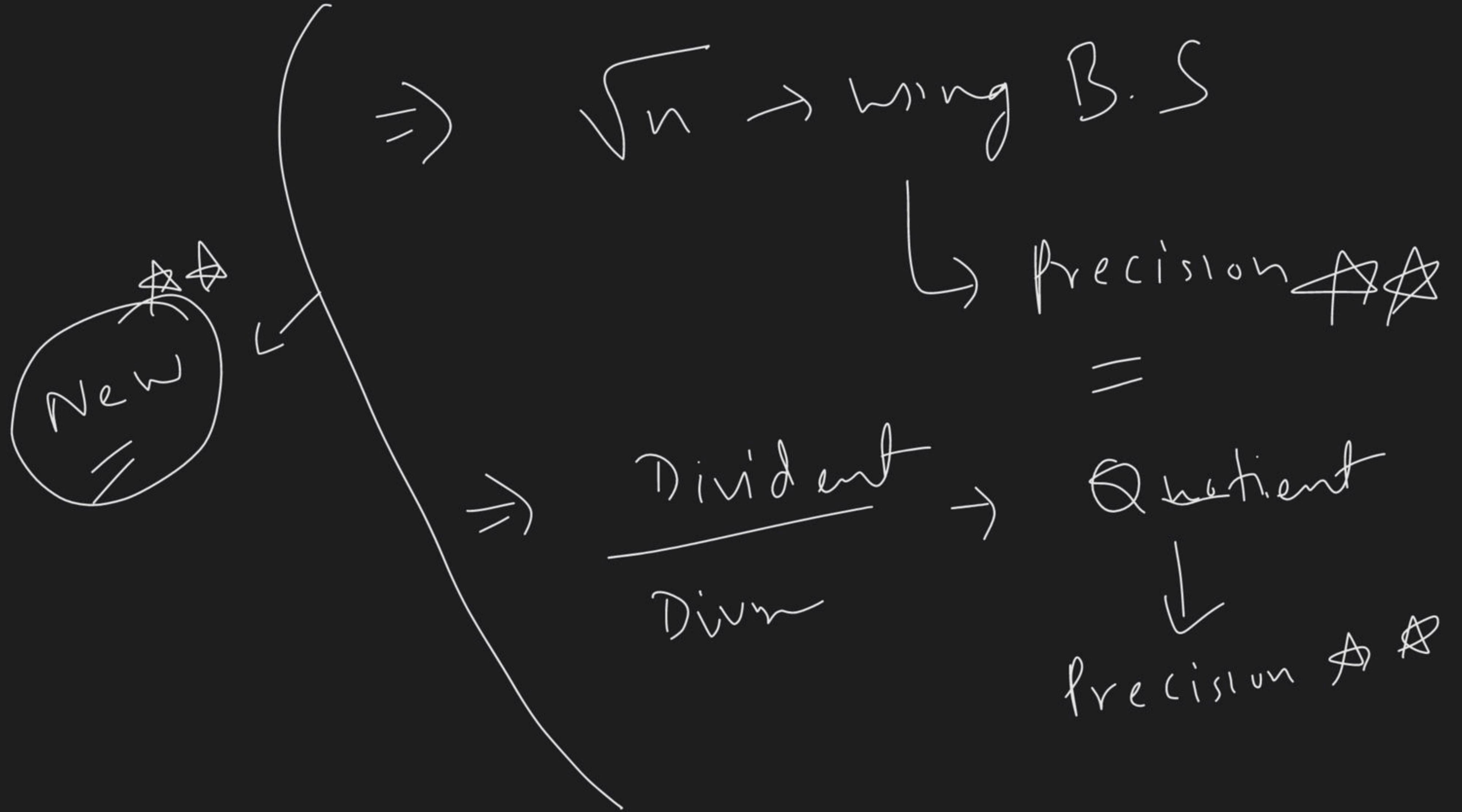


Doubts with Lakshay Bhaiya [Week 5]

Special class







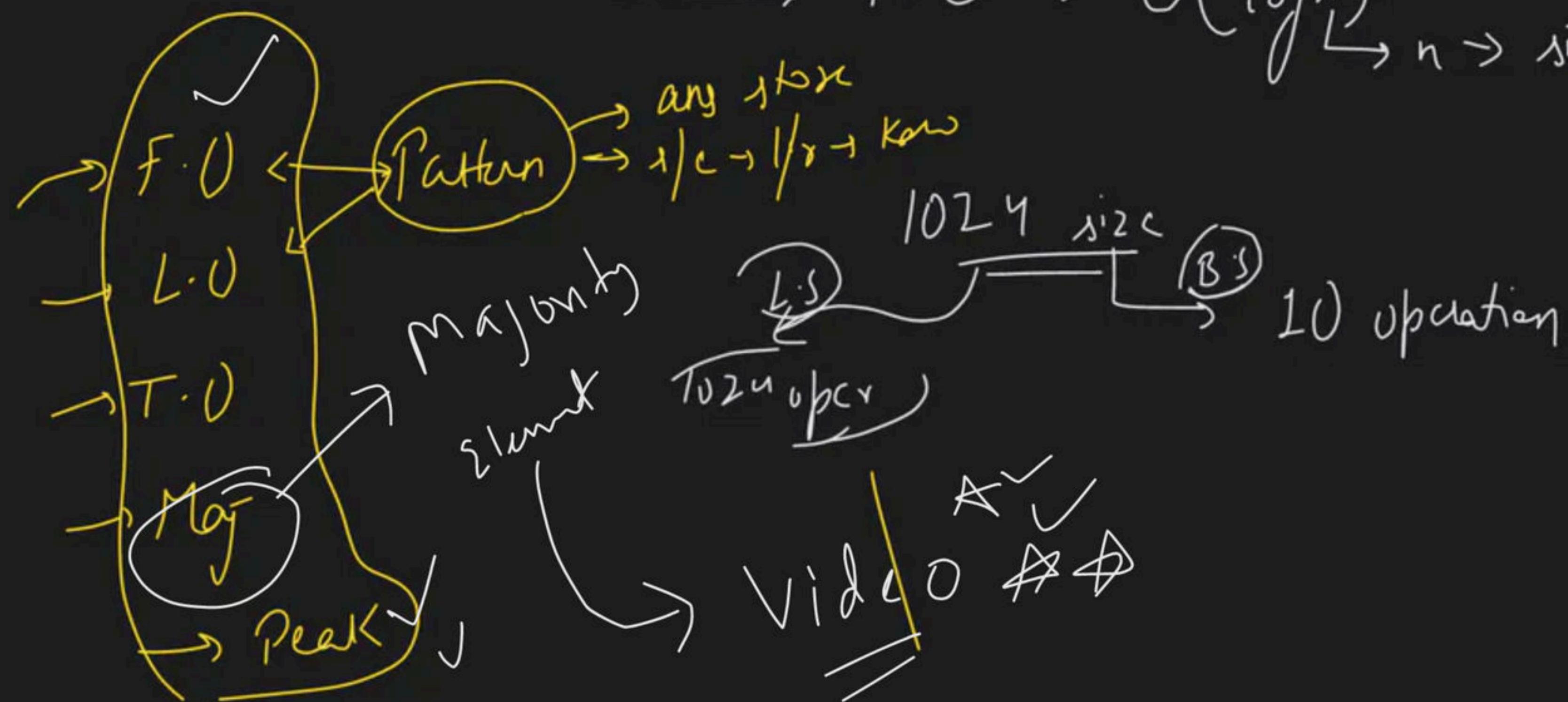
Searching & Sorting - Level 2

Special class

Love Babbar • Sept 18, 2023

→ Binary Search $\xrightarrow{\text{cond.}} \text{monotonic func.} \xrightarrow{\text{asc. or desc.}}$

$T.C \rightarrow O(\log n)$, $n \rightarrow \text{size of array}$



Find Pivot element:

Search is a rotated

~~A sorted array~~

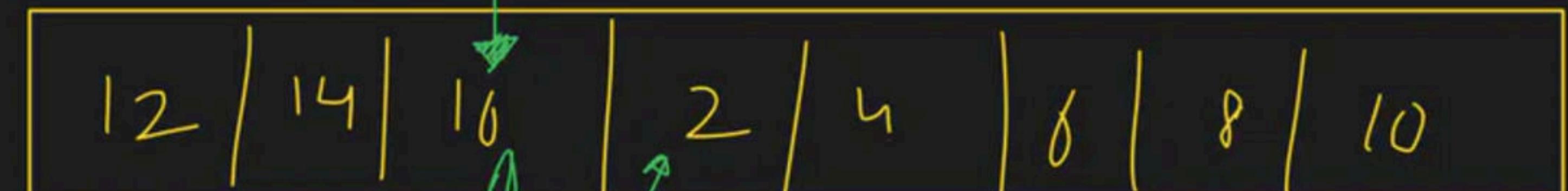
۲۷

burkd



Pivot

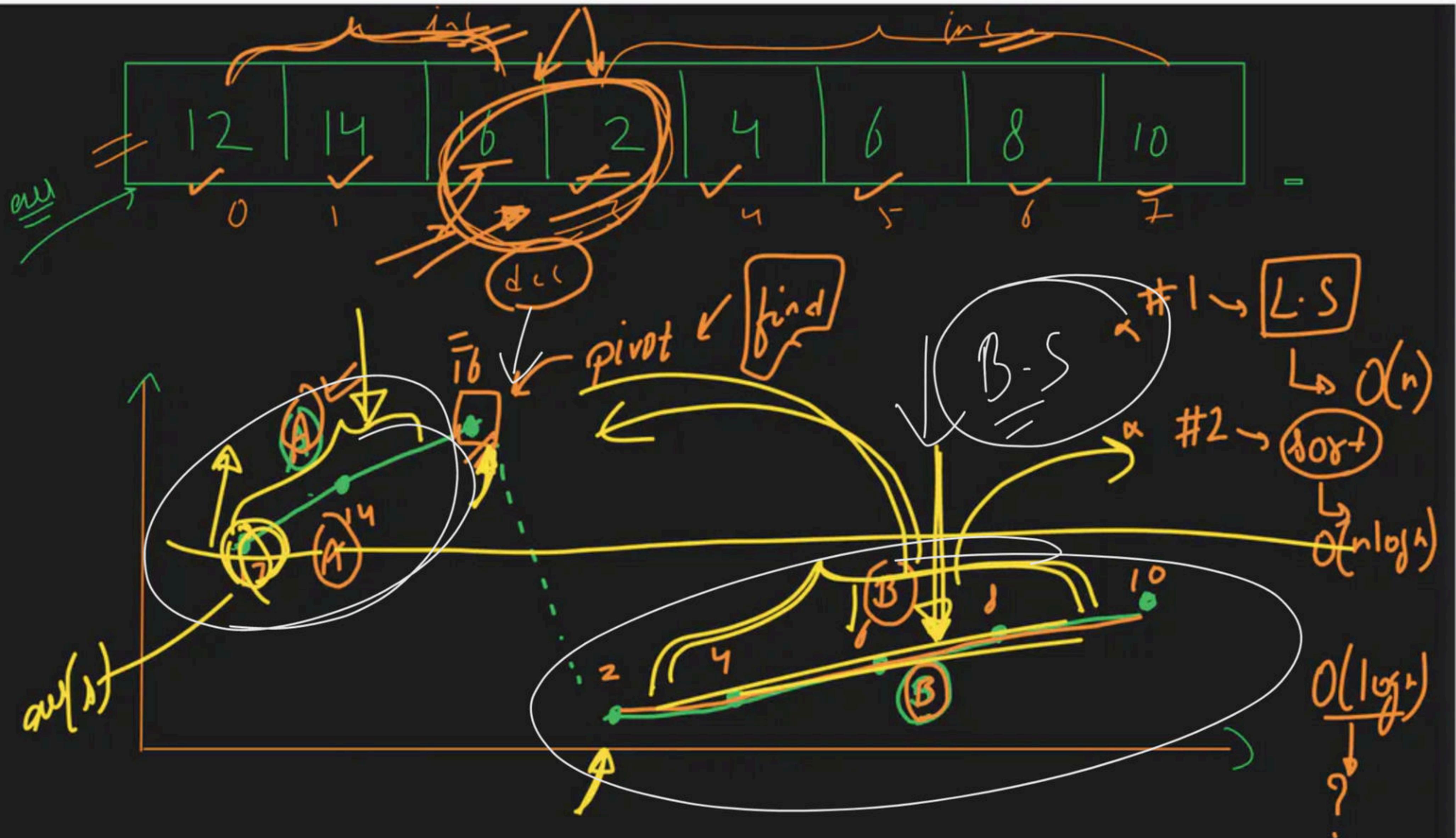
rotate.
~~E~~
soyka

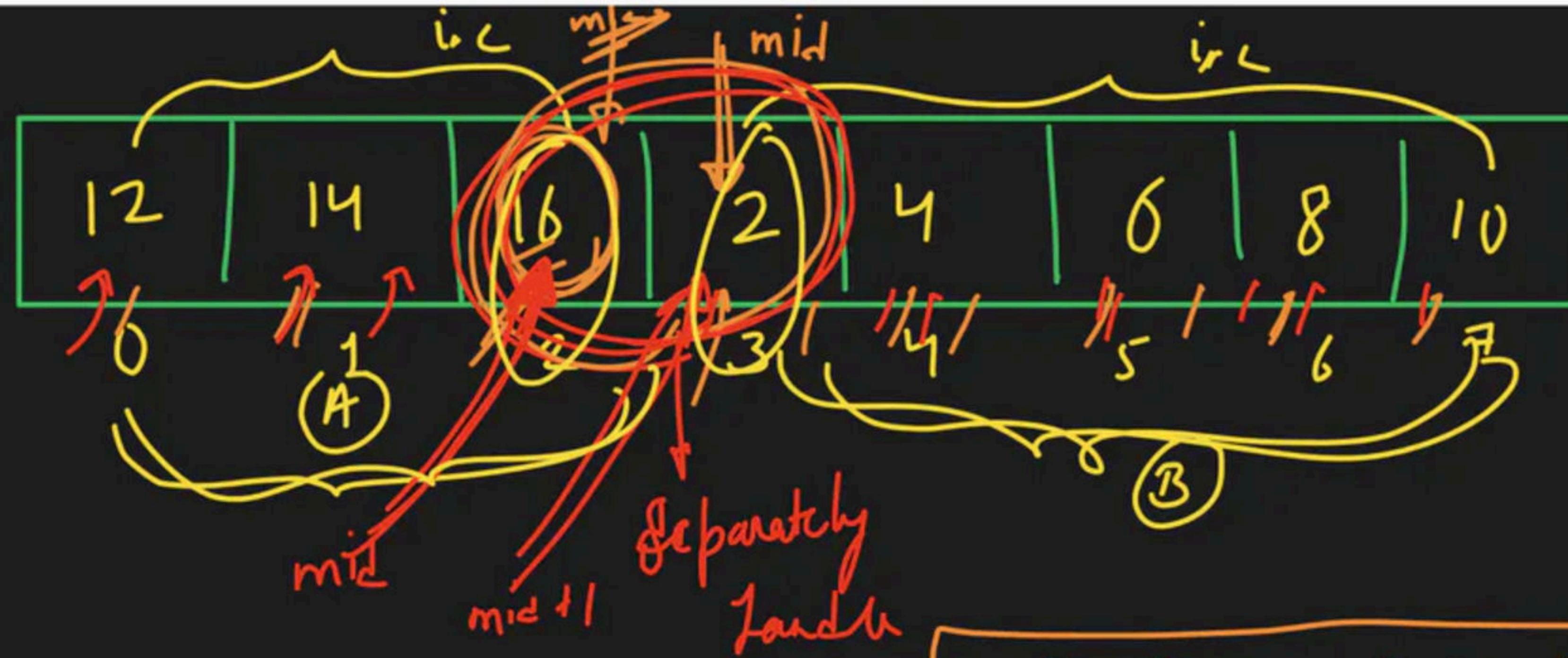


17

14

10





$$\text{arr}[\text{mid}] < \text{arr}[\text{mid} - 1]$$

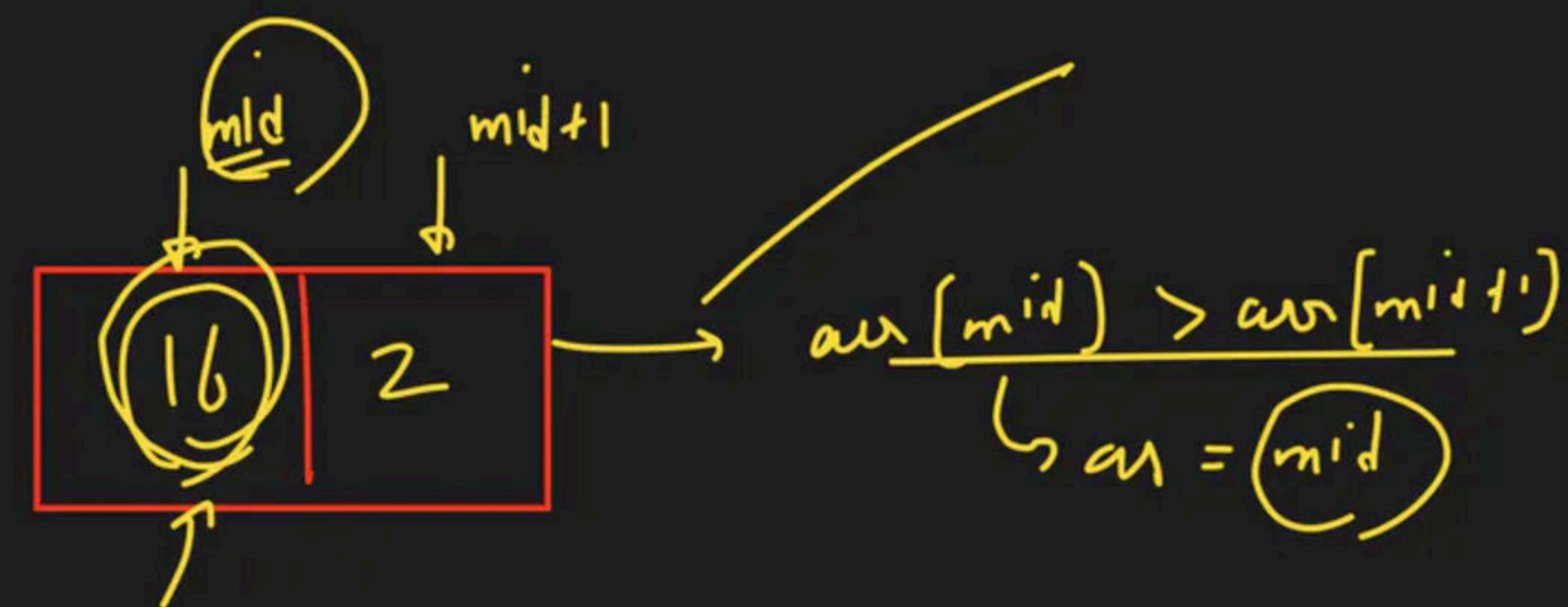
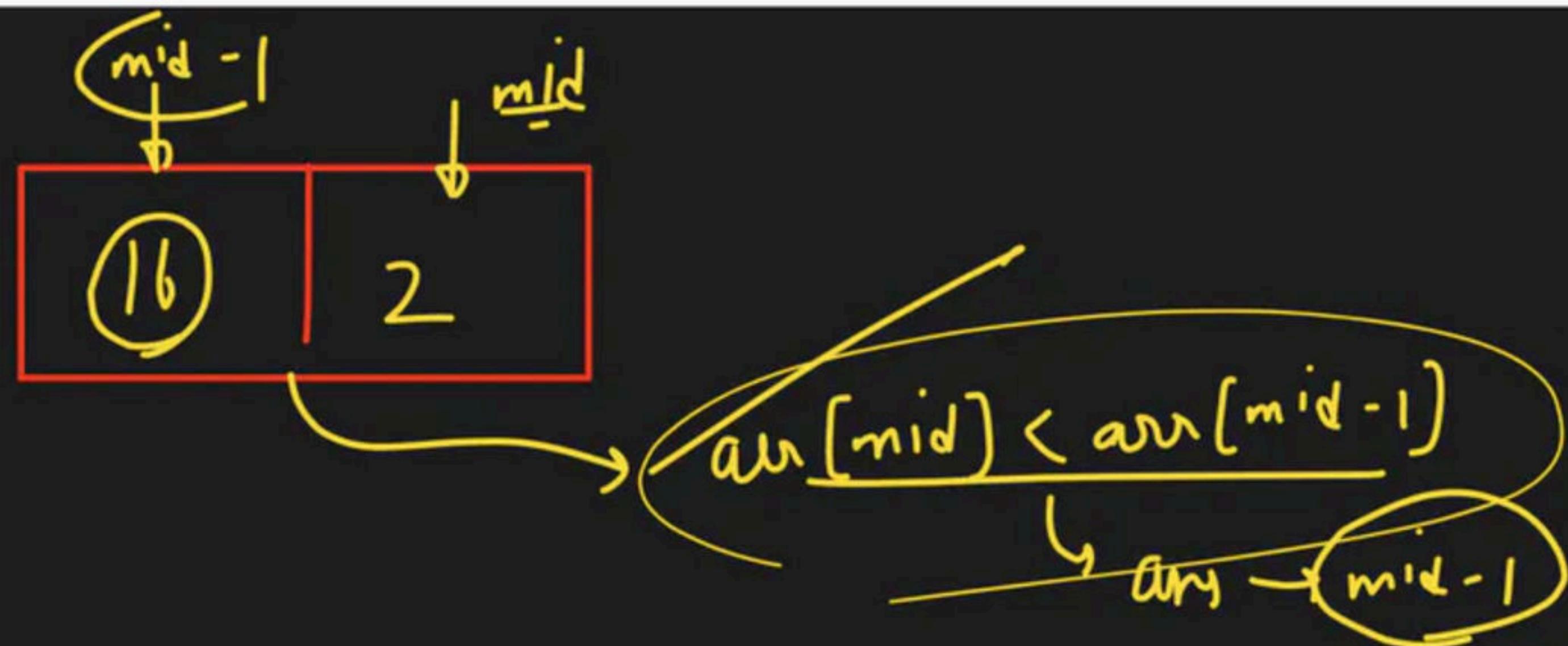
(I)

$$\text{ans} = (\text{mid} - 1)$$

$$\text{arr}[\text{mid}] > \text{arr}[\text{mid} + 1]$$

(II)

$$\text{ans} = \text{mid}$$



if $arr[s] > arr[mid]$ → ♂

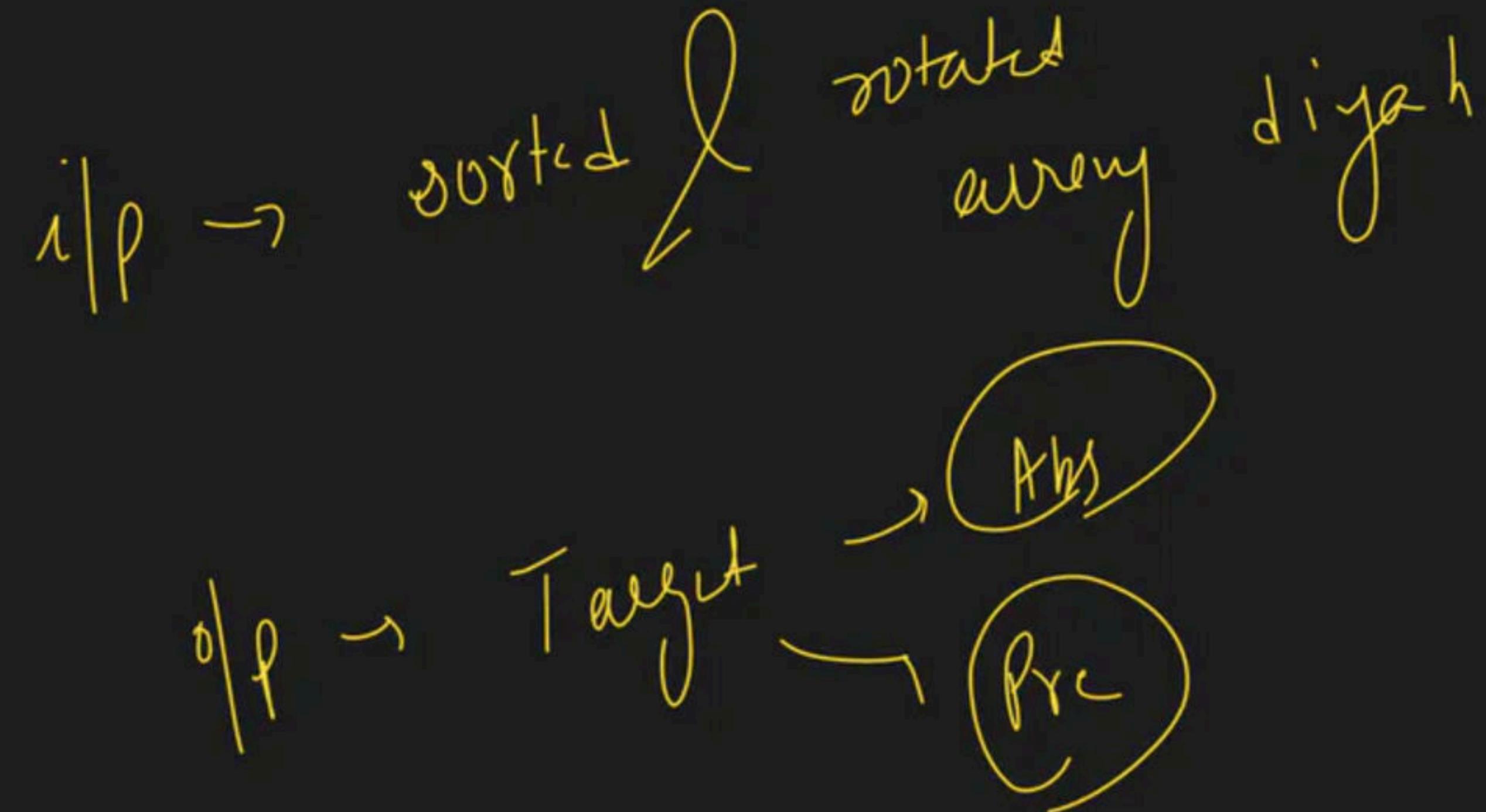
↳ left



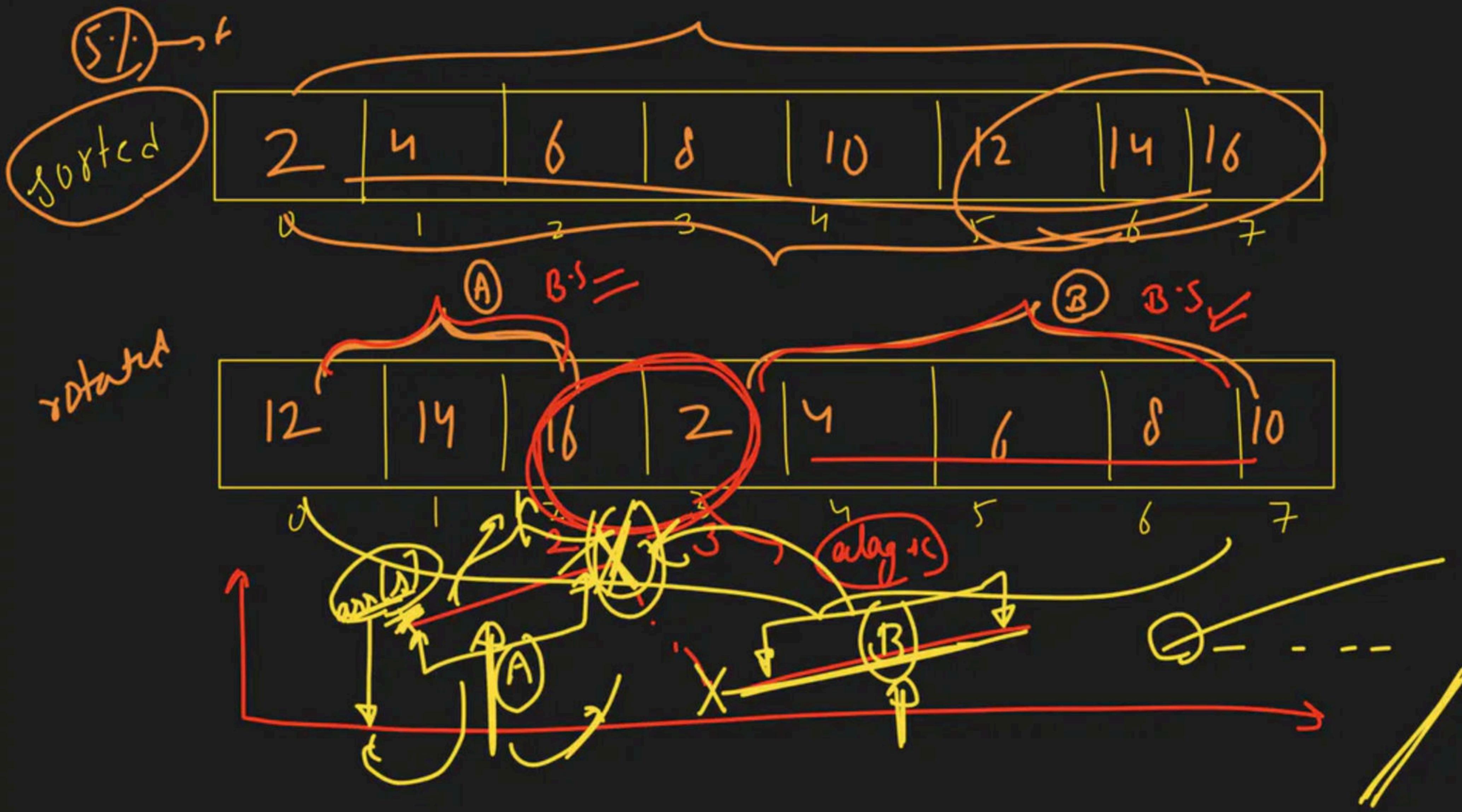
```

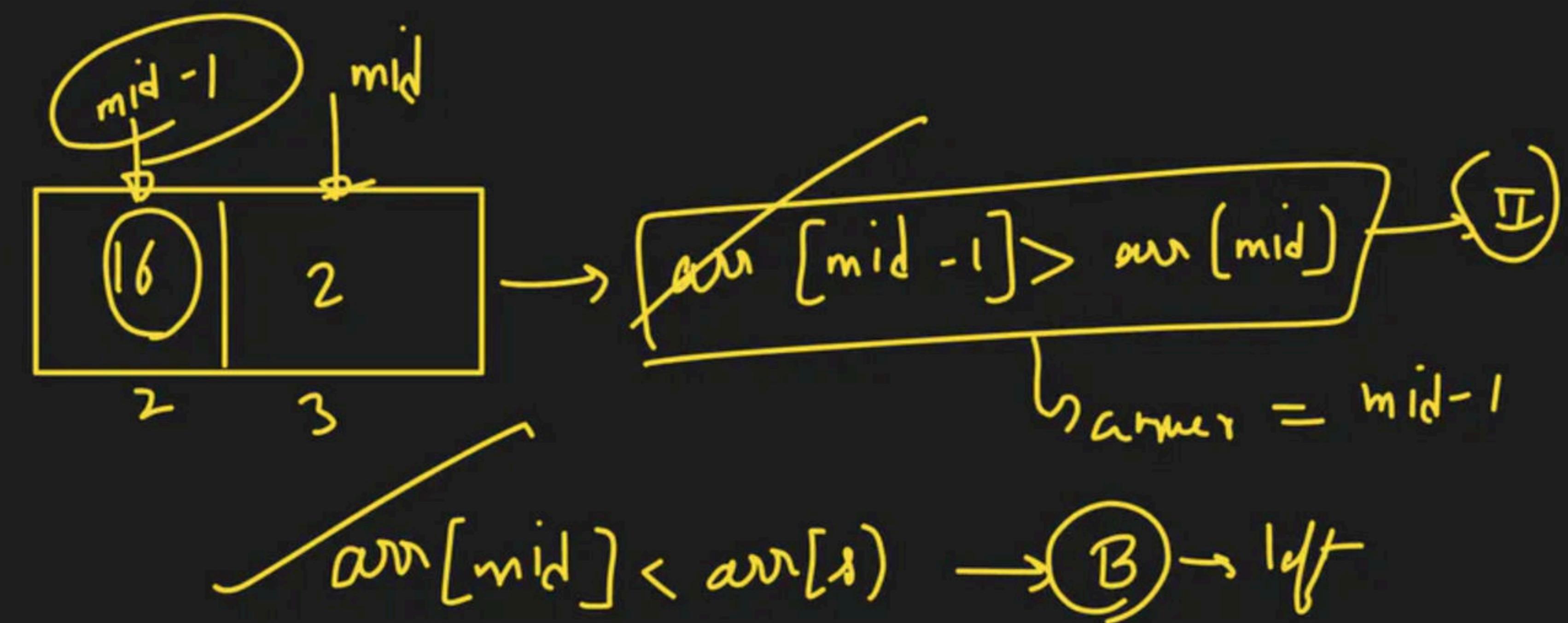
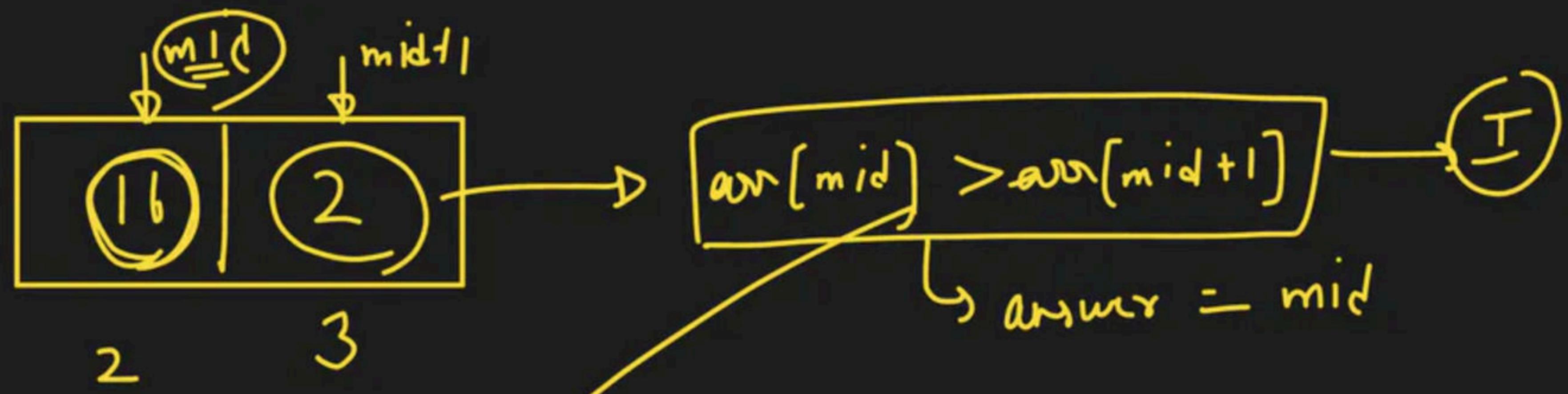
int findPivotIndex ( arr[ ], r )
{
    int s = 0, e = n - 1; int mid = (s + e) / 2;
    while ( s <= e ) {
        if ( i == e ) return s;
        if ( arr[mid] < arr[mid - 1] ) return mid - 1;
        else if ( arr[mid] > arr[mid + 1] ) return mid;
        else if ( arr[s] > arr[mid] ) e = mid - 1;
        else s = mid + 1;
    }
    return -1;
}

```









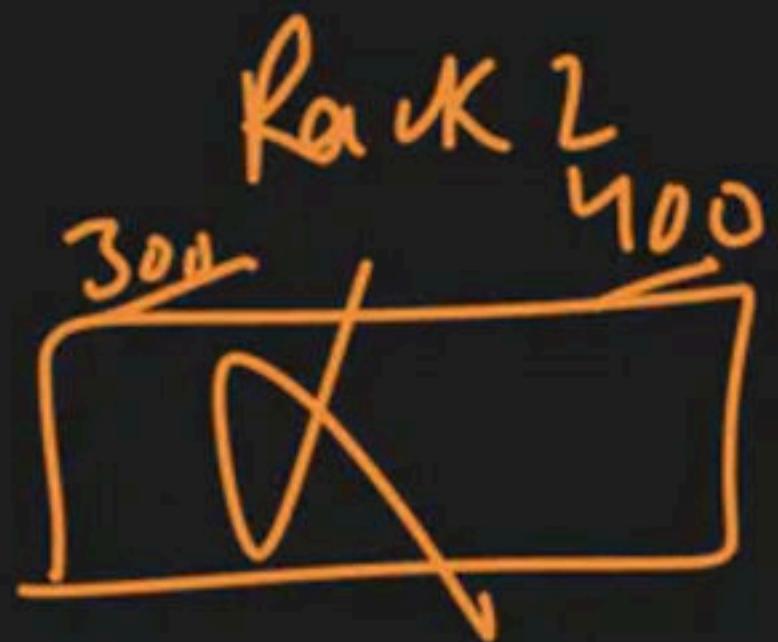
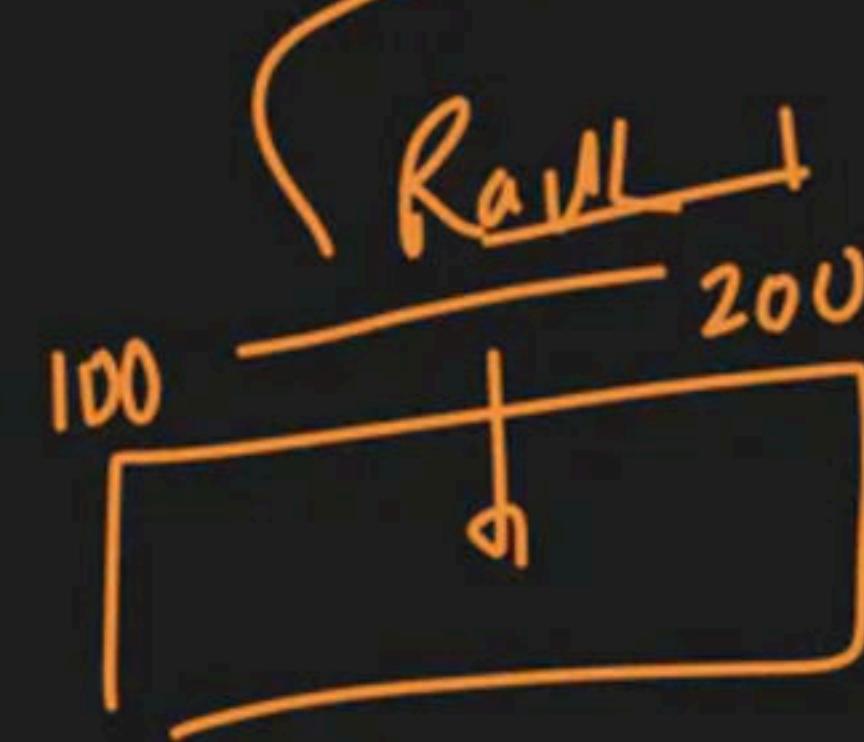
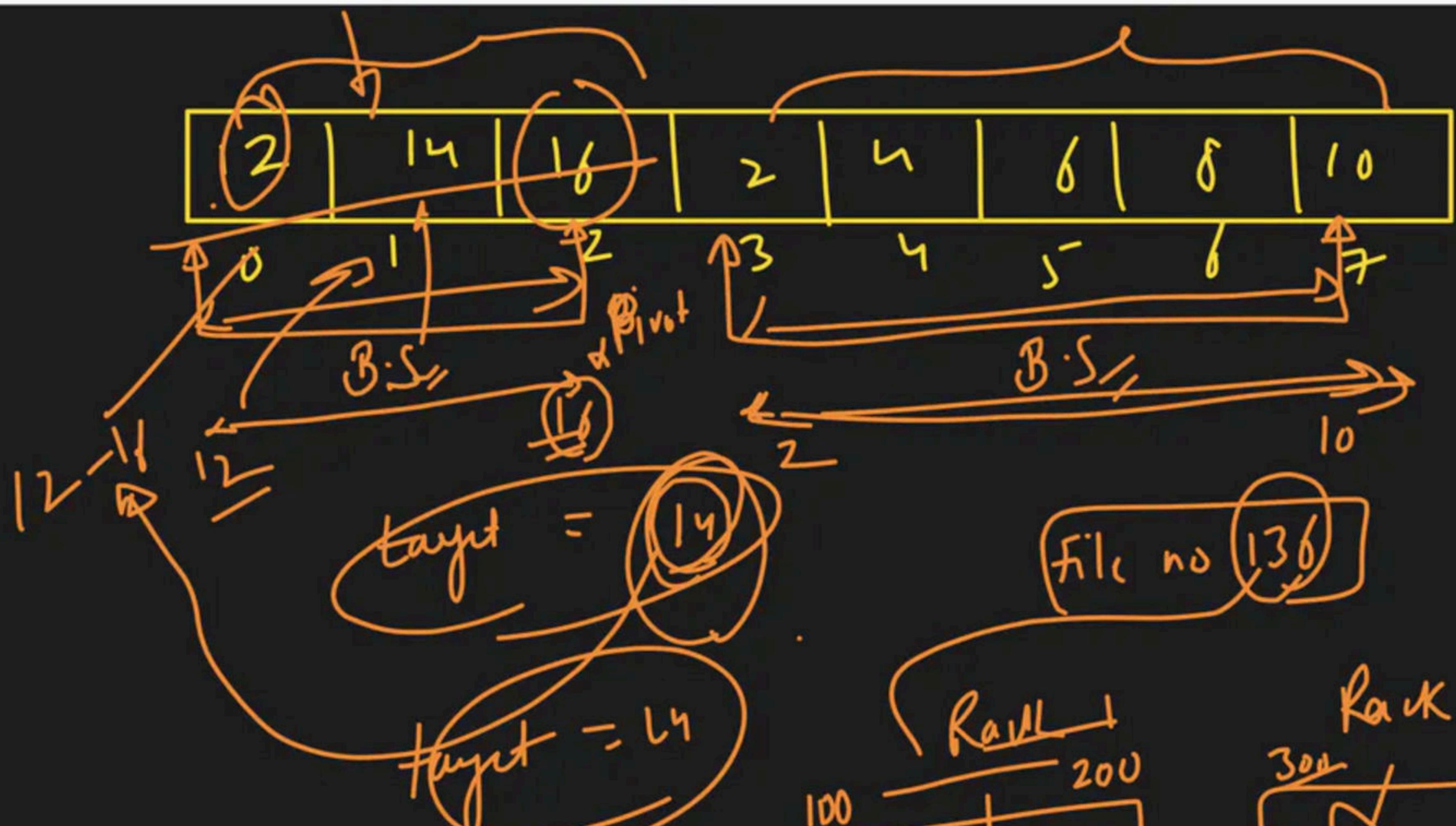
$\text{arr}[\text{mid}] > \text{arr}[s] \rightarrow (\text{R}) \rightarrow \text{right}$

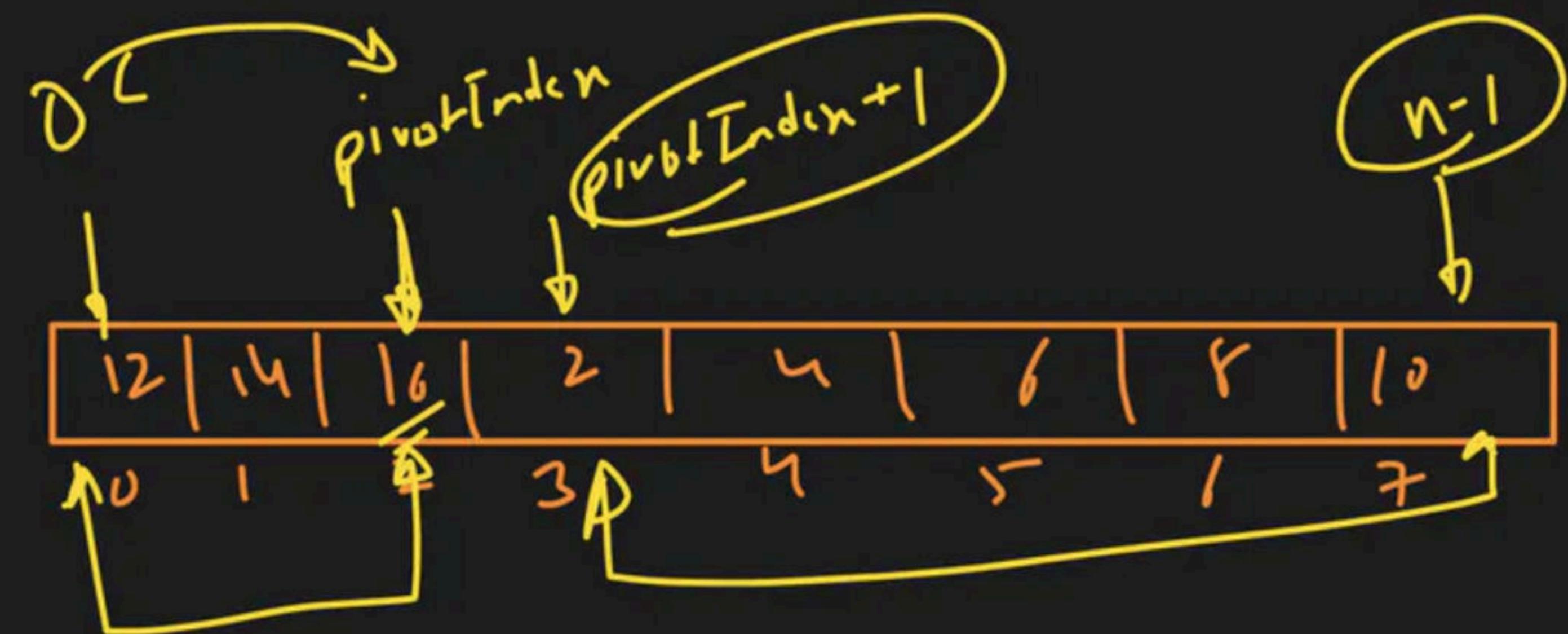
$\boxed{\text{if } (\lambda == c) \text{ return } s}$

$H | w \rightarrow$

right char

$[1, 3]$







Pivot

$arr[mid] > arr[mid+1] \times$

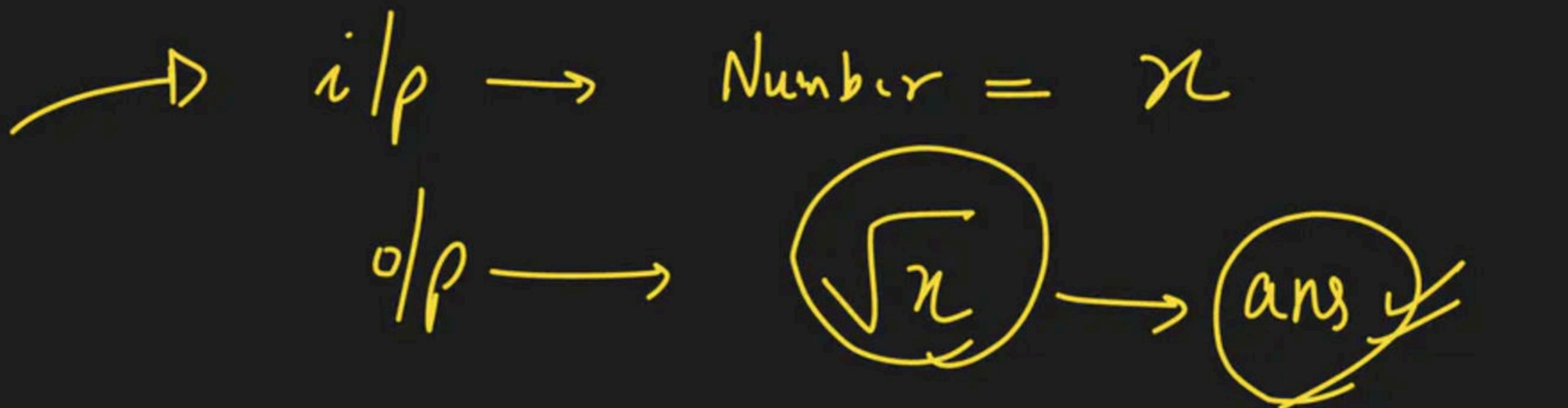
$arr[mid+1] > arr[mid]$

01

[-1]

↑

$\gamma_{\text{Paani}}^{\min}$

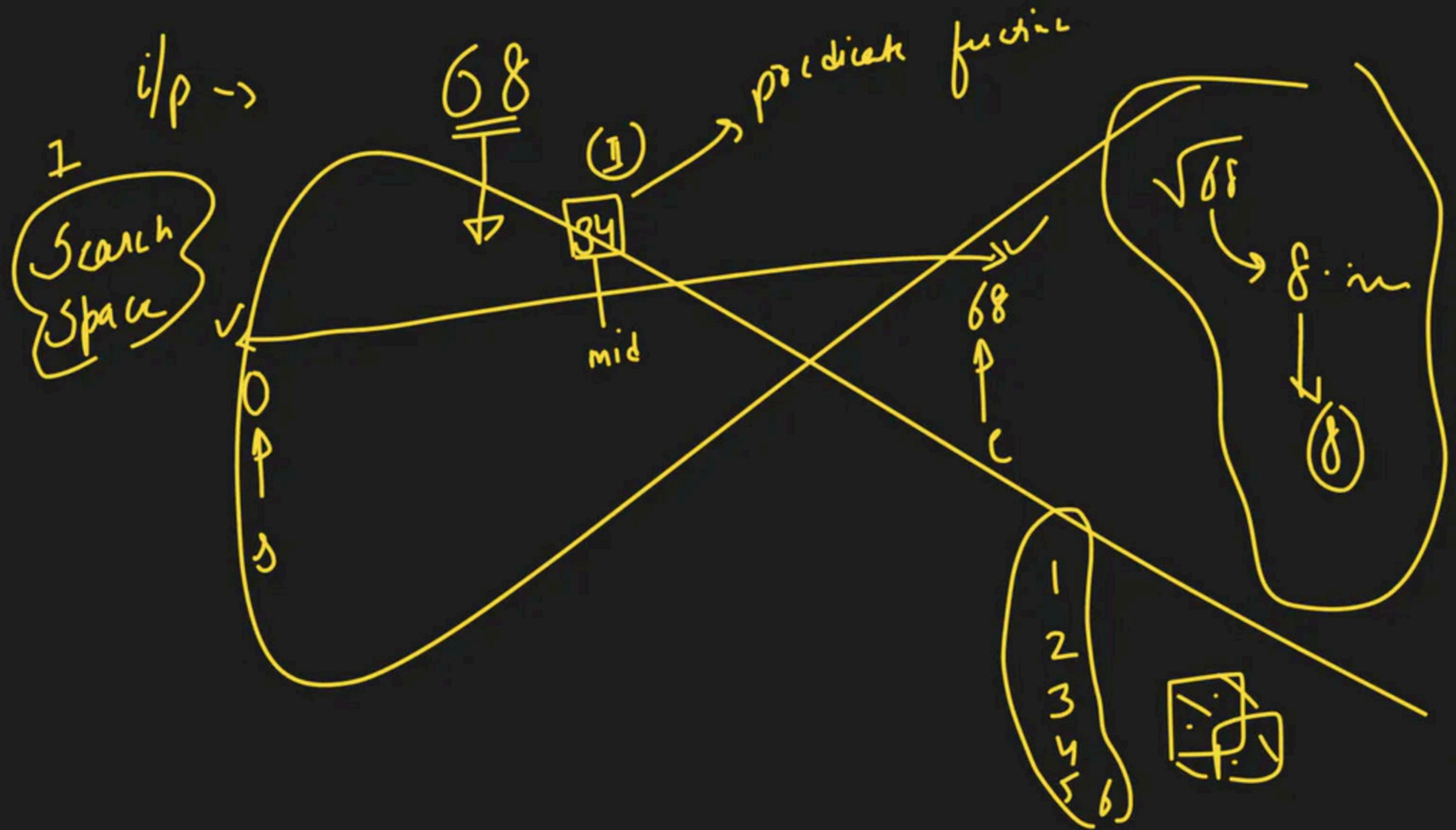


$i/p \rightarrow 25, 36, 50$

$\sqrt{25} = 5$

$\sqrt{36} = 6$

$\sqrt{50} = 7.0$



① $i/p \rightarrow n$

$o/p \rightarrow \text{sqrt}(n) \rightarrow \sqrt{n} \rightarrow \text{ans}$

(A) Search space
① predicted from

$$n = 68$$

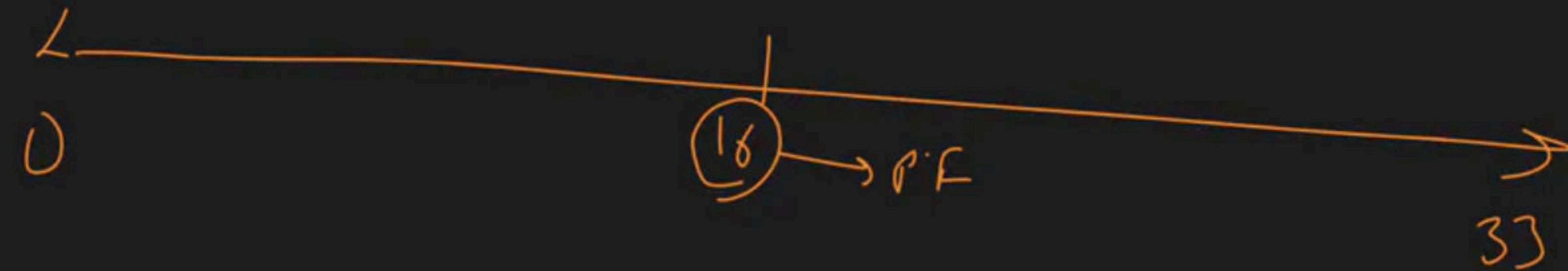
$$o/p \rightarrow \sqrt{68} \rightarrow 8$$



$$\begin{aligned} \delta &= 0 \\ \epsilon &= 0.1 \end{aligned}$$

$$\cancel{34} \times \cancel{34} = 18$$

$$\begin{aligned} 34 \times 34 &> 68 \rightarrow \text{left} \rightarrow c = mid - 1 \\ c &= 34 - 1 \\ &= 33 \end{aligned}$$



mid > 16

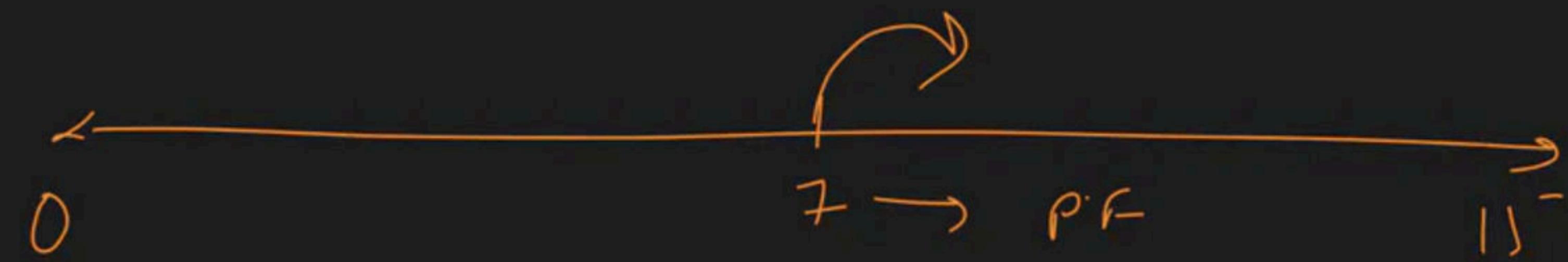
$$16 \times 16 \rightarrow 256 = 268$$

~~256~~

$$256 > 68 \rightarrow \lfloor y \rfloor = e^{m,j-1}$$

$$c = 16 - 1$$

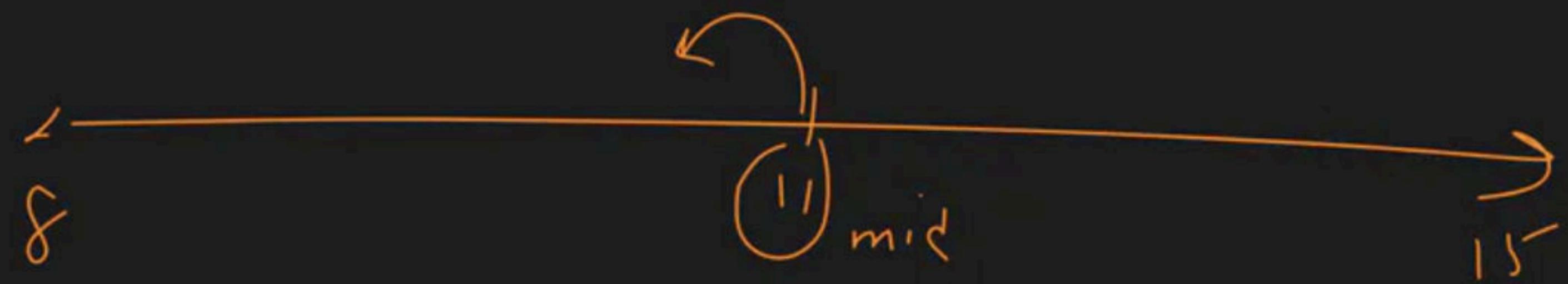
lr



$$mid \rightarrow \frac{0.75}{2}$$

$$7 \times 7 = 49 = 368 \times$$

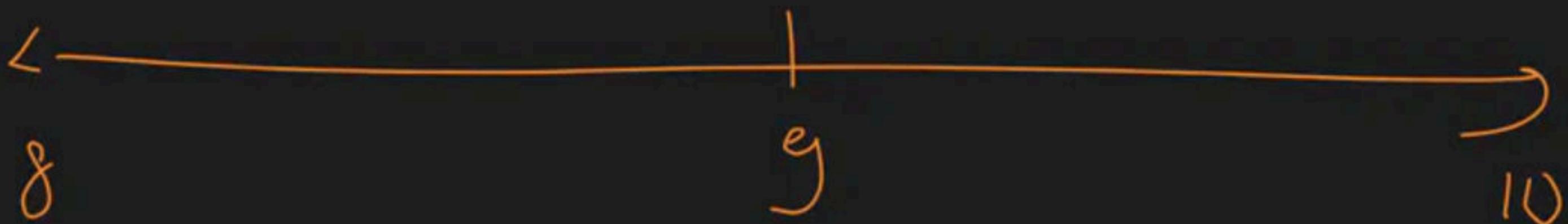
$$\begin{array}{c}
 7 \times 7 - 49 < 68 \rightarrow 112 \\
 mid = 7 \\
 d = mid + 1 \\
 = 8
 \end{array}$$



$$mid =$$

$$11 \times 11 = -6 \cancel{J}$$

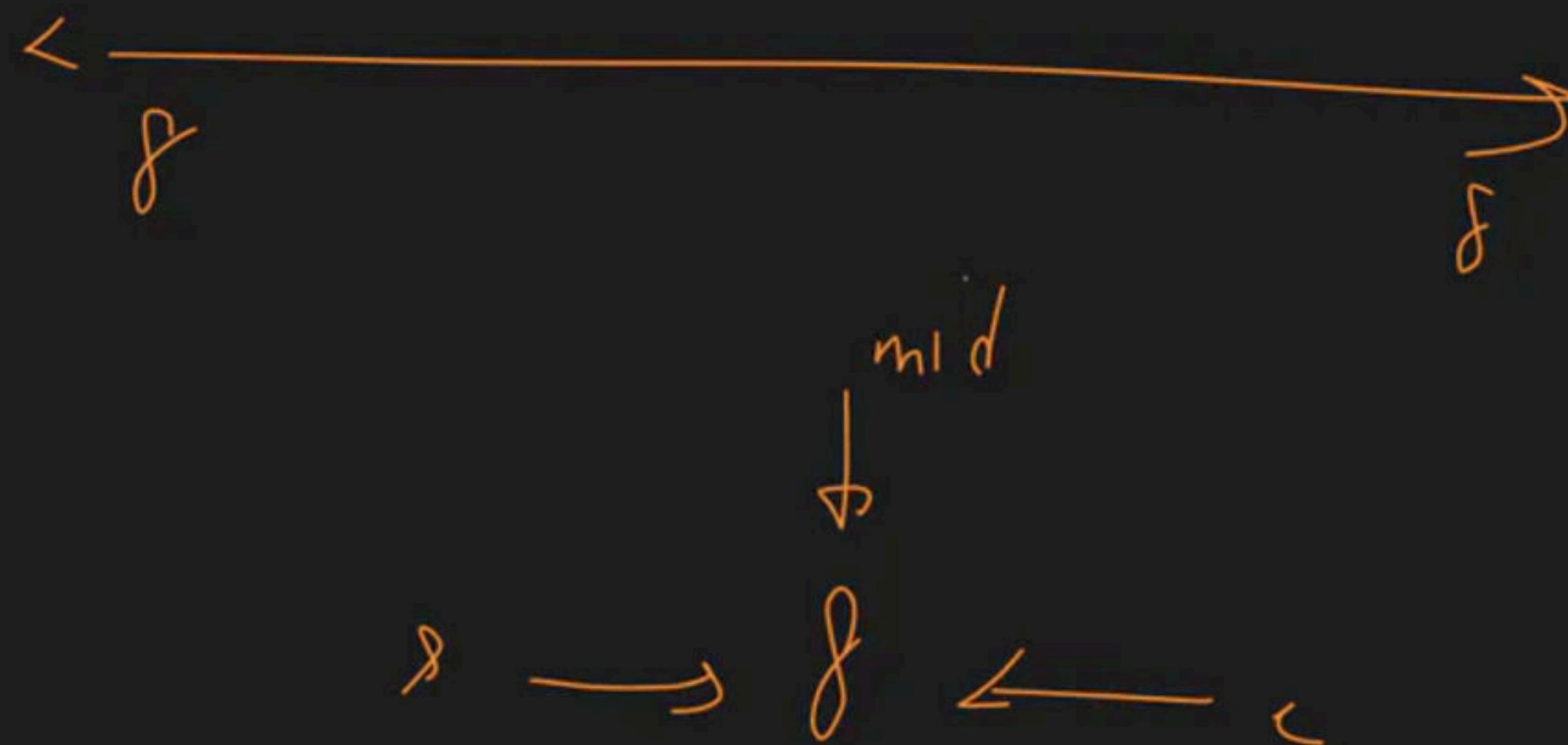
$$11 \times 11 > 11 \rightarrow \text{left} \quad C = 11 - 1 \\ = \textcircled{10}$$



$$9 \times 9 = 81$$

$$9 \times 9 > 64 \rightarrow 16 \rightarrow e = 16 - 1 \\ \approx 15 \\ \approx 8$$

$$\delta = \text{mid } h$$
$$\approx g$$



$$\delta \times \delta = \delta \delta \propto$$

$$\delta \times \delta > \delta \delta \propto$$

~~$\delta \times \delta < \delta \delta \propto$~~

ans - 1th v

$$\sqrt{\delta \delta}$$

δ \curvearrowright

ans = δ



Rukjya

(A) $\xleftarrow{\text{start}}$ $\xrightarrow{\text{phase}}$

(B) $P \cdot F \longrightarrow T/F$

(C) $\xrightarrow{\rho \cdot f}$

$T \quad T \quad T \quad T \quad T \quad T$

L

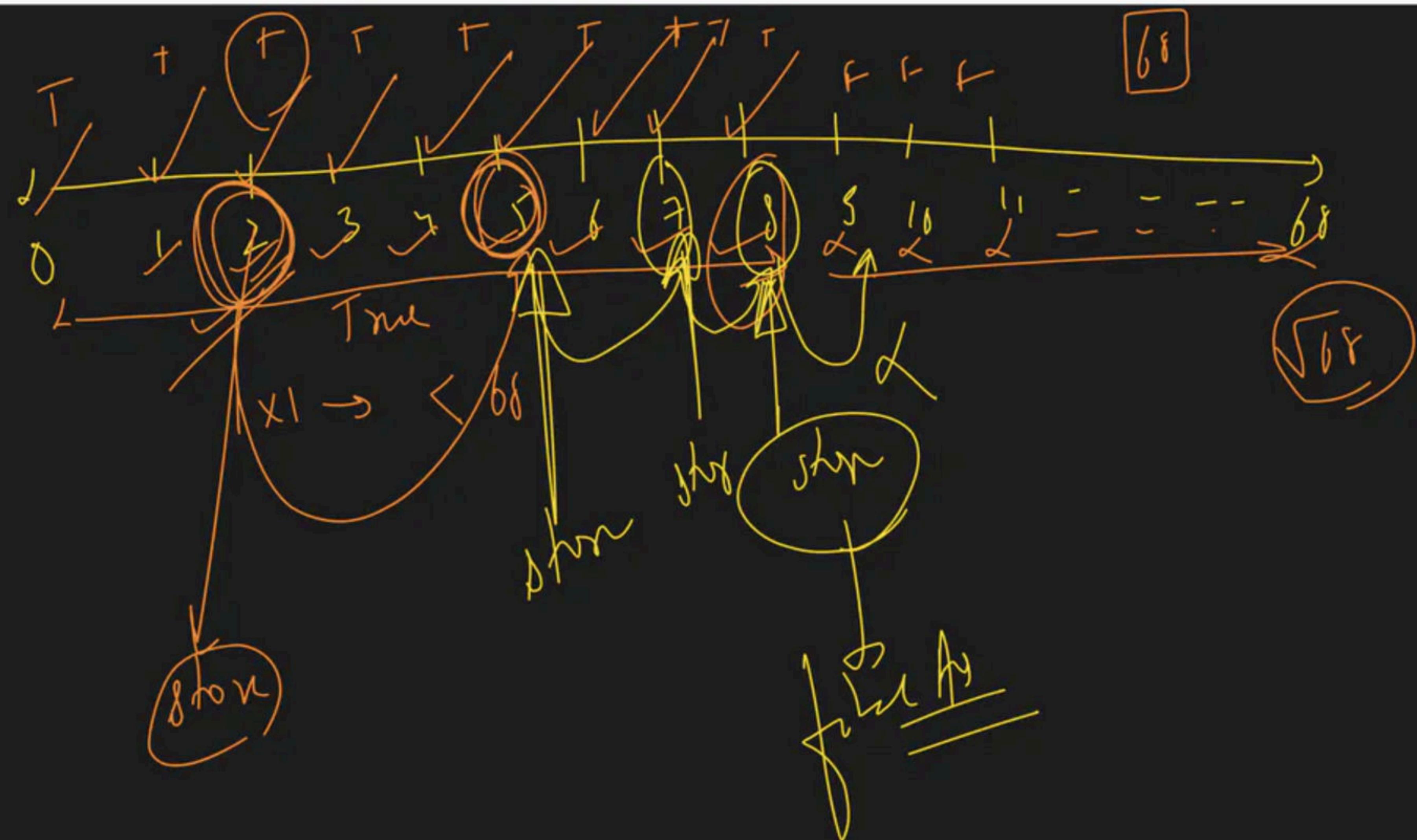
was shown



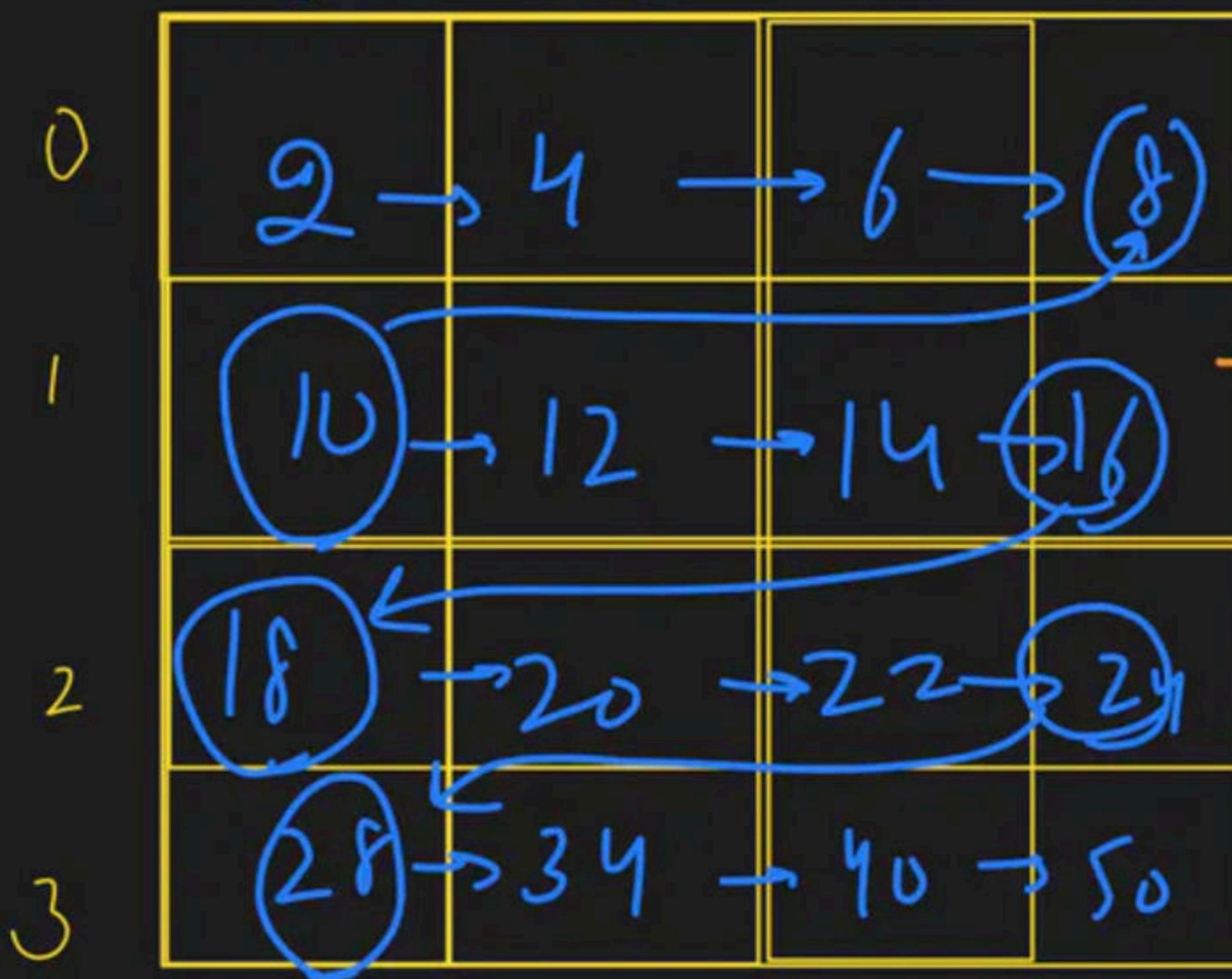
$$\begin{aligned} n &= 68 \\ \partial\rho &\rightarrow 8 \cdot 246 \end{aligned}$$

$$\begin{aligned} H\omega &\rightarrow \sqrt{68} \rightarrow 8 \cdot 246 \\ &\text{up to } 345 \text{ and curved plane} \end{aligned}$$

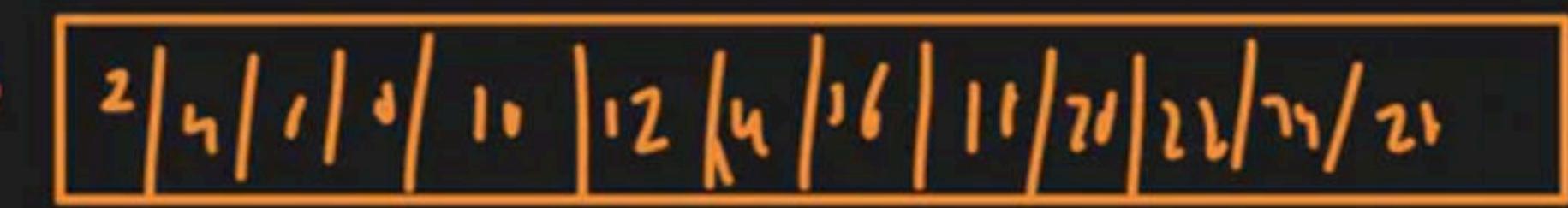
A diagram showing a large circle with radius $8 \cdot 246$. A smaller circle inside it is labeled "up to 345 and curved plane". An arrow points from the center of the smaller circle to the center of the larger circle.



Binary Search on



2D array



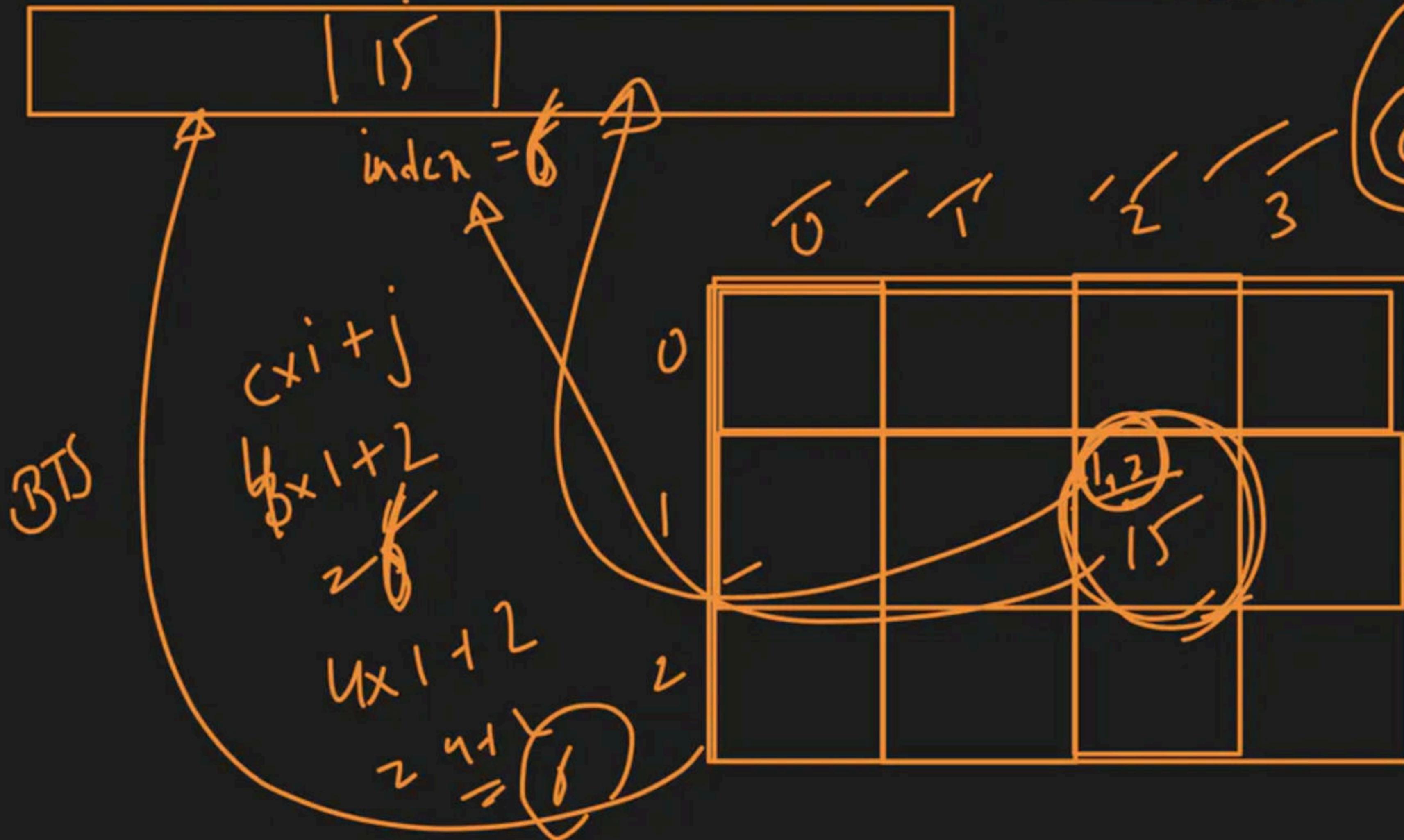
all order

$2D \rightarrow 1D \Rightarrow f * i + j$

$1D \rightarrow 2D$ $i = \frac{mid}{c}$ $j = mid \% c$

$j = mid \% c$

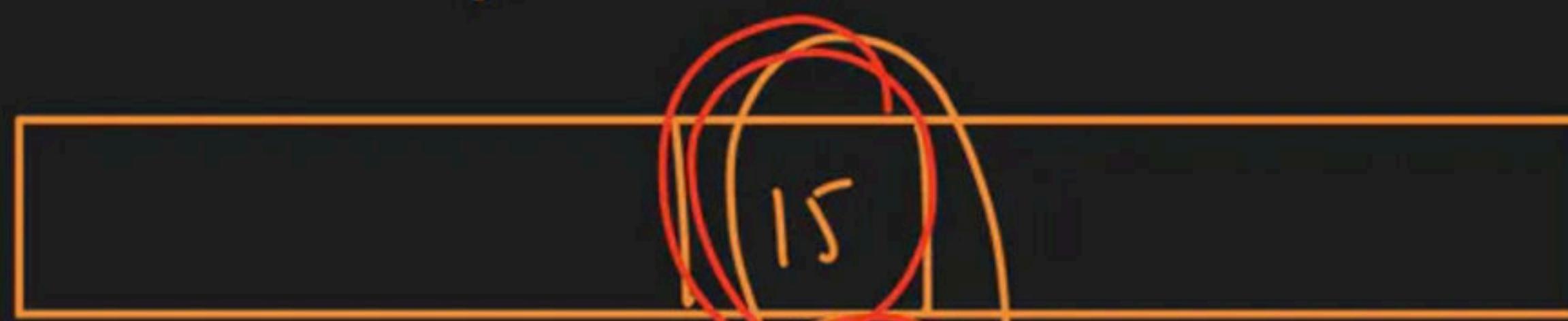
$20 \rightarrow 10 \rightarrow cx^i + j$



19



2D



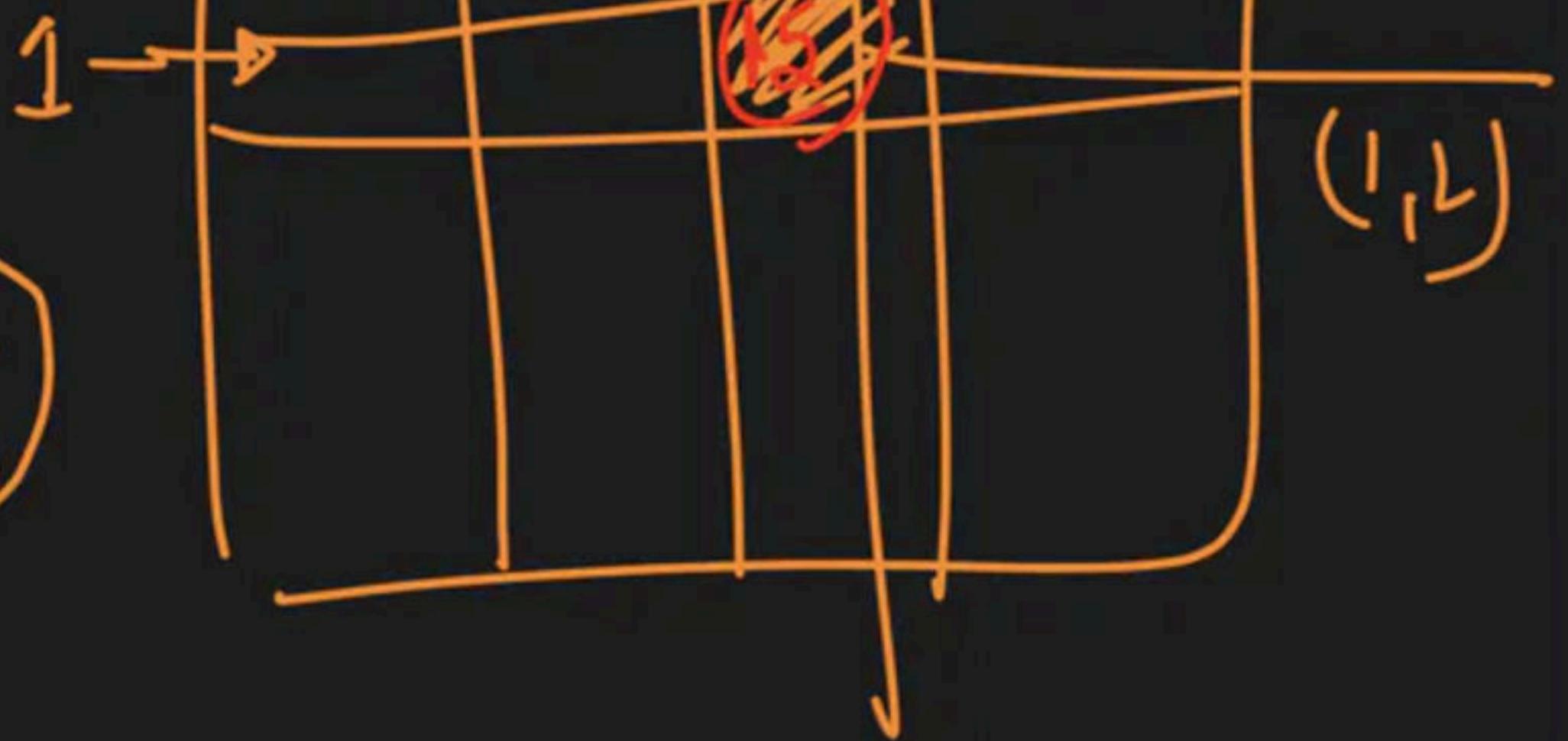
$c=4$

2

$$i = \frac{\text{index}}{\text{col}} = \frac{6}{4} = 1$$

$$j = \text{index} \% \text{col}$$
$$\approx 6 \% 4 = 2$$

19



2D → 1D →

$c \times i + j$

1D → 2D

$O(m \times n)$
 $O(\log(m \times n))$

$i =$

index
col

$j =$ index
row

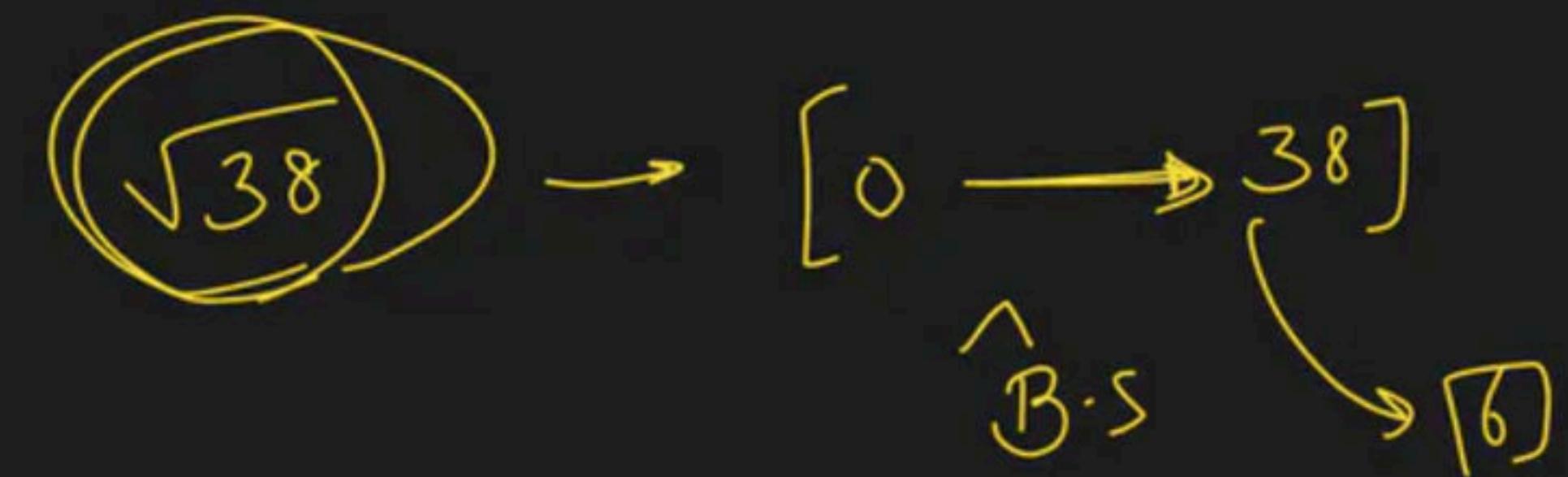


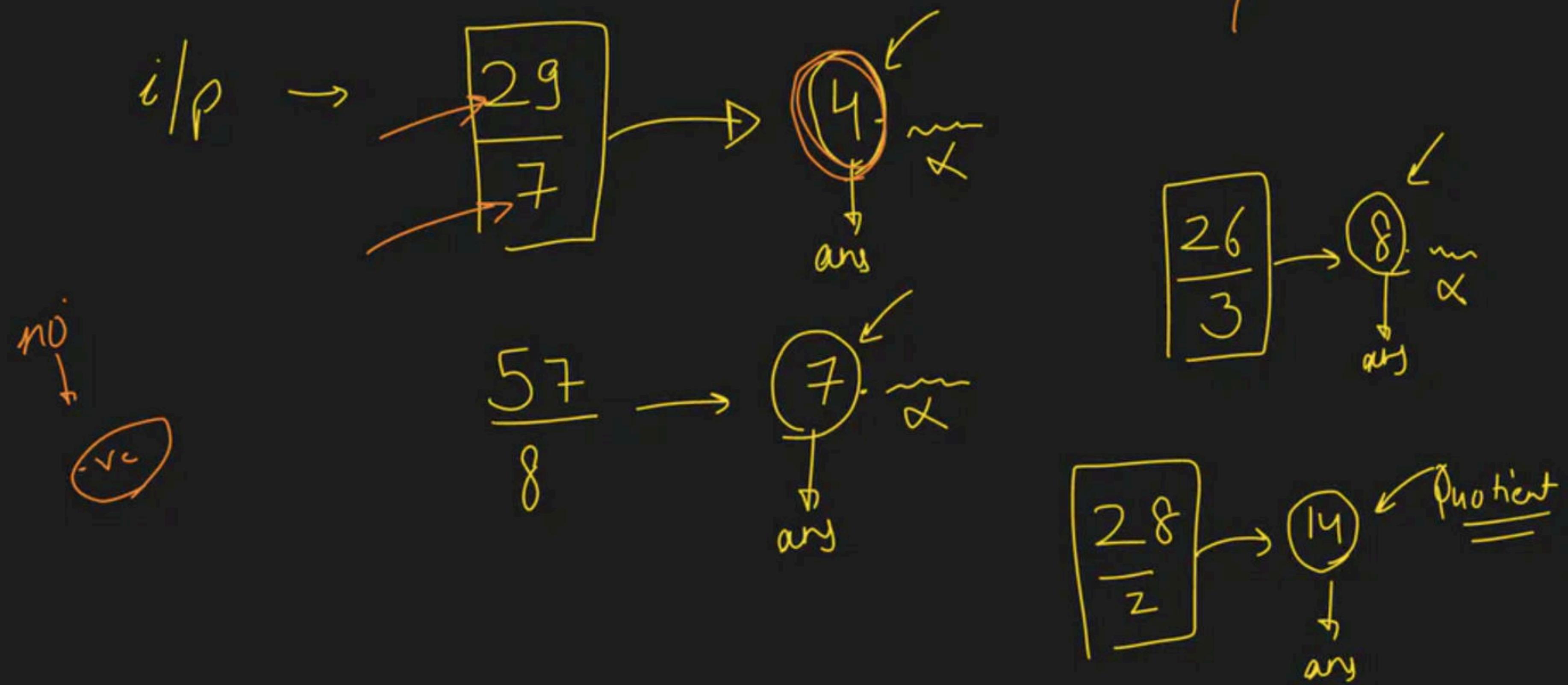
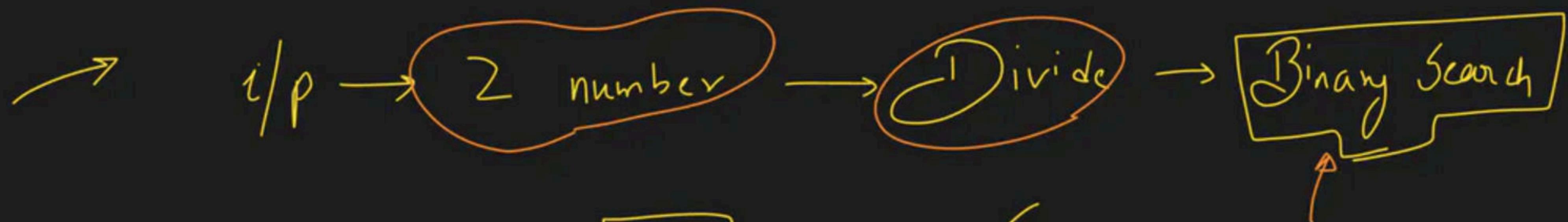
Searching & Sorting - Level 3

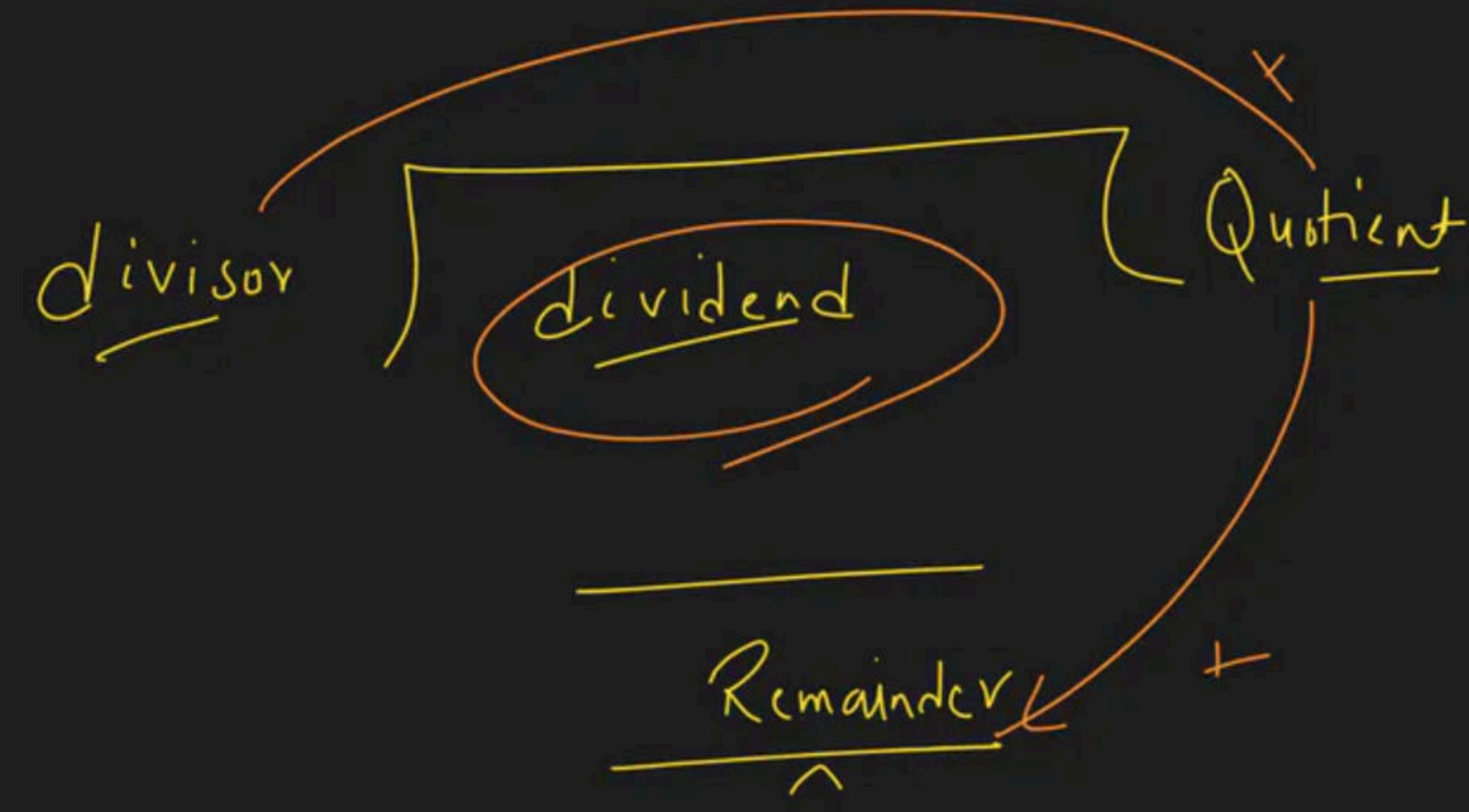
Special class

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→ Binary Search:-

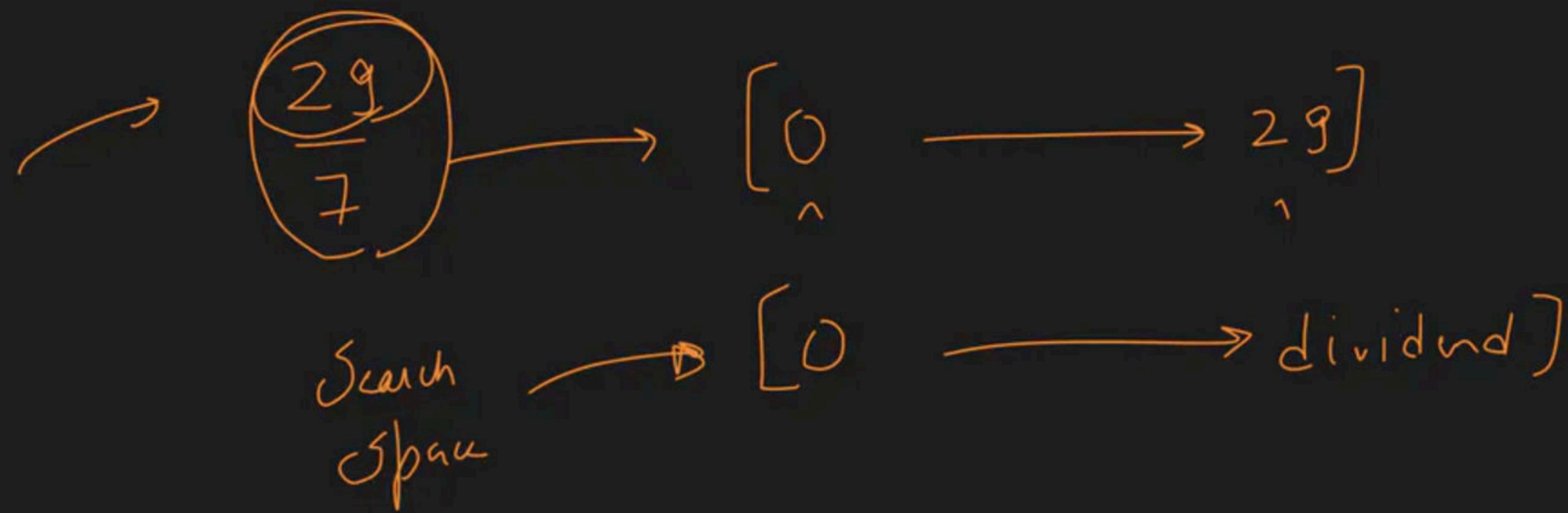


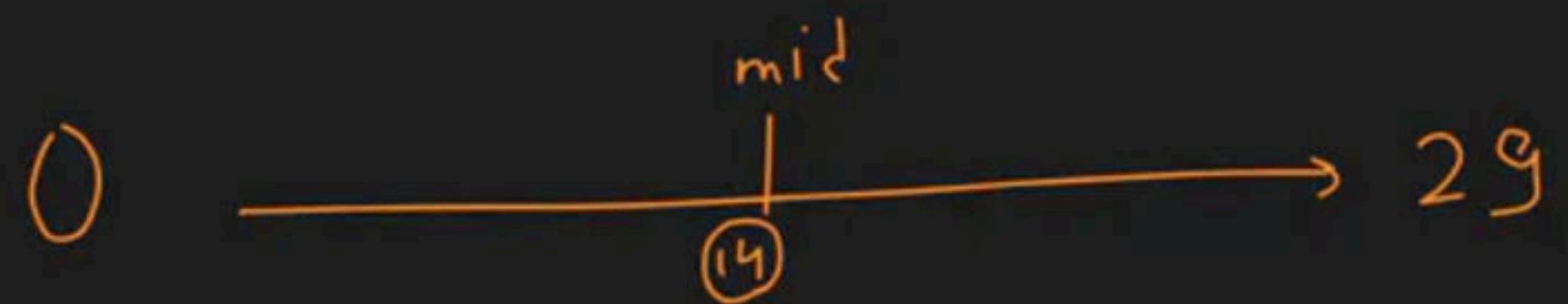




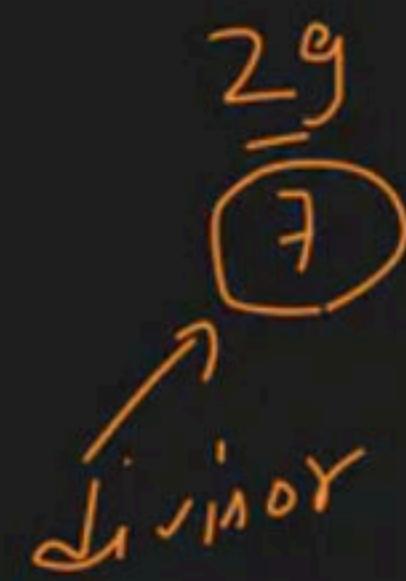
$$\text{Quotient} * \text{Divisor} + \cancel{\text{Remainder}} = \text{Dividend}$$

$$\text{Quotient} * \text{Divisor} \leq \text{Dividend}$$

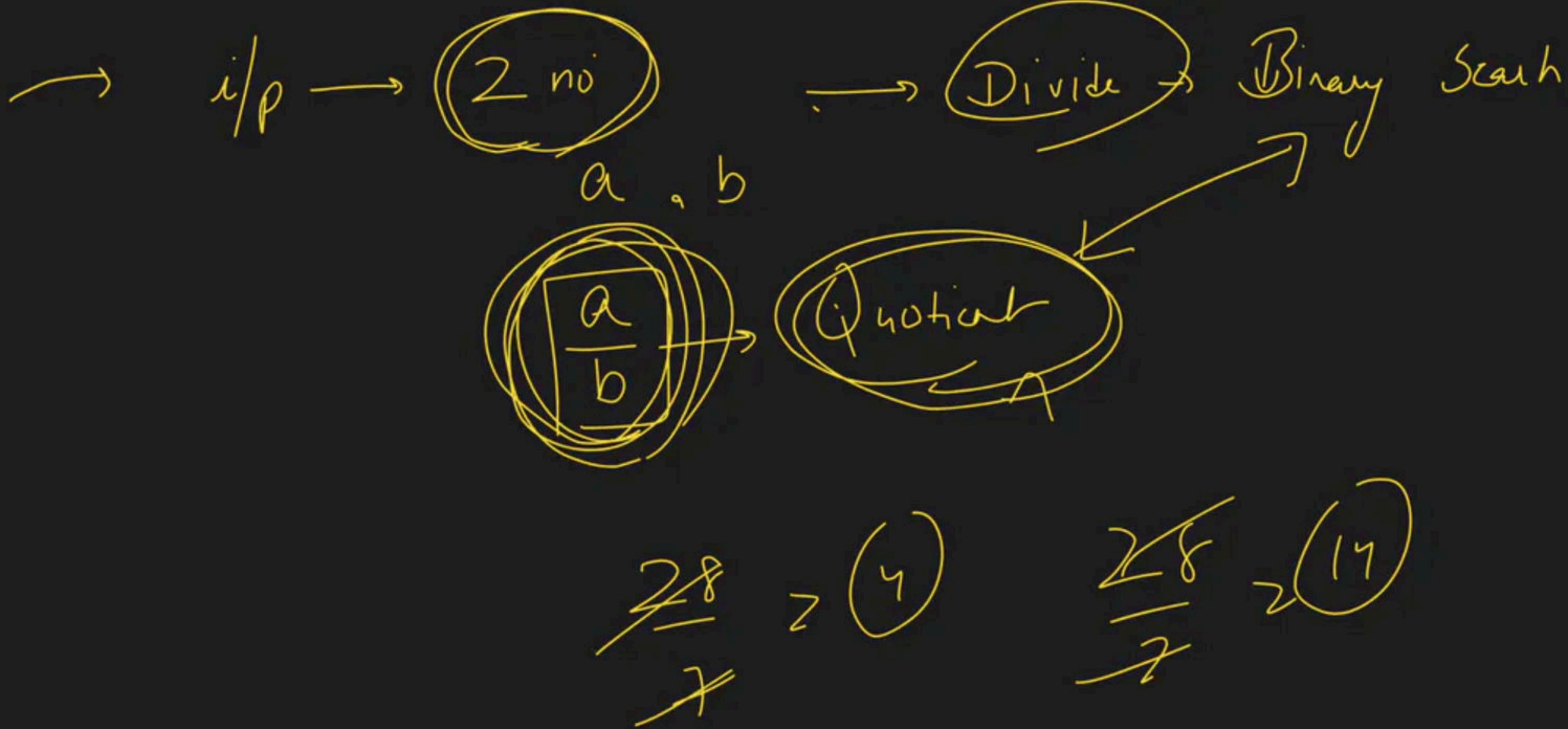




$l = 0$, $r = 29$, $mid = \frac{0+29}{2} = \boxed{14}$
is 14 a possible answer?



$Q \times \mathcal{D}_i$



A diagram illustrating the components of division. It features a horizontal line with three main parts: 'divisor' on the left, a bracketed area in the middle labeled 'dividend', and 'Quotient' on the right.

Ruairí Ó Cinnéide

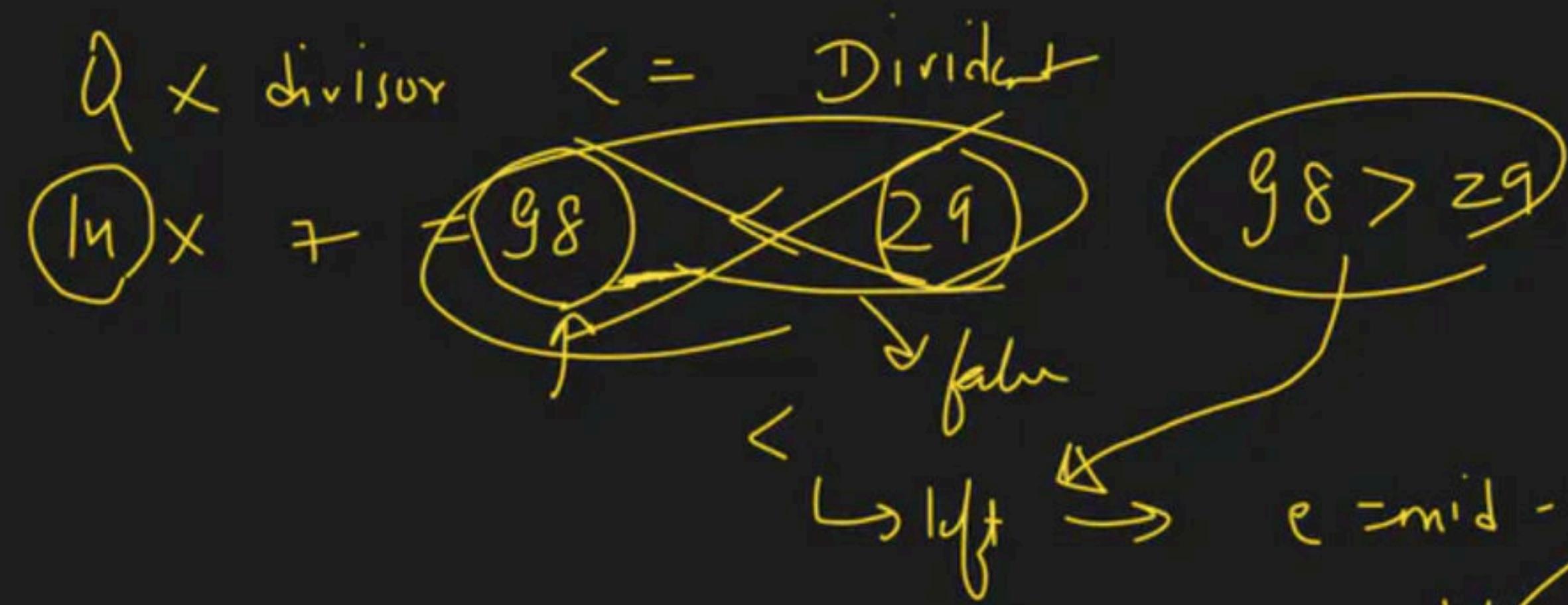
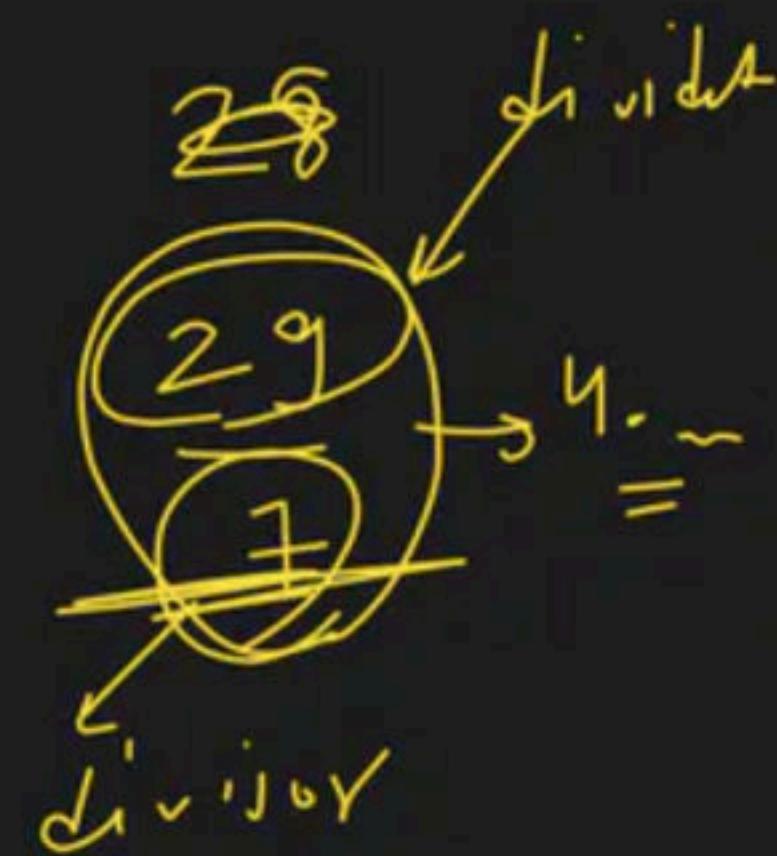
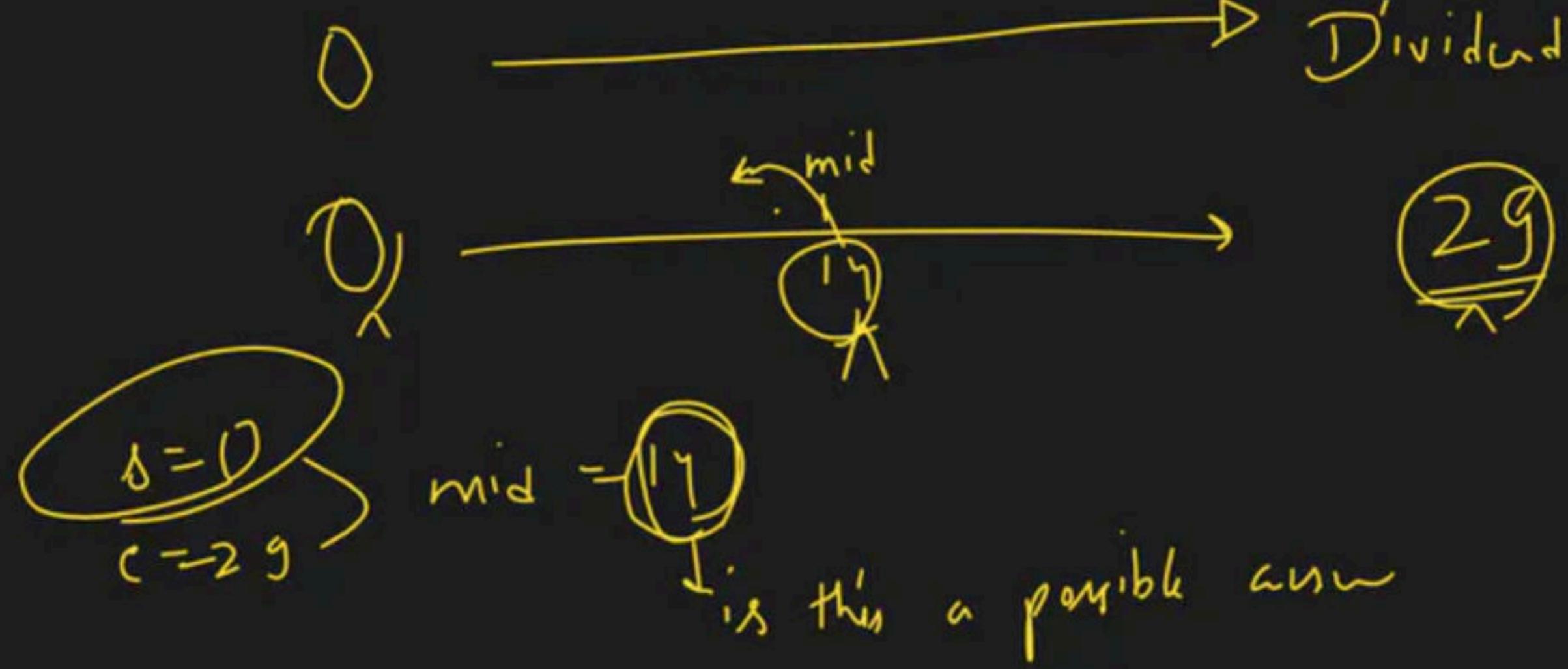
Quotient

Division

Remainder

Dividend

$\frac{\text{Quotient} \times \text{Divisor}}{+ \text{Remainder}} <= \text{Dividend}$



$e = \text{mid} - 1$
 $c = b - 1 = 13$



$$d = 0 \\ e = 13 \\ \Rightarrow \text{mid} = \frac{0+13}{2} = 6$$

$Q \times \text{divisor}$

dividend

$$6 \times 7$$

$$m_2 > 2^9$$

$$\text{left} \rightarrow c = \text{mid} - 1$$

$$= 6 - 1 \\ = 5$$



$$g = 0$$

e 2 /

$$\text{mid} = \frac{0+5}{2} = 2$$

$Q \times \text{divisor} <= \text{dividend}$

$$2 \times 7 <= 25$$

$14 <= 25$

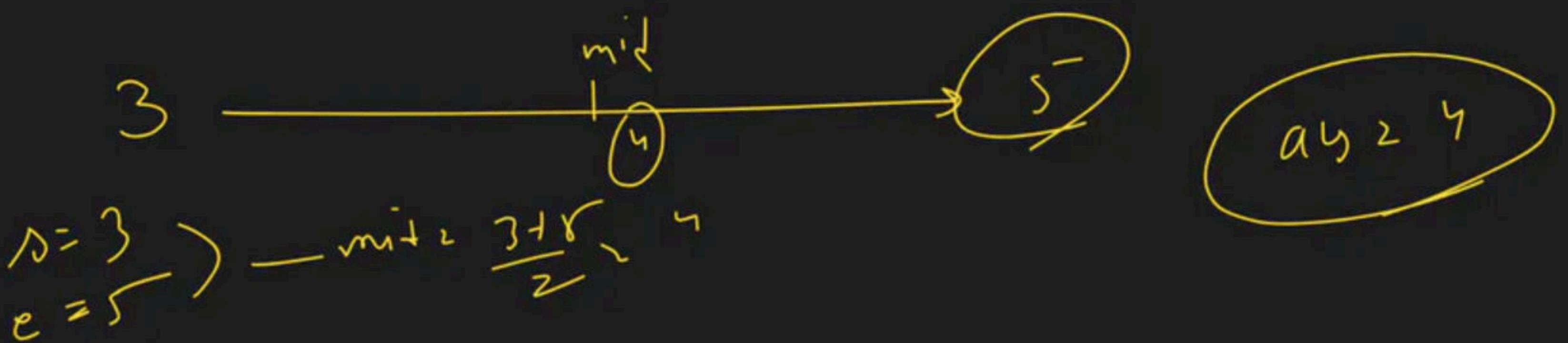
Valid as

$\rightarrow \text{ans store}$

$\rightarrow \text{right}$

$$1 \leq \text{mid} \leq 1$$

$$\rightarrow Q \leftarrow 3$$



$Q \times \text{dinner} \leftrightarrow \text{dinner}$

$4 \times 7 \leq 29$
 $28 \leq 29 \rightarrow \text{Valid ans}$

↴ an shown
 ↴ right

$s = mid + 1$

$= -1$

$$S \xrightarrow{\quad} S'$$

$$mid = \frac{S+1}{2} = 5$$

$$0 > S' \\ c = S'$$

$Q \times \text{divisor} \leq \text{divisor}$

$$S \times 7 \leq 2^9$$

$$35 \leq 2^9 \rightarrow \text{false}$$

left

$c = m - 1$
 $c = 5 - 1$

$$S > S' \\ \ell = 1$$

$c > e$

$$m < j^n$$

$$\rightarrow Q \times \text{divisor} = = \text{dividend}$$

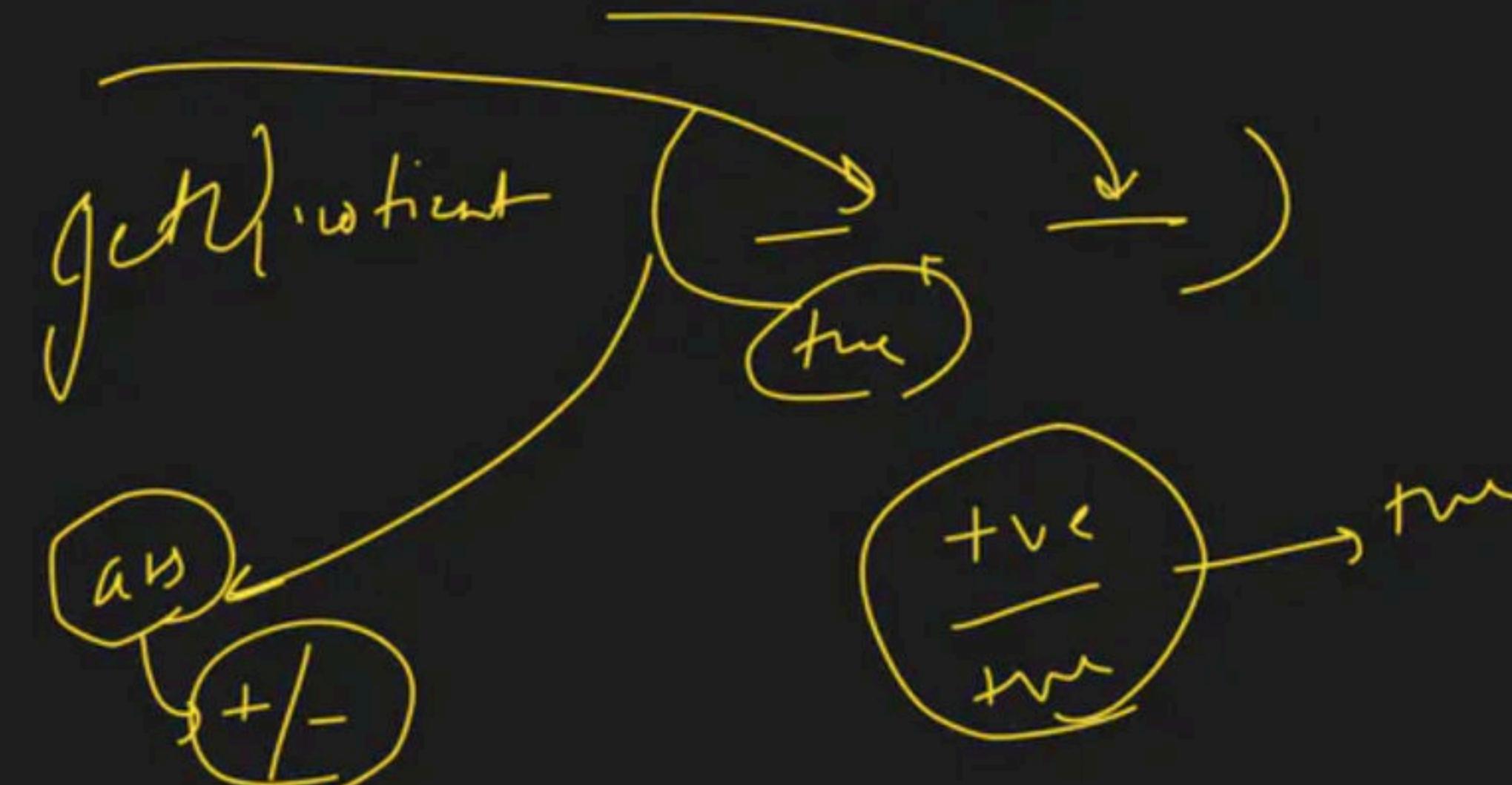
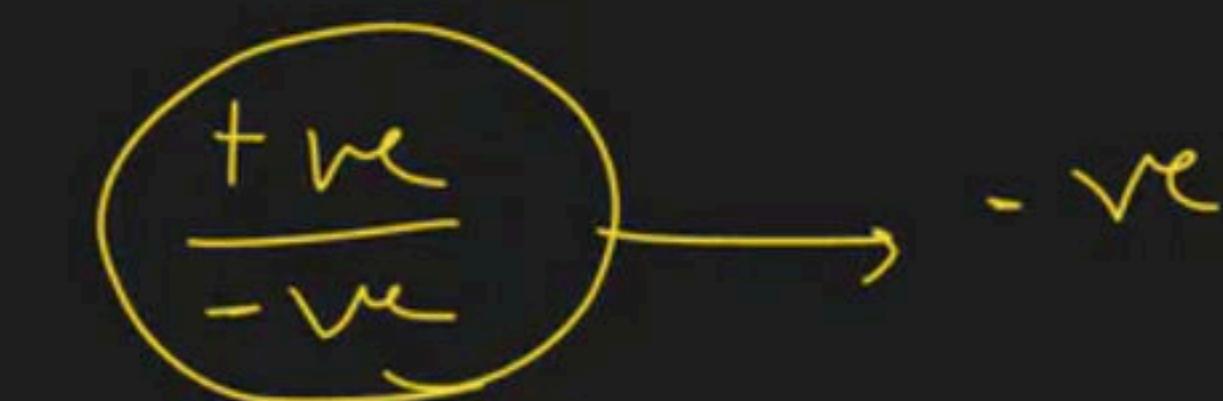
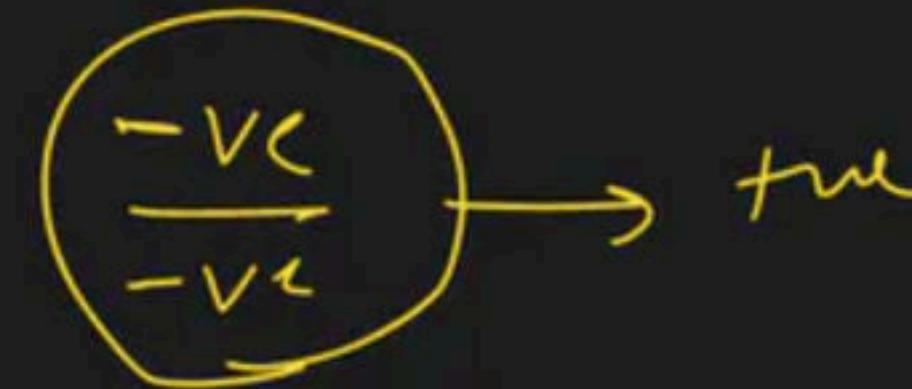
$Q \rightarrow \text{finalAns}$

$\rightarrow Q \times \text{divisor} < \text{dividend}$

$\omega \rightarrow$ short right

$\rightarrow q \times \text{divisor} > \text{dividend}$

100



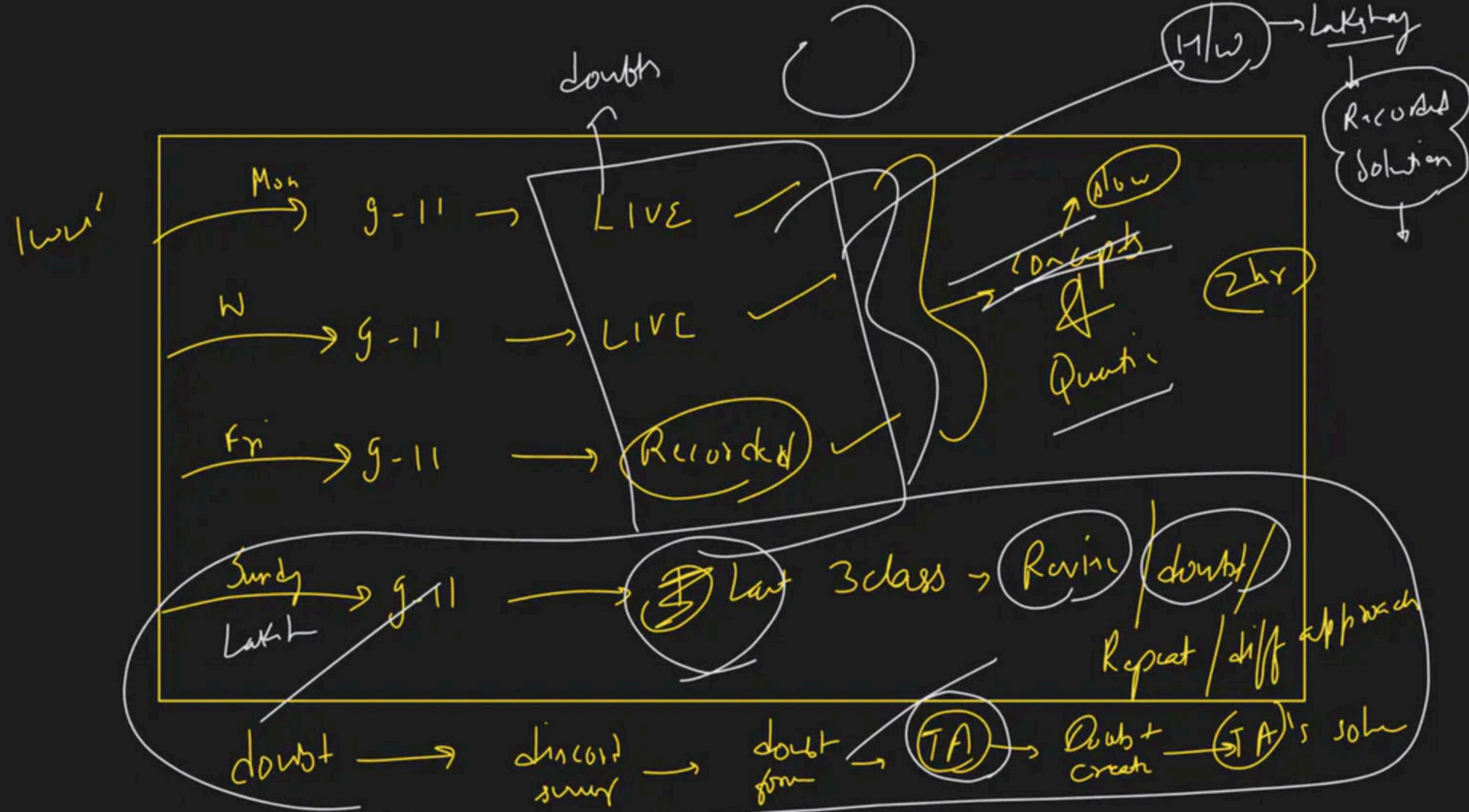
$$\sqrt{r^+} \rightarrow \textcircled{1/\omega}$$

$$\sqrt{35} \rightarrow \textcircled{6 \text{ wavy}}$$

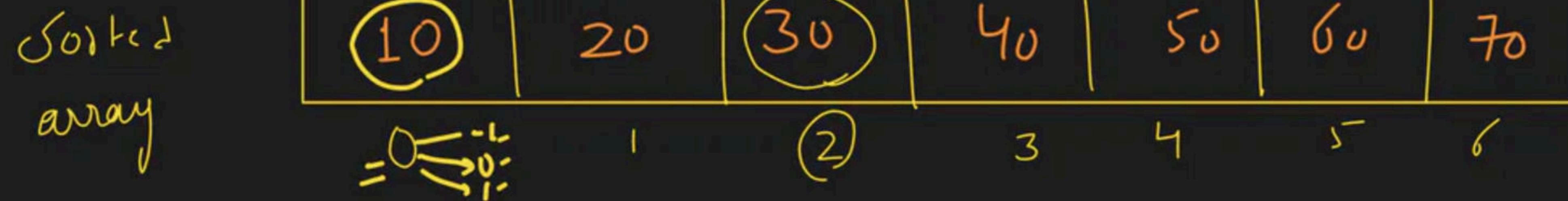
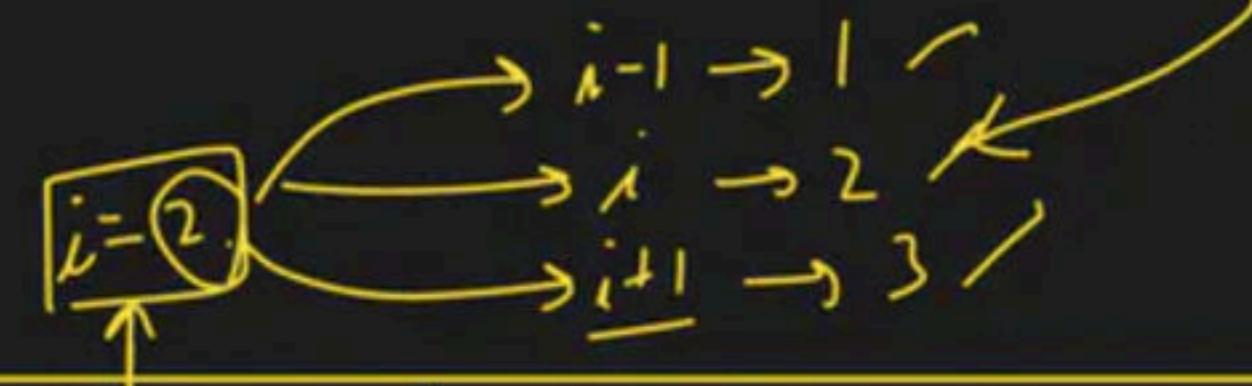
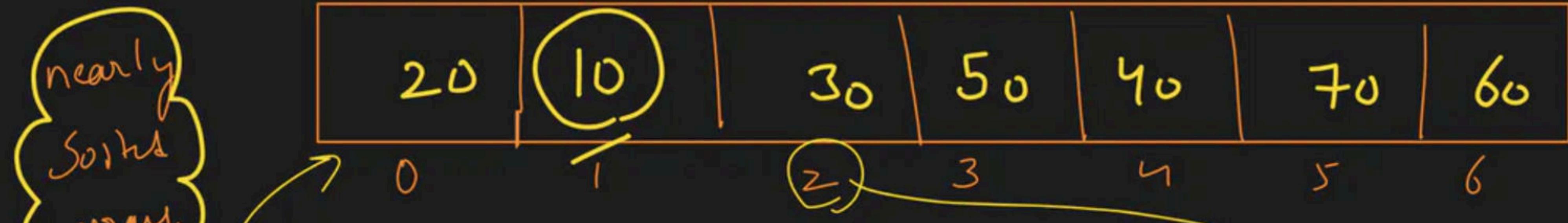
= precision

$$\text{dink} \rightarrow \frac{29}{7} \rightarrow \textcircled{9 \cdot \text{wavy}} \\ \textcircled{1/\omega}$$

(2 digit)



→ Binary Search or nearly sorted Array

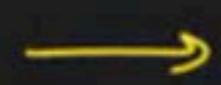


normal sorted array



```
if (arr[mid] == target)  
    return mid
```

mid
mid - 1
mid + 1



```
if (target > arr[mid])  
    Right
```

else

Left

nearly sorted array

```
if (arr[mid - 1] == target)
```

return mid - 1

```
if (arr[mid] == target)
```

return mid

```
if (arr[mid + 1] == target)
```

return mid + 1

```
if (target > arr[mid])
```

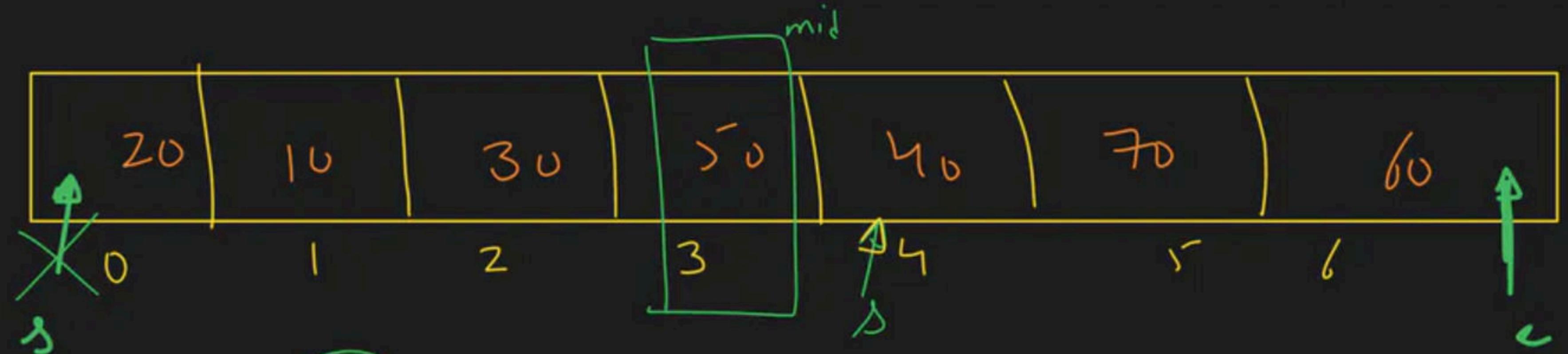
else

Right

Left

if

target → Caten



$$s=0 \rightarrow \text{mid} = 3$$

$$e = 6$$

$$\text{target} = 70$$

$\text{arr}[mid - 1] \rightarrow 30 = -70 \times$

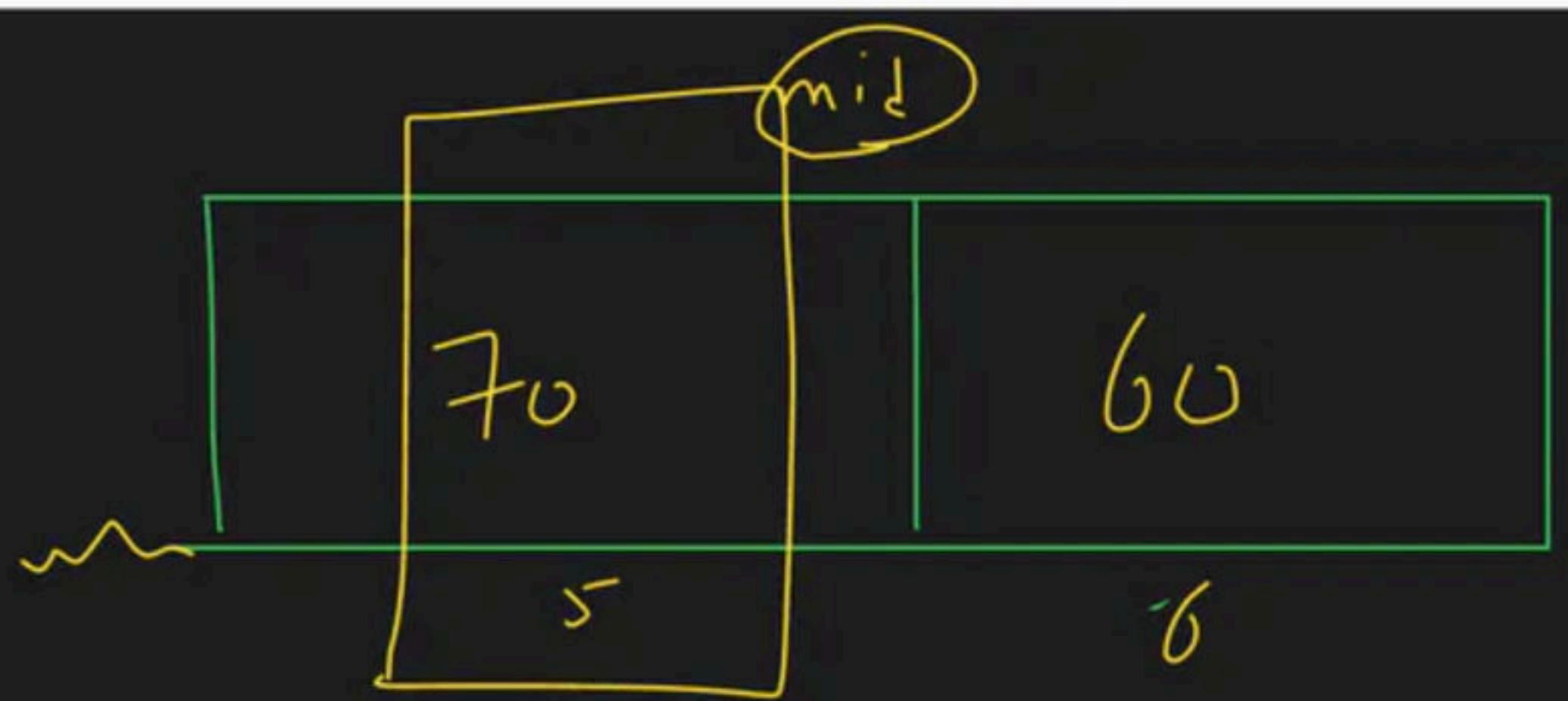
$\text{arr}[mid] \rightarrow 50 = > 70 \times$

$\text{arr}[mid + 1] \rightarrow 40 = -70 \times$

if ($\text{target} > \text{arr}[mid]$)

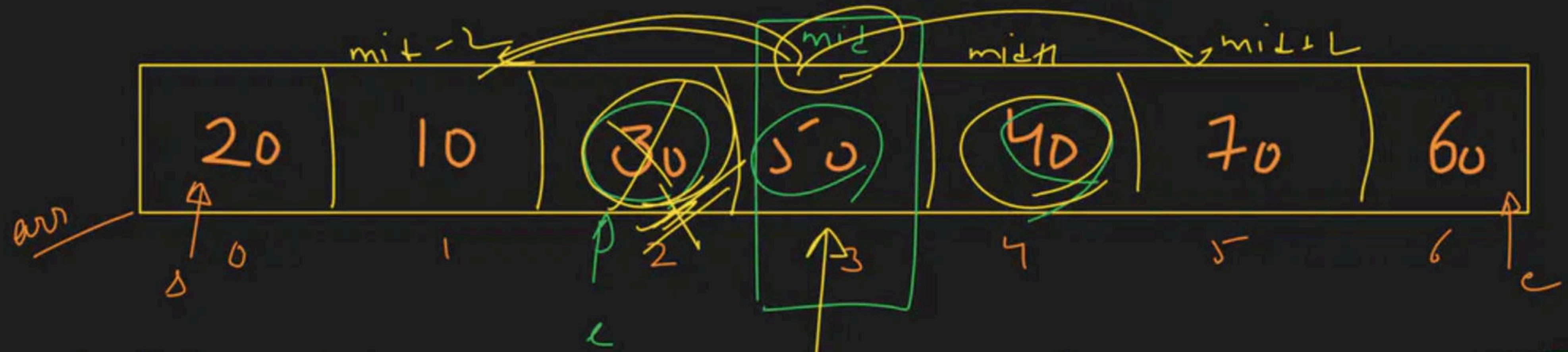
$70 > 50 \rightarrow \underline{\underline{j+1}} \rightarrow \boxed{j = mid + 1}$

$j = mid + 2$



$s = 5 \rightarrow$ mid $, s = 6$

$70 = = 70$
→ thru 5'



$$g = 0 \\ c = 6 \Rightarrow \text{mid} = 3$$

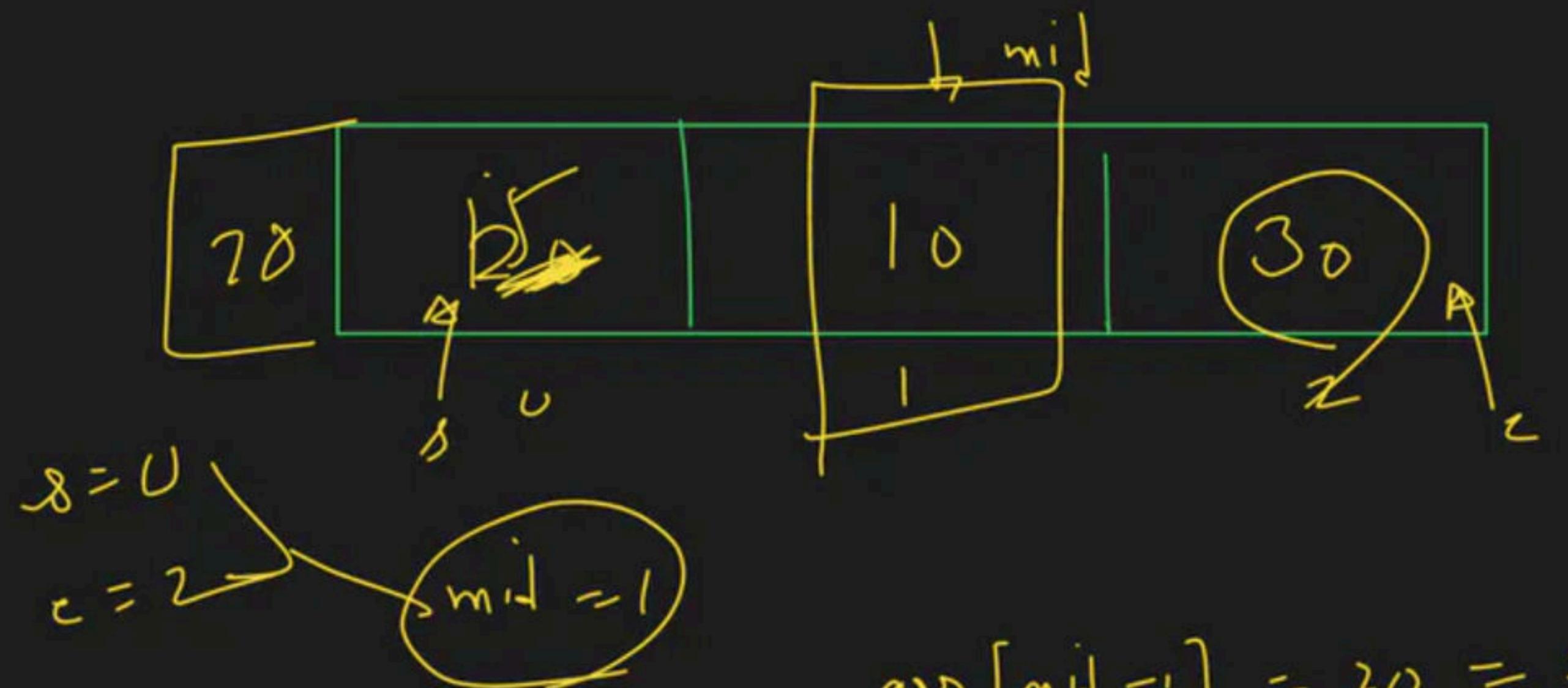
$\text{arr}[\text{mid} + 1] = \cancel{30} = 20 \times$

$\text{arr}[\text{mid}] = \cancel{50} = 20 \times$

$\text{arr}[\text{mid} - 1] = \cancel{70} = 70 \times$

$\text{target} = 20$

if ($\text{target} > \text{arr}[\text{mid}]$)
 $20 > 50 \rightarrow \text{false}$ left = $c - \text{mid} - 2$
 $c = 3 - 1$
 $c = 2$



$$arr[mid - 1] = 20 = = 20 \quad \checkmark$$

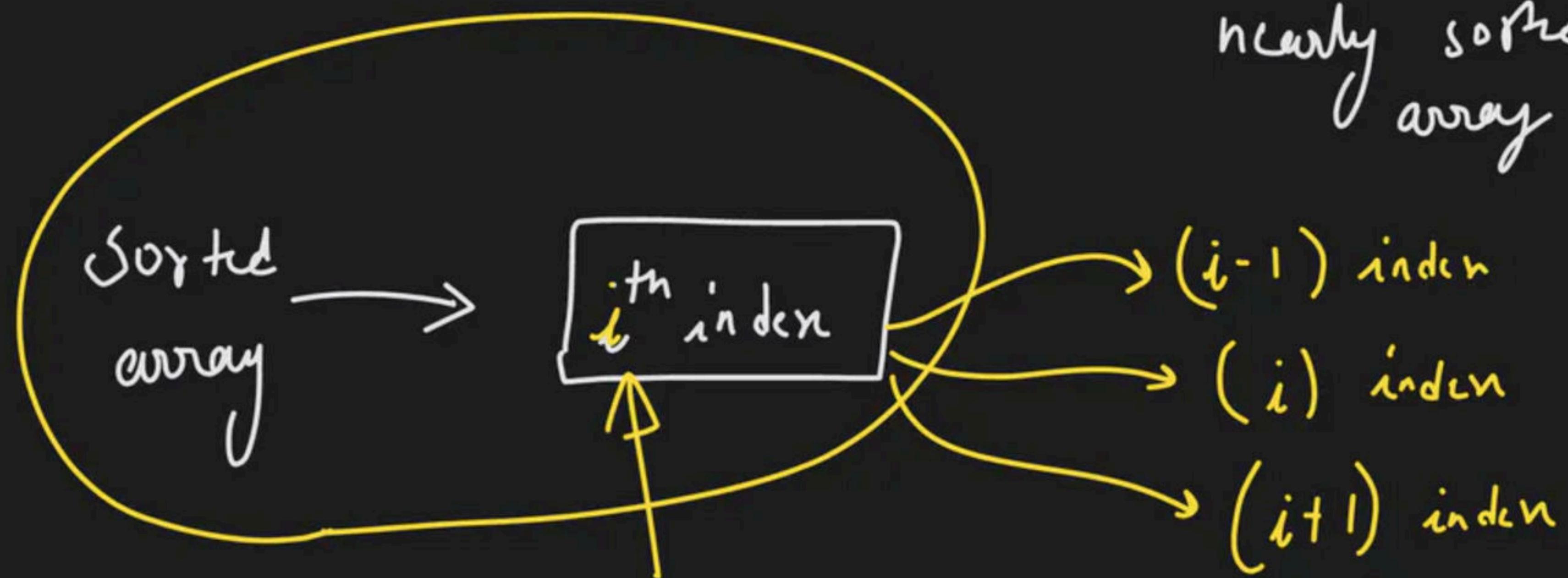
$$arr[mid]$$

$$arr[mid + 1] = 30$$





nearby sorted
array



S.A

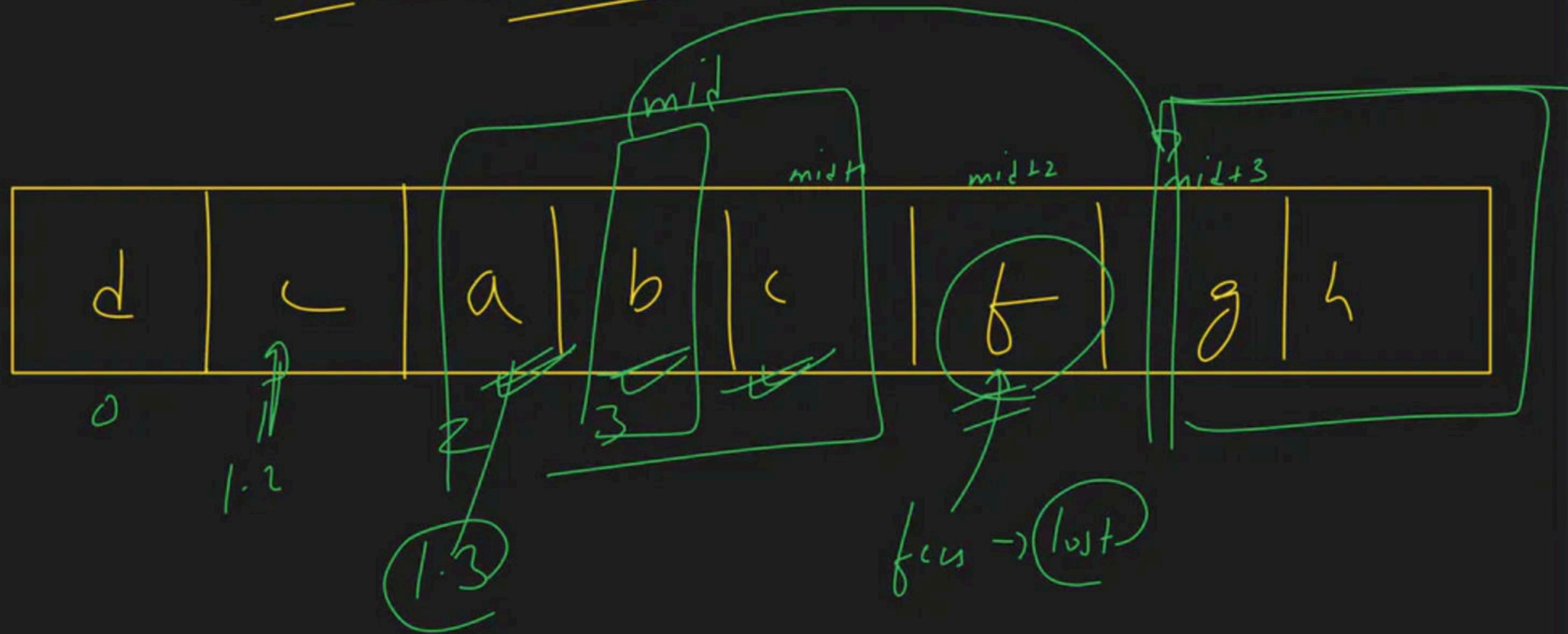
colony

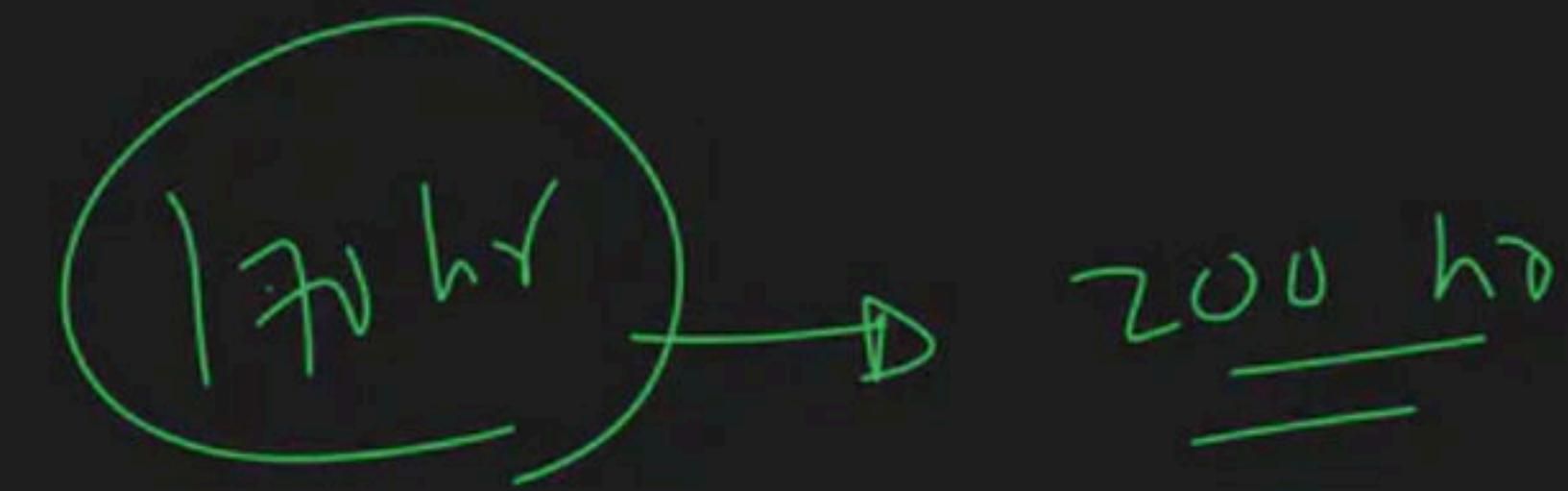
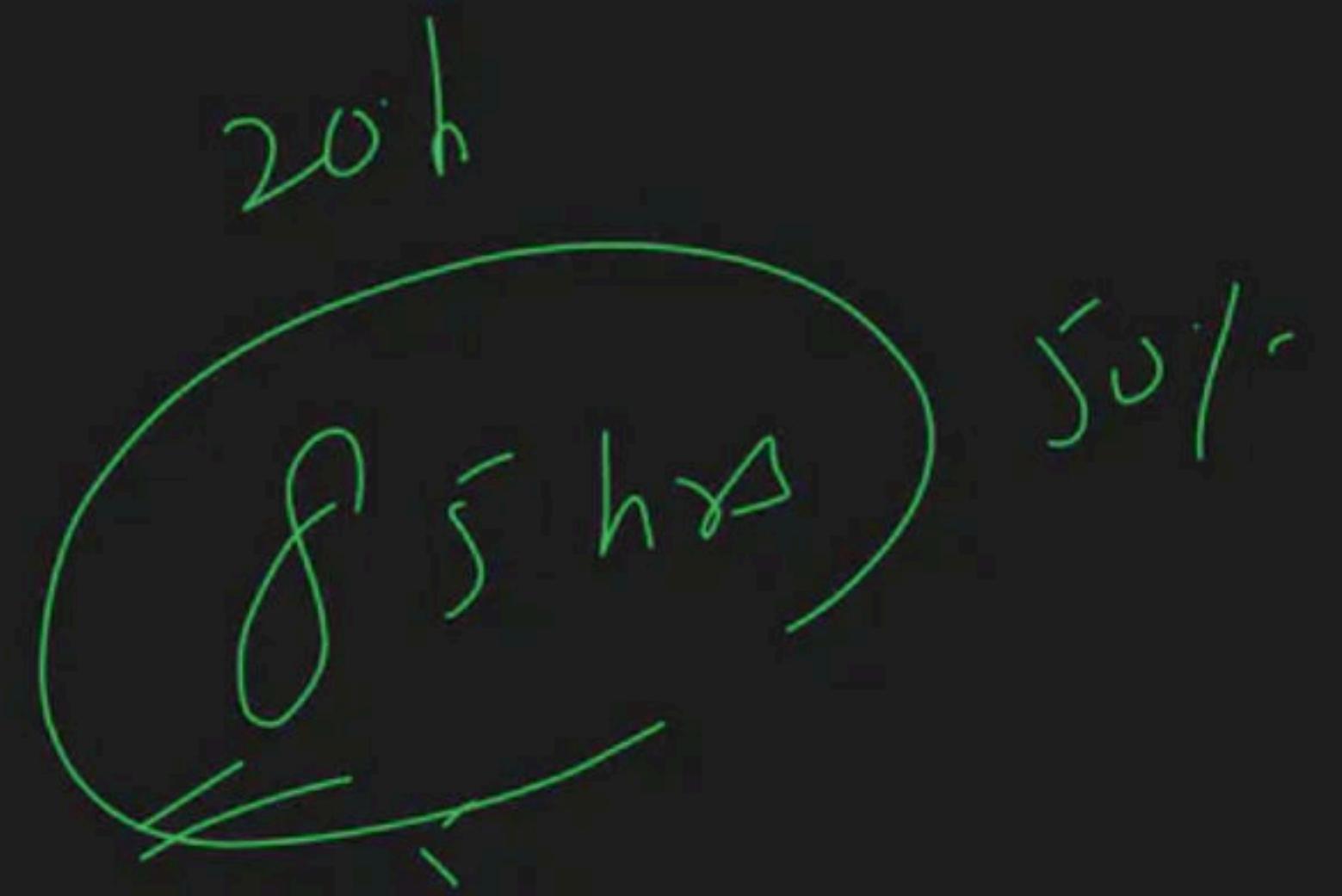
10

NSA

9 | 10 | 11

Paam Break → 2 mⁱⁿ

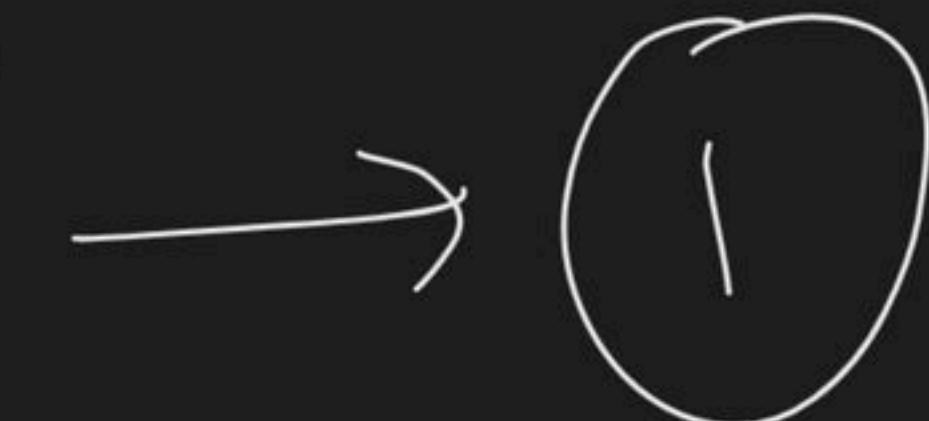




26 Oct

Openij

B.S



classical Studi

↳ simple s-



Search space, predicates



Index par logic

↗

Dynamische low

Book also ~

EKO spujs

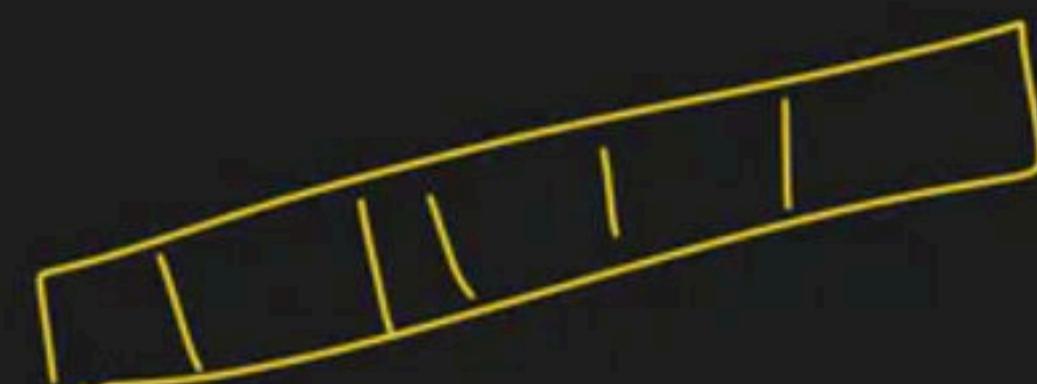
PTTAX spujs

$\text{XOR} \rightarrow O(n)$

Find the odd occurring element

$SUM_k \geq 1$

find element
that occurs
odd times

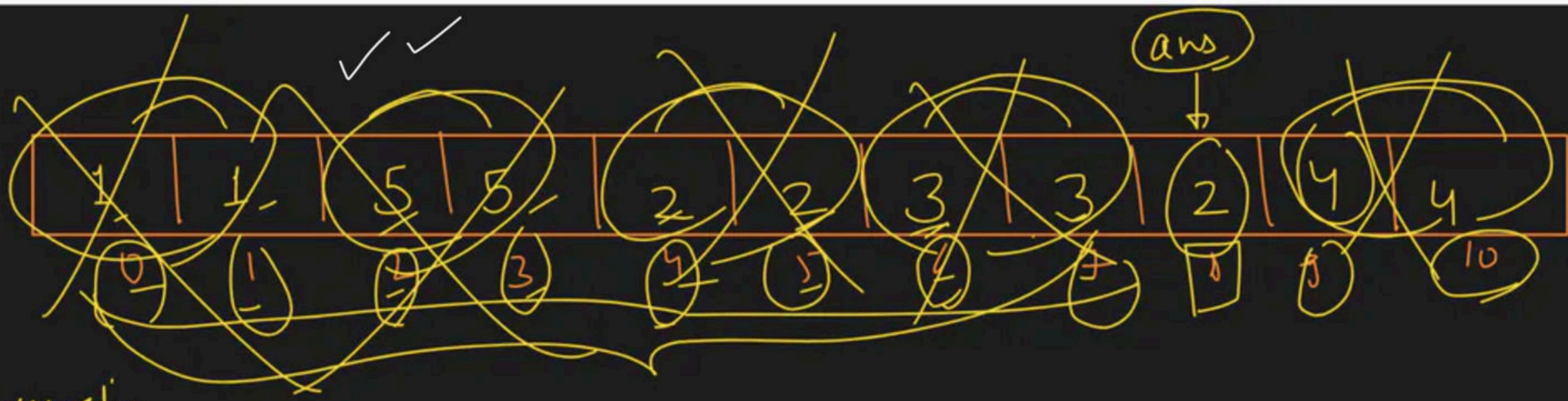


all elements → even no. of times occur
except one → odd

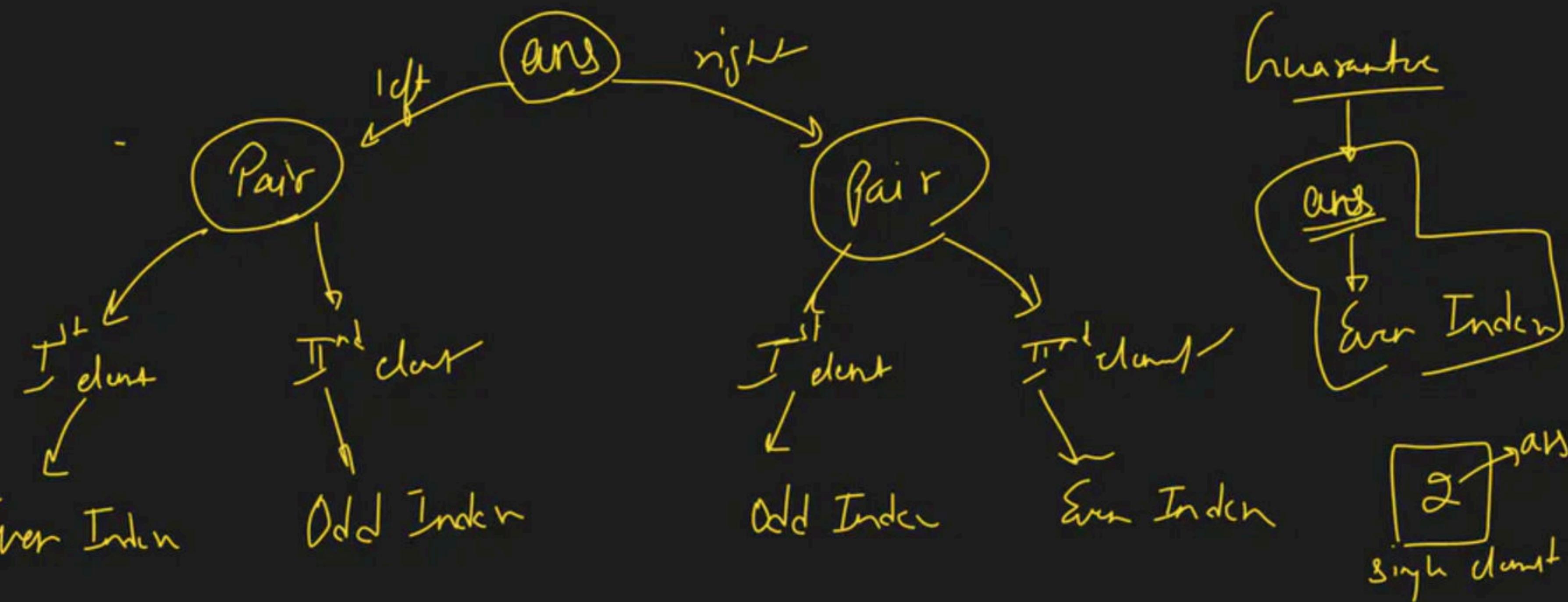
all repeating no. → pairs repeat

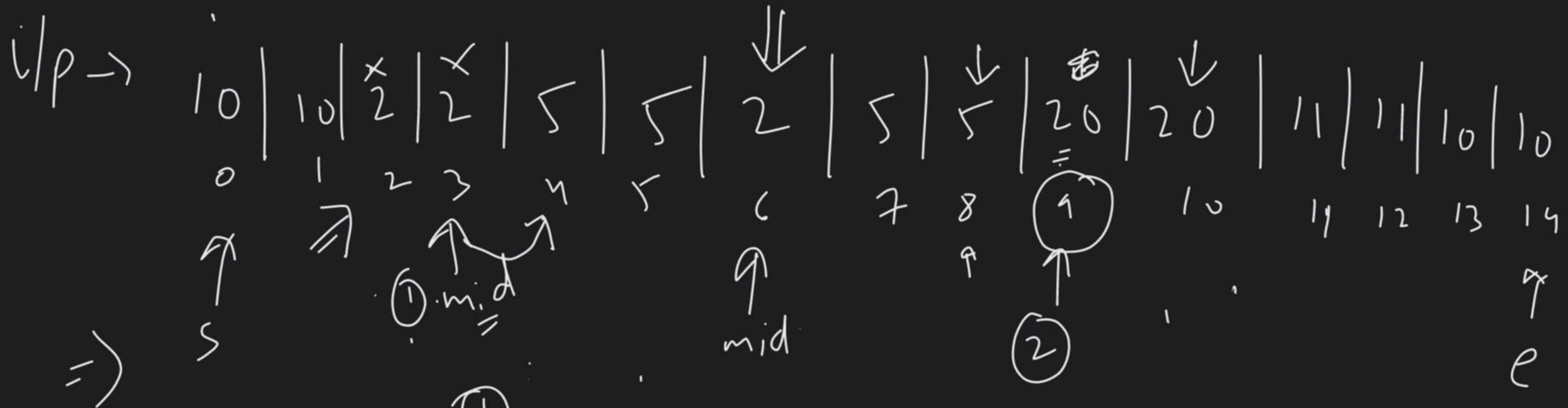
& pairs are not repeated

ek baar me koi bhi no. 2 se
jader baar nahi aor ΔK_L

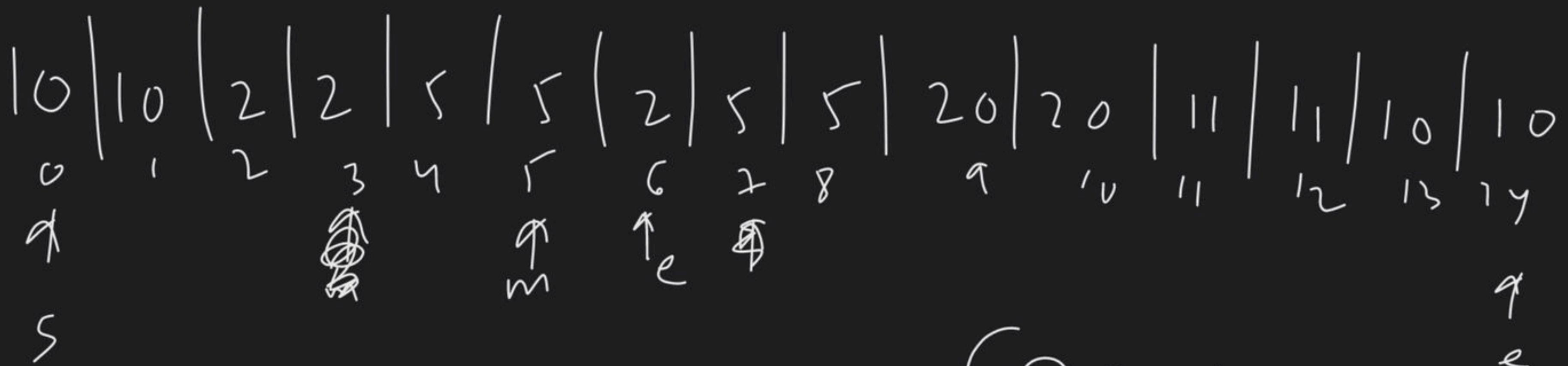


Observation





mid is even \Rightarrow ① if ($v[mid] == v[mid + 1]$)
 { // right jaw
 } $s = mid + 2;$
 ③ else {
 } $ans = mid;$ ② else if ($v[mid - 1] == v[mid]$)
 } break;
 } $e = mid - 2;$
 }
 \Rightarrow



① $s = 0, e = 14, \text{mid} = 7$

Odd hai $\rightarrow e \Rightarrow 6$

③ $s = 4, e = 6$
 $\text{mid} = 5$

Odd \rightarrow right jo -

② $s = 0, e = 6$
 $\text{mid} = 3$

Odd hai $\rightarrow s = 3 + 1 = 4$

$s = 5 + 1 = 6$
 $s = 6, e = 6$
 $\text{mid} = 6$

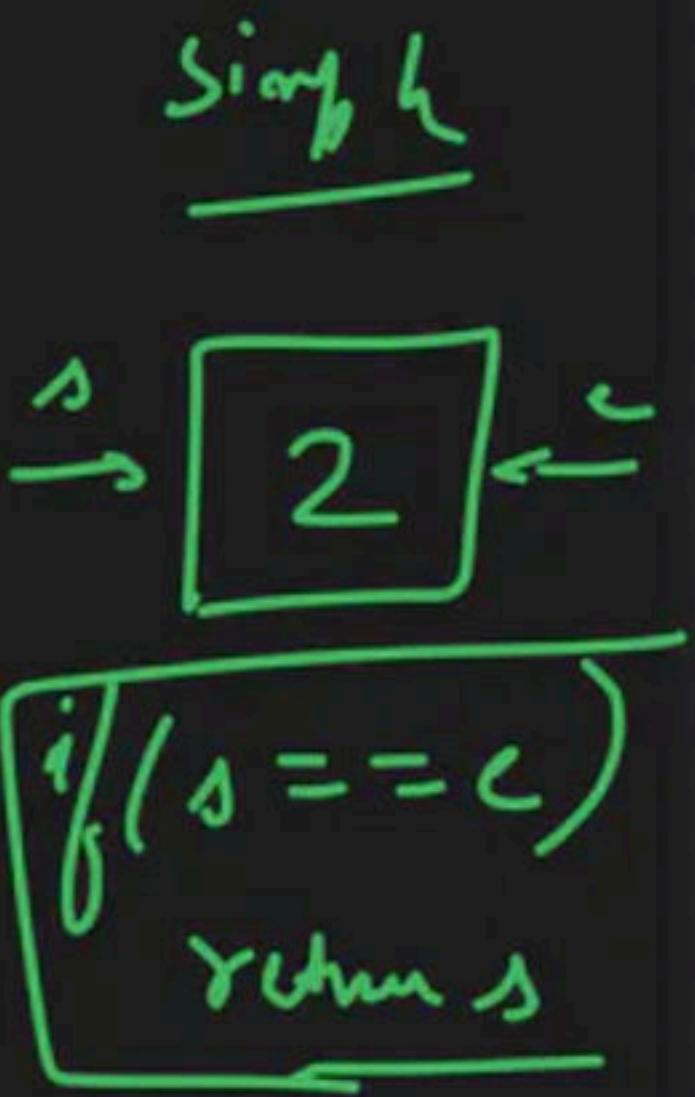
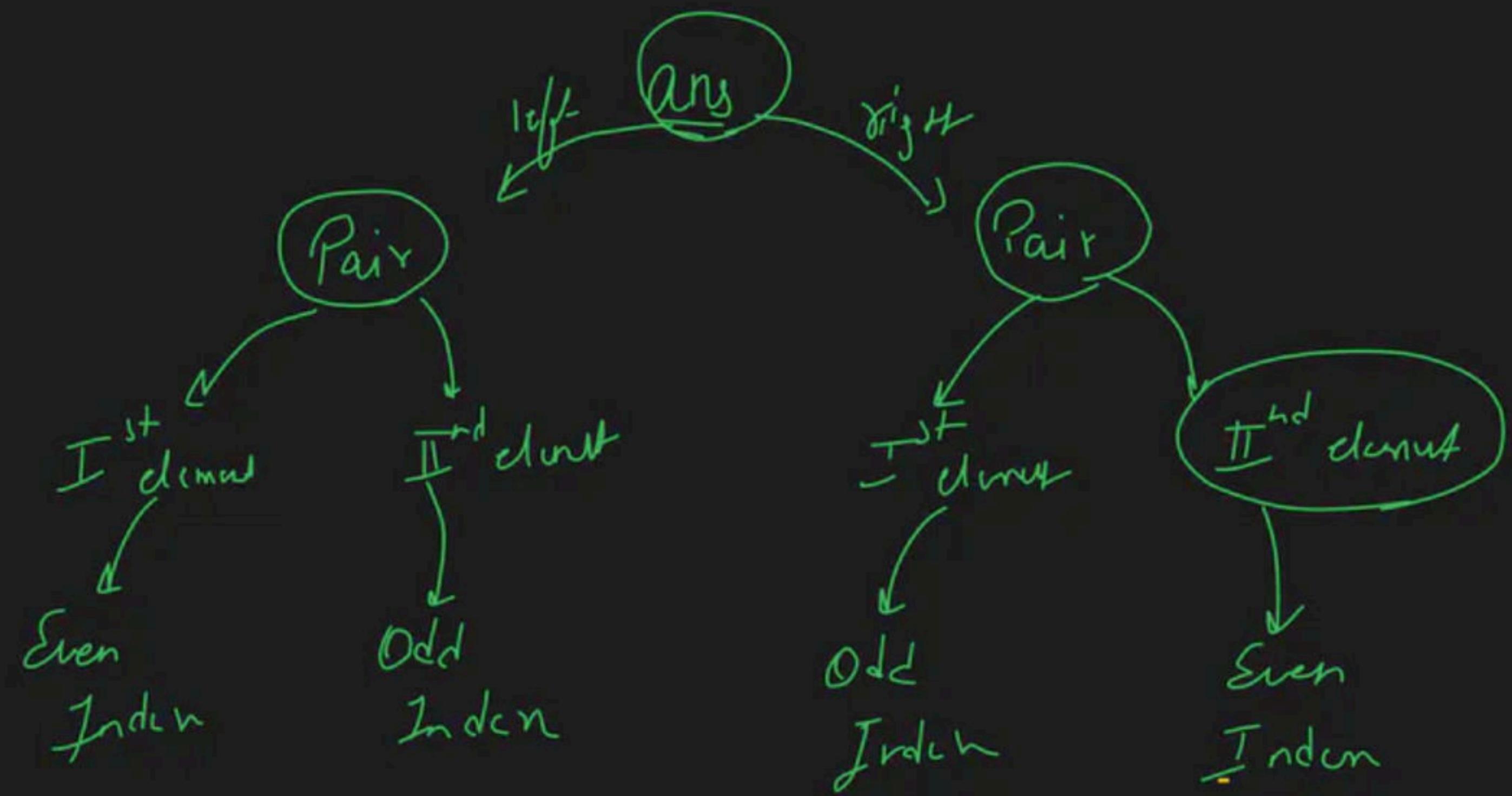
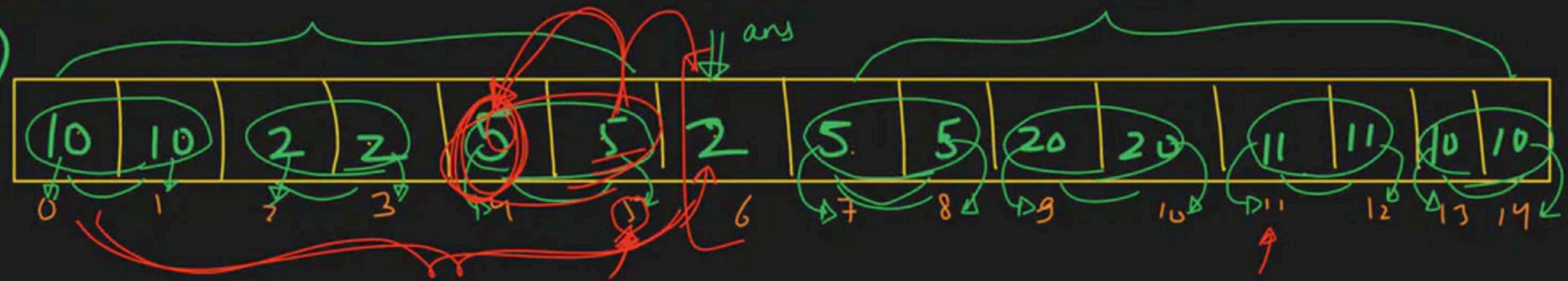
Even \rightarrow ③ case
ans = mid
break;

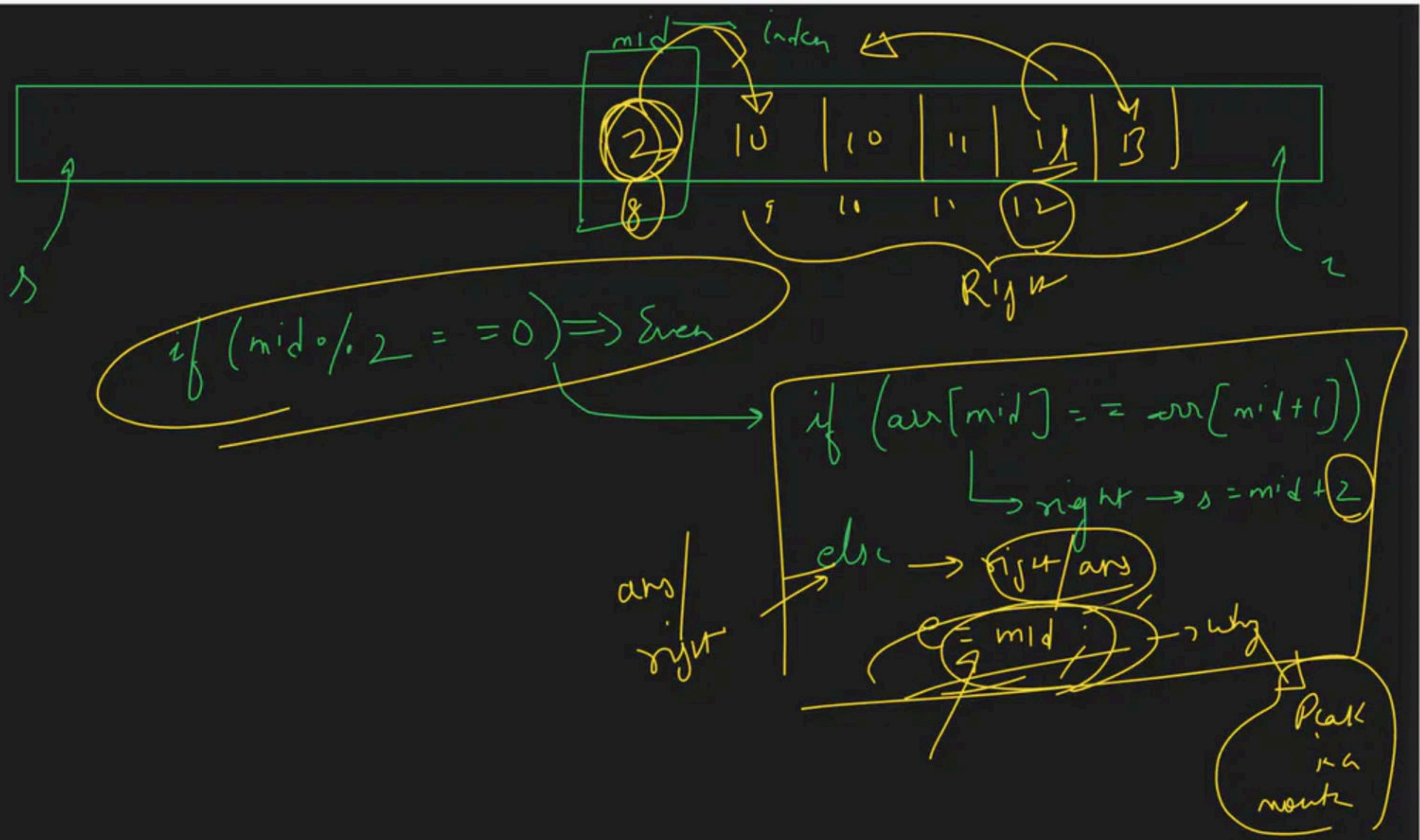
$\text{mid} \Rightarrow \text{odd hai} \Rightarrow$

if ($v[\text{mid} - 1] == v[\text{mid}]$)
{ // right gao
 s = mid + 1;
}

else { // left gao
 e = mid - 1;
}

lip





int s=0, e=n-1, mid = s + (e-s)/2

while (s <= e)

{

// single var

if (s == e)

return s;

if (mid & 1)

if (arr[mid] == arr[mid-1]) $\rightarrow s = mid + 1$

else $e = mid - 1$

else $\rightarrow even$

if (arr[mid] == arr[mid+1]) $\rightarrow s = mid + 2$

else $c = mid;$

ans / 2 + 1

if ($\text{mid} \% 2 == 1$)



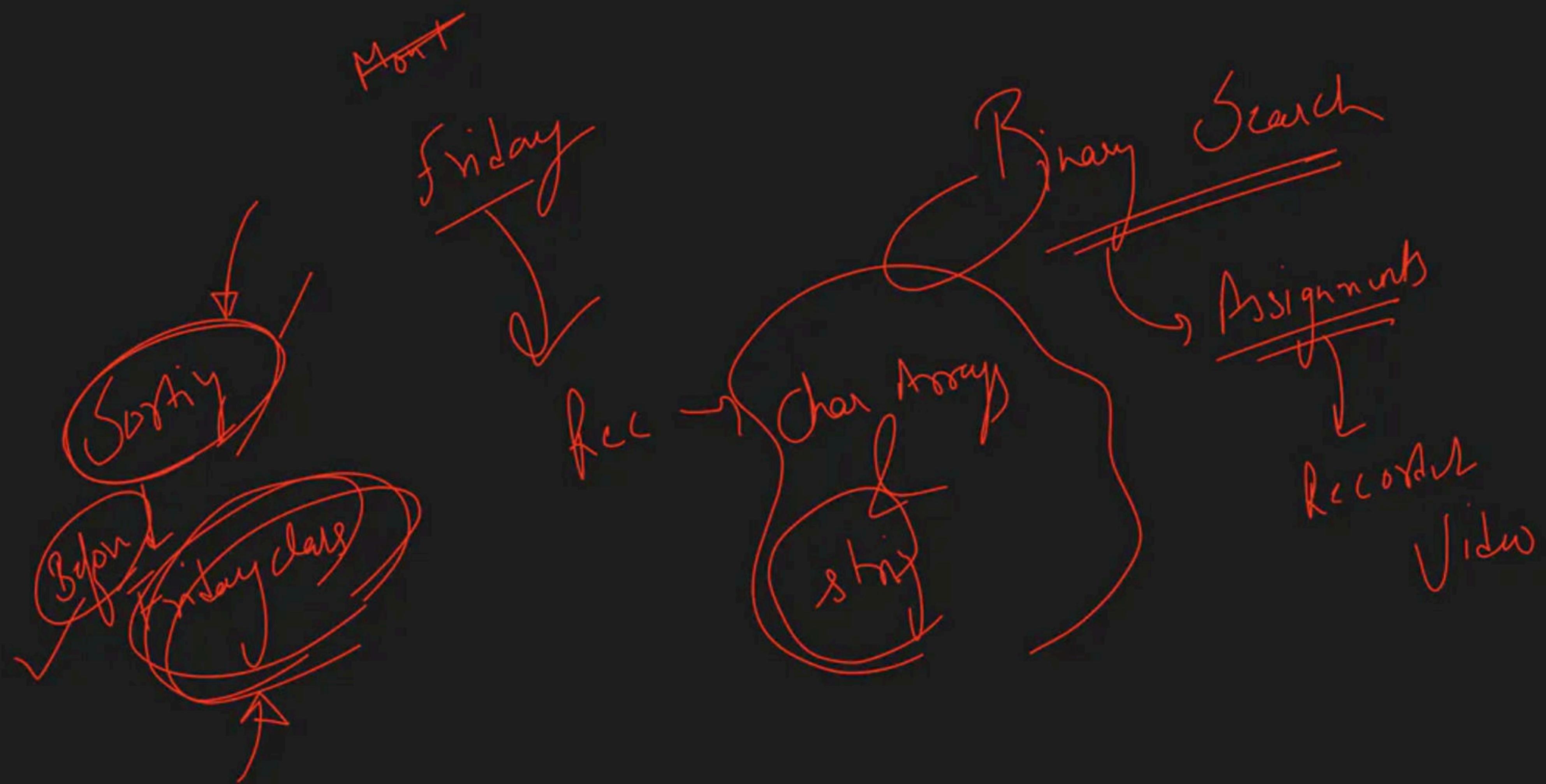
if ($\text{arr}[\text{mid}] == \text{arr}[\text{mid}-1]$)

right $\rightarrow n = \text{mid} + 1$

else

left $\rightarrow c = \text{mid} - 1$

ans $\leftarrow \text{left min}$





102



1 min

1 day

\Rightarrow Sorting \Rightarrow Bubble sort

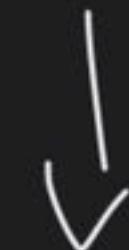
Select i th

insertion

Sort() \rightarrow merge

\Rightarrow char arrays
= \hookrightarrow char ch[r];
=

Up \rightarrow cin >> ch ; \rightarrow



Terminator

(TB)

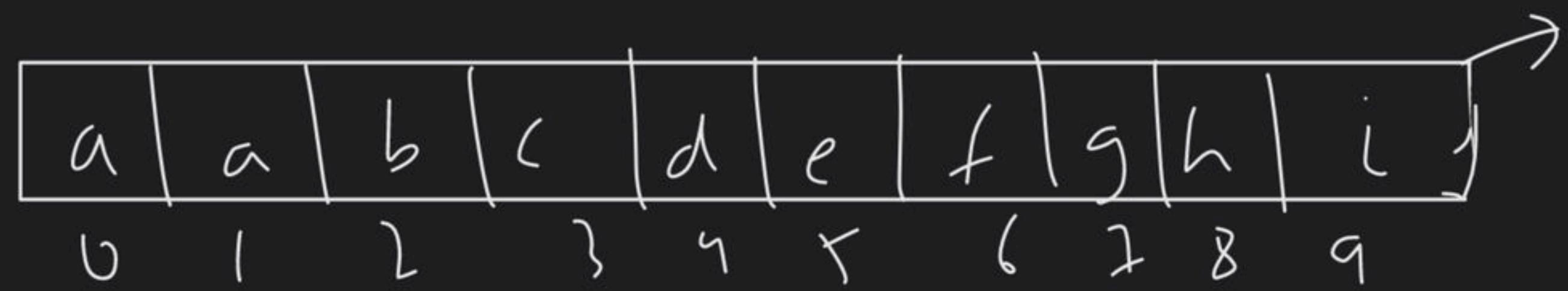
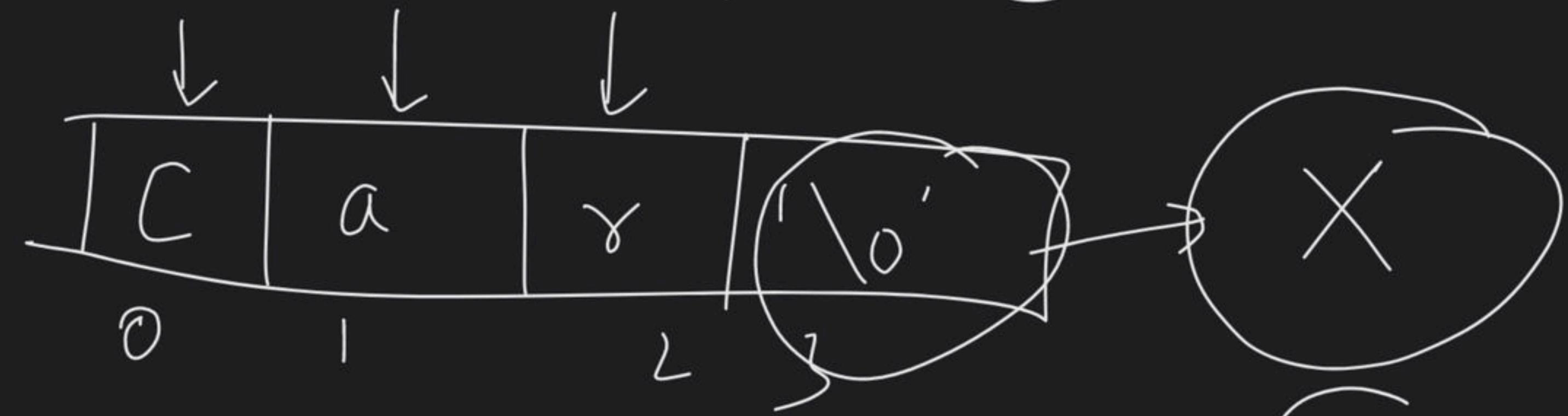
Space, tab, enter

|
cin.getline(ch, 100);
size

\Rightarrow Length of string

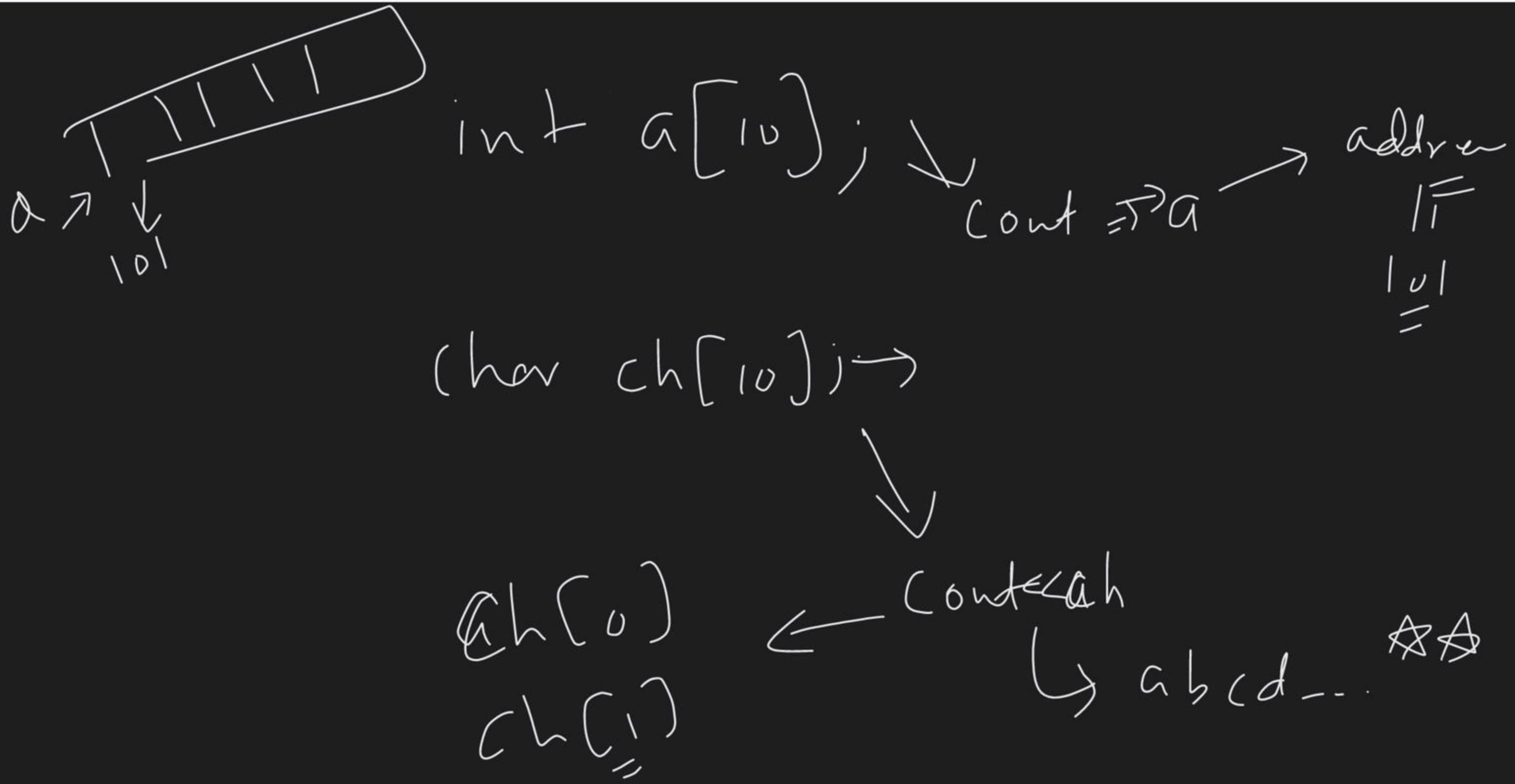
3

A hand-drawn diagram illustrating a database relationship. The word "Untergrund" is written at the top right, with an arrow pointing downwards towards the word "Lands". To the left of "Lands", there is a wavy line connecting it to two smaller "L"s, which are then connected by a bracket underneath, indicating a many-to-one relationship.

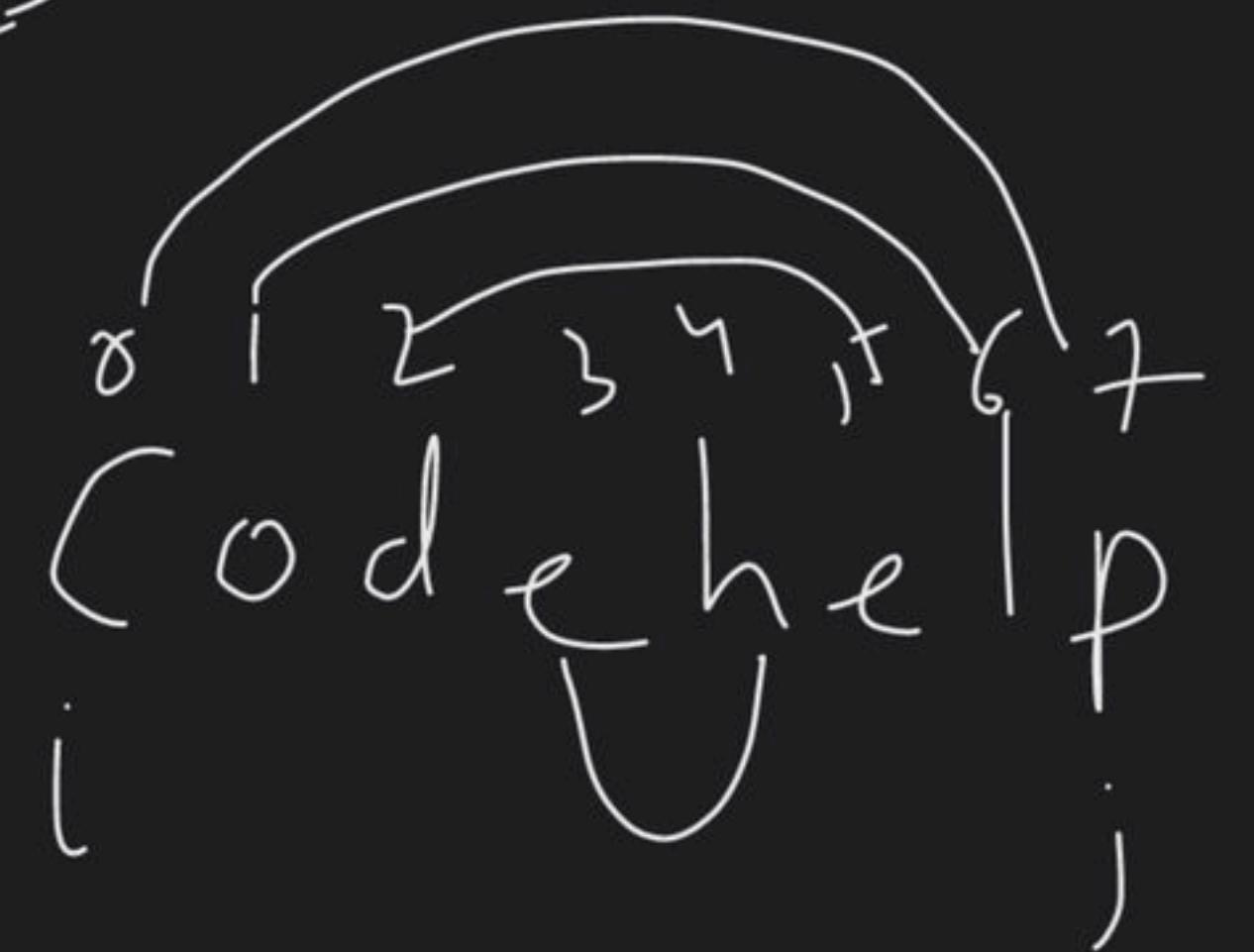


char ch[10] = {0};
null
↓
shlen(ch) ← length

length



Revenue sharing



\Rightarrow

Upper Case Conversion

\equiv

~~* ch - 'a' + 'A'~~

Lower Case

char ch = 'a'

char Uch = toupper(ch)

char ch = ~~toupper(ch)~~

if (ch >= 'a' & ch <= 'z')

Lowercase

~~* ch - 'A' + 'a'~~

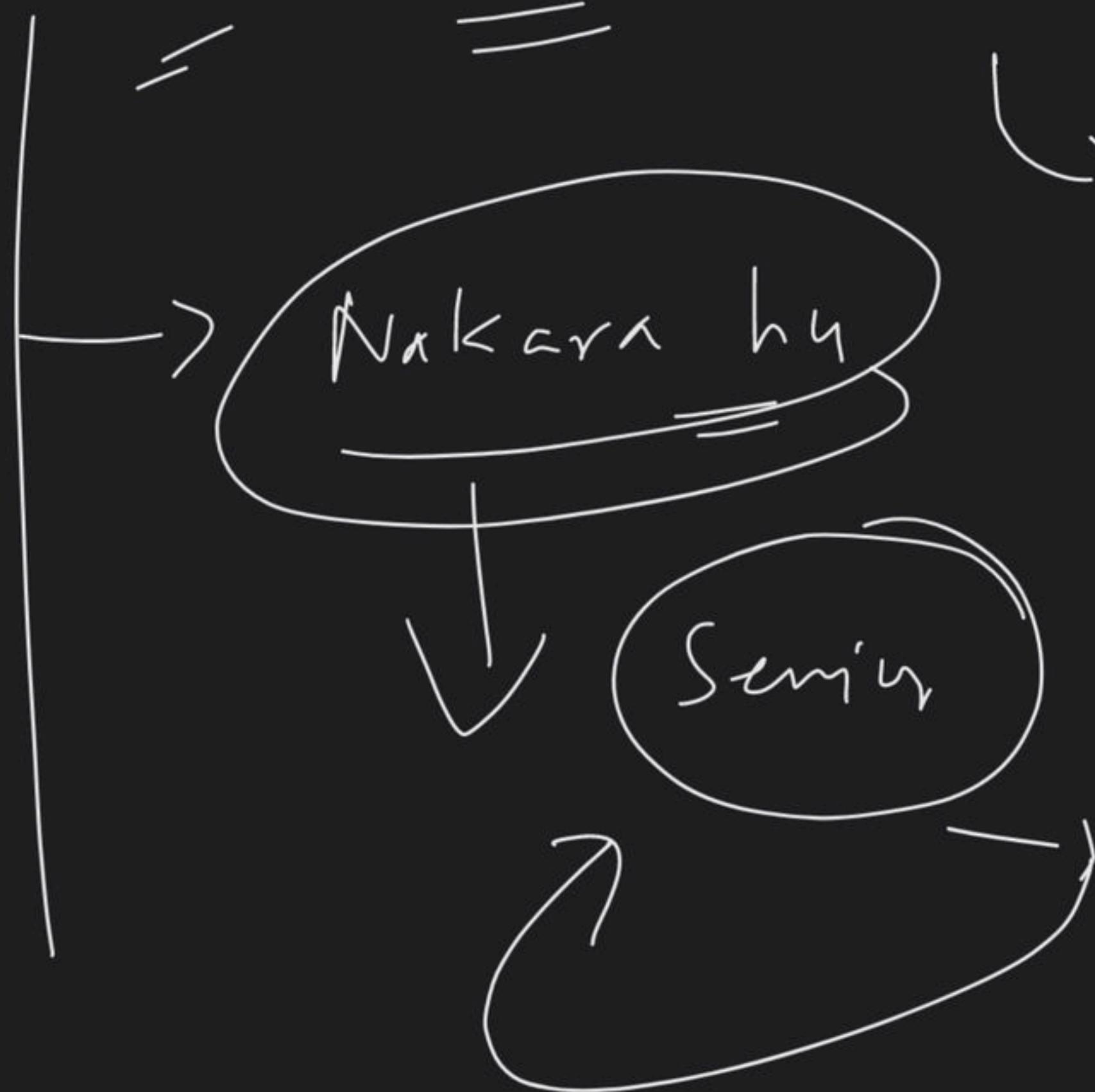
~~* A~~

\rightarrow tolower()

\Rightarrow Replace @ with space char


~~@~~ ~~@~~

⇒ Check Palindrome ✘ ✘



ini. → std.

→ std::

I um

(n, p);

=>

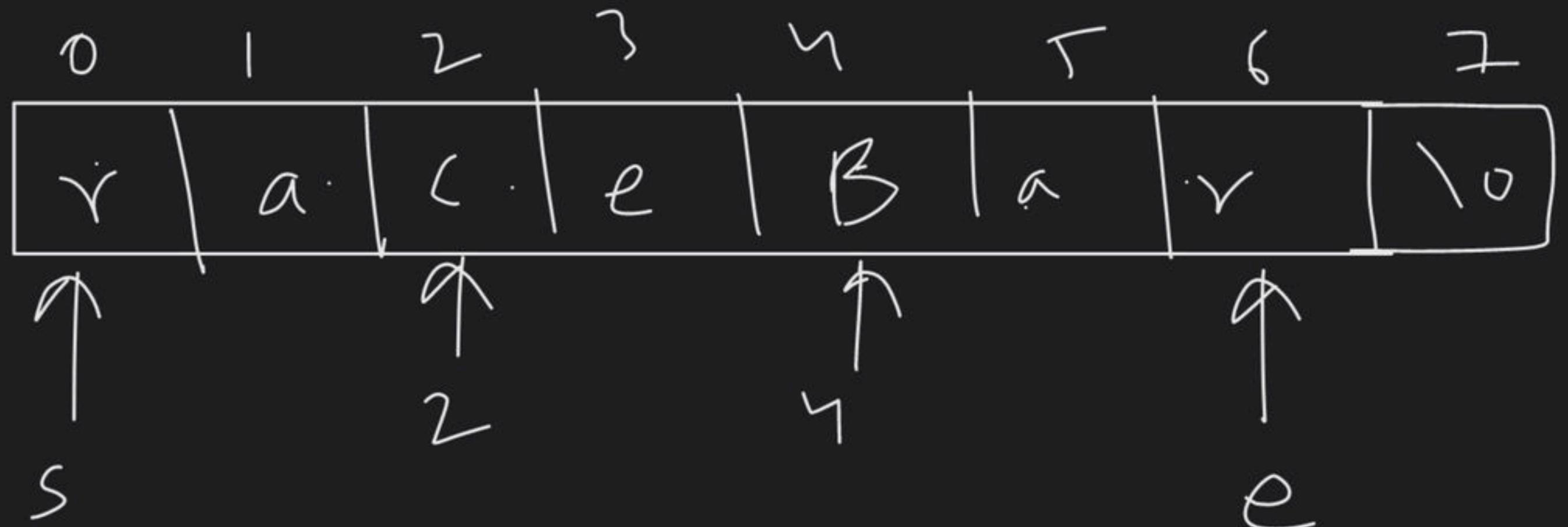
char ch[10];

cin >> ch;



enter
=

"
racecar "
=



$$s = 0$$

$$e = \text{strlen}(ch) - 1$$

$$\Rightarrow s = 0, e = 6, r = r$$

$$\Rightarrow 1, s, a = a ?$$

$$\Rightarrow 2, r \rightarrow c = B; r$$

$$\Rightarrow$$

while ($s < e$)

{ if ($ch[s] \neq ch[e]$)
return false.

$s++$, $e--$

3 \rightarrow return true;

STL \Rightarrow String \Rightarrow Decl

Duniya's behaviour \Rightarrow hotcha.
size, length, \rightarrow substr, push_back
 $\oplus \ominus$
s.find()

s + b \Rightarrow s.pop.

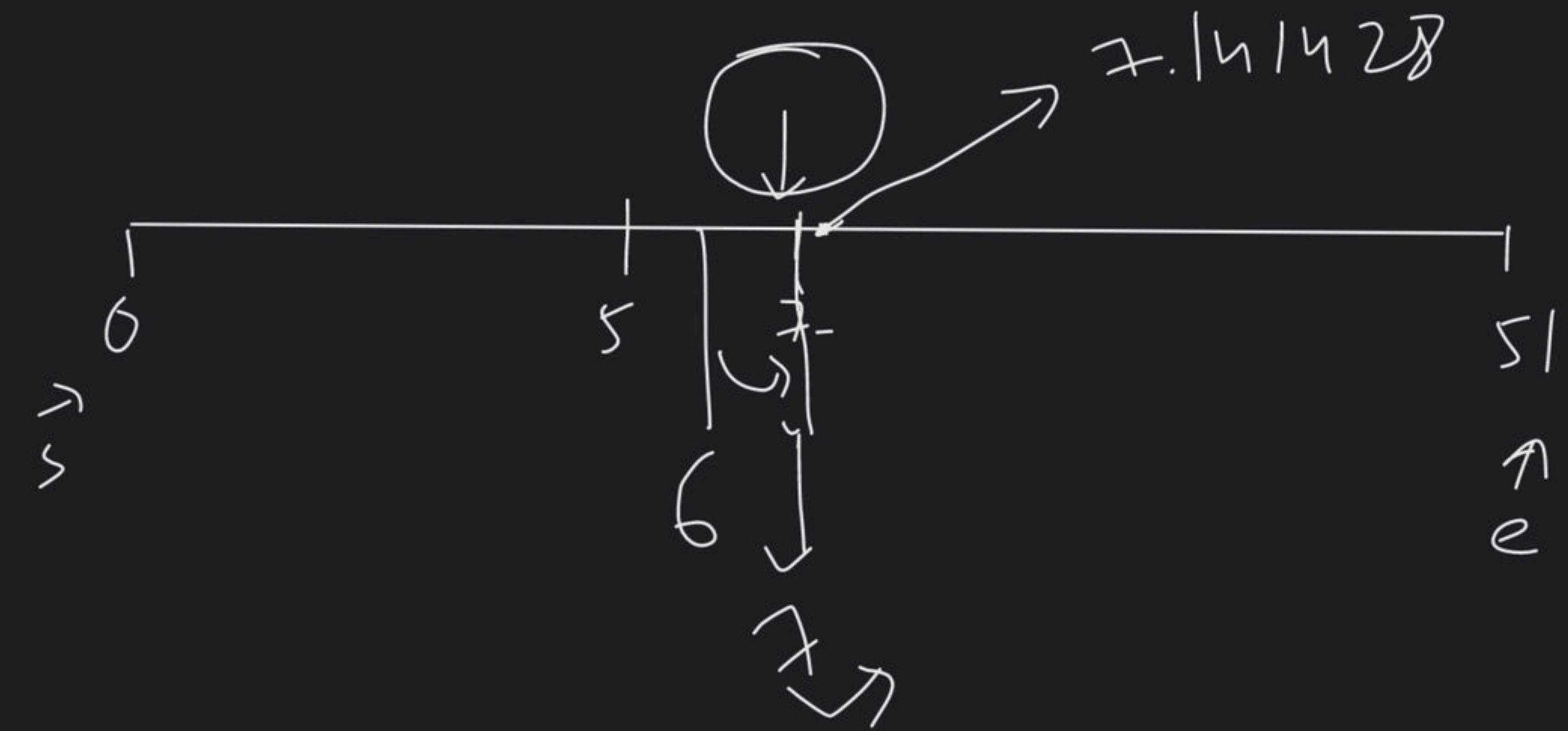
$\Rightarrow \sqrt{x}$ / Divide ~~long~~ BS's prec.

↳ 2 min plain ~~cross~~

Q => Find sqrt of an integer using B.S

$$N = 51$$

$$\sqrt{51} = 7.141428$$



$$OS = 0$$

$$mid = 25$$

$$l = 51$$

$$\frac{50 + 51}{2} \Rightarrow$$

$$mid * mid \leq 51$$

↓ false

go left

(2) $s = 0$

$$m = 12$$

$$l = 24$$

$$12 * 12 \not\leq 51$$

left gap

(3) $s = 0$

$$n = 5$$

$$l = 11,$$

$$5 * 5 \leq 51 \checkmark$$

$$ans = 5$$

(4) $s = 6$
 $e = 11$

$$m = 8$$

$$8 * 8 \not\leq 51$$

left ja

(5) $s = 6$
 $e = 7$

$$m = 6$$

$$6 * 6 \leq 51 \checkmark$$

ans = 6

(6) $s = 7$
 $e = 7$

$$m = 7$$

$$7 * 7 \leq 51 \checkmark$$

ans = 7
8 \neq 7 STOP

(7) $s = 8$
 $e = 7 \Rightarrow s \leq e$

1

best integer

sqr^t hikaku ha =

F

$$\begin{array}{r} 7.1 \\ + 0.01 \\ \hline 7.11 \end{array}$$

$$7.1414 \dots$$

$$7.14141414 \dots$$

1

$$\text{sqr}t = 7.14$$

j = 7.1

$$j = 7.1$$

while ($j * j \leq N$)

$$\begin{cases} \text{sqr}t = j \\ j += 0.01 \end{cases}$$

$$7.14 * 7.14 \leq 51$$

✓

$$j = 7.14 + 0.01$$

$$7.15 \rightarrow$$

$$7.15 * 7.15 \not\leq 51$$

Code \rightarrow Xcode \Rightarrow mac
 \downarrow
 $=$

\Rightarrow Doubts
 $=$



1 $(\log^* p_{rel})$
 $O(p)$

2 $\log^{10} p$
 $O(p)$

```
double myPrecisionSqrt(int n)
{
    double sqrt = mySqrt(n); ←
    int precision = 10; |
    double step = 0.1;
    for (int i = 0; i < precision; ++i)
    {
        double j = sqrt;
        while (j * j <= n) ✓
        {
            sqrt = j;
            j += step;
        }
        step /= 10;
    }
    return sqrt;
}
```

sqrt \Rightarrow 7.19
Step = 0.0001
 $j = 7.01$
while $\sqrt{3} \leq 7.19$
 {
 if $\sqrt{3} \leq 7.19$
 {
 ...
 }
 }
Step = 0.16 |
10

~~Q~~ → Precision Divide

if Dividend = 29

Divisor = 7

4, -----

~~Q~~ uotient
in Precision

$$\begin{array}{r} 29 \\ \overline{)7} \end{array}$$

