



Searching & Sorting - Level 3

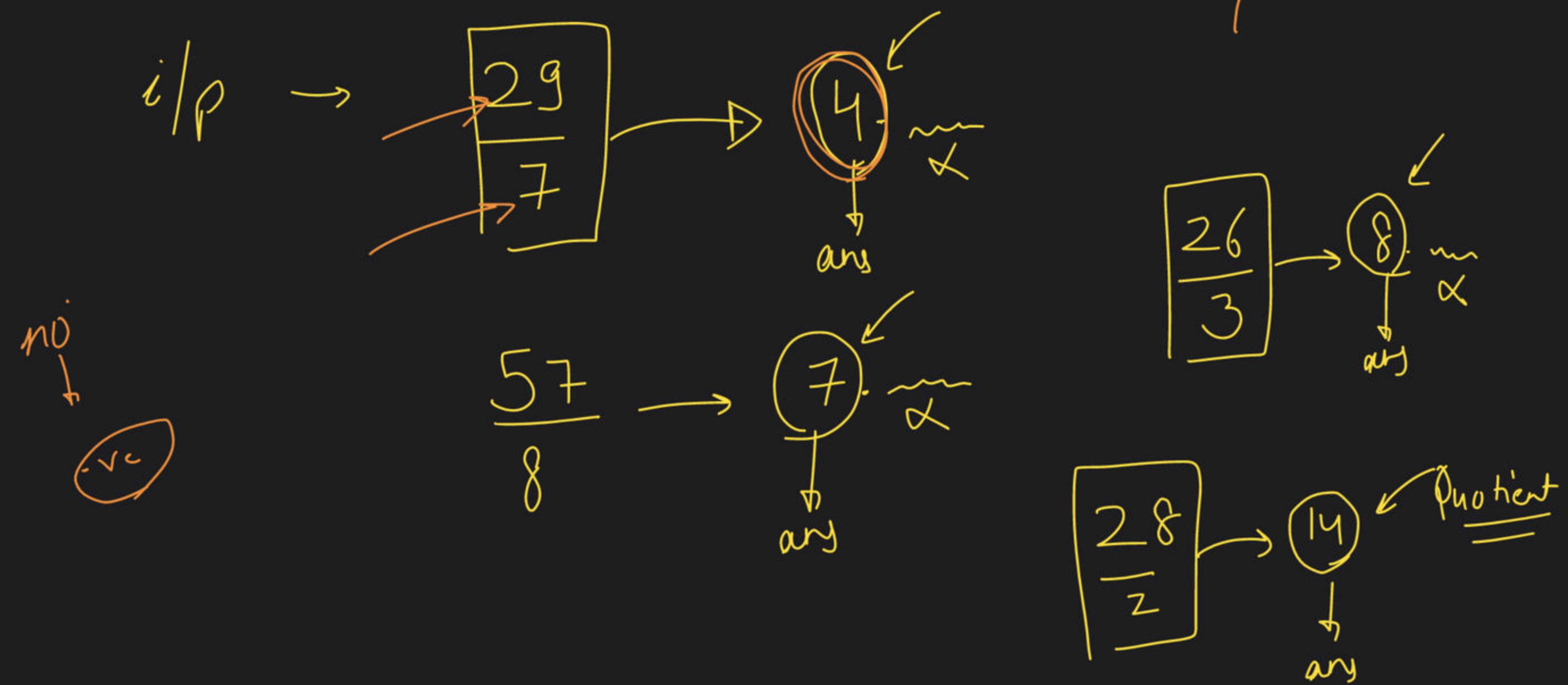
Special class

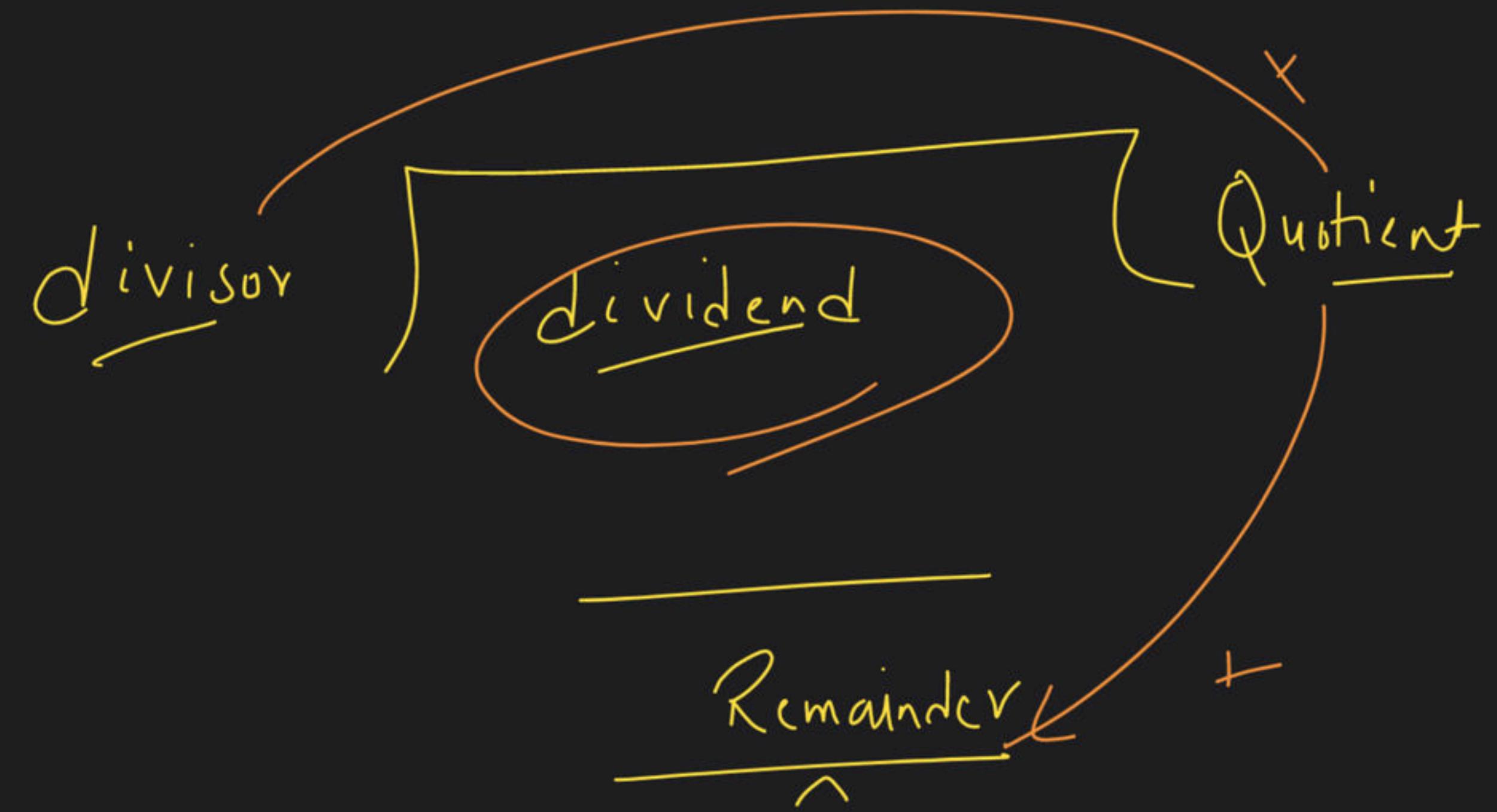
\rightarrow β_{binary}

$\beta_{\text{canch.}}$

$$\sqrt{38}$$

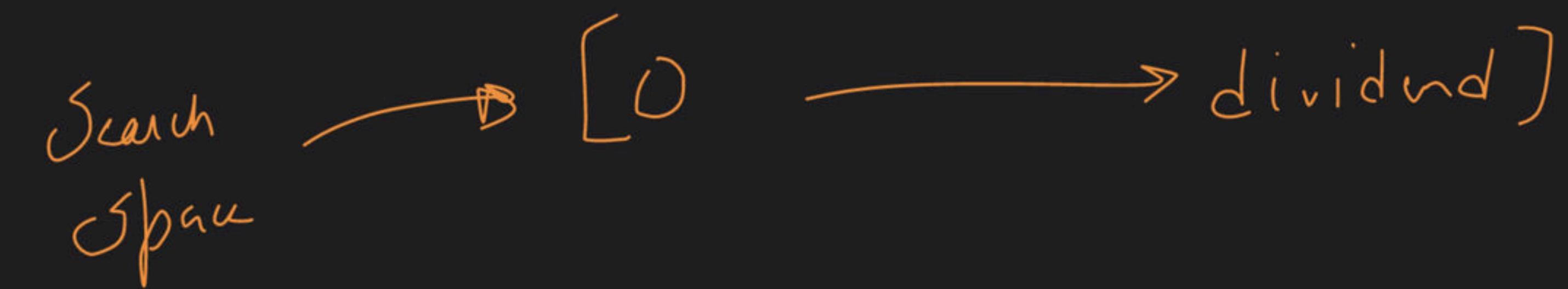
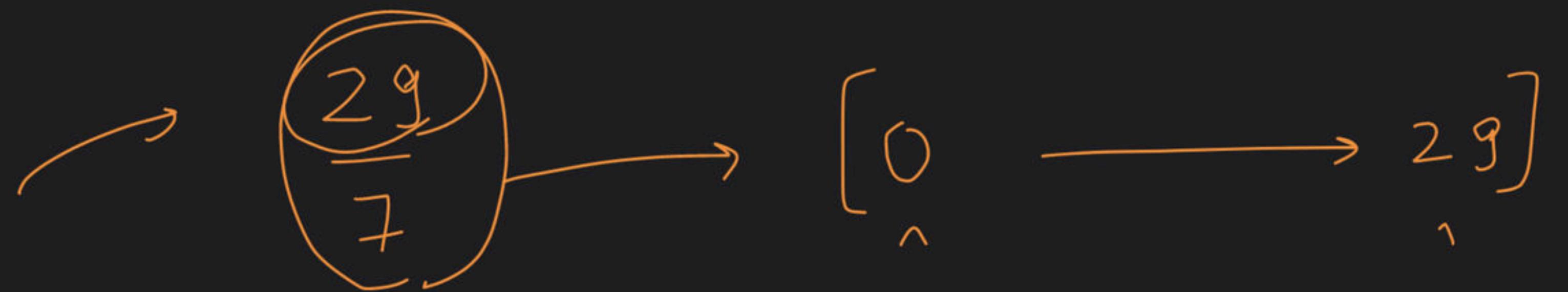
$$[0 \xrightarrow{\quad} 38] \\ \uparrow \beta \cdot S \\ \boxed{6}$$





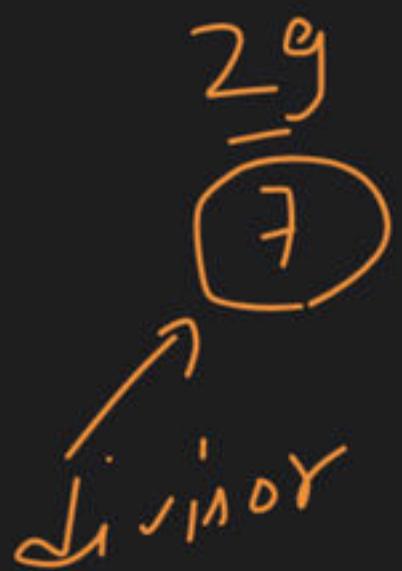
$$\text{Quotient} * \text{Divisor} + \cancel{\text{Remainder}} = \text{Dividend}$$

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

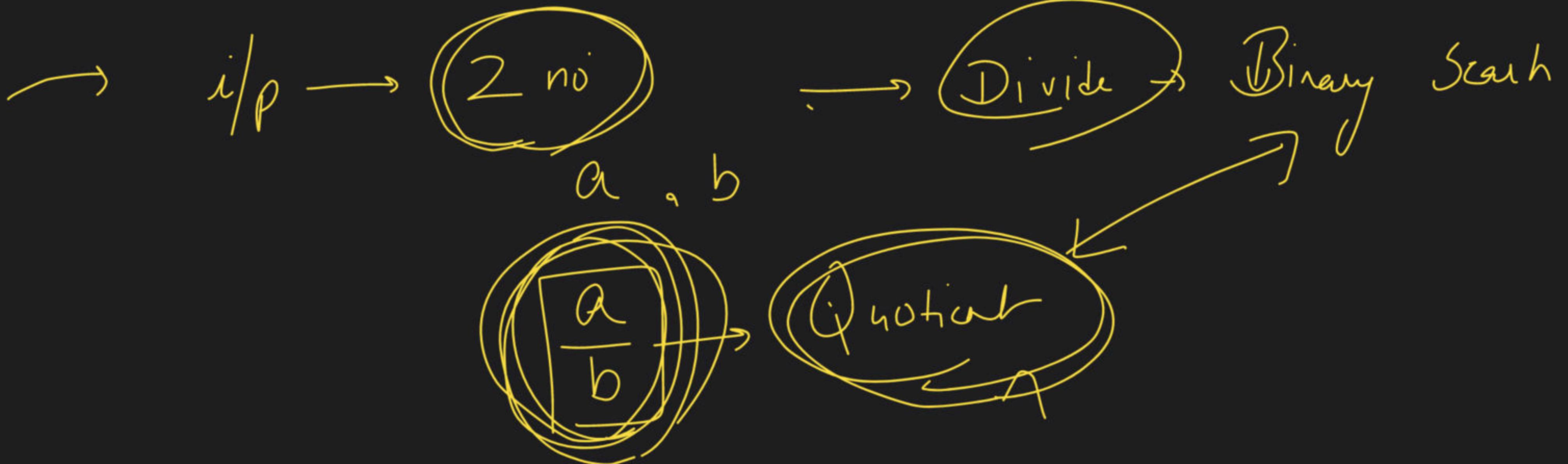




$l=0$, $r=29$, $mid = \frac{0+29}{2} = \boxed{14}$
is 14 a possible answer?



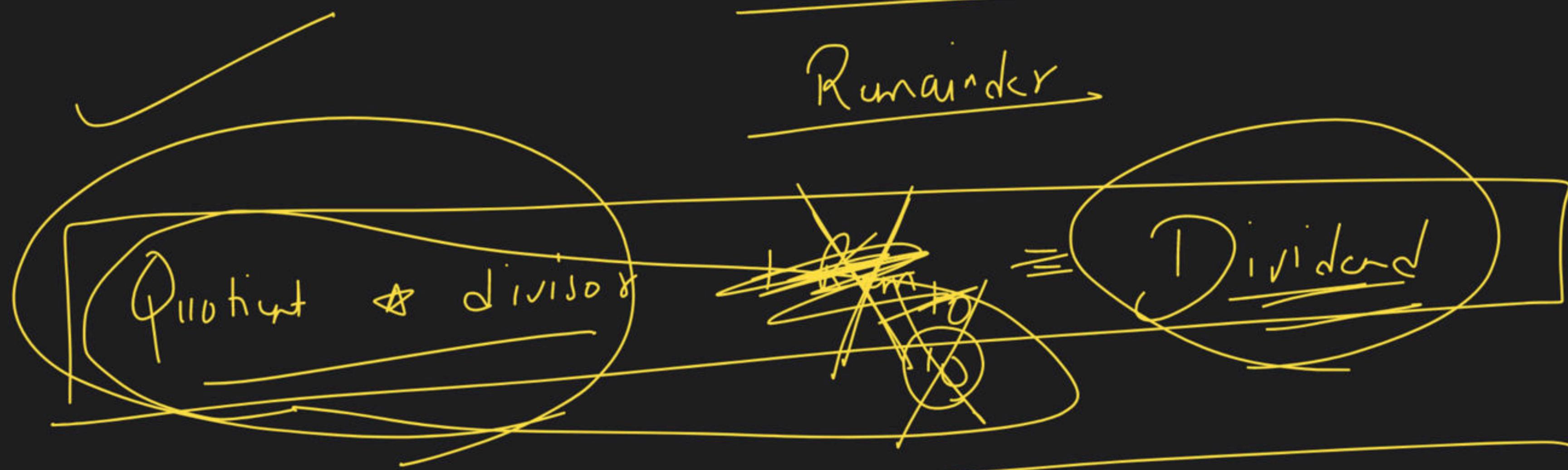
$Q \times D_{14}$



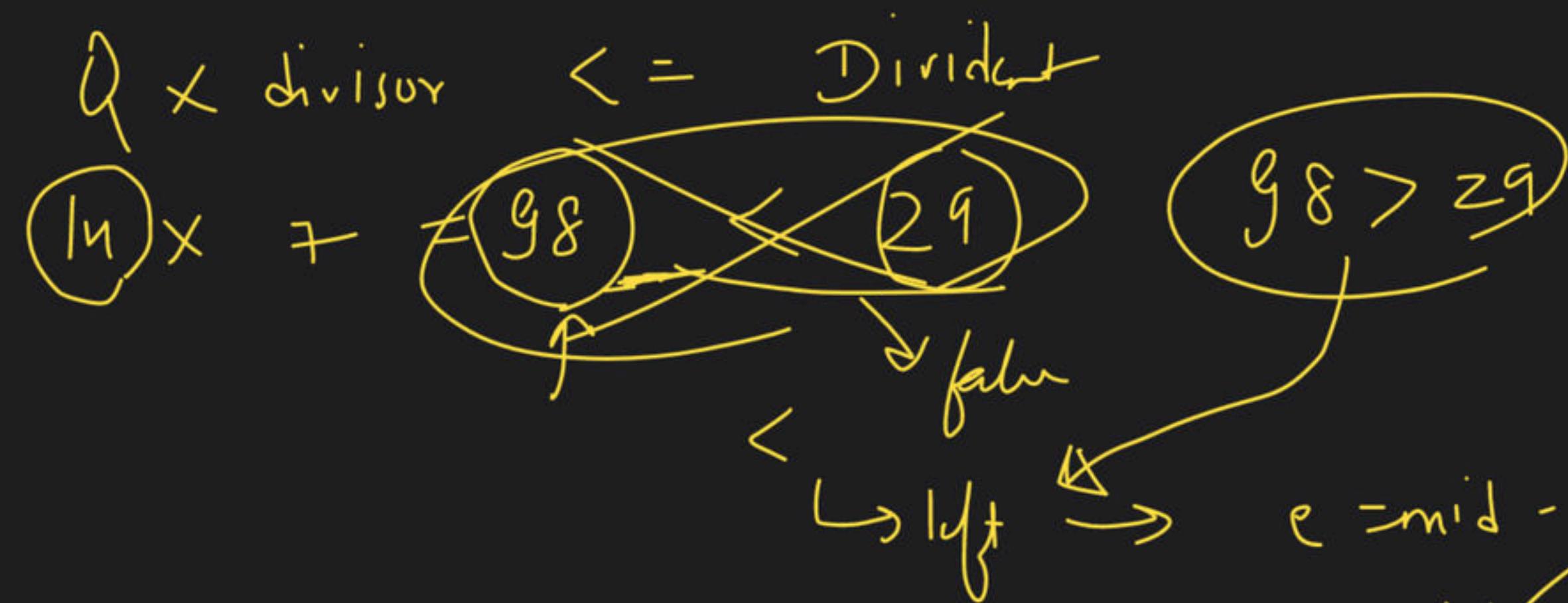
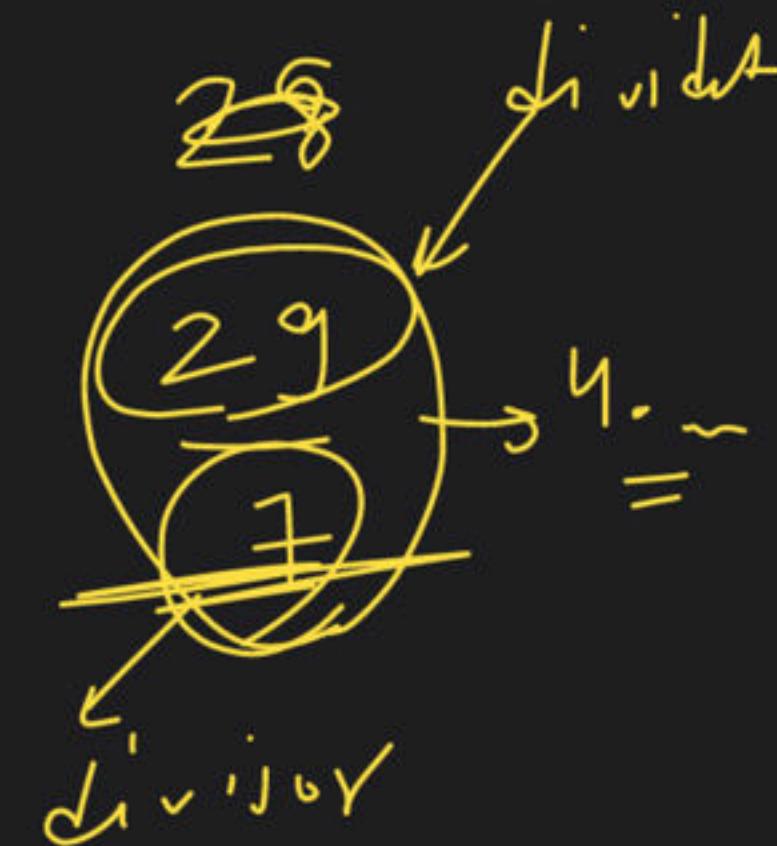
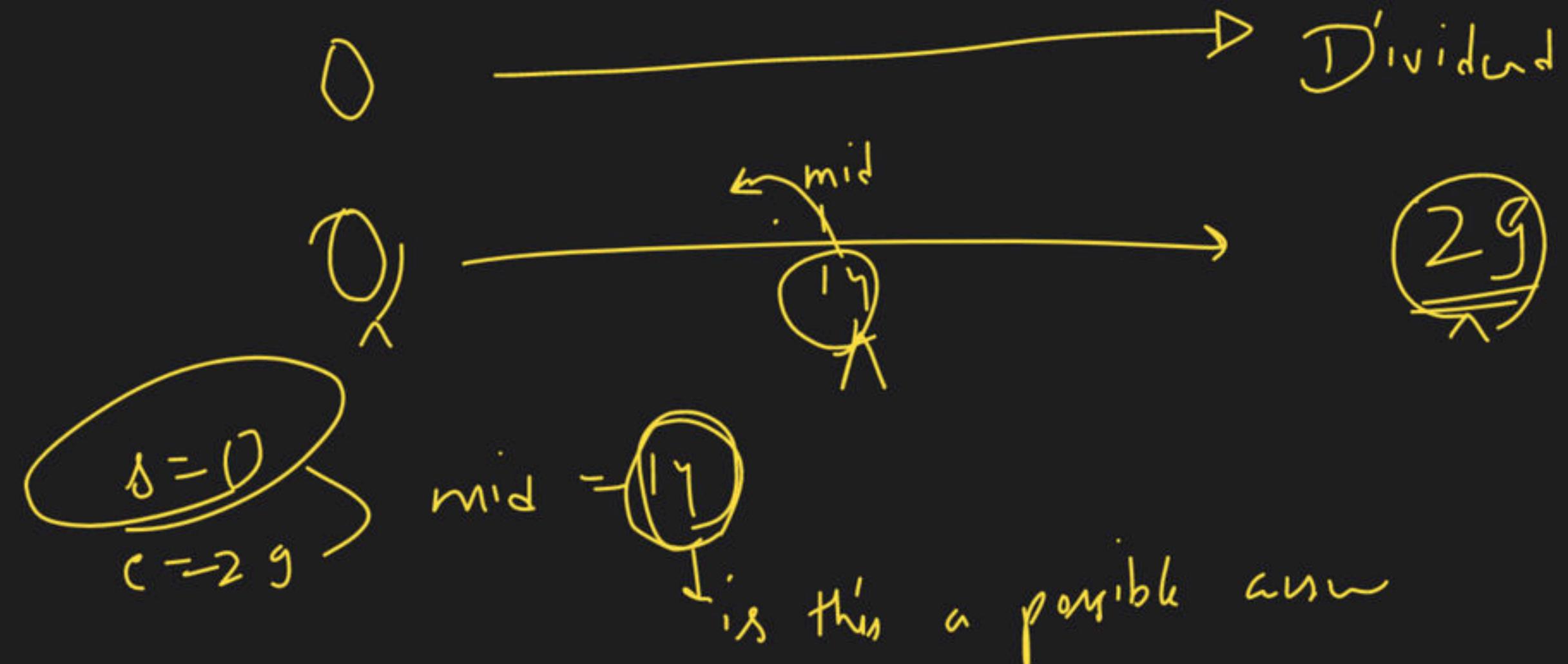
$$\begin{array}{r} 28 \\ \times 7 \\ \hline 28 \end{array} \quad \rightarrow (7)$$
$$\begin{array}{r} 28 \\ \times 14 \\ \hline 28 \end{array} \quad \rightarrow (14)$$

divisor] dividend Quotient

—————
Quotient



Quotient * divisor <= Dividend



$$\begin{aligned}
 e &= \text{mid} - 1 \\
 c &= b - 1 = 13
 \end{aligned}$$

$$0 \xrightarrow{\quad} \text{mid} \xrightarrow{\quad} 13$$

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

$s=0$
 $e=13$

$Q \times \text{divisor}$ divided

$$6 \times 7$$

$$m_2 \rightarrow 2^9$$

$$\left\{ \begin{array}{l} l = mid - 1 \\ \dots \end{array} \right.$$

$$= 6 - 1$$

$\rightarrow 5$



ans = 2

$$g = 0$$

e \rightarrow

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

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

$$2 \times 7 <= 25$$

$14 <= 25$

Valid as

ans store

right

$\rightarrow \text{mid} \rightarrow 1$

$\rightarrow Q \rightarrow 3$



$$D = 3 \rightarrow \text{mid} = \frac{3+5}{2} = 4$$

$$e = 5$$

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

$$4 \times 7 \leq 2^9$$

$2^8 \leq 2^9 \rightarrow \text{Valid ans}$

→ ans shown

→ right

$$S = \text{mid} + 1$$



$S \xrightarrow{\quad} S'$

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

$0 \leq i \leq$
 $c \geq s$

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

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

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

left

$c > mid - 1$
 $\leftarrow 5 - 1$
 $c = 4$

$$j > i \\ i = 1$$

$i > c$

$W < j^n^0$

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

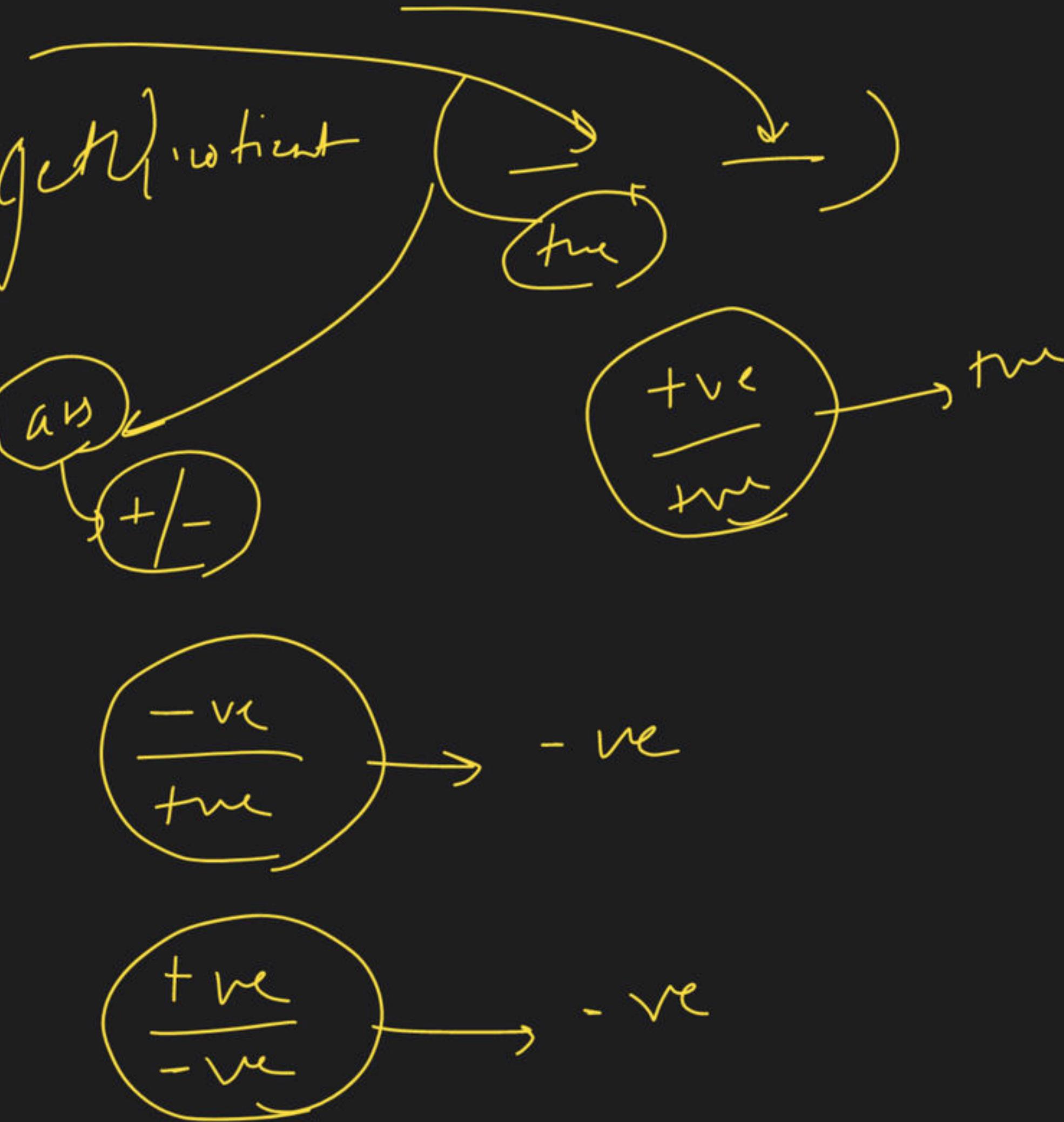
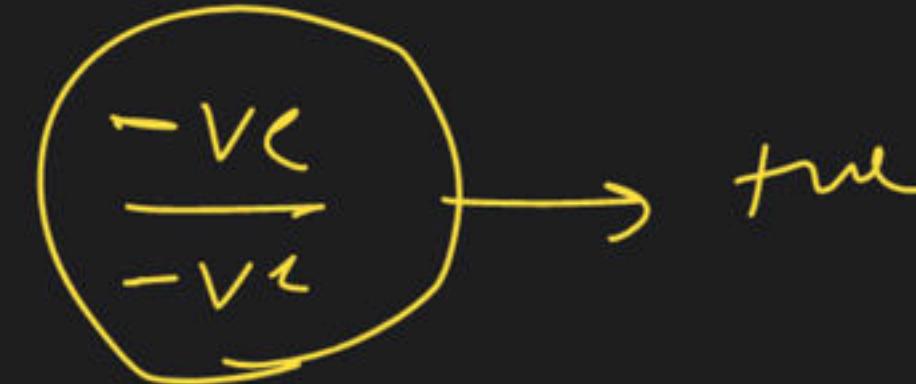
$Q \rightarrow \text{final digit}$

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

and
right

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

left

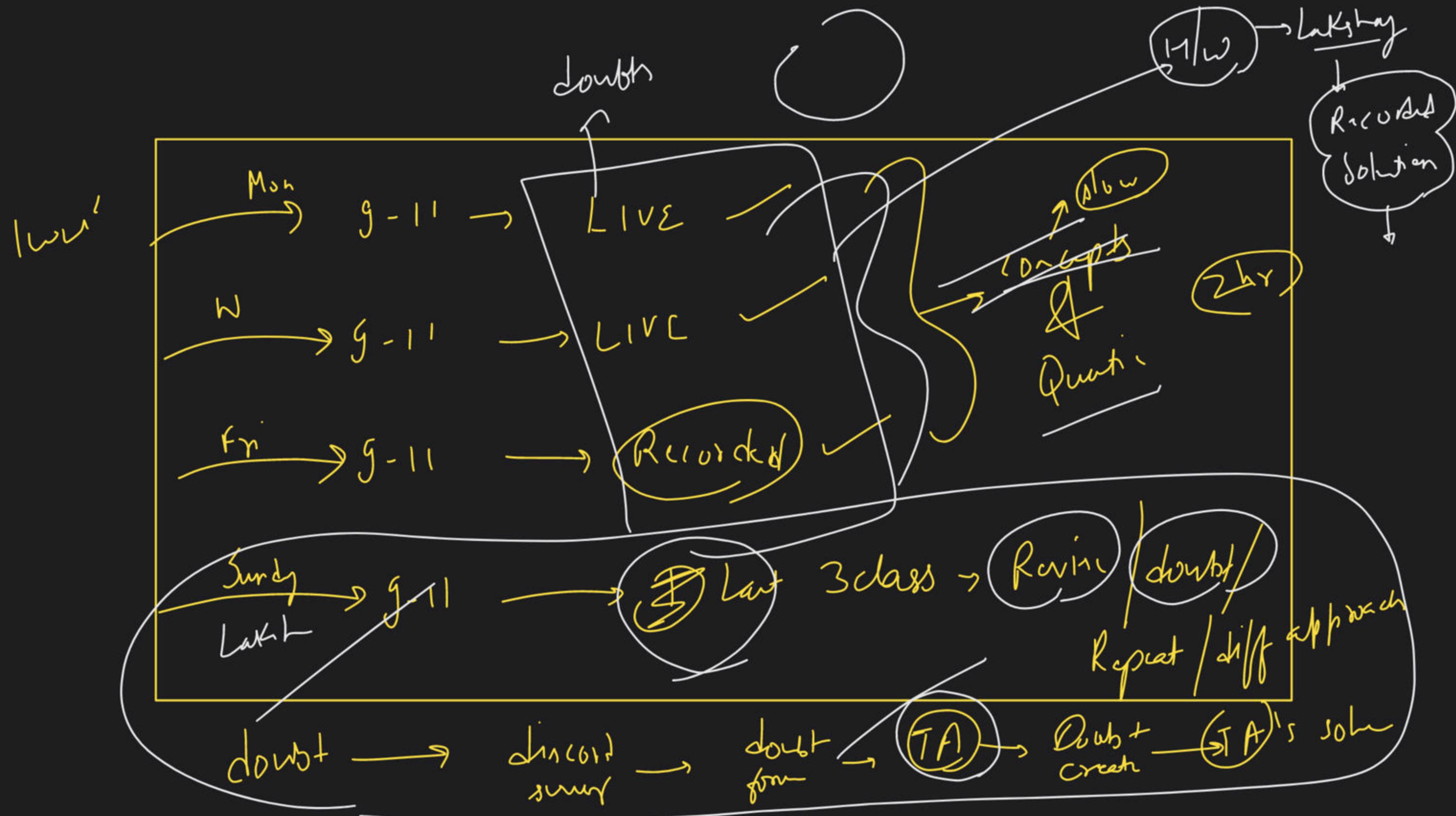


$$\sqrt{\gamma} \rightarrow \eta/\omega$$

$$\sqrt{35} \rightarrow 6 \text{ (precision)}$$

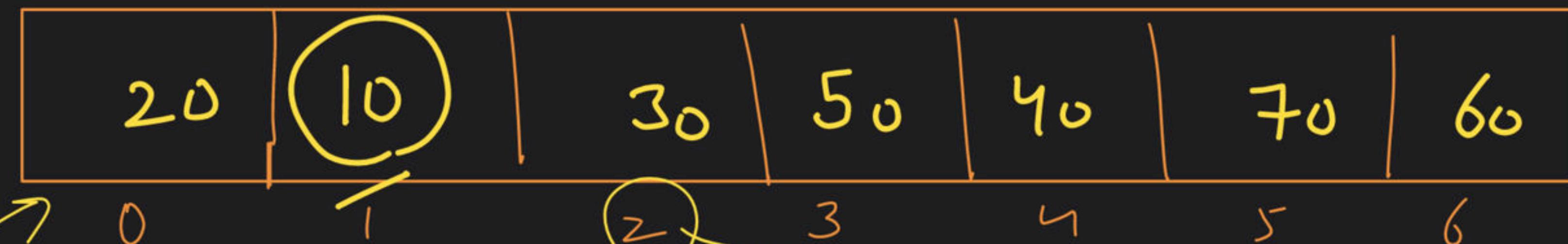
$$\text{dilate} \rightarrow \frac{29}{7} \rightarrow 9 \cdot \eta/\omega$$

(2 digit)

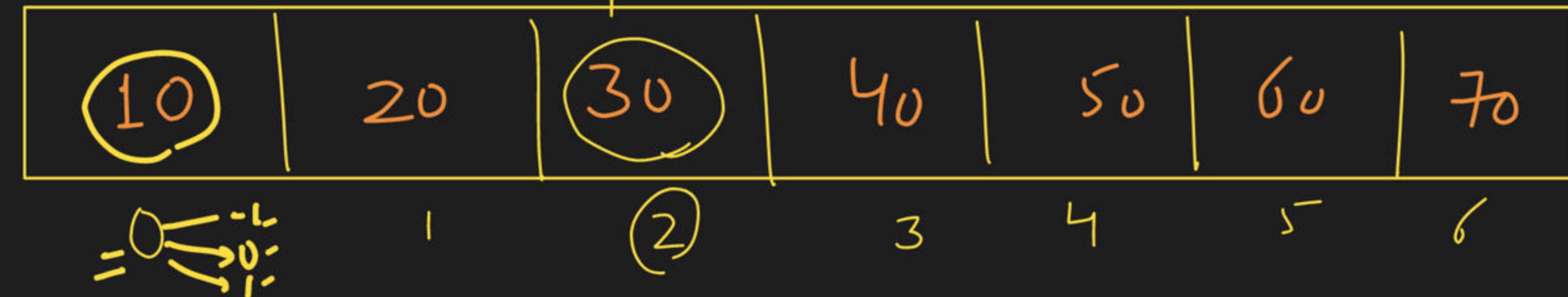


→ Binary Search on nearly sorted Array

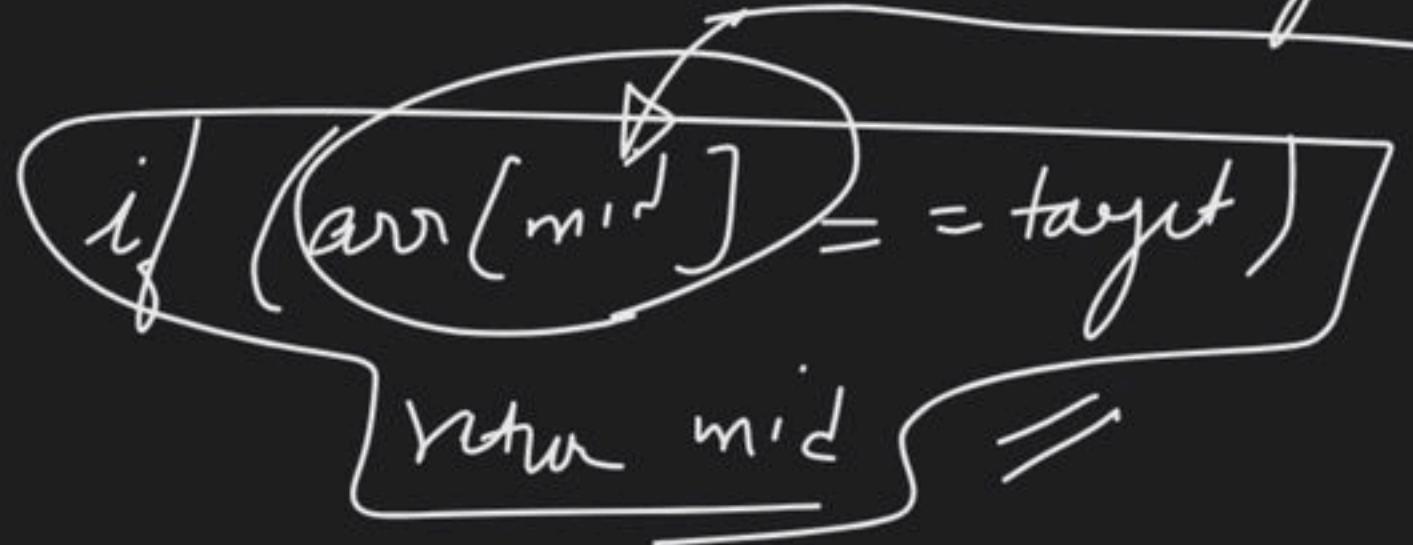
nearly sorted array



Sorted array



normal sorted array



mid
 $\text{mid} - 1$
 $\text{mid} + 1$



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

else

Left

nearly sorted array

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

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

if ($\text{arr}[\text{mid} + 1] = \text{target}$)
return $\text{mid} + 1$

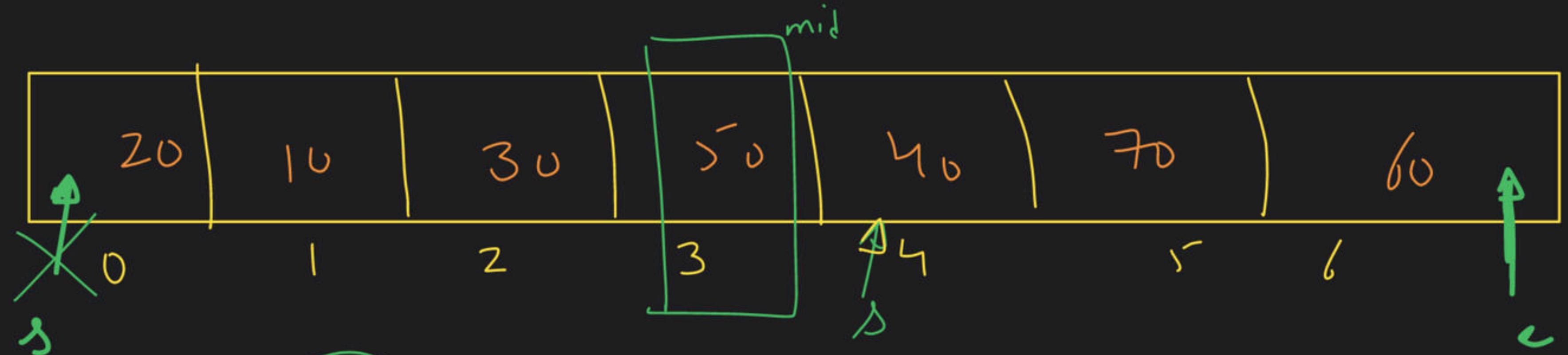
if ($\text{target} > \text{arr}[\text{mid}]$)
Right

else

Left

Left

Left



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

$$e = 6$$

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

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

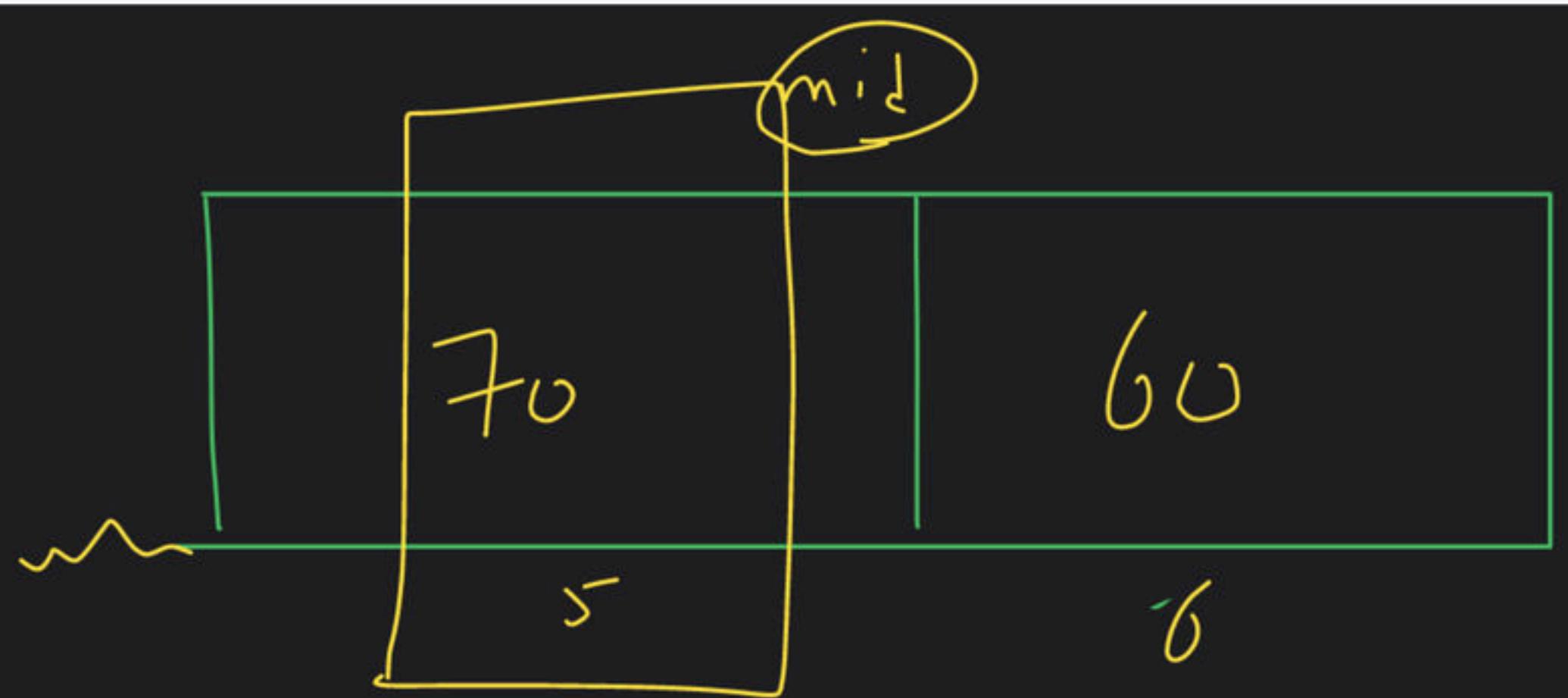
$\text{arr}[mid + 1] \rightarrow 40 = -70 \times$

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

$\text{target} > 50 \rightarrow \underline{\underline{\text{right}}} \rightarrow \boxed{j = mid + 1}$

$s = mid + 2$

$\text{target} = 70$



$$\begin{aligned} s &= 5 \\ e &= 6 \end{aligned} \rightarrow \text{mid } 25'$$

$\mathcal{F}_0 = = \mathcal{F}_0$ ↗
↗ $\Rightarrow \text{char } 5'$



$$s = 0 \\ c = 6 \rightarrow \text{mid} = 3$$

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

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

$\cancel{\text{arr}[\text{mid} + 1] = 40 = 20}$

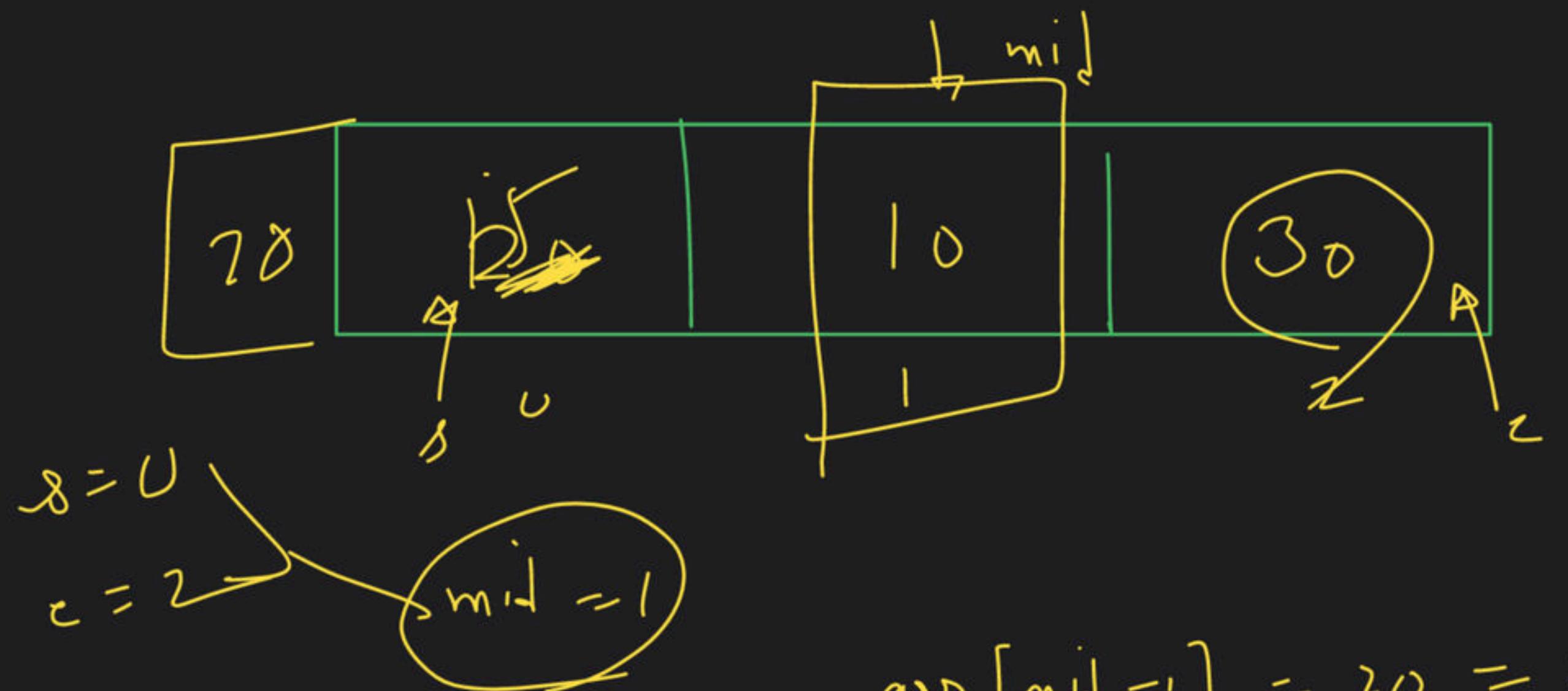
if ($\text{target} > \text{arr}[\text{mid}]$)

$20 > 50 \rightarrow \text{false}$, left = $c = \text{mid} - 1$

$\text{target} = 20$

catch

$c = 3 - 1$
 $c = 2$



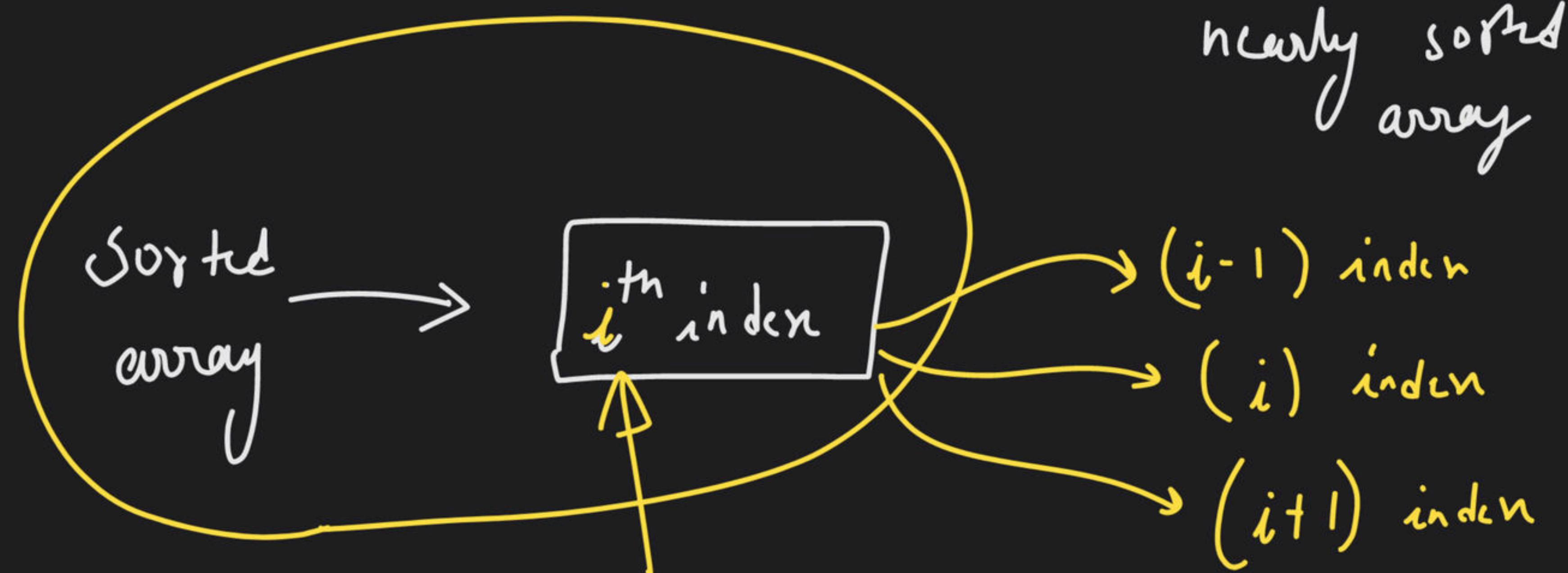
$$arr[mid - 1] = 20 = = 20 \quad \checkmark$$

$$arr[mid]$$

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





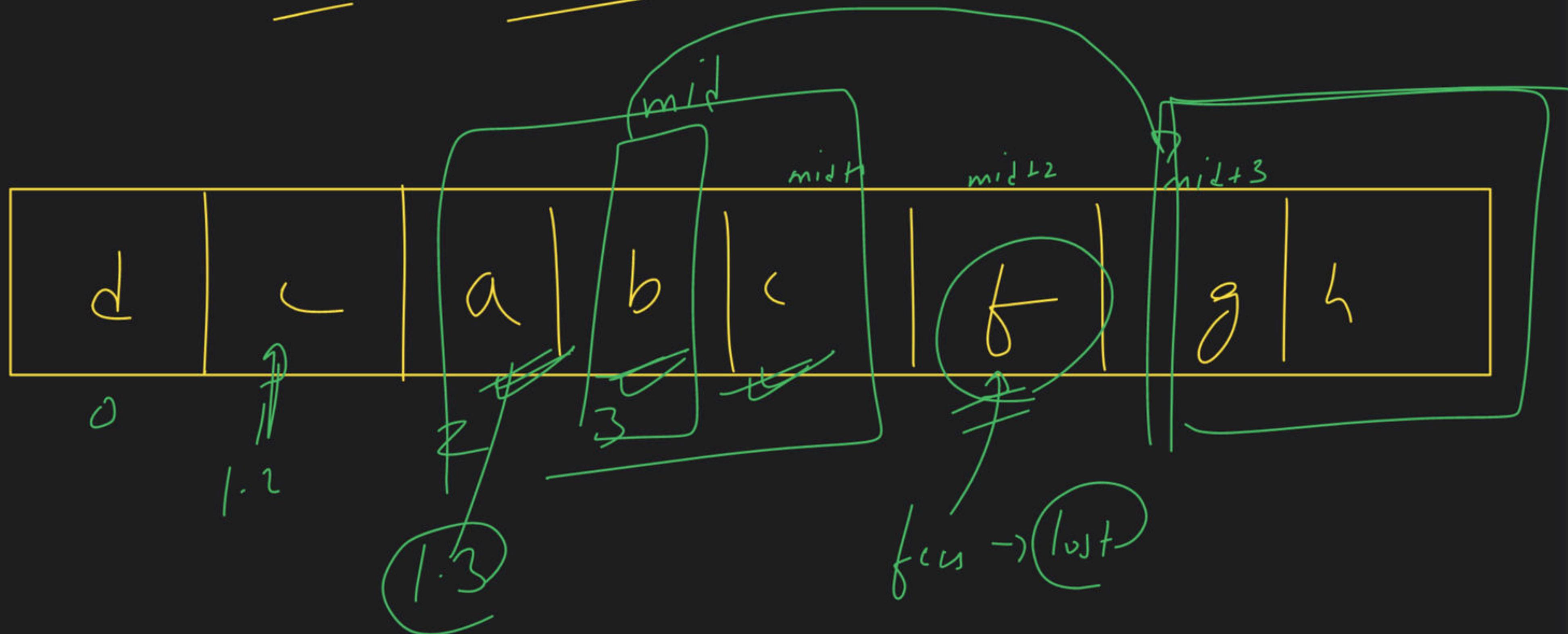


Panc

Break

→ 2

min



20 h

fish has

50 %

170 hr

200 hr

26 Oct

Studi Obj

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

Find the odd occurring element

$\Sigma_{i=1}^n k_i \geq 1$

find elements
that occurs
odd times

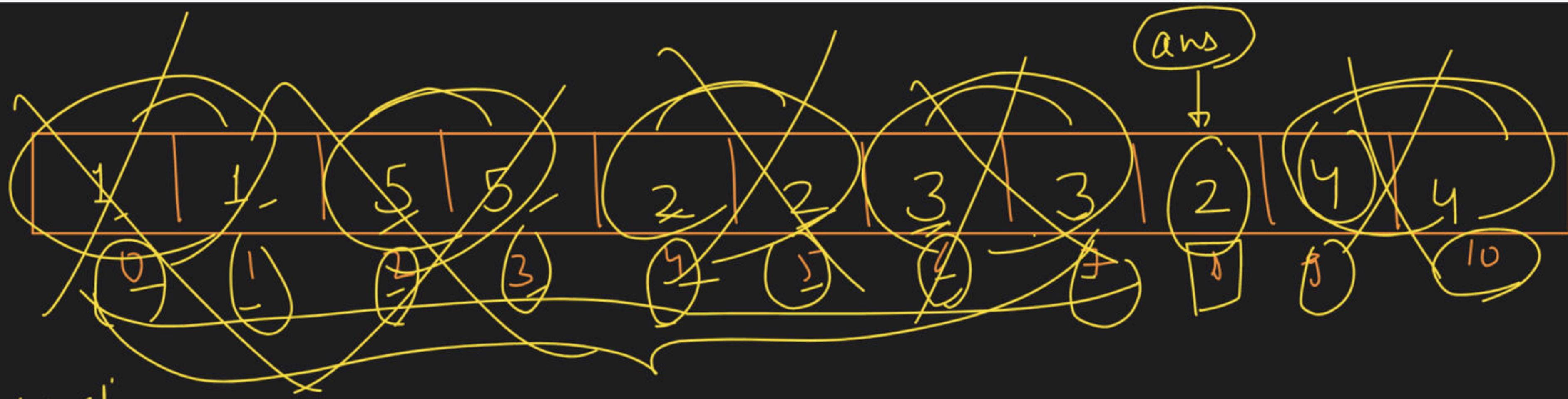


all elements → even no. of times occur
except one → odd

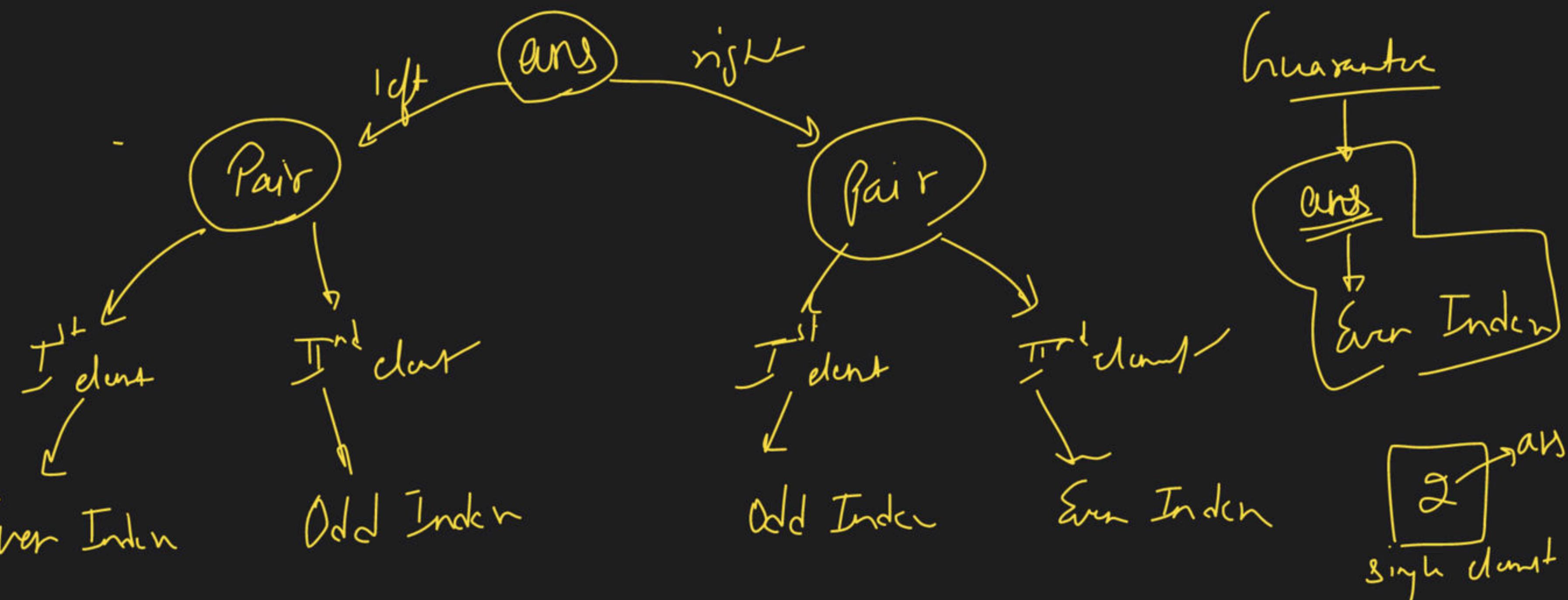
all repeating no. → pairs repeat

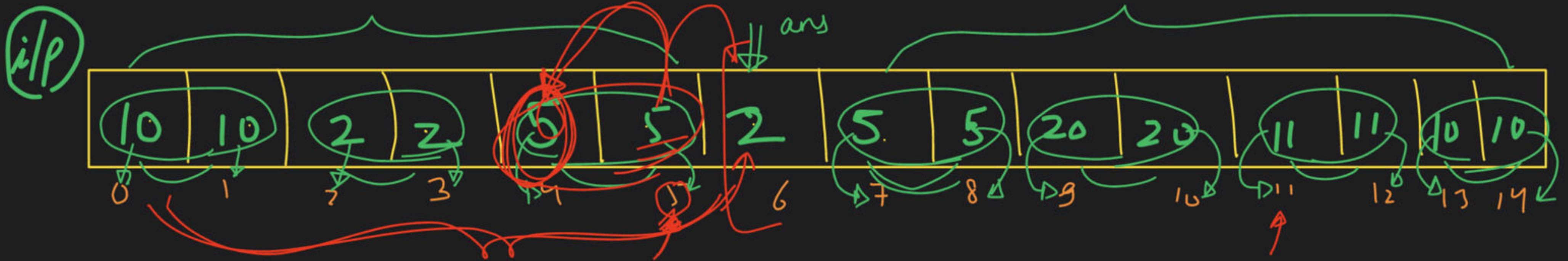
& pairs are not repeated

check baan me koi bhi no. 2 se
jader baan nahi aor ΔK_L

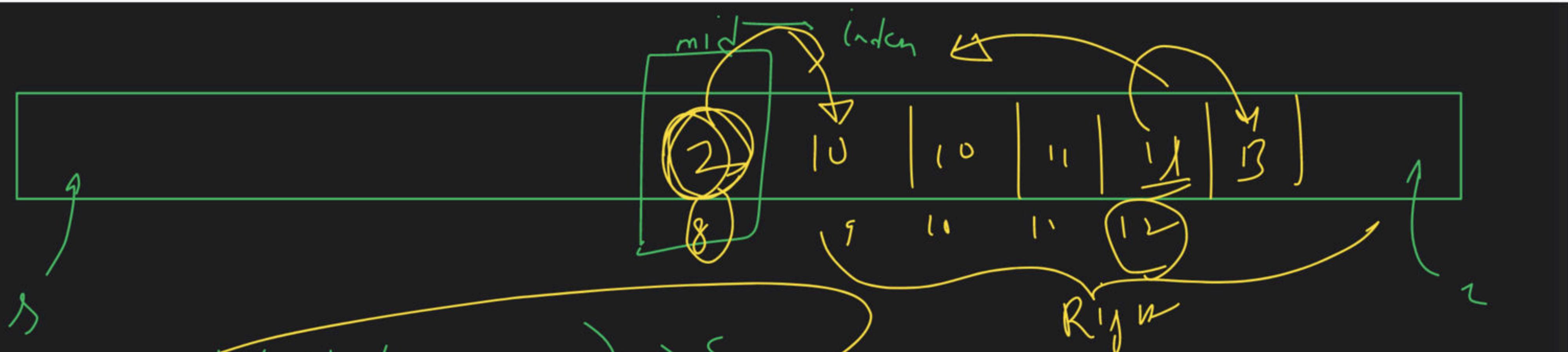


Observation





The diagram illustrates a stack structure. At the top, the word "Stack" is written above a horizontal line. Below this line, there is a square box containing the number "2". Two arrows point to this box: one from the left labeled "s" and one from the right labeled "c". Below the line, the variable "s" is shown pointing to the number "2" in the box. To the right of the box, the variable "c" is shown pointing to the same number "2".



$\text{if } (\text{mid} \% 2 == 0) \Rightarrow \text{Even}$

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

$\rightarrow \text{right} \rightarrow s = \text{mid} + 2$

else

$\rightarrow \text{right} / \text{ans}$

$\rightarrow \text{mid} \rightarrow \text{why}$

Peak
in
mount

```
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]) → s=mid+1  
else e=mid-1
```

else → even

```
if (arr[mid] == arr[mid+1]) → s=mid+2  
else {  
    c=mid;  
    do {
```

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 $\leftarrow \text{arr}[n]$

