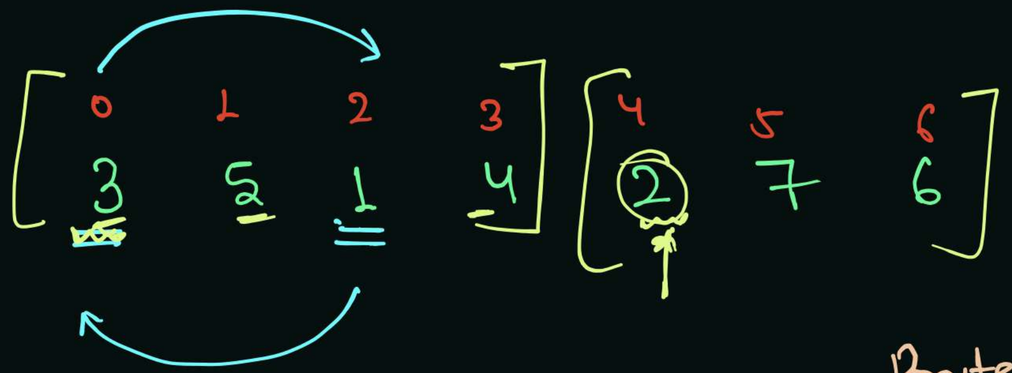
Count Inversion

Sunday, 14 November 2021 11:17 AM



Arrays
Search n Sorting
Bits

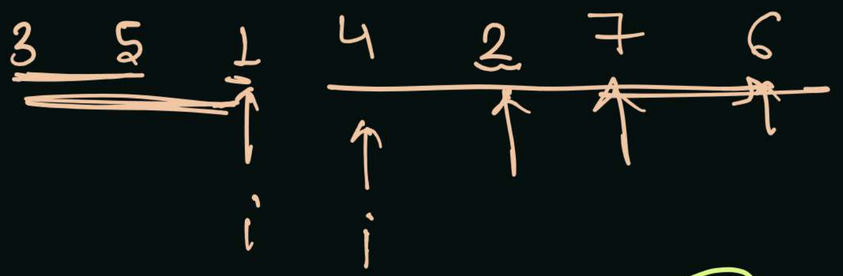
Condition for Inversion count

(*) arr[i] > arr[j]
and
i < j

→ It is responsible condition for Inversion.

At smaller index, there is a greater value.

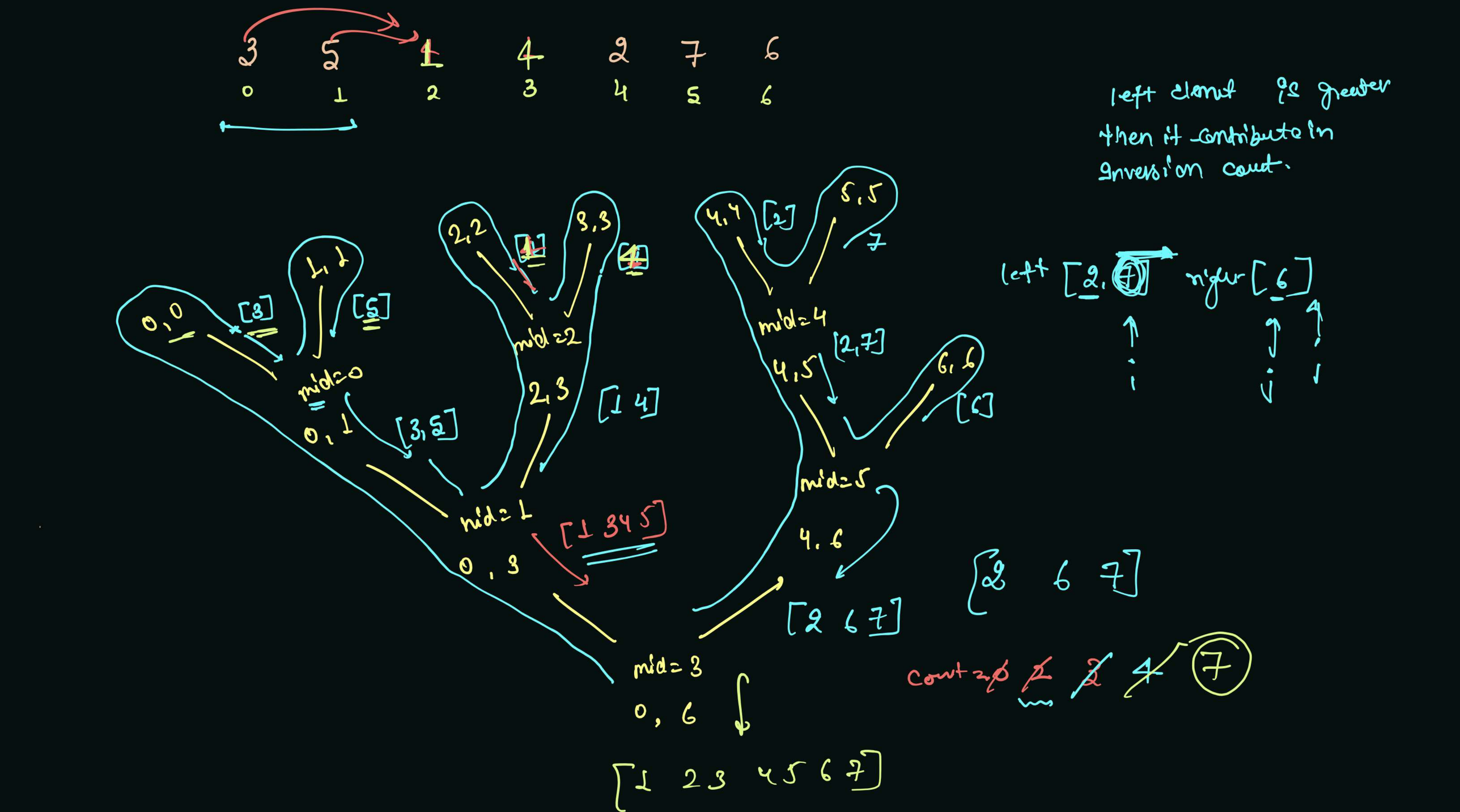
Brute force → Time complexity - $O(n^2)$

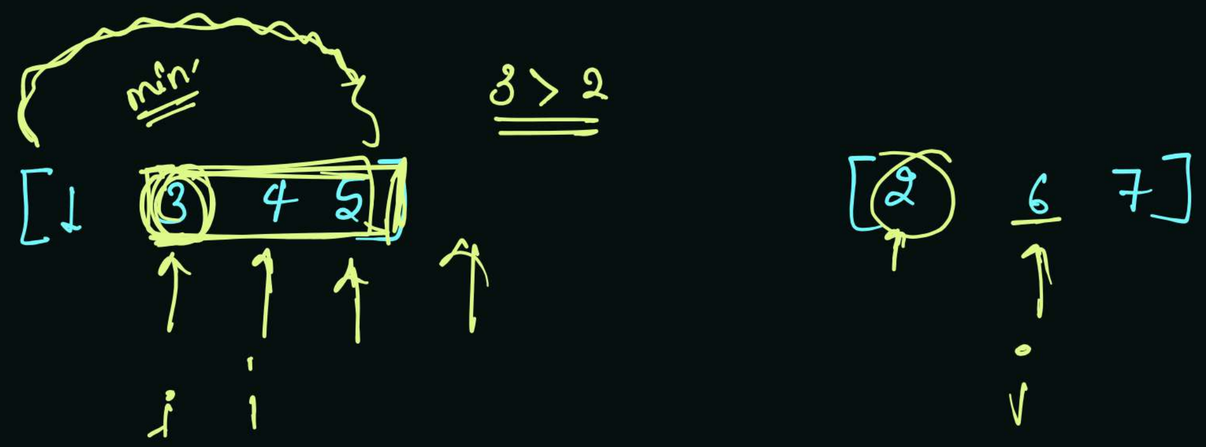


(f) Ans

8-1
8-2
5-1
5-4
5-2
4-2
7-6

Allowed time complexity - $O(n \log m)$


3 5 1 4 2 7 6
0 1 2 3 4 5 6
left element is greater then it contribute in inversion count.
0,0
1,1
2,2
3,3
4,4
5,5
6,6
mid=0
mid=2
mid=4
mid=1
mid=5
mid=3
[3]
[5]
[1]
[4]
[2]
[7]
[6]
0,1
[3,5]
2,3
[1 4]
4,5
[2,7]
[5]
0,3
[1 3 4 5]
4,6
[2 6 7]
0,6
[1 2 3 4 5 6 7]
left [2,7]
right [6]
[2 6 7]
count=0 1 2 4 7



Merged array → [1 2 3 4 5 6 7]

count → ~~4~~ 7

Median of two sorted array

Sunday, 14 November 2021 1:05 PM

Brute force → Merge two sorted array and find Median.

$O(m+n)$

Allowed → $O(\log(\min(m,n)))$

arr1 → 1 2 7 8 10 — mid1

arr2 → 3 4 6 9 11 12 — mid2

median = $\frac{mid1 + mid2}{2}$

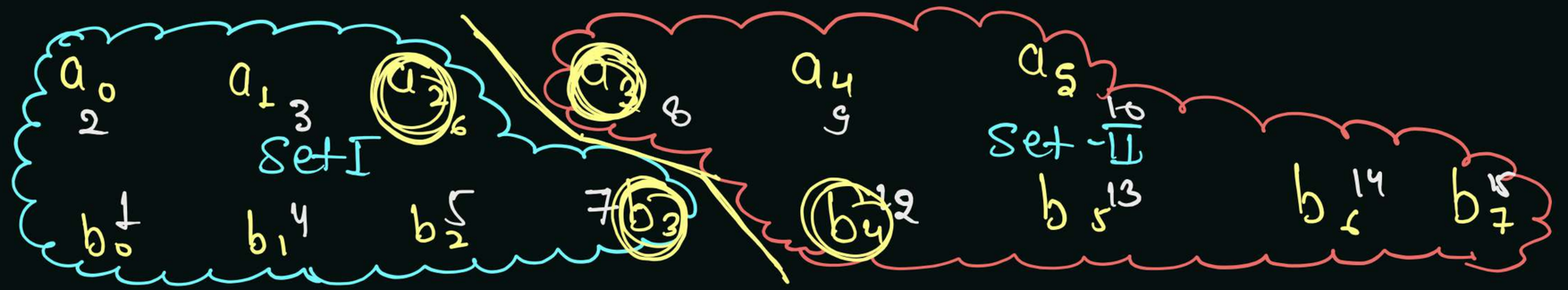
Merge 1 2 3 4 6 [7] 8 9 10 11 12 — mid

median = mid

median

Steps for Brute force →

1. Merge two sorted array to form sorted array.
2. find mid if odd no. elements there and if Even the find $\frac{mid1 + mid2}{2}$ for median.



Even:

How to figure out median

Max

{ Random array } | mid1

Smaller than mid1, No guarantee for order.

min

mid2 | { Random array }

greater than mid2 then no guarantee for order.

Even no. of Elements → Spliting will be Equal in size

Assume a valid splitting →

$\left(\begin{matrix} a_0 & a_1 & a_2 \\ b_0 & b_1 & b_2 & b_3 \end{matrix}\right) <$

$\left(\begin{matrix} a_3 & a_4 & a_5 \\ b_4 & b_5 & b_6 & b_7 \end{matrix}\right)$

for valid splitting →

Even no. of elements

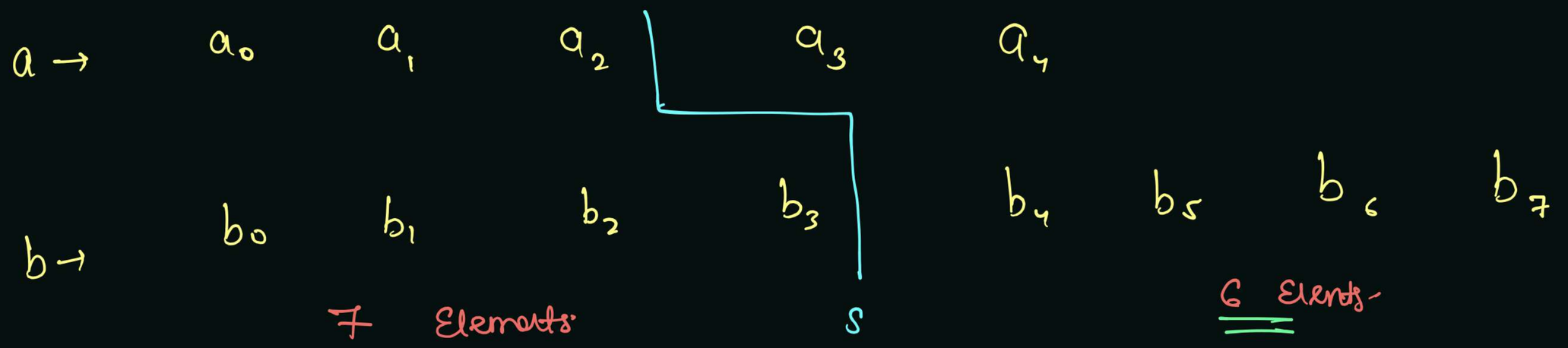
Given → $a_2 < a_3$

$b_3 < b_4$

if $\left[\begin{matrix} a_2 <= b_4 \\ b_3 <= a_3 \end{matrix}\right]$ → True, True → then splitting is valid.

Assume it is valid,

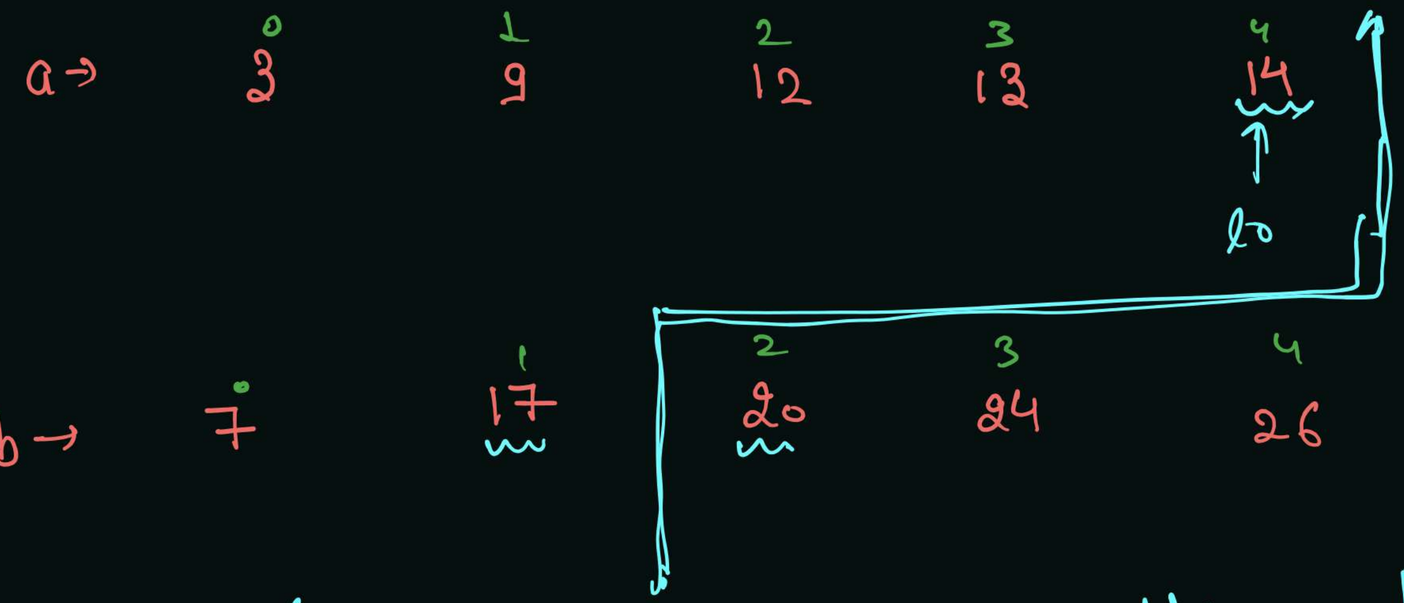
median = $\frac{\max(a_2, b_3) + \min(a_3, b_4)}{2}$



Suppose we have splitting 'S'. it is valid if-

if $(a_2 <= b_4$ && $b_3 <= a_3)$ ⟶ condition of splitting is valid.

median = max (a_2, b_3)



median = 18

Total Element = 14

mid = $\frac{0+6}{2}$ = 3

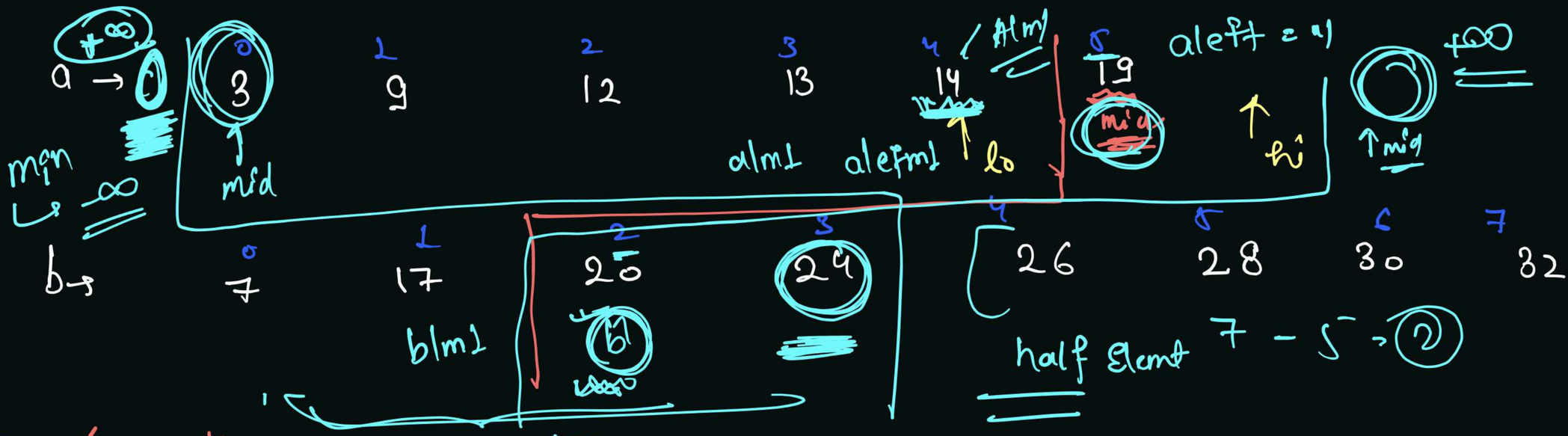
= $\frac{4+6}{2}$ = 5

median = $\frac{\max(14,17) + \min(19,20)}{2}$

= $\frac{17+19}{2}$ = 18 Result

$\frac{17+19}{2}$ = 18

median: 3 7 9 12 13 14 17 19 20 24 26 28 30 32



lo = ~~0~~ 4

hi = length = 6

$$mid = \frac{lo + hi}{2} = 3$$

$$mid = \frac{4+6}{2} = ⑤$$

Check Splitting →

12 < 26 ✓

24 < 13 ✗ false

if(arr[mid] < arr2[blm1])

lo = mid + 1

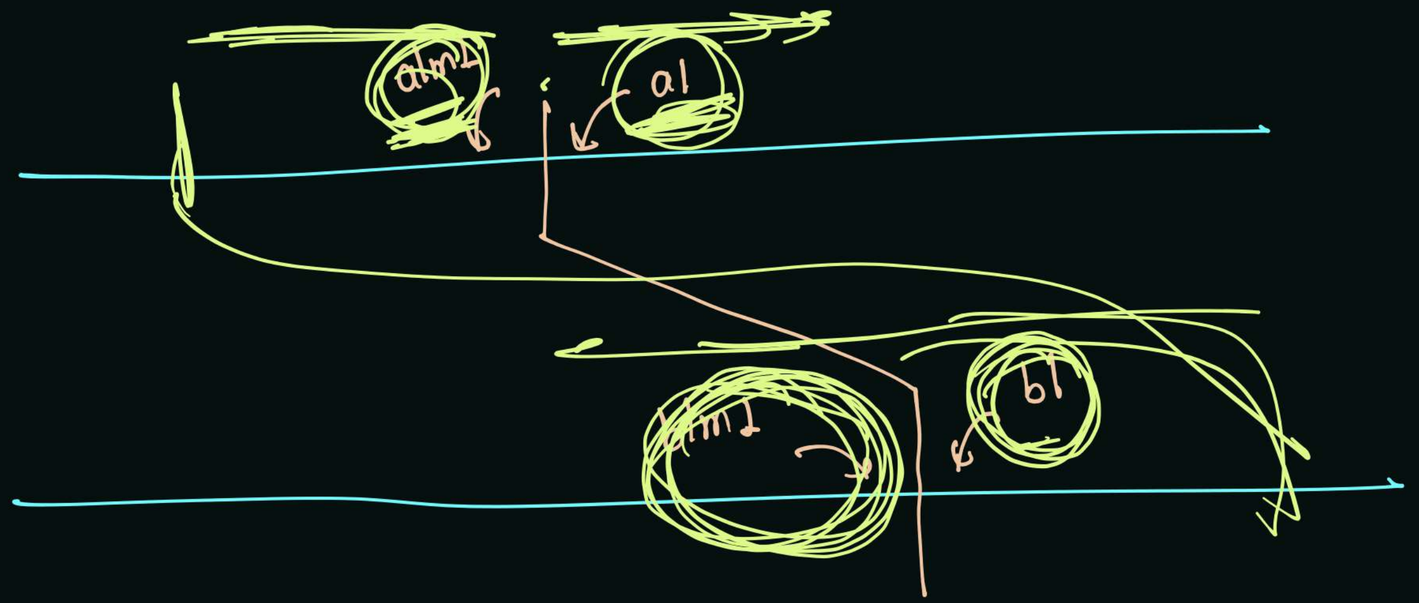
Check Splitting →

14 < 20 ✓

17 < 19 ✓

$$median = \frac{\max(17 \text{ vs } 14) + \min(19, 20)}{2}$$

$$= \frac{17+19}{2} = ⑱$$



alml

odd Elemul

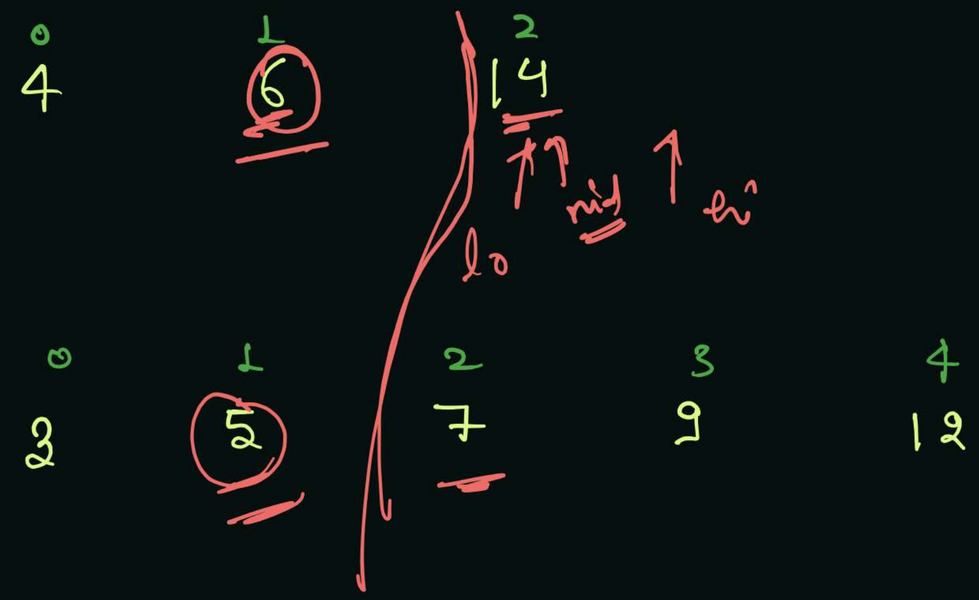
check for validity -

if(alml <= bl && blml <= al) {

valid Splitting -

$$\text{median} = \frac{\max(alml, blml) + \min(al, bl)}{2.0}$$

}



te = 8

$\frac{9}{2} = 4 - 1 = 3$

$\frac{9}{2} = 4 - 2 = 2$

lo = 2

hi = 3

2

mid = 2