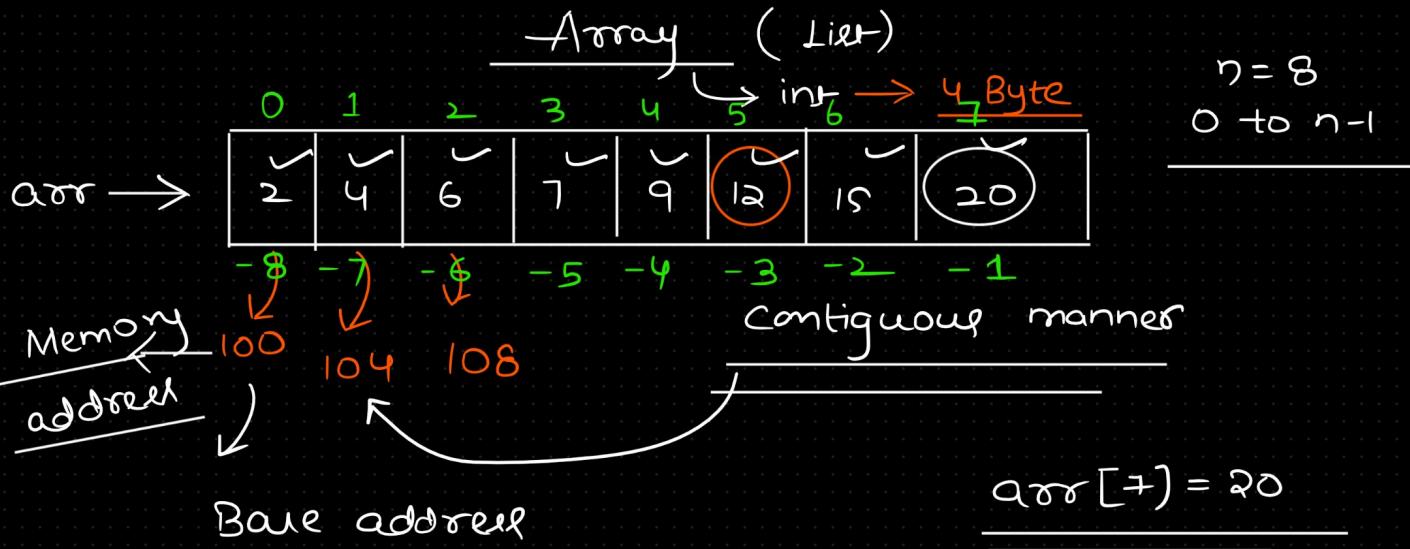
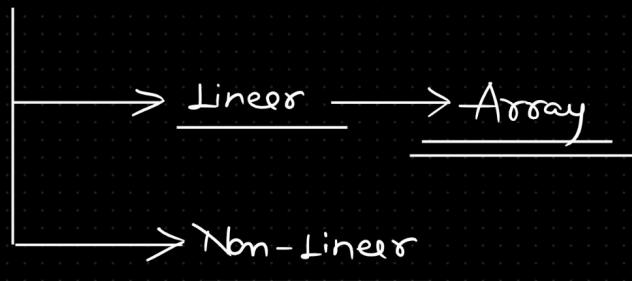


Data Structure

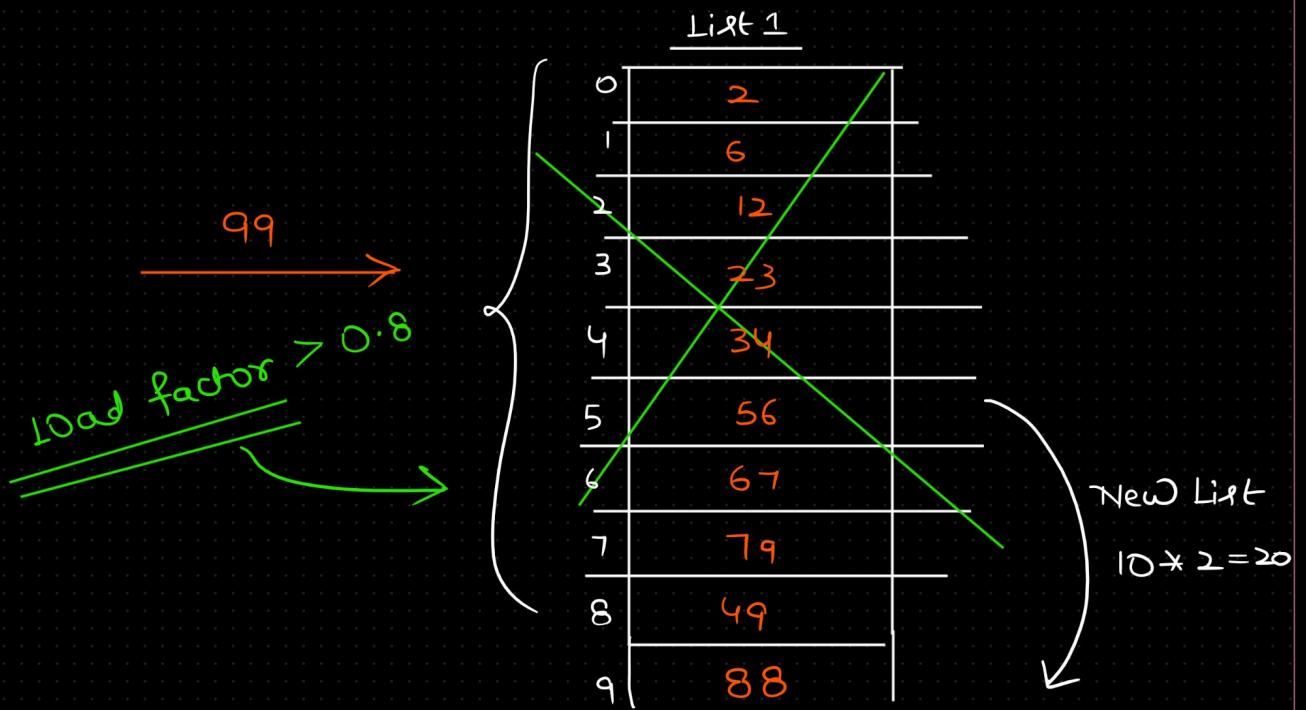
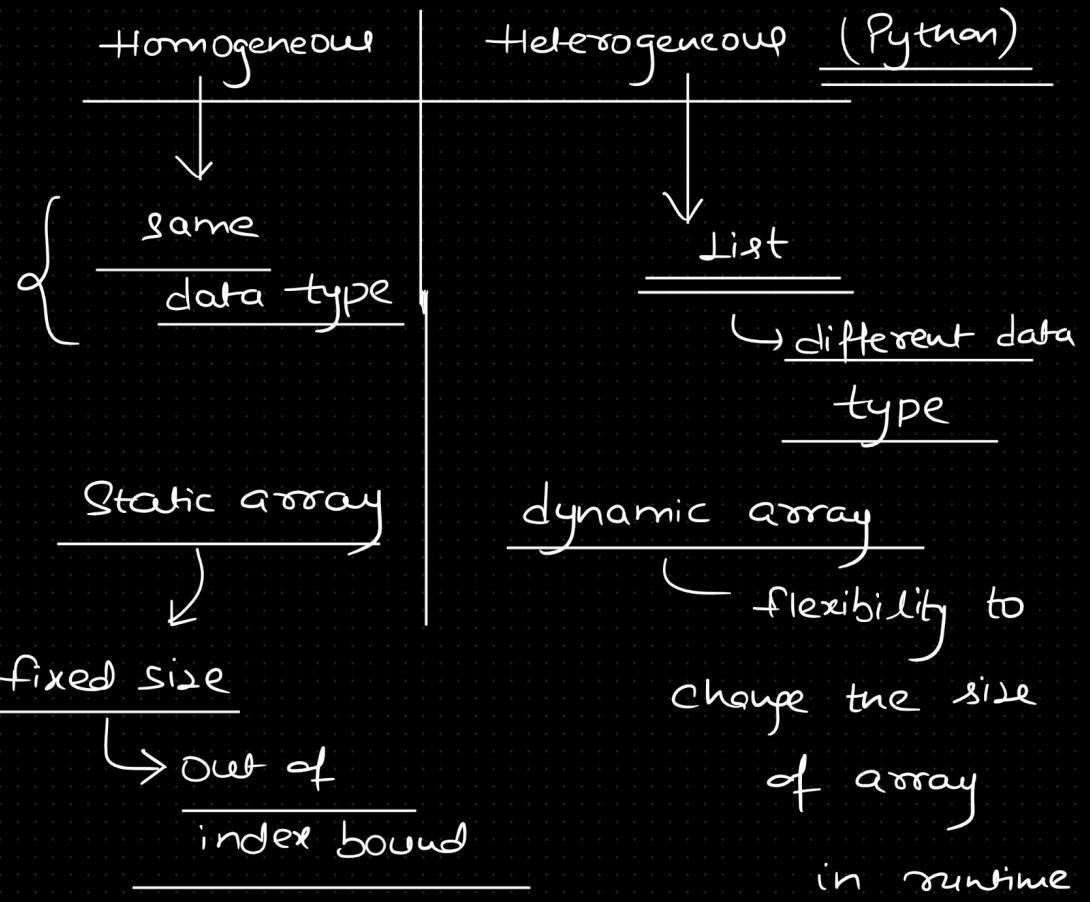


1st element in an array Access any element

$\text{arr}[5] = 12$

index number Time complexity $= O(1)$

Constant



- Delay in response time
- ① Creation of new list (double)
- ② Copy of all elements to the new list

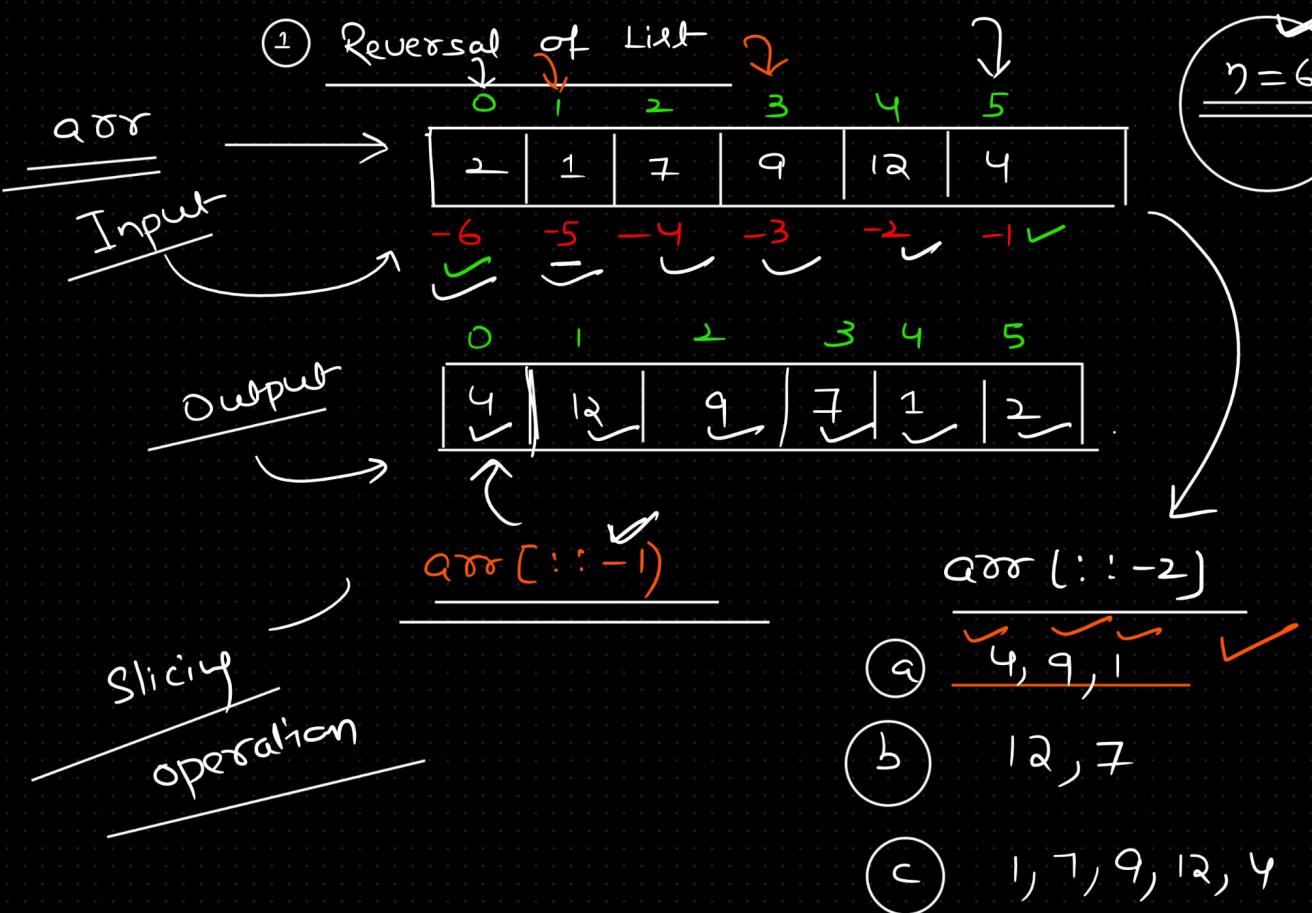
0	2
1	6
2	12
3	23
4	
5	
6	
7	88
8	99
9	

21 elements

20

$$20 \times 2 = 40$$

$$(1, n+1) \rightarrow (1, 7)$$



aor (:: -2)

aor [:: -1]

for (i = n - 1; i >= 0; i = i - 2)

for (i = n - 1; i >= 0; i --) ←

for

↳

\uparrow^{n-1}

range (1, 6)

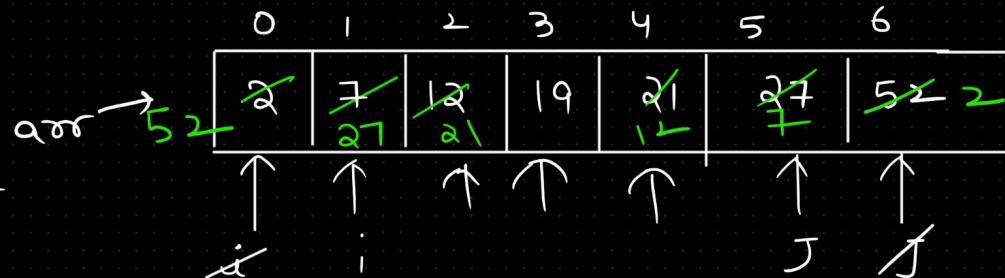
↳ 1, 2, 3, 4, 5

↗ constant
 $O(1)$ $O(n)$

Two Pointers
Approach

Space Complexity variable
 ↓
 Data structure
→ extra space to implement
the code

5 2 7 1 19 12 7 2



$$i = 0, j = n - 1$$

$$i = \cancel{0} \cancel{1} \cancel{2}$$

$$j = \cancel{6} \cancel{5} \cancel{4} \cancel{3}$$

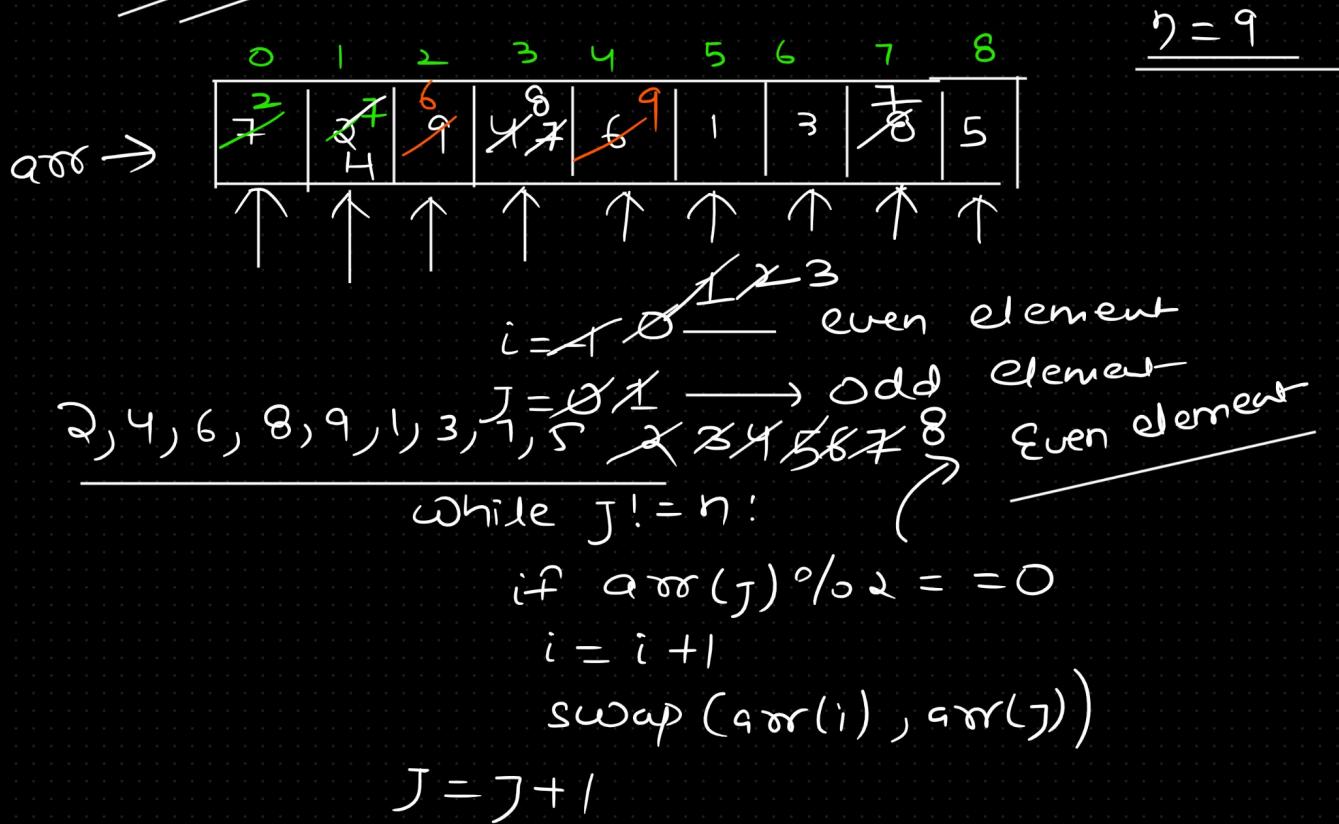
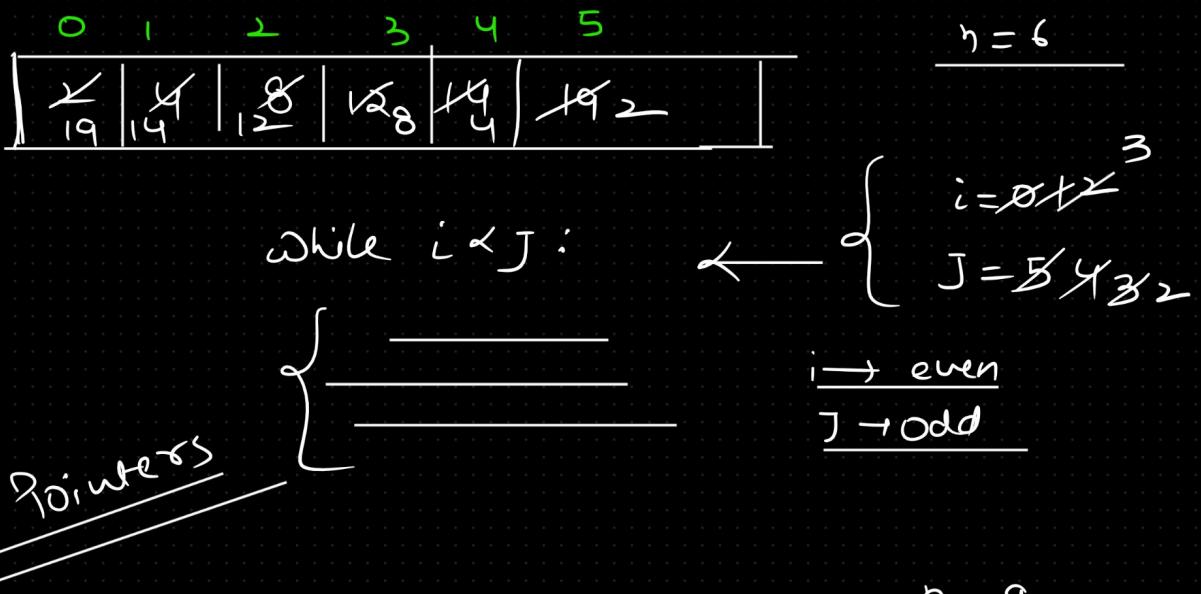
while $i < j$:

 swap(arr[i], arr[j])
 $i = i + 1$
 $j = j - 1$

return arr

time complexity $\rightarrow O(n)$

Space complexity $\rightarrow O(1)$



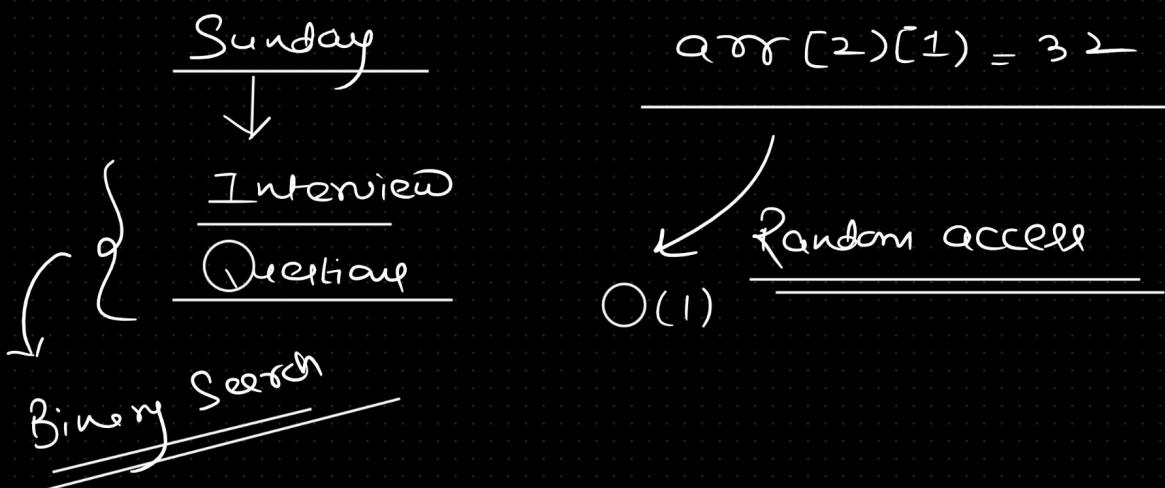
→ $i \rightarrow \text{even element}$

$J \rightarrow \text{odd element}$

<u>(Rows, column)</u>	<u>2 D - array</u>	<u>Matrix computation</u>
<u>(3, 3)</u>	<u>0 1 2</u>	<u>column</u>
<u>↓</u> <u>9</u>	<u>0 23 47 65</u> <u>1 46 24 99</u> <u>2 29 32 42</u>	

Row Column

$\text{arr}[\text{row_index}][\text{col_index}]$



Applications

① Searching \rightarrow Array

0	1	2	3	4
2	4	9	12	15

$n = 5$

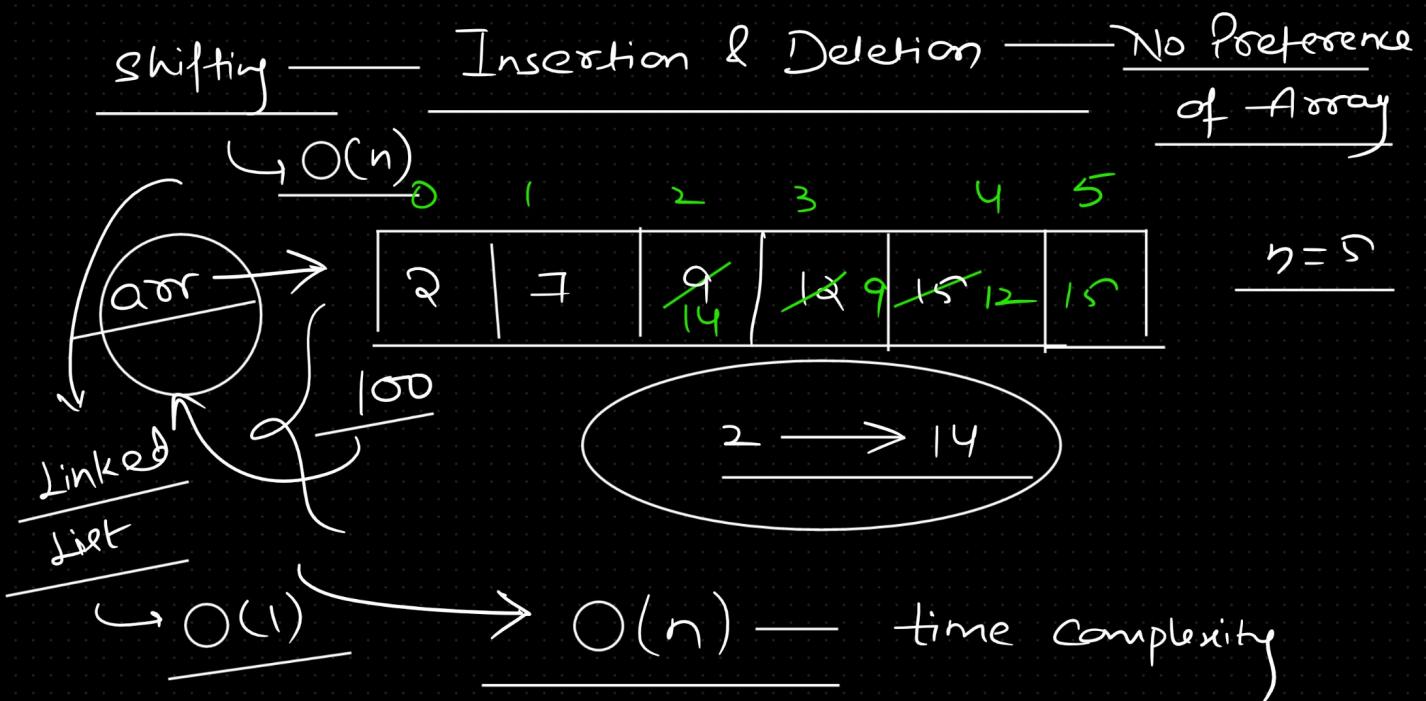
target = 12

output = 3

target = 17

No element is available

output = -1



$\text{O}(1) \rightarrow \text{Space Complexity}$

2 Sorting → ascending / descending

2 1 5 3 9

↓ Algorithm

1 2 3 5 9

$\text{O}(1)$ Inplace → No extra space

$\text{O}(n)$ Outplace (MergeSort) extra space (External DS)

3

Computer VisionDataset (Image)Image segmentationPixel value2D array2D ArrayFiltersCNN

0	1	2	3	4	5
1	2	3	4	5	6
0	1	2	3	4	5
0	1	2	3	4	5

0 1 2 3 4 5
 1, 2, 3, 4, 5, 6
 ↑ ↑ ↑ ↑ ↑ ↑
 2 4 6

$i = 1 \text{ to } 2$
 $j = 0 \text{ to } 5$

2, 6, 4, 5, 7, 9

0 1 2 3 4
 2, 3, 7, 9, 4
 ↑ ↑ ↑ ↑ ↑
 4 3

$i = 1 \text{ to } 1$
 $j = 0 \text{ to } 3$

2, 4, 7, 9, 3

Sunday → 8 to 11

1

→ 21st Jan 2024

Mon, Wed, Fri

8 to 11PM
