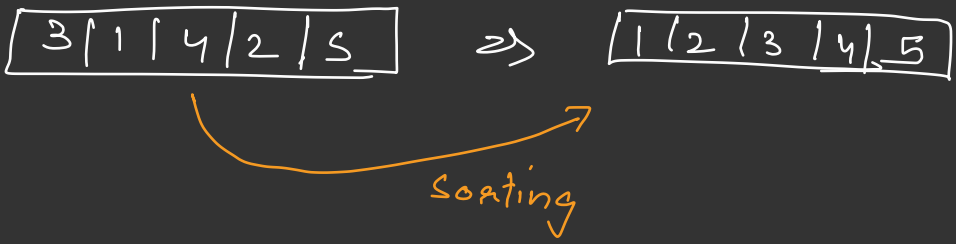
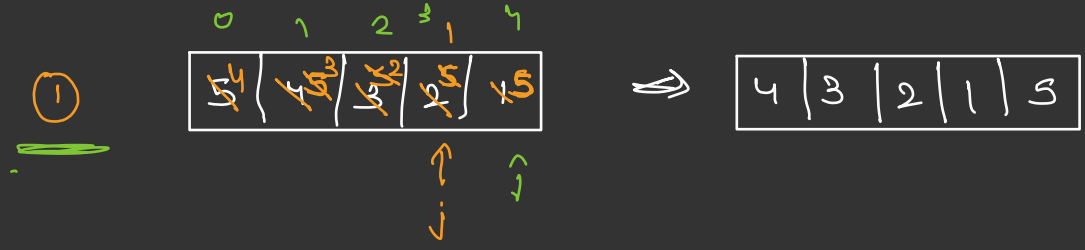
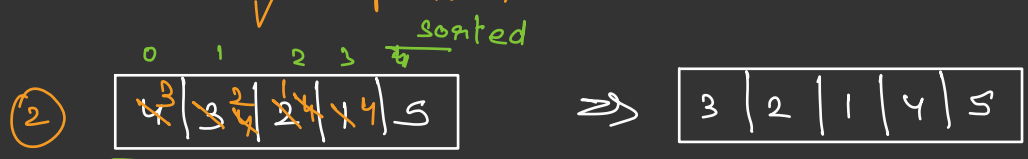
SORTINGS



(1) Bubble Sort



Bubble the max in unsorted array to its right position



$j <= n - i$

(4) | ~~2~~ 1 | ~~1~~ 2 | 3 | 4 | 5 | $\Rightarrow$ | 1 | 2 | 3 | 4 | 5 |

j

$i = 1 - n$

$n - 1$

$i = 1 \quad j = 0 \quad n - 1 \Rightarrow n - 1$

$i = 2 \quad j = 0 - n - 2 \quad n - 2$

$\vdots$

$i = n \quad j = 0 - 1 \quad 1$

Time

$1 + 2 + 3 \ldots n - 2 + n - 1$

$\Rightarrow n \times \frac{(n-1)}{2} \Rightarrow \frac{n^2 - 1}{2}$

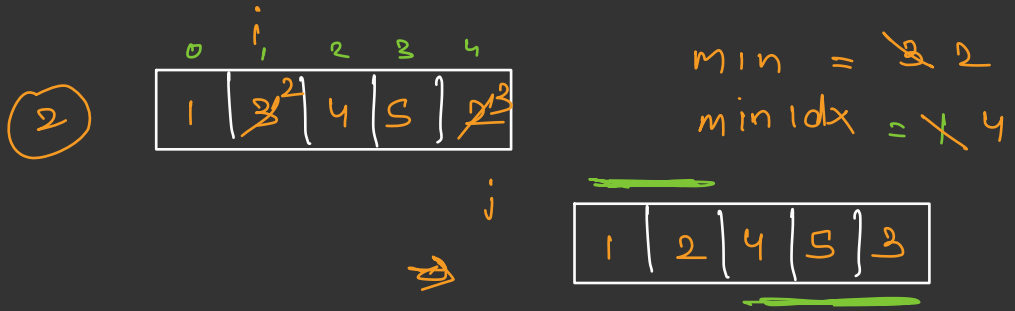
$\Rightarrow O(n^2)$

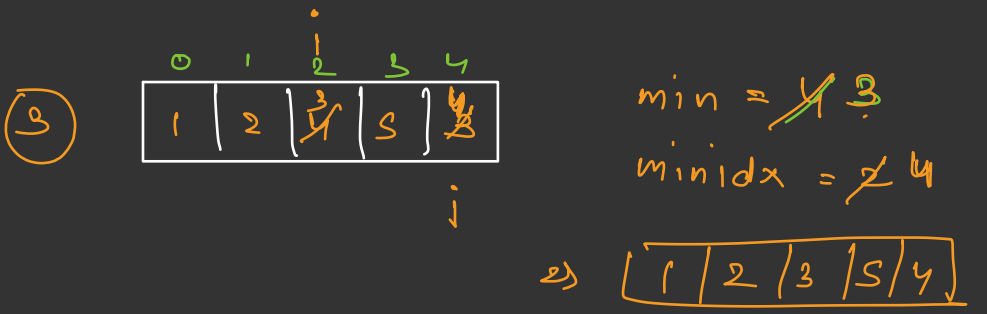
Space

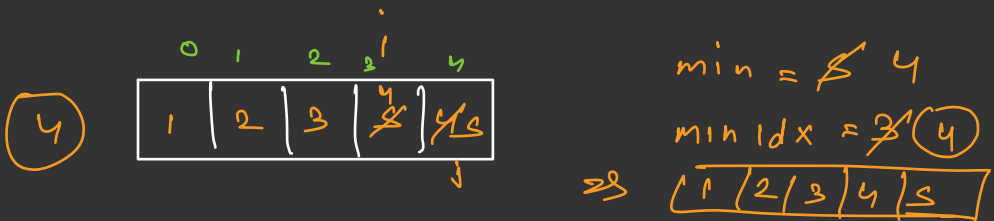
Auxilary space

$\Rightarrow O(1)$

(2) Selection Sort







Time Complexity

i - 0 - n-1

		Operations
i = 0	j ⇒ 1 - n	n
i = 1	j ⇒ 2 - n	n-1
i = 2	j ⇒ 3 - n	n-2
i = n	j ⇒ n - n	0

$0 + 1 + 2 + 3 + 4 + \cdots n$

$\Rightarrow \frac{n \times (n+1)}{2} \Rightarrow \frac{n^2 + 1}{2}$

$\Rightarrow O(n^2)$

Space

Auxilary space ⇒ O(1)

Inplace sorting

stable

1	5	1	3	5	4

⇒

1	1	3	4	5	5

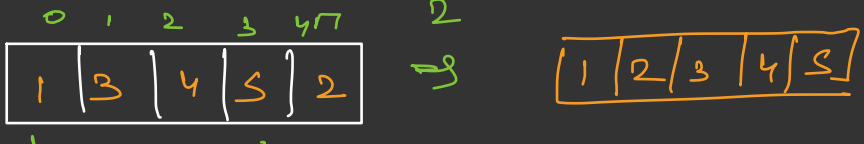
(3) Insertion sort

(1)

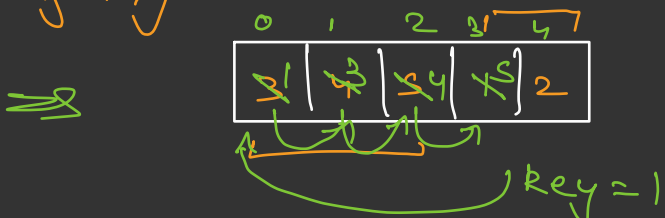
(2)

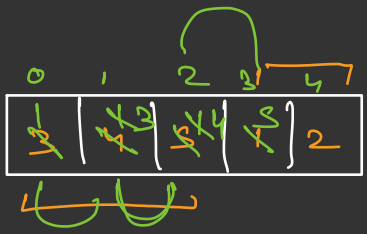
(3)

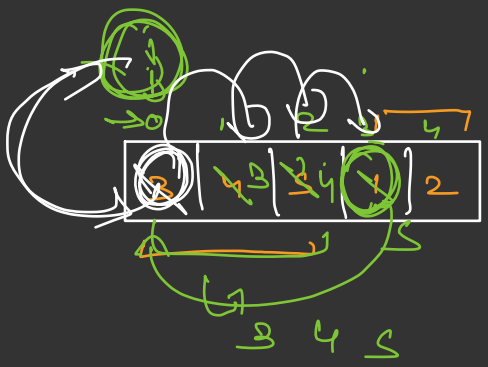
(4)



Shifting








```
arr[i+1] = arr[i];
i--;
```