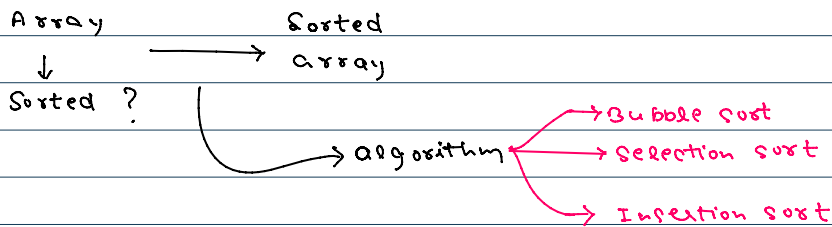
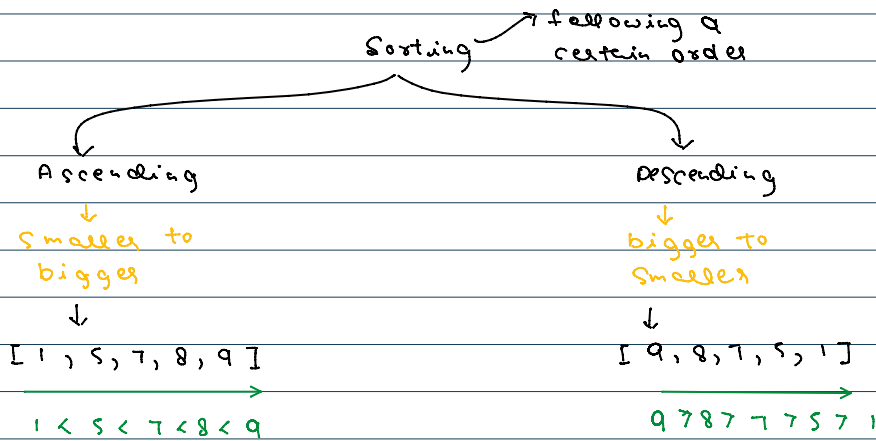


Sorting - 1



Bubble sort

"Bubble the max element at last"

arr \rightarrow [7, 1] \rightarrow arr[0] > arr[1] \Rightarrow swap (arr[0], arr[1])

\downarrow

arr \rightarrow [1, 7]

arr[i] > arr[i+1] \Rightarrow swap (arr[i], arr[i+1])

arr \rightarrow [1, 5, 2, 6, 4]

1 > 5 \rightarrow x 1 > 2 \rightarrow x 1 > 2 \rightarrow x 1 > 2 \rightarrow x
 5 > 2 \rightarrow ✓ 2 > 5 \rightarrow x 2 > 4 \rightarrow x
 5 > 6 \rightarrow x 5 > 4 \rightarrow ✓
 6 > 4 \rightarrow ✓

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

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

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

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

↓
 $i \rightarrow 0 \text{ to } n-1$

minimum in the array

↗

arr \rightarrow [5, 2, 4, 6, 1]

min \rightarrow arr[0]

↘ ~~5~~ ~~2~~ 1

5 < min \rightarrow X

```
if(arr[i] < min)
    min = arr[i];
```

iterate over
 this array

2 < min \rightarrow ✓

4 < min \rightarrow X

6 < min \rightarrow X

1 < min \rightarrow ✓

Selection Sort

"Fix minimum at first position"

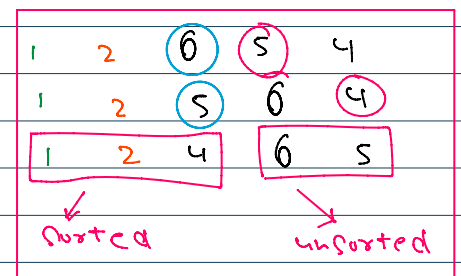
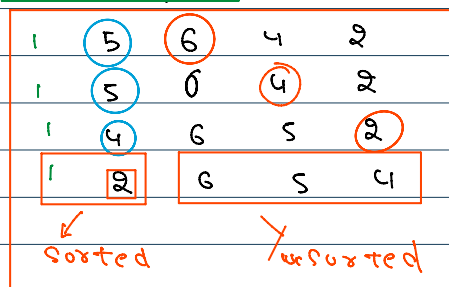
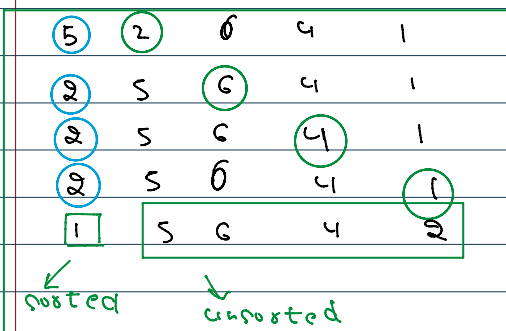
```
min = arr[0];
if(arr[i] < min) {
    // min = arr[i];
    swap(min, arr[i]);
}
```

arr \rightarrow 5 2 6 4 1
 ↓ \rightarrow sort
 arr \rightarrow 1 2 4 5 6

2 < 5 \rightarrow ✓
 6 < 2 \rightarrow X
 4 < 2 \rightarrow X
 1 < 2 \rightarrow ✓

6 < 5 \rightarrow X
 4 < 5 \rightarrow ✓
 2 < 4 \rightarrow ✓

5 < 6 \rightarrow ✓
 4 < 5 \rightarrow ✓



place
 push in a sorted array.

1 3 5 6 7 (4)

1 3 5 6 7

sorted

4

place
push this element
to its sorted
position

arr[j]

$j \rightarrow n-1$

$j = i-1$ to 0

1 3 5 6 7 4
1 3 5 6 4 7
1 3 5 4 6 7
1 3 4 5 6 7

$7 > 4 \rightarrow \checkmark$
 $6 > 4 \rightarrow \checkmark$
 $5 > 4 \rightarrow \checkmark$
 $3 > 4 \rightarrow \times$

Insertion sort

"push" place
element one in sorted array"

5 | 4 3 2 1

4 5 | 3 2 1

3 4 5 | 2 1

2 3 4 5 | 1

1 2 3 4 5 |

4 5 | 3 2 1 $5 > 3 \rightarrow \checkmark$
4 3 | 5 2 1 $4 > 3 \rightarrow \checkmark$
3 4 5 | 2 1

3 4 5 | 2 1 $5 > 2 \rightarrow \checkmark$
3 4 2 | 5 1 $4 > 2 \rightarrow \checkmark$
3 2 | 4 5 1 $3 > 2 \rightarrow \checkmark$
2 3 4 5 | 1

$i \rightarrow 1$ to $n-1$