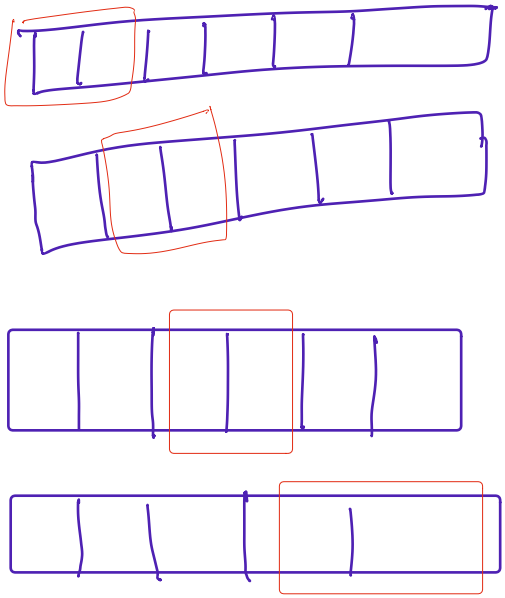
Bubble Sort

13	46	24	52	20	9

we have to do the adjacent swap in increasing order so after one round it will give n-1 as max value



Idea

Push the max to the last by adjacent swap

13, 46, 24, 52, 20, 9

13, 46, 24, 52, 20, 9

13, 24, 46, 52, 20, 9

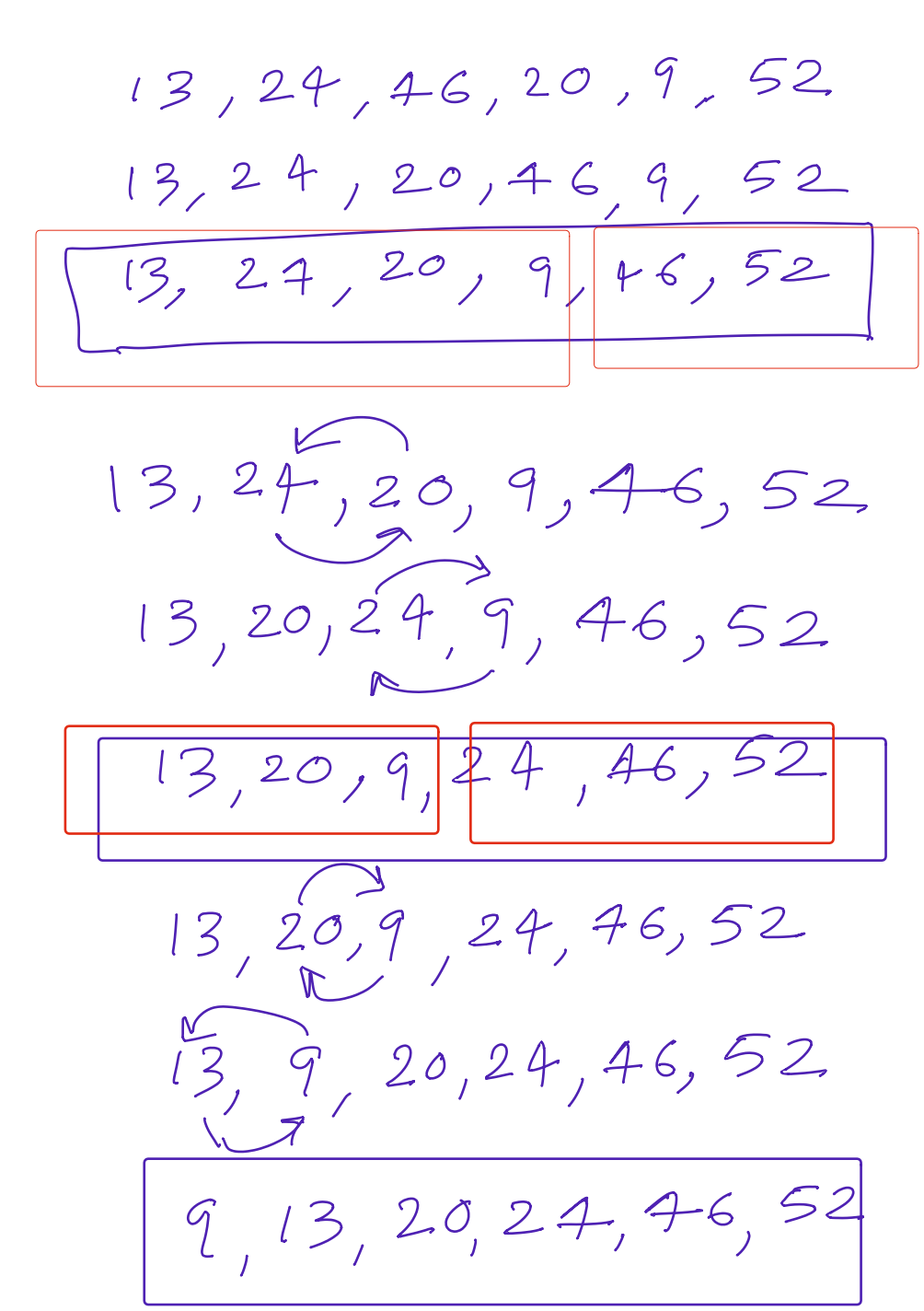
13, 24, 46, 52, 20 9

13, 24, 46, 20, 52, 9

13, 24, 46, 20, 9, 52

one round of swaping max num is at end

now repeated for index 0 to n-2



0 — n-1

n-2

n-3

n-4

n-5

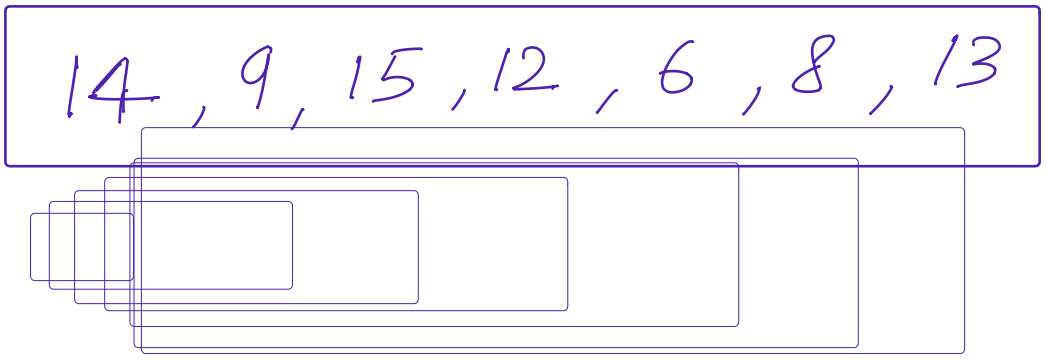
0 — 1

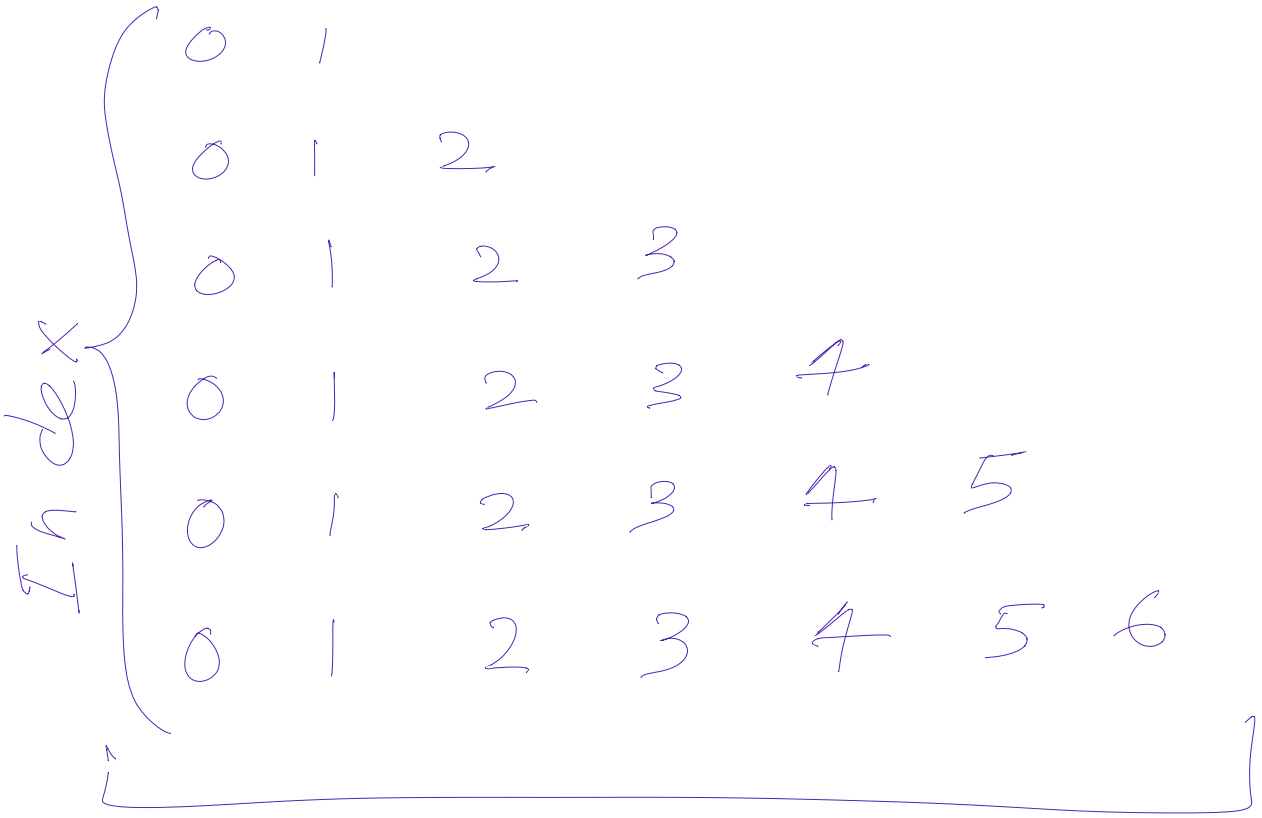
```
for(i=n-1; i>=1; i--)
{
    didswap=0;
    for(j=0; j<i-1; j++)
    {
        if(a[j] > a[j+1])
        {
            swap(a[j], a[j+1])
            didswap=1;
        }
    }
    if(didswap==0){
        break;
    }
}
```

$O(N^2)$ Worst, Average

Best $\rightarrow O(N)$

Insertion Sort





Idea

Take an element
& place it in correct orders.

14 9 15 12 6 8 13

9 14 15 12 6 8 13

9 14 15 12 6 8 13

9 12 14 15 6 8 13

6 9 12 14 15 8 13

6 8 9 12 14 15 13

6 8 9 12 13 14 15

```
for (i=0; i<n-1; i++)
{
    j = i;
    While(j>0 && a[j-1]>a[j])
    {
        swap(a[j-1], a[j])
        j--;
    }
}
```

Worst → $O(n^2)$

Average case → $O(n^2)$

Best → $O(n)$