



ACHIEVER'S BATCH 3



SORTING ALGORITHMS

CODEGREEDY



Hey!! Don't worry, you will make it one day 😊

"The future belongs to those who believe in the beauty of their dreams."

WHAT IS SORTING

Arranging the numbers either in ascending or descending order, is called as sorting.

↓ ↓
increasing decreasing

Ascending : 1 1 2 3 4 4

Descending : 5 4 4 3 1

Increasing : 1 2 3 4 5 6

Decreasing : 5 4 3 2 1

BUBBLE SORT (Increasing)

7 5 9 8 3

- It mainly compares two adj. elements
- if they are not in correct place, then it swap { $a(i) > a(i+1)$

$N = 5$

7 5 9 8 3

pass 1

7 5 9 8 3

5 7 9 8 3

5 7 9 8 3

5 7 8 9 3

5 7 8 3 9

pass 2

5 7 8 3 9

5 7 8 3 9

5 7 8 3 9

5 7 3 8 9

pass 3

5 7 3 | 8 9

5 7 3 8 9

5 3 7 8 9

pass 4

5 3 | 7 8 9

3 5 7 8 9

N = 5

1 ... N-pass (N-pass)
2 ... (N-1)
pass 1: 4 (5-1) = 4

pass 2: 3 (5-2) = 3

pass 3: 2 (5-3) = 2

pass 4: 1 (5-4) = 1

```

void bubbleSort( int arr[], int n)
{
    for ( pass=1 : pass <= N-1 : pass++)
        ( N-1 )
        {
            for ( j=0 : j < N-pass : j++)
                ( N-1 )
                {
                    if ( arr[j] > arr[j+1] )
                        swap ( arr[j], arr[j+1] )
                }
        }
}

```

$O(N^2)$

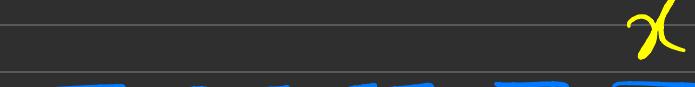
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always have worst case

$(N-1) \times (N-1)$

$N^2 - N - N + 1$

$$\boxed{N} \Rightarrow (N-1)$$

pass 1 = 

pass 2 = 

pass 3 = 
(4)

$N = 7$

9 3 8 4 5 | 1 2

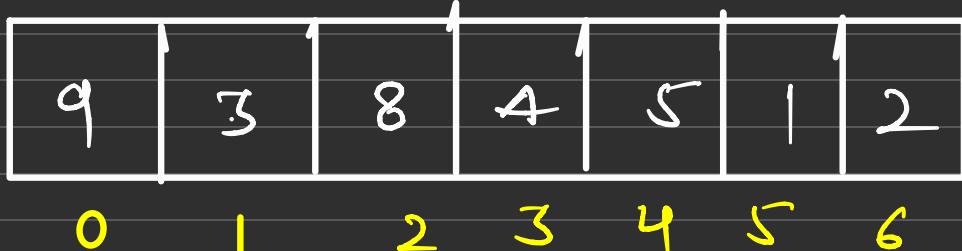
Count the inversion?

inversion : pairs such that they are not in
correct order , $a(i) > a(i+k)$

$K = 0, 1, 2, 3 \dots N-1$

$N=7$

SELECTION SORT



```
void selectionSort(arr, n)
```

```
?           for ( i=0 ; i<n ; i++ )  
?             min = arr[i]  
?             index = i  
?               for ( j=i+1 ; j<n ; j++ )  
?                 if ( arr[j] < min )  
?                   min = arr[j]
```

$T.C : O(N^2)$

index = j

y

y

swap(arr(i), arr(index))

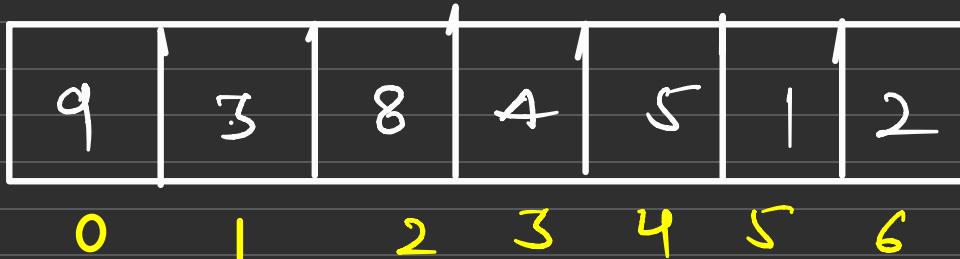
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① Stable Sorting Algo.: Relative position maint.

② Inplace = O(N) = No Need of Extra Space
to sort Element

INSERTION SORT



Sorted

3

Unsorted

9 8 4 5 1 2

SRT

Unsorted

9 | 3 8 4 1 2

| 2 3 4 8 9

3 q | 8 4 1 2

3 8 | 9 | 4 1 2

3 8 - 9 | 1 2

3 4 8 9 | 1 2

1. 3 4 8 9 | 2

```
void insertionSort ( a , n )
```

```
}
```

```
for ( i=1 ; i < n ; i++ )
```

```
{
```

```
    int num = a(i)
```

```
    j = i - 1
```

```
    while ( j ≥ 0 && a(j) > num )
```

```
{
```

```
        a(j+1) = a(j)
```

```
        j --
```

```
y
```

```
a(j+1) = num
```

$O(N^2)$

- Selection

- MS

- Bubble

- DFS

- Insertion

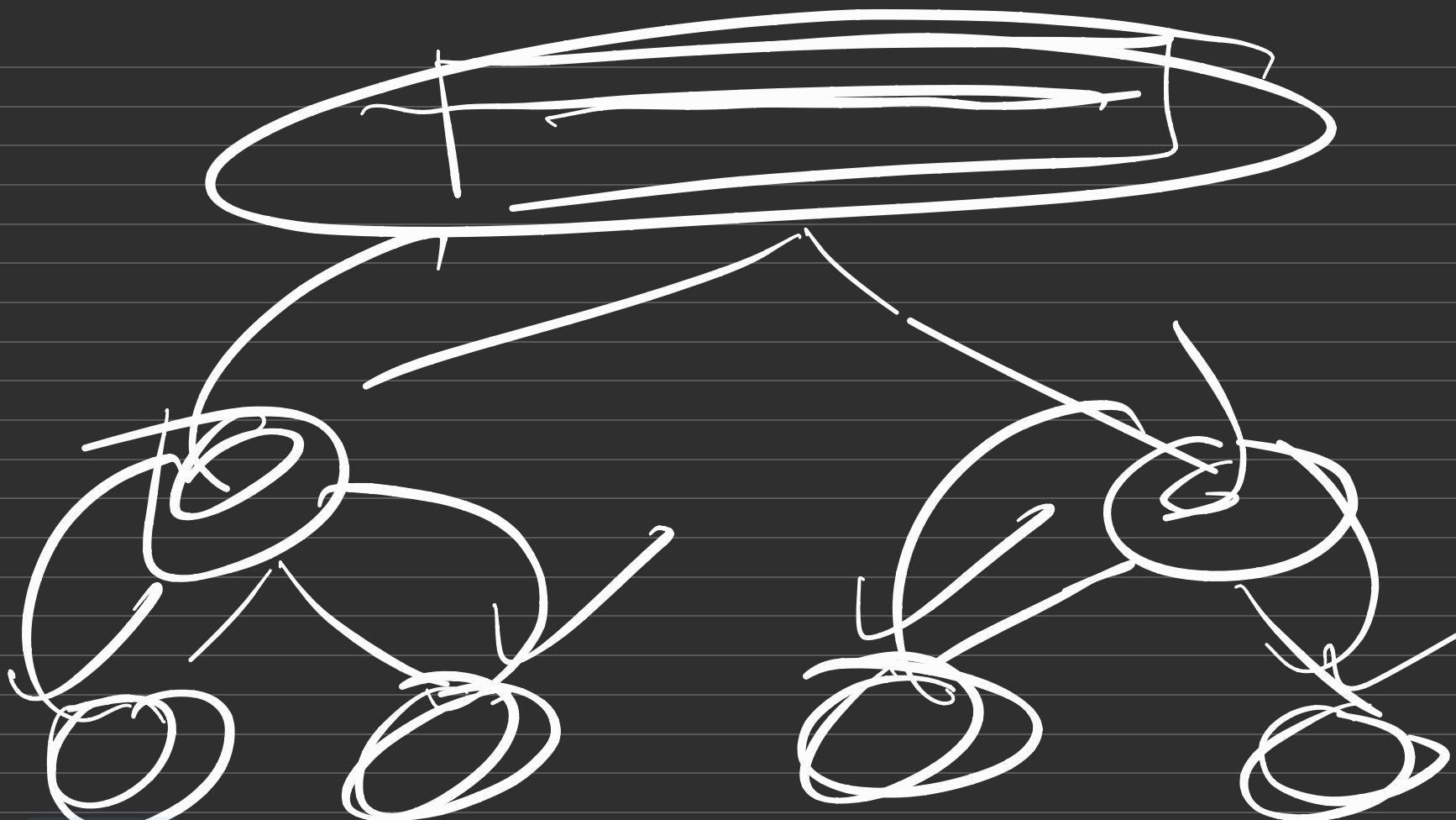
Online Search

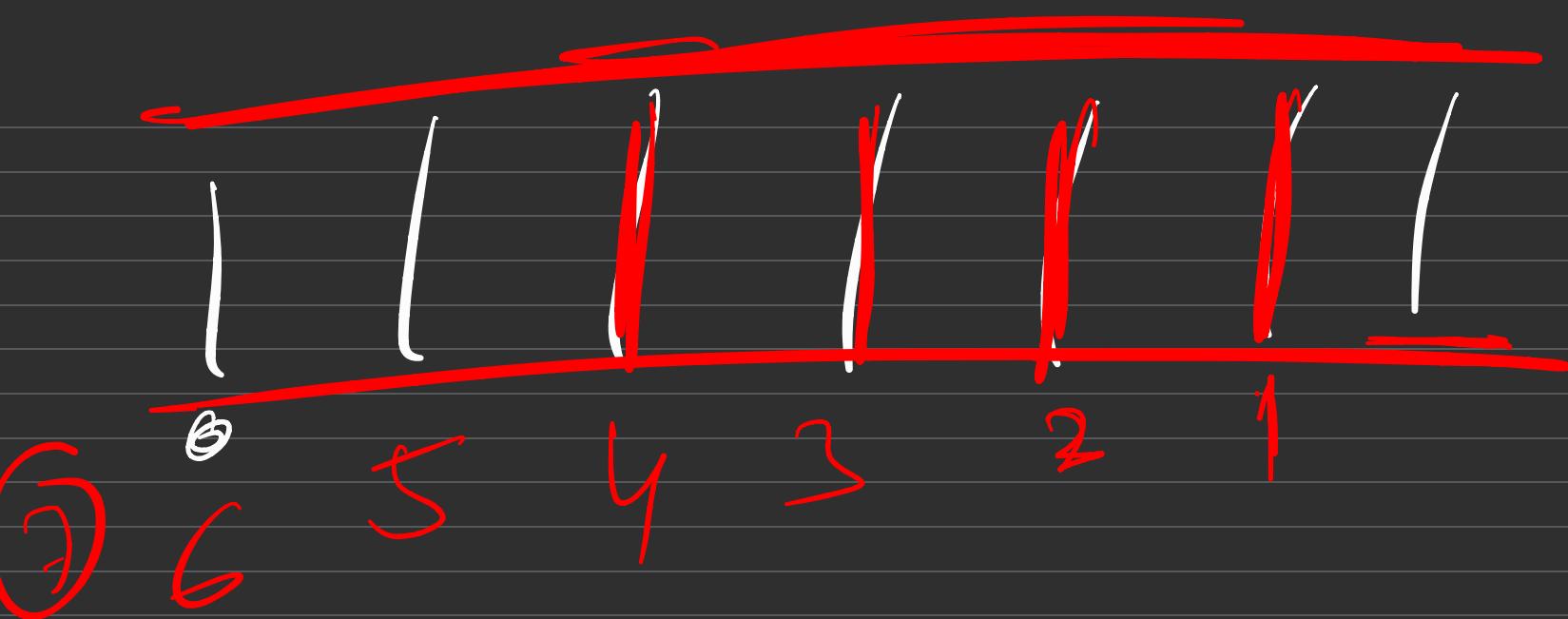
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ϕ_s



MS