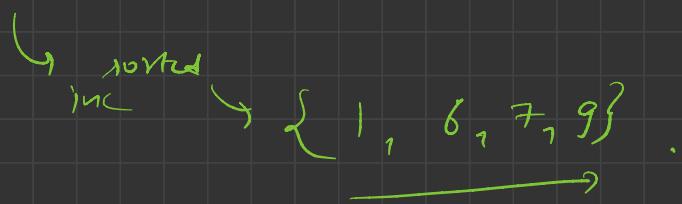



Bubble Sort

Round i^{th}
 i^{th} (array) \rightarrow right place

arr - { 7, 1, 6, 9 }



B.S

$a > b \rightarrow \text{swap}$, $10 > 1$ $10, 10 =$
 $a < b \rightarrow 10 < 14 \rightarrow \text{ignore}$

10	1	7	6	14	9

\nwarrow swap \nearrow

Round 1:

\hookrightarrow done

1 10 7 6 14 9

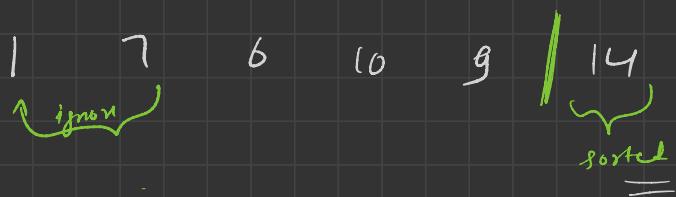
1 7 10 6 14 9

$(n-1)$ round

1 7 6 10 14 9

1	7	6	10	14	9

\nwarrow swap \nearrow



1 7 6 10 9 14

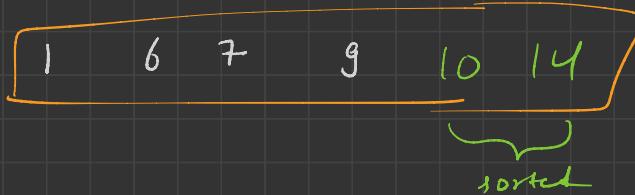
skip

1 6 7 10 9 14

ignore

1 6 7 10 9 14

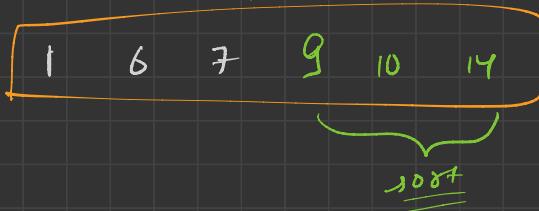
skip



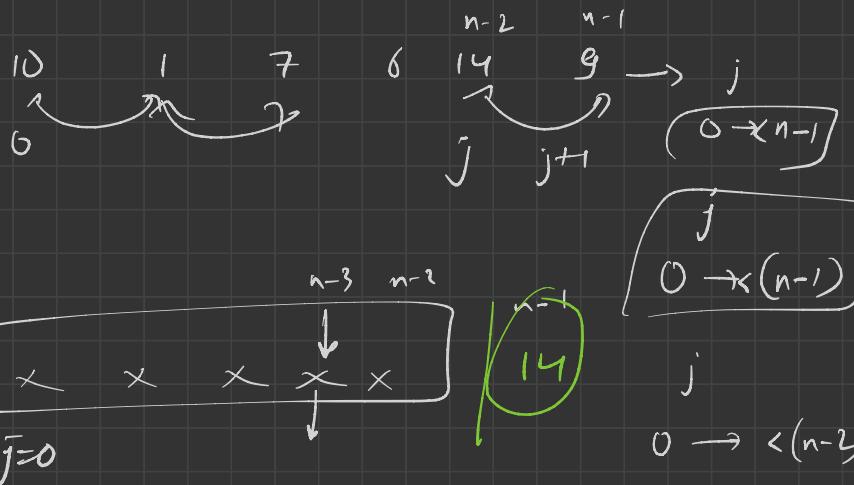
1 6 7 9 | 10 14

1 6 7 9 10 14

1 6 7 9 10 14



Round
3



$\bar{j} \rightarrow 0 \rightarrow <(n-1)$
 $0 \rightarrow <(n-2)$
 $0 \rightarrow <(n-3)$

$1^{1+} \rightarrow <(n-1)$
 $2^m \rightarrow <(n-2)$
 $3^r \rightarrow <(n-3)$

$i=0 \rightarrow <(n-1)$
 $j=0 \rightarrow <(n-i-1)$
 How many ways?

$i \rightarrow \{ 1 \rightarrow <n | 1, 2, 3, \dots, (n-1) \}$
 $j \rightarrow 0 \rightarrow < n-i$

$i=1 < n$

$i=2$

round 2
 $n=6$

0	1	2	3	4	5
1	7	6	10	9	14

↓
308kd

 $j=0 \rightarrow < n-i$
 $0 \rightarrow < n-2$
 $0 \rightarrow < b-2$
 $0 \rightarrow < u$

0	1	7	6	10	9	14
---	---	---	---	----	---	----

$i=2$

$j=0$

0	1	7	6	10	9	14
---	---	---	---	----	---	----

ignore

$i=2$

$j=1$

0	1	2	6	10	9	14
---	---	---	---	----	---	----

j swap

0	1	2	3	4	5
---	---	---	---	---	---

$i=2$

$j=2$

0	1	2	3	4	5
---	---	---	---	---	---

j ignore

0	1	6	7	10	9	14
---	---	---	---	----	---	----

$i=2$

$j=3$

0	1	2	3	4	5
---	---	---	---	---	---

j swap

0	1	6	7	10	9	14
---	---	---	---	----	---	----

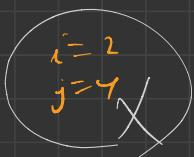
$i=2$

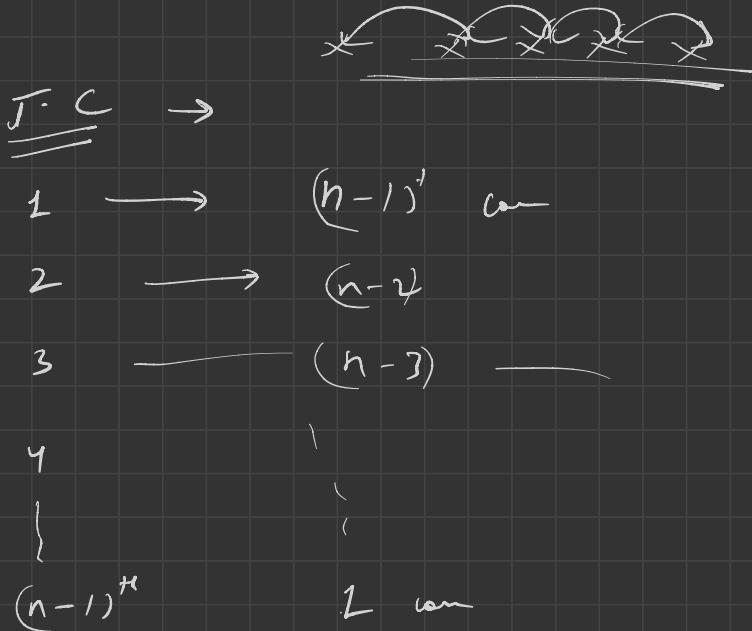
$j=4$

0	1	2	3	4	5
---	---	---	---	---	---

0	1	2	3	4	5
---	---	---	---	---	---

1	6	7	9	10	14
---	---	---	---	----	----





$$T.C \rightarrow 1 + 2 + 3 + \dots + (n-2) + (n-1)$$

$$= \boxed{\frac{n(n-1)}{2}} = \boxed{O(n^2)}$$

$n = \text{size of array}$

Space complexity → $\boxed{O(1)}$

→ Optimize ?

Best case → already sorted → $\boxed{O(n)}$

Worst case → severely sorted → $\boxed{O(n^2)}$

a b c d e → no swaps

$a < b, b < c, c < d, d < e$

$(a < b < c < d < e) \rightarrow$ sorted

Homework → $[n-i]$ $i=0 \rightarrow n-1$

$j=? \rightarrow$ Only Run

→ stable or Unstable - ?

Round i^{th} \rightarrow In-place sort ?
 i^{th} target \rightarrow Right place

Now → Link bFG

↳ Quicksort ~~on~~ Bubble sort

for description ← Solution

