

Week 2 LIVE

Basic Array Problems and Sorting Algorithms

In This Lecture

- 1.Q: Swap two Numbers in an Array ✓
- 2.Q: Find the Smallest Number in an Array ✓
- 3.Q: Place the Number in the Sorted position in an Array ✓
4. Bubble Sort
5. Selection Sort
6. Insertion Sort

Swap two Numbers in an Array

`int a[] = { 1, 3, 5, 2, 4 }`

→ `i & j`

`int temp = a[i];`
`a[i] = a[j];`
`a[j] = temp;`

`int a = 5;`

`int b = 2;`

`temp = a;`

`a = b;`

`b = temp;`

`a = a ^ b`
`b = a ^ b`
`a = a ^ b`

Find the Smallest Number in an Array



`int min = Integer.MAX_VALUE; → $2^{32} \times 10^9$`

`for (int i = 0; i < a.length; i++) {`

`if (a[i] < min) {`

`min = a[i];`

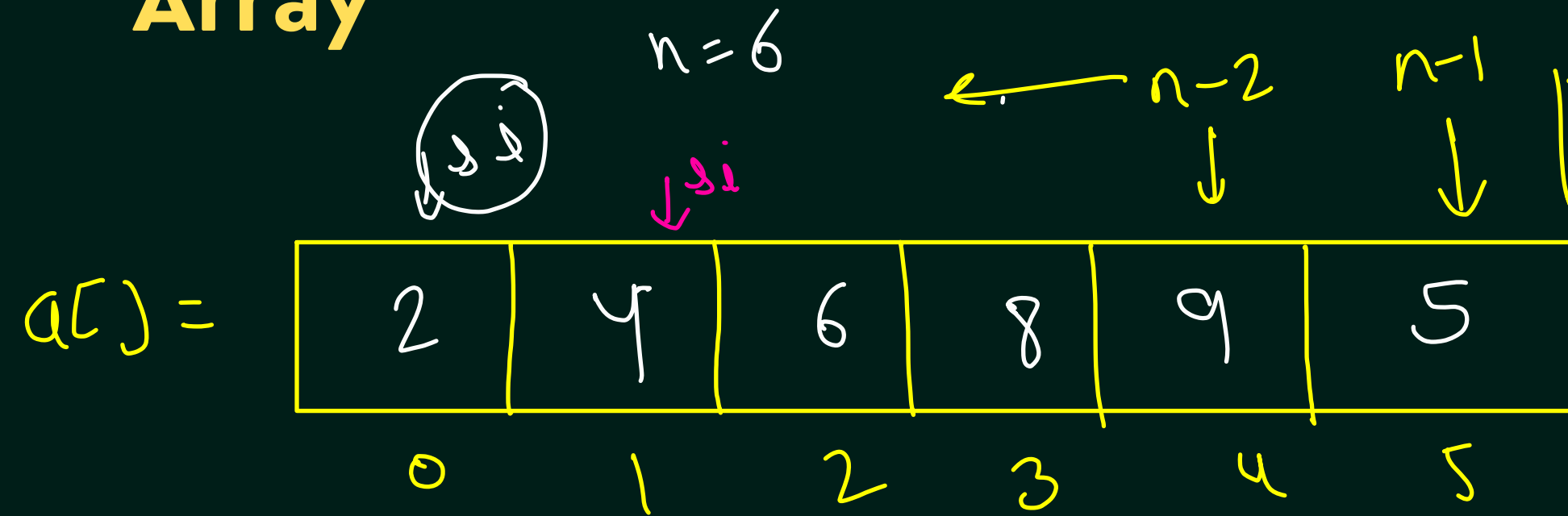
`}`

`}`

`return min;`

`min = 1`

Place the Last Number in the Sorted position in an Array



$int\ last = 4$

```
static void lastNumberInSortedPosition(int a[]) {
    int n = a.length;
    int last = a[n-1];
    int swapIndex = n-2;

    while(swapIndex >= 0 && a[swapIndex] > last) {
        swapIndex--;
    }
}
```

$swapIndex = 0;$

Handwritten annotations for the sorting process:

- $n-1$ points to index 5.
- $a[i] = a[i-1];$
- $si + 2$
- Shift elements to the right:
 - $a[5] = a[4];$
 - $a[4] = a[3];$
 - $a[3] = a[2];$
 - $a[2] = a[1];$
 - $a[1] = last;$

$swapIndex + 2$

Bubble Sort

$n = 6$

int a[] =

4	1	8	2	3	7
---	---	---	---	---	---

outer loop $\rightarrow (n-1)$

inner loop

$0 \rightarrow (n-i-1)$

1	4	2	3	7	8
---	---	---	---	---	---

1st iteration

1	2	3	4	7	8
---	---	---	---	---	---

2nd iteration

1	2	3	4	7	8
---	---	---	---	---	---

$(n-1)$ iteration

Bubble Sort

Q

⁰_j
¹
²
³
⁴
 $n=5$
 $[9, 5, 4, 2, 3]$

$O(N^2)$

$i=0$ $[5, 4, 2, 3, 9]$ 4

$i=1$ $[4, 2, 3, 5, 9]$ 3

$i=2$ $[2, 3, 4, 5, 9]$ 2

↓
 $i=3$ $[2, 3, 4, 5, 9]$ 1

Selection Sort

$i=0$

$n=6$

4	1	8	2	3	7
---	---	---	---	---	---

sorted unsorted

$i=0$

1	4	8	2	3	7
---	---	---	---	---	---

0 1 2 3 4 5

$i=1$

1	2	8	4	3	7
---	---	---	---	---	---

$i=2$

1	2	3	4	8	7
---	---	---	---	---	---

$i=3$

0	1	2	3	4	5
1	2	3	4	8	7

$i=4$

1	2	3	4	7	8
---	---	---	---	---	---

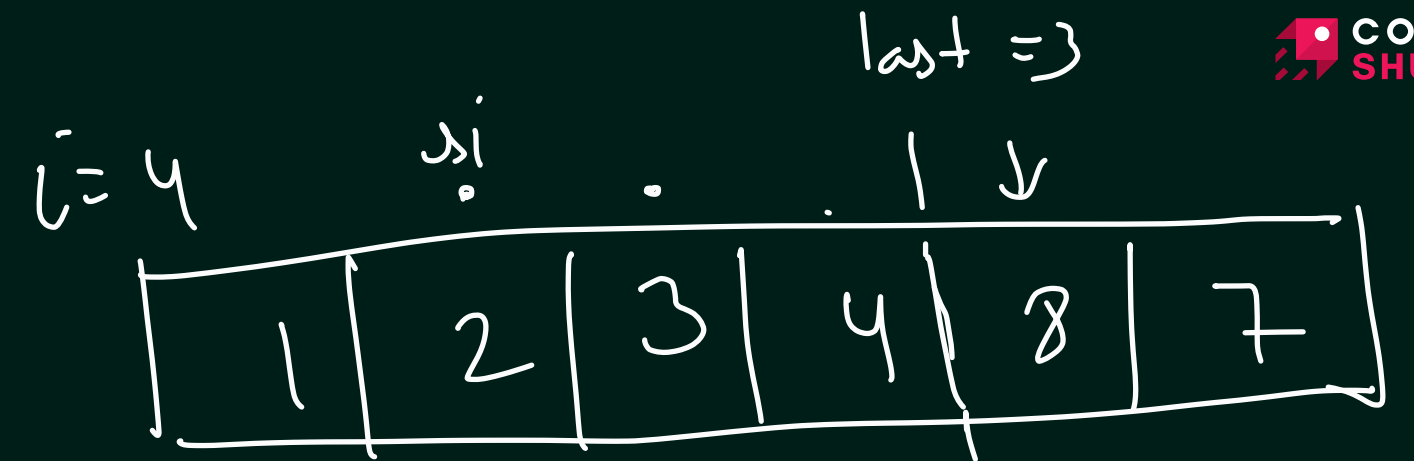
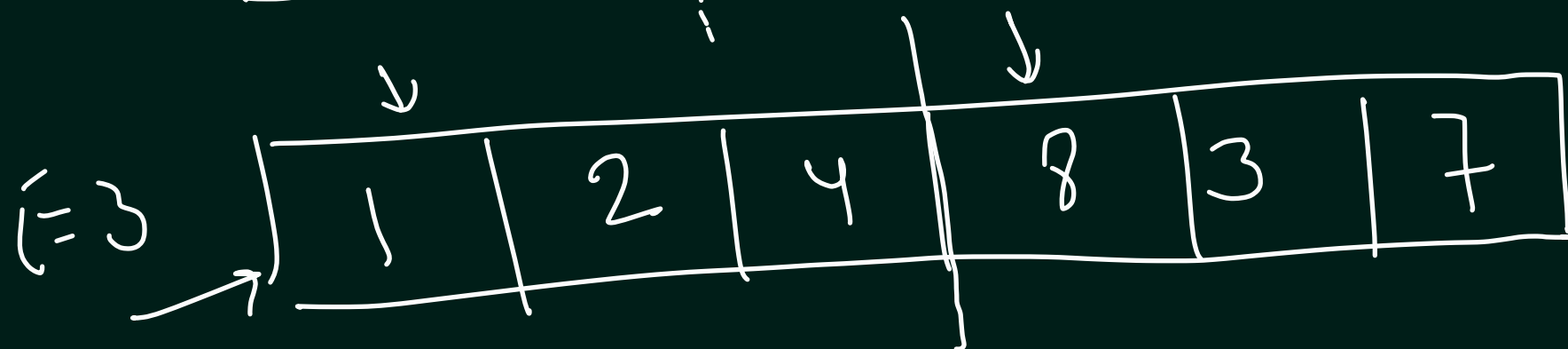
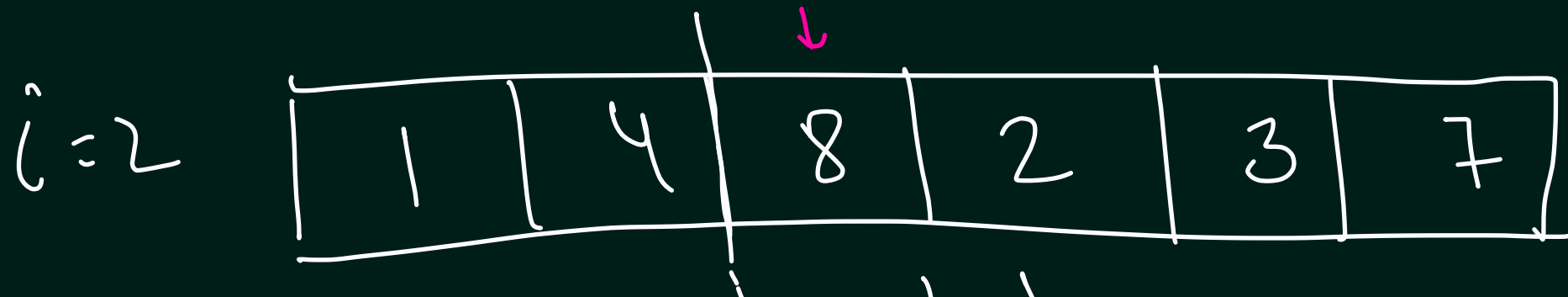
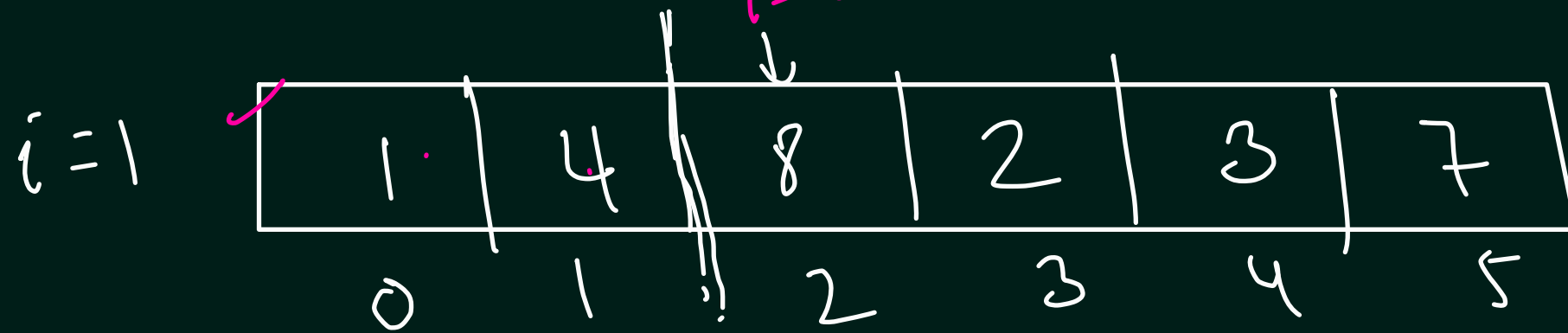
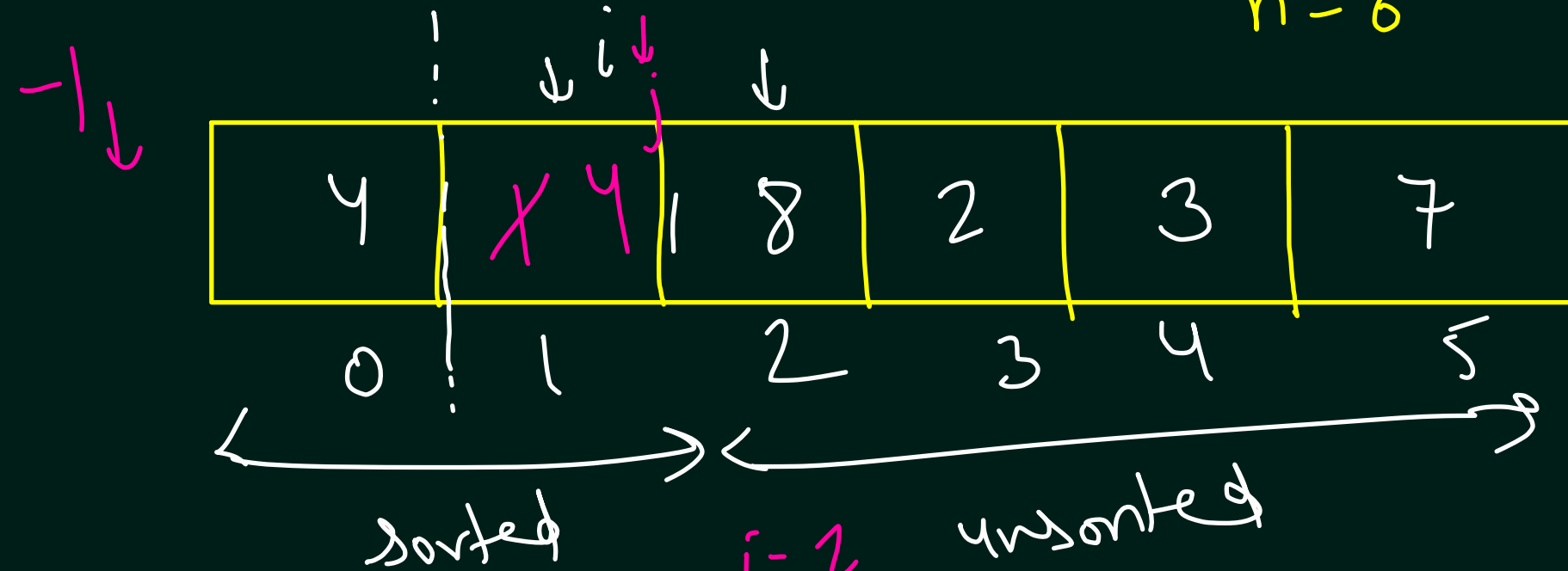
$[i=0 \rightarrow 4]$

Selection Sort

Insertion Sort

$last = 1$

$n = 6$



$last = 8$
 $a[j] = i$
 $a[j] = a[j-1]$

Insertion Sort

