

Algorithm

Insertion Sort
Time Complexity





Insertion Sort

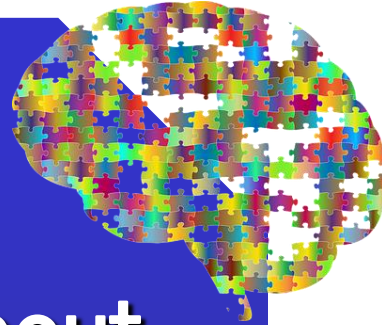
Insertion Sort

Best Case

Average Case

Worst Case

Let's think about...
Best Case





Insertion Sort

**Best
Case**

**Already
Sorted**

[1, 2, 3, 6, 8]



Insertion Sort

**Best
Case**

[1, 2, 3, 6, 8]



Insertion Sort

**Best
Case**





Insertion Sort

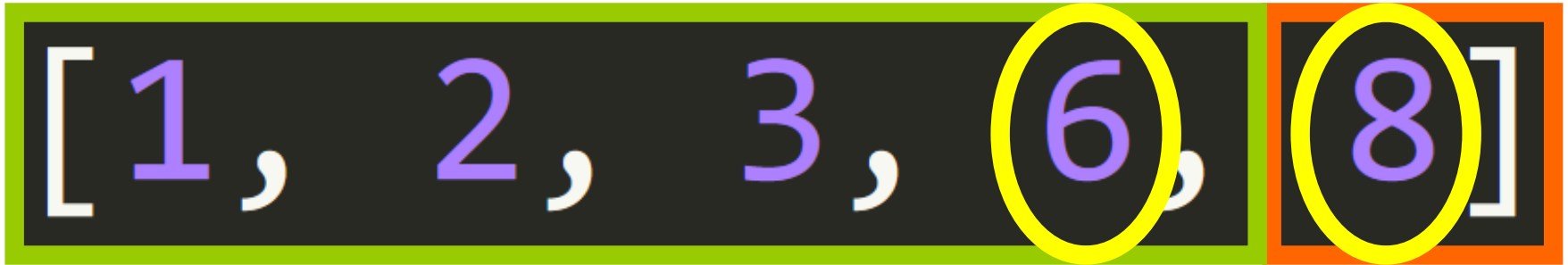
**Best
Case**





Insertion Sort

**Best
Case**





Insertion Sort

**Best
Case**

[1, 2, 3, 6, 8]



Insertion Sort

How many comparisons?

[1, 2, 3, 6, 8]



Insertion Sort

How many swaps?

[1, 2, 3, 6, 8]



Insertion Sort

Best-Case Time Complexity

$O(n)$





Let's think about...
Average Case



Insertion Sort

**Average
Case**

[1, 2, 8, 3, 4]



Insertion Sort

Average-Case Time Complexity

$O(n^2)$



Let's think about...
Worst Case



Insertion Sort

**Worst
Case**

**Reverse
Order**

[8, 6, 3, 2, 1]



Insertion Sort

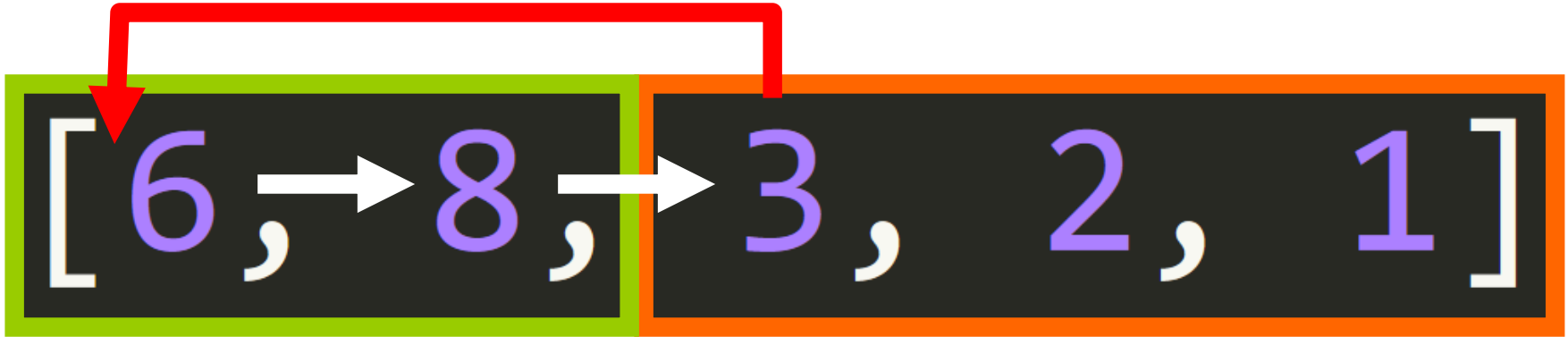
**Worst
Case**





Insertion Sort

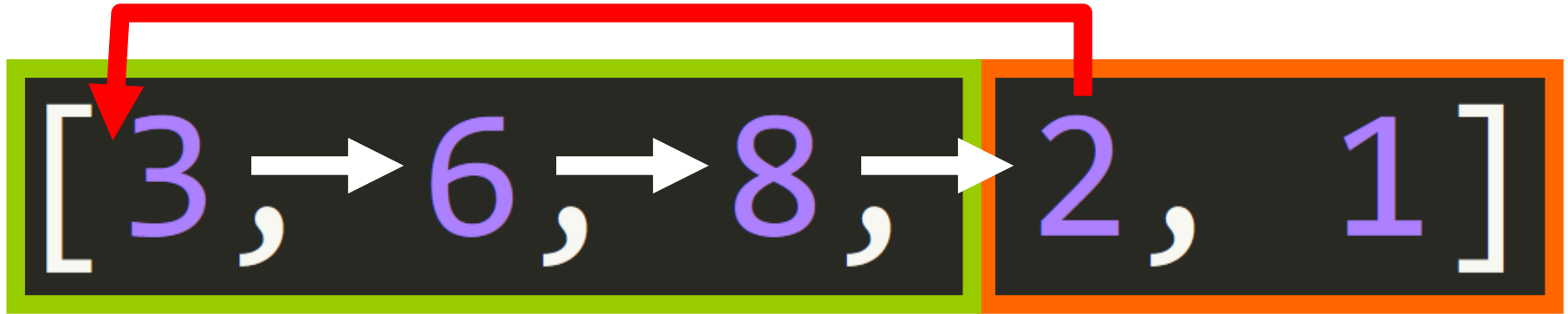
**Worst
Case**





Insertion Sort

**Worst
Case**





Insertion Sort

**Worst
Case**





Insertion Sort

**Worst
Case**

[1, 2, 3, 6, 8]



Insertion Sort

Worst-Case Time Complexity

$O(n^2)$





Insertion Sort

Use Cases:

- Not efficient for large lists.
- Efficient for very small lists.
- Efficient for small lists that are mostly sorted.





Time to Practice!

