Insertion Sort

Worst Case

Input Array => 10, 9, 8, 7, 6, 5, 4, 3, 2 ,1

1st Iteration => 1 Comparison (**9,** 10, 8, 7, 6, 5, 4, 3, 2 ,1)

2nd Iteration => 2 Comparisons (**8, 9,** 10, 7, 6, 5, 4, 3, 2 ,1)

3rd Iteration => 3 Comparisons (**7, 8, 9,** 10, 6, 5, 4, 3, 2 ,1)

4th Iteration => 4 Comparisons (**6, 7, 8, 9,** 10, 5, 4, 3, 2 ,1)

5th Iteration => 5 Comparisons (**5, 6, 7, 8, 9,** 10, 4, 3, 2 ,1)

6th Iteration => 6 Comparisons (**4, 5, 6, 7, 8, 9,** 10, 3, 2 ,1)

7th Iteration => 7 Comparisons (**3, 4, 5, 6, 7, 8, 9,** 10, 2 ,1)

8th Iteration => 8 Comparisons **(2, 3, 4, 5, 6, 7, 8, 9,** 10 ,1)

9th Iteration => 9 Comparison (**1, 2, 3, 4, 5, 6, 7, 8, 9,** 10)

f(n) = (n-1) + (n-2) + (n-3) + … + 3 + 2 + 1 = n(n-1)/2

Worst Case Complexity = O(n^2)

Average Case Complexity = θ(n^2)

Best Case

Input Array => 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Total number of comparisons = n-1

Best Case Complexity = Ω(n)

Insertion Sort is good for :

1. **Sorting small input size**
2. **When you know input is partially sorted.**

Space Complexity = O(1)