**[22,27,16,2,18,6]** => Insertion Sort

1. Write the stages of the above sequence according to the sort type.
2. Write the Big-O notation.
3. Time Complexity: Average case: The number we are looking for is in the middle, Worst case: The number we are looking for is at the end, Best case: The number we are looking for is at the beginning of the series.
4. What case does the number 18 fall into after the array is sorted? Write.

Write the first 4 steps of [7,3,5,8,2,9,4,15.6] according to Insertion Sort.

**1-) Steps**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 22 | 27 | 16 | 2 | 18 | 6 |

**Step = 1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 22 | 27 | 16 | 2 | 18 | 6 |

**Step = 2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 16 | 22 | 27 | 2 | 18 | 6 |

**Step = 3**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2 | 16 | 22 | 27 | 18 | 6 |

**Step = 4**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2 | 16 | 18 | 22 | 27 | 6 |

**Step = 5**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2 | 6 | 16 | 18 | 22 | 27 |

**2-) Big-O Notation**

It is **O(****n²)** in the worst case because it travels all the elements at each step.

n \* (n + 1) / 2 = (n² + n) / 2 => **O(n²)**

**3-) Time Complexity**

Average case: **O(n²)**

Worst case: **O(n²)**

Best case: **O(n)**

**4-) Which case for 18**

After the array is sorted, the number 18 is included in the average case, since it is near the midpoint of the array.

**First 4 Insertion Sort Steps**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 3 | 5 | 8 | 2 | 9 | 4 | 15 | 6 |

**Step = 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | 7 | 5 | 8 | 2 | 9 | 4 | 15 | 6 |

**Step = 2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | 5 | 7 | 8 | 2 | 9 | 4 | 15 | 6 |

**Step = 3**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | 5 | 7 | 8 | 2 | 9 | 4 | 15 | 6 |

**Step = 4**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2 | 3 | 5 | 7 | 8 | 9 | 4 | 15 | 6 |