**Merge Sort Steps for [16,21,11,8,12,22]**

**Merge Sort is a divide-and-conquer algorithm. It recursively splits the array into halves, sorts each half, and then merges them.**

**Step-by-step breakdown:**

1. **Split the array:**
   * **[16,21,11] and [8,12,22]**
2. **Split further:**
   * **[16,21,11] → [16], [21,11] → [21], [11]**
   * **[8,12,22] → [8], [12,22] → [12], [22]**
3. **Sort and merge:**
   * **[21] and [11] → merge → [11,21]**
   * **[16] and [11,21] → merge → [11,16,21]**
   * **[12] and [22] → merge → [12,22]**
   * **[8] and [12,22] → merge → [8,12,22]**
4. **Final merge:**
   * **[11,16,21] and [8,12,22] → merge → [8,11,12,16,21,22]**

**Final sorted array: [8,11,12,16,21,22]**

**Big-O Notation**

* **Best Case**: O(nlog⁡n)O(n \log n)
* **Worst Case**: O(nlog⁡n)O(n \log n)
* **Average Case**: O(nlog⁡n)O(n \log n)

Merge Sort consistently performs well regardless of input order, making it efficient for large datasets.