**Sorting Customer Orders**

**Bubble Sort**

* **Description**: A simple and one of the fundamental comparison-based algorithm where each pair of adjacent elements is compared, and they are swapped if they are in the wrong order. This process is repeated until the list is fully sorted.
* **Time Complexity**: O(n^2) in the worst and average case, O(n) in the best case when the array is already sorted.

**Insertion Sort**

* **Description**: Builds the sorted array one item at a time by inserting each elements into its correct position.
* **Time Complexity**: O(n^2) in the worst and average case, O(n) in the best case when the array is already sorted.

**Quick Sort**

* **Description**: Follows divide and conquer strategy where it selects a pivot element and partitions the list into elements less than or greater than the pivot, recursively sorting the partition.
* **Time Complexity**: O(n^2) in the worst case, O(n log n) on average, and in the best case.

**Merge Sort**

* **Description**: A divide-and-conquer algorithm that divides the array into two halves, recursively sorts them, and then merges the sorted halves.
* **Time Complexity**: O(n log n) in the worst, average, and best case. And it requires additional space for merging.

**Analysis**

**Time Complexity Comparison**

* **Bubble Sort**:
  + **Best Case**: O(n) when the array is already sorted.
  + **Average Case**: O(n^2).
  + **Worst Case**: O(n^2) when the array is sorted in reverse order.
* **Quick Sort**:
  + **Best Case**: O(n log n) when the pivot divides the array into two nearly equal halves.
  + **Average Case**: O(n log n).
  + **Worst Case**: O(n^2) when the pivot is the smallest or largest element, leading to unbalanced partitions (rare with good pivot selection).

**Why Quick Sort is Generally Preferred Over Bubble Sort**

* **Performance**: Quick Sort is significantly faster than Bubble Sort on average due to its O(n log n) time complexity compared to Bubble Sort's O(n^2).
* **Efficiency**: Quick Sort efficiently handles large datasets and performs well with a good pivot selection strategy.
* **Practical Use**: Bubble Sort is primarily used for educational purposes and small datasets due to its simplicity but is impractical for large datasets.