**Sorting Customer Orders**

**Bubble Sort**

* **Description**: A simple 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 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 repeatedly picking the next item and inserting it into the 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**: A divide-and-conquer algorithm that selects a 'pivot' element and partitions the array into two sub-arrays according to whether they are less than or greater than the pivot. It then recursively sorts the sub-arrays.
* **Time Complexity**: O(n^2) in the worst case (rare), 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.

**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.