Sorting Customer Orders

- Sorting Algorithms:

Bubble Sort:

- ➢ Description: Repeatedly steps through the list, compares adjacent elements, and swaps them if they are in the wrong order. This process is repeated until the list is sorted.
- ➢ Time Complexity:

Best Case: O(n) (when the list is already sorted)

Average Case: O(n^2)

Worst Case: O(n^2)

Insertion Sort:

Description: Builds the sorted array one element at a time by repeatedly picking the next element and inserting it into the correct position in the already sorted part.

- ➢ Time Complexity:

Best Case: O(n) (when the list is already sorted)

Average Case: O(n^2)

Worst Case: O(n^2)

Quick Sort:

- ➢ Description: Selects a 'pivot' element and partitions the array into two sub-arrays, according to whether they are less than or greater than the pivot. The sub-arrays are then sorted recursively.
- ➢ Time Complexity:

Best Case: O (n*log n)

Average Case: O (n*log n)

Worst Case: O(n^2) (when the smallest or largest element is always chosen as the pivot)

Merge Sort:

- Description: Divides the array into halves, recursively sorts them, and then merges the sorted halves to produce the final sorted array.
- Time Complexity:

Best Case: O (n*log n)

Average Case: O (n*log n)

Worst Case: O (n*log n)

- Time Complexity Comparison:

Bubble Sort:

- Best Case: O(n)
- Average Case: O(n^2)
- Worst Case: O(n^2)

Quick Sort:

- Best Case: O (n*log n)
- Average Case: O (n*log n)
- Worst Case: O(n^2)

- Why Quick Sort is Generally Preferred Over Bubble Sort:

Efficiency: Quick Sort is significantly more efficient on average than Bubble Sort due to its O (n*log n) average time complexity compared to O(n^2) for Bubble Sort.

Performance: Quick Sort performs well on large datasets and is typically faster in practice due to fewer comparisons and swaps.

Divide and Conquer: Quick Sort uses a divide-and-conquer approach, which is more scalable and adaptable to various types of data.

Memory Usage: Quick Sort is an in-place sorting algorithm, meaning it requires a small amount of additional memory space compared to other sorting algorithms like Merge Sort.