1. Understanding Sorting Algorithms:

Common Sorting Algorithms:

1. Bubble Sort:

- Compares adjacent elements and swaps if out of order.

- Time Complexity: O(n^2) in worst and average case.

- Space Complexity: O(1)

- Simple but inefficient for large datasets.

2. Insertion Sort:

- Builds the sorted array one item at a time.

- Time: O(n^2), Best: O(n) (when nearly sorted)

- Space: O(1)

3. Merge Sort:

- Divide and conquer, divides list into halves, merges sorted halves.

- Time: O(n log n) in all cases.

- Space: O(n) (due to auxiliary array)

4. Quick Sort:

- Divide and conquer, picks a pivot and partitions around it.

- Time: Best/Average: O(n log n), Worst: O(n^2) (rare with good pivot)

- Space: O(log n) due to recursion stack.