1. **Understand Sorting Algorithms:**
   1. **Explain different sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Merge Sort).**

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| **Algorithm** | **Best Case** | **Average Case** | **Worst Case** | **Space Complexity** | **Stable** | **In-place** |
| **Bubble Sort** | O(n) | O(n^2) | O(n^2) | O(1) | Yes | Yes |
| **Insertion Sort** | O(n) | O(n^2) | O(n^2) | O(1) | Yes | Yes |
| **Quick Sort** | O(n log n) | O(n log n) | O(n^2) | O(log n) | No | Yes |
| **Merge Sort** | O(n log n) | O(n log n) | O(n log n) | O(n) | Yes | No |

1. **Analysis:**
   1. **Compare the performance (time complexity) of Bubble Sort and Quick Sort.**

**Bubble sort :** O(n^2) in both average and worst case.

**Quick sort :** O(n log n) for average case and O(n^) for worst case.

* 1. **Discuss why Quick Sort is generally preferred over Bubble Sort.**

Quick Sort has significantly better average and worst-case time complexity, making it much faster for larger datasets.