**Exercise 3: Sorting Customer Orders**

1. Explain different sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Merge Sort).
   * Bubble sort is a straightforward sort algorithm that repeatedly steps through the list, compares adjacent elements and swaps them if they are in the wrong order.
   * Insertion Sort is the way in which the sorted array is built, one item at a time, picking the next element out of the unsorted array and then inserting it into the right place among the sorted items.
   * Quick Sort: In this process, a divide-and-conquer algorithm selects a pivot element in the array. It then orders the rest of the elements on both sides of the array such that one part of the partition is of elements that have values less than the one chosen, while the other part of the partition is of elements that have values greater than the selected element. One applies the above procedure recurrently to the subarray of elements with smaller values and independently to the subarray of elements with greater values.
   * Merge Sort: A divide-and-conquer algorithm that divides this array into two halves, sorts the two halves recursively, and then merges the sorted halves.
2. Compare the performance (time complexity) of Bubble Sort and Quick Sort.
   * Bubble Sort:
     1. Best Case: O(n) if the list is already sorted.
     2. Average Case: O(n²).
     3. Worst Case: O(n²).
   * Quick Sort:
     1. Best Case: O(n log n) when the pivot divides the array into balanced parts.
     2. Average Case: O(n log n).
     3. Worst Case: O(n²) when the pivot selection is really bad—for example, always picking the minimum or maximum element.
3. Discuss why Quick Sort is generally preferred over Bubble Sort.
   * Quick Sort, hence, should be used rather than Bubble Sort for an e-commerce application since the former gives much better performance for large data. Although implementation is a bit easier with Bubble Sort, however, since it is based on inefficiency, practically it is not recommended for large customer orders.