Lab Assignment - 1
Analysis and Design of Algorithms
(CS1401)

Part1: Searching in lists

For the given list: 1, 4, 7, 7, 8, 9, 18, 27, 31, 56, 81
Write a program in c/c++/java to implement the following:

1. Search for 1, 81, 7, 3 in the list by scanning the list linearly and analyze the searching complexity.
2. Optimize the above searching algorithm to perform searching for the same elements in O(log(n)) average time complexity by comparing search key to the middle of the list and recursively decreasing the size of search space to one half.

Part2: Sorting elements of a list

For the given list: 18, 56, 27, 7, 8, 4, 9, 31, 81, 1
Write a program in c/c++/java to implement the following:

1. Sort the list by selecting the smallest element in the list and placing it in the beginning, and repeating the process with the leftover elements until the entire list is sorted in increasing order. Also output the number of comparisons and iterations required for sorting.
2. Perform bubble sort on the same list and analyze the change in time complexity and number of comparisons required.
3. Implement Insertion sort algorithm to sort the above list and analyze the change in time complexity and number of comparisons required.
4. Given two sorted sub-halves of the list 7, 8, 18, 27, 56 and 1, 4, 9, 31, 81 implement the process of merging two sorted lists in linear time.
5. Use the above program to implement the complete merge-sort algorithm.