CST 370 Homework (Sorting)

- 1. Sort the array of numbers 10, 4, -3, 8, 1 in ascending order using the **selection sort algorithm**. Show the state of the array after each iteration of the algorithm.
 - 10, 4, -3, 8, 1 Scan the entire list and locate the smallest element.
 - -3, 4, 10, 8, 1 Swap the smallest element with the element in position 1.
 - -3, 4, 10, 8, 1 Scan the list from the 2nd position and locate the smallest element.
 - -3, 1, 10, 8, 4 Swap the smallest element with the element in position 2.
 - -3, 1, 10, 8, 4 Scan the list from the 3rd position and locate the smallest element.
 - -3, 1, 4, 8, 10 Swap the smallest element with the element in position 3.
 - -3, 1, 4, 8, 10 Scan the list from the 4th position and locate the smallest element.
 - -3, 1, 4, 8, 10 Swap the smallest element with the element in position 4 (itself in this case, no swap).
 - -3, 1, 4, 8, 10 Sort ends, the final element is correctly positioned (outer loop stops at n-1).

1st Iteration: -3, 4, 10, 8, 1 2nd Iteration: -3, 1, 10, 8, 4 3rd Iteration: -3, 1, 4, 8, 10 4th Iteration: -3, 1, 4, 8, 10

Final sorted array: -3, 1, 4, 8, 10

- 2. Sort the array of numbers 10, 4, -3, 8, 1 in ascending order using the **bubble sort algorithm**. Show the state of the array after each iteration of the algorithm.
 - 10, 4, -3, 8, 1 Compare the element at position 0 in the array with the element at position 1.
 - 4, 10, -3, 8, 1 Swap elements since 4 < 10.
 - 4, 10, -3, 8, 1 Compare the element at position 1 in the array with the element at position 2.
 - 4, -3, 10, 8, 1 Swap elements since -3 < 10.
 - 4, -3, 10, 8, 1 Compare the element at position 2 in the array with the element at position 3.
 - 4, -3, 8, 10, 1 Swap elements since 8 < 10.
 - 4, -3, 8, 10, 1 Compare the element at position 3 in the array with the element at position 4.
 - 4, -3, 8, 1, 10 Swap elements since 1 < 10.

1st Iteration: 4, -3, 8, 1, 10 2nd Iteration: -3, 4, 1, 8, 10 3rd Iteration: -3, 1, 4, 8, 10 4th Iteration: -3, 1, 4, 8, 10

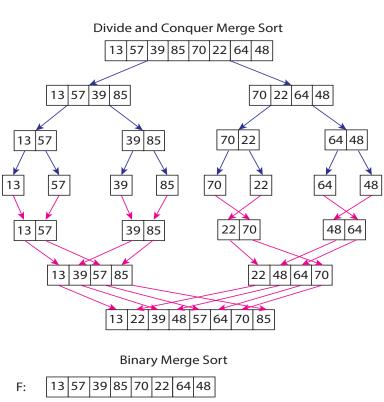
Final sorted array: -3, 1, 4, 8, 10

3. Sort the array of numbers 10, 7, 3, 8, 1, 9, 0 in ascending order using the insertion sort algorithm. Show the state of the array after each iteration of the algorithm.

Array: 10, 7, 3, 8, 1, 9, 0
1st Iteration: 7, 10, 3, 8, 1, 9, 0
2nd Iteration: 3, 7, 10, 8, 1, 9, 0
3rd Iteration: 3, 7, 8, 10, 1, 9, 0
4th Iteration: 1, 3, 7, 8, 10, 9, 0
5th Iteration: 1, 3, 7, 8, 9, 10, 0
6th Iteration: 0, 1, 3, 7, 8, 9, 10

Final sorted array: 0, 1, 3, 7, 8, 9, 10

4. Use diagrams similar to the one shown in the slides and in your textbook to show the various stages of the merge sort algorithm for the following array of numbers: 13, 57, 39, 85, 70, 22, 64, 48



- F1: 13 39 70 64
- F2: 57 85 22 48
- F: 13 57 39 85 22 70 48 64
- F1: 13 57 22 70
- F2: 39 85 48 64
- F: 13 39 57 85 22 48 64 70
- F1: 13 39 57 85
- F2: 22 48 64 70
- F: 13 22 39 48 57 64 70 85