Question 1: All True

**Question 2**. Find an array that makes the bubble sort exhibits its worst behaviour, when the basic operation is the **Swap**.

Worst case: when the number is lower than or equal to the one before it. In other words, when we have a non-ascending list.

Question 3. Sorting the following array:

[30, 50, 70, 10, 40, 60]

a. Insertion Sort

Expected number of iterations: n – 1 = 5

After iteration 1:

[30, 50, 70, 10, 40, 60]

After iteration 2:

[30, 50, 70, 10, 40, 60]

After iteration 3:

[10, 30, 50, 70, 40, 60]

After iteration 4:

[10, 40, 30, 50, 70, 60]

After iteration 5:

[10, 40, 30, 50, 60, 70]

b. Selection sort

In each iteration: try to find the th smallest element and swap it with the current element

After iteration 1:

[10, 50, 70, 30, 40, 60] (swap 10 and 30)

After iteration 2:

[10, 30, 70, 50, 40, 60] (swap 50 and 30)

After iteration 3:

[10, 30, 40, 50, 70, 60] (swap 70 and 40)

After iteration 4:

[10, 30, 40, 50, 70, 60] (don’t swap)

After iteration 5:

[10, 30, 40, 50, 60, 70] (Swap 60 and 70)

c. Bubble sort

In each iteration: Try to swap pairs of elements

[30, 50, 70, 10, 40, 60]

Iteration 1:

[**30, 50**, 70, 10, 40, 60] -> do not swap (correct position)

[30, **50, 70**, 10, 40, 60] -> do not swap

[30, 50, **10, 70**, 40, 60] -> Since 10 < 70, swap 10 and 70

[30, 50, 10, **40, 70**, 60] -> Since 40 < 70, swap 40 and 70

[30, 50, 10, 40, **60, 70**] -> Since 60 < 70, swap 60 and 70

Iteration 2:

[30, 10, 40, 50, 60, 70]

Iteration 3:

[10, 30, 40, 50, 60, 70]

Iteration 4:

[10, 30, 40, 50, 60, 70]

Iteration 5:

[10, 30, 40, 50, 60, 70] -> Sorted

**Question 4:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Case | Pre condition | Post condition | Test Data | Expected Result | Actual Result |
| ***Sort Random Array*** | Given a random array of non-sorted elements | The random array should be sorted | [1, 4, 2, 3, 5, 6, 9, 7, 8, 10] | [1, 2, 3, 4, 5, 6, 7, 8, 9, 10] |  |
| Already sorted array | Given an array of sorted elements | The array should be sorted | [1, 2, 3, 4, 5, 6, 7, 8, 9, 10] | [1, 2, 3, 4, 5, 6, 7, 8, 9, 10] |  |
| Array reversely sorted | Given an array of reversely sorted elements | The array should be sorted in the other direction | [10, 9, 8, 7, 6, 5, 4, 3, 2, 1] | [1, 2, 3, 4, 5, 6, 7, 8, 9, 10] |  |
| Empty array | Given an array of no elements | The array is unchanged (no elements) | [] | [] |  |