

Algorithms and Data Structures 1 - Assignment 2

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1. Array vs. Single Linked List

Array: [7,7,5,4,2,1,1,0]

List: [7] -> [7] -> [5] -> [4] -> [2] -> [1] -> [1] -> [0]

Insert 4 into an array:

Step 0:

Array: [7,7,5,4,2,1,1,0]

Current element: ^

Current element index: 0

Comment: if 7 < 4 -> increment index

Step 1:

Array: [7,7,5,4,2,1,1,0]

Current element: ^

Current element index: 1

Comment: if 7 < 4 -> increment index

Step 2:

Array: [7,7,5,4,2,1,1,0]

Current element: ^

Current element index: 2

Comment: if 5 < 4 -> increment index

Step 3:

Array: [7,7,5,4,2,1,1,0]

Current element: ^

Current element index: 3

Comment: if 4 < 4 -> insert 4 at index 3, end

Final array: [7,7,5,4,4,2,1,1,0]

Insert 4 into a list:

Step 0:

List: [0] -> [1] -> [1] -> [2] -> [4] -> [5] -> [7] -> [7]

Current element: ^

Comment: if 0 > 4 -> next element by following the pointer

Step 1:

List: [0] -> [1] -> [1] -> [2] -> [4] -> [5] -> [7] -> [7]

Current element: ^

Comment: if 1 > 4 -> next element by following the pointer

Step 2:

List: [0] -> [1] -> [1] -> [2] -> [4] -> [5] -> [7] -> [7]

Current element: ^

Comment: if 1 > 4 -> next element by following the pointer

Step 3:

List: [0] -> [1] -> [1] -> [2] -> [4] -> [5] -> [7] -> [7]

Current element: ^

Comment: if 2 > 4 -> next element by following the pointer

Step 4:

List: [0] -> [1] -> [1] -> [2] -> [4] -> [5] -> [7] -> [7]

Current element: ^

Comment: if 4 > 4 -> insert 4 before the current element, end

Final list: [0] -> [1] -> [1] -> [2] -> [4] -> [4] -> [5] -> [7] -> [7]

Comments for the operations:

- When inserting an element to a list, one needs to take care of the pointers of the previous element and current element.
- For example, in the list, the element 4 is inserted between 2 and 5. The pointer of 2 is changed to point to 4, and the pointer of 4 is changed to point to 5.
- One can add or remove elements from an array regardless of the element order.