



Introduction to Algorithms (CELEN086)

Problem Sheet 4

Topics: Recursive algorithm; Helper function; List

1. Write the pseudocode for creating the list $L = [4, 6, 8, 5, 3]$.
2. For the given list L in Q1, write pseudocodes for getting following lists or elements:
 - i. $[8, 5, 3]$
 - ii. 6
 - iii. 3
 - iv. $[3]$
3. Write an algorithm called **isSingle()** that takes a non-empty list as input and return True if the list has only one element; otherwise return False.
4. Write a recursive algorithm called **maxList()** that takes a non-empty list as input and return the largest element of the list.

You should write a helper function (i.e., using the method as introduced in the last page of Lecture 4).
5. Trace your algorithm in Q4 for $\text{maxList}([4, 5, 1, 9, 3])$.
6. Write a recursive algorithm called **index(x,L)** that takes a number x and a list L as inputs, and returns the position of element x in the list (Assume the list contains element x).

For example, calling $\text{index}(9, [4, 5, 1, 9, 3])$ should return 4, as 9 is the 4th element in the list.

Trace your algorithm with the given example to show it is working correctly.
7. Write a recursive algorithm called **getNth(n,L)** that takes a position index number n and a list L , and returns the n -th element of L . For example,
 $\text{getNth}(4, [4, 5, 1, 9, 3]) = 9$.

Trace your algorithm in Q7 with the given example.
8. Write a recursive algorithm called **linSearch(x,L)** that checks if number x is an element of the list L . It should return True if x is found in the L ; otherwise return False.



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9. Write a recursive algorithm called **delNth(n,L)** that deletes the n-th element of list L as specified by the position index number n. It should return a new list after the deletion.

For example,

$\text{delNth}(4, [4, 5, 1, 9, 3]) = [4, 5, 1, 3]$

(Hint: you may need to use the function $\text{cons}(x, \text{list})$.)

10. Trace your algorithm in Q9 with the given example.

11. Write a recursive algorithm called **reverse()** that takes a list as its input and return a list in reversed order. For example,

$\text{reverse}([4, 5, 1, 3]) = [3, 1, 5, 4]$.

(Hint: you may need to design a helper function.)

12. Trace your algorithm in Q11 with the given example.