

## Assignment Series 3

### O'Caml Programming with Tuples and Lists

#### Assignment 6:

Implement the following functions in O'Caml:

1. `nth (n,l)` that yields the `n`th element of a list; counting of list elements starts with 0.  
Example: `nth (2, [1,2,3]) = 3`
2. `heads l` that given a list of non-empty lists `l` yields the list of first elements of the sublists.  
Example: `heads [[1,2,3], [4,5,6]] = [1,4]`
3. `pair (l,m)` that given a pair of lists yields the list of pairs of elements from corresponding list positions. If the length of one argument list exceeds the length of the other, surplus elements are ignored.  
Example: `pair ([1,2,3], [true,false]) = [(1,true), (2,false)]`
4. `isSublist (l,m)` that checks whether or not the argument list `l` is a sublist of the argument list `m`.  
Example: `isSublist ([3,4], [1,2,3,4]) = true`  
Example: `isSublist ([2,4], [1,2,3,4]) = false`
5. `substitute (a,b) l` that yields the list that results from replacing all occurrences of value `a` in list `l` by value `b`.  
Example: `substitute (0,42) [3,2,1,0,1,0,0] = [3,2,1,42,1,42,42]`
6. `evenOddList l` that yields a pair of lists `(e,o)` where list `e` contains all elements at even positions of argument list `l` while list `o` contains all elements at odd positions of argument list `l`.  
Example: `evenOddList [0,1,2,3,4,5,6,7] = ([0,2,4,6], [1,3,5,7])`
7. `filter v l` that yields the list that results from removing all occurrences of argument value `v` from argument list `l`.

Where needed auxiliary functions shall be defined locally to their host functions. Each function shall be preceded by a comment stating the function's most general type alongside a brief justification of that type.

#### Assignment 7: Quicksort

Implement a function `quicksort l` in O'Caml that sorts a given list of integer numbers in ascending order.

The algorithmic idea of quicksort is to divide a given list into the list of elements that are less than or equal a freely chosen pivot element and the list of elements that are greater than the pivot element. These two lists are (recursively) and the resulting sorted lists are concatenated to form the overall result.

**Assignment due date: February 23, 2010, lecture**