

## 580: Algorithms Preparation 1

We will begin by studying, in a surprising amount of detail given its simplicity, the following computational problem. It will be helpful if you have just looked over the problem and the solution before the initial lectures.

**Problem: (Sequence Search).** Given an *ordered* sequence  $L = \langle a_1, \dots, a_N \rangle$  of  $N$  integers, and an integer  $k$ , determine whether  $k$  is in  $L$  or not.

This problem is specified using mathematical notation so that it is independent of any particular language. The first proposed solution we will look at is as follows.

```
1: procedure SIMPLESEARCH( $L = \langle a_1, \dots, a_N \rangle, k$ )
2:   for  $e$  in  $L$  do
3:     if  $e == k$  then
4:       return True
5:     end if
6:   end for
7:   return False
8: end procedure
```

This solution is written in *pseudocode*. I hope it is clear to you what this solution does, meaning that you could implement it in a language of your choice if you had to, picking an appropriate data structure for the sequence.

Pseudocode has no formal syntax rules. It is often a mixture of natural language, mathematical notation and constructs that resemble common programming languages. If it is clear and unambiguous it is OK. Where there might be ambiguity, I will follow the pseudocode conventions set out in the book *Introduction to Algorithms* (Cormen *et al.* 2009). (This is the main course textbook.) They are:

- Variables are local to the given procedure.
- A variable representing an array or object is treated as a pointer.
- Parameters are passed to procedures by value. When objects are passed as parameters, the pointer is copied.

The course also assumes the same *computational model* as Cormen: a single-processor random-access machine (RAM). All instructions are executed sequentially. There are no concurrent operations.