(a) Present the top-down design of a program that generates calendars for a given month and year, as in this example:

October 2003
S M Tu W Th F S
1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31

Express your program using a readable pseudo-code, carefully outlining the program’s design. You may assume that primitives for weekday and date calculations are provided. [10 marks]

(b) Consider the following ML function declarations:

```
fun app([], ys) = ys
  | app(x::xs, ys) = x :: app(xs,ys);
fun nlength [] = 0
  | nlength (x::xs) = nlength xs + 1;
fun nrev [] = []
  | nrev(x::xs) = app(nrev xs, [x]);
```

Use structural induction (on `xs`) to prove the equations

(i) \( n\text{length}(\text{app}(xs,ys)) = n\text{length} \, xs + n\text{length} \, ys \), and

(ii) \( n\text{length}(\text{nrev} \, xs) = n\text{length} \, xs \).

[10 marks]