

Solutions – Practical 1

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This practical should have been straightforward, once you got to grips with the editor, Unix, and interaction with the ML system.

A simple answer to Question 2 would be

```
fun FF 0 = 1
  | FF 1 = 3
  | FF 2 = 5
  | FF n = 1 + FF(n-1) + FF(n-3)
```

But this would take aeons to compute $FF(200)$, so the iterative version given is necessary.

Since there was some confusion over what was intended (despite the fact that the instructions were clear), answers that counted internal nodes, rather than nodes, were also marked correct.

```

structure Answers1 : A1 = struct
  (* Question 1 *)
  fun C (n,r) = if r <= 0 then 1
                else n * C(n-1, r-1);

  (* Question 2 - improved *)
  local
    fun FFtriple 0 = (1,3,5)
      | FFtriple n =
        let val (a, b, c) = FFtriple (n-1)
        in
          (b, c, a+c+1)
        end
  in
    fun FF n = let val (a,_,_) = FFtriple n
              in a
              end
  end;

  val FF20 = FF 20
  and FF200 = FF 200;

  (* Question 3 *)
  fun G(0, b) = 1
    | G(n, b) =
      if n <= b then 2 + G(n-1, b)
      else G(n-1, b) + G(n-1-b, b) + 1;

  (* Question 4 *)
  fun RB 0 = 1
    | RB n = RB(n-1) + RB(n div 2) + 1;

  val RB100 = RB 100;
end;

```

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