Question:

What is the propagation delay of mul32 in terms of FA (Full Adder) delays? Assume add32 represents a 32-bit ripple carry adder.

function Bit#(64) mul32(Bit#(32) a, Bit#(32) b);
    Bit#(32) tp = 0;
    Bit#(32) prod = 0;
    for(Integer i = 0; i < 32; i = i+1)
    begin
        Bit#(32) m = (a[i]==0) ? 0 : b;
        Bit#(33) sum = add32(m,tp,0);
        prod[i] = sum[0];
        tp = sum[32:1];
    end
    return {tp,prod};
endfunction

32 + 2*31 = 94 Full Adder Delays

Explanation:

Delay of the first add32: 32 FAs
Each subsequent add32 adds 2 FA delay

Example: Consider 1101 X 111

```
  1 1 0 1
  1 1 1
  0 0 0 0
  1 1 0 1
  1 1 0 1
  1 1 0 1
  1 0 0 1
  1 1 0 1
  1 0 1 1 0 1 1
```

Four FA delay for first adder
Two FA delay for each subsequent adder