perform the following operations in sign-magnitude & then in 2's complement.

\[
\begin{align*}
\text{a. } & \ 1010001 \\
+ & \ 1000010 \\
\hline
& \ 1010011
\end{align*}
\]

\[
\begin{align*}
\text{b. } & \ 0111001 \\
+ & \ 10010111 \\
\hline
& \ 10100010 \\
\end{align*}
\]

\[
\begin{align*}
\text{b. } & \ 111001 \\
- & \ 010111 \\
\hline
& \ 100010
\end{align*}
\]
Is the following good Verilog? If not, fix it. If so, draw the circuit it represents.

module mystery(a, b, c, d);
    input logic [3:0] a, b;
    output logic c;
    output logic [3:0] d;
    logic [3:0] e;
    integer i;
    always_comb begin
        c = 1'b0;
        d = 4'b0000;
        e = 4'b0000;
        for (i=0; i<4; i++) begin
            if (a[i] | b[i])
                e[i] = 1'b1;
            else
                if (a[i] ^ b[i])
                    d[i] = 1'b1;
            end
        end
        c = (e == 4'b1111);
    end
endmodule
Using the following equation

\[ F = \overline{A} \overline{B} \overline{C} + (A + \overline{C}) + \overline{B} \overline{C} \]

to implement these technologies.

a) 8:1 MUX
b) 3:8 Decoder
c) 4:1 MUX
Build a 5-bit counter to do the following:

<table>
<thead>
<tr>
<th>C1</th>
<th>C0</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Reset (out = 0)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Parallel to Good</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>x2, multiply the current value by 2.</td>
</tr>
</tbody>
</table>
| 1  | 0  | Divide the current value by 2, rounding down if the current value is odd.

"Cel" if odd, round down.

2's complement unsigned.
Design a circuit that can tell if a 3-bit unsigned number is prime.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

\( F = AC + \overline{A}B \)