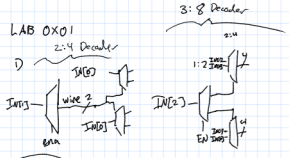
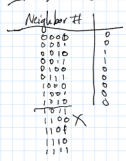
LAB 0x01




Conway Cell logic

Is it between 2 & 3?



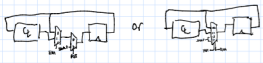

$$\left(\overbrace{\overline{N_8}\,\overline{N_2}\,N_1\,\overline{N_0}}^{\text{is it 2?}} + \overbrace{\overline{N_3}\,\overline{N_2}\,N_1\,N_0}^{\text{is it 3?}}\right) \text{alive} + \overline{\text{alive}}\left(\overline{N_3}\,\overline{N_2}\,N_1\,N_0\right)$$

| alive | between | |
|---|---|---|
| 0 | 0 | X |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

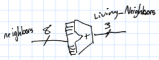
$$\text{state_}t = \text{alive}\left(\overline{N_3}\,\overline{N_2}\,N_1\,\overline{N_0}\right) + \overline{N_3}\,\overline{N_2}\,\overline{N_1}\,N_1\,N_0$$

$$= \overline{N_3}\,\overline{N_2}\,N_1\left(\text{alive}_t + N_0\right)$$

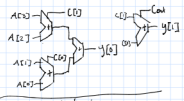
Reset logic



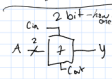

Adders



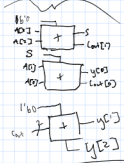

Reduce to 2 bit case



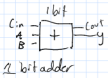

2 bit - how many ones?




4/8 - How many ones?




Full adder




2 bit adder

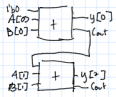
Truth table

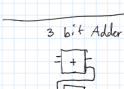
| Cin | A | B | Cout | y |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 |

$$y = \overline{C_{in}}\,A \oplus B + C_{in}\,\overline{(A \oplus B)}$$

$$C_{out} = \overline{C_{in}}\,A_1 A_0 + (A_1 A_0)\,C_{in}$$

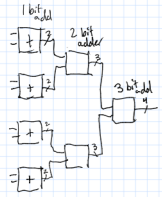
2 bit adder



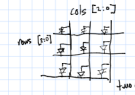




3 bit Adder ... etc

How Many ones?




Display driver




rows iterates through

correct

row = ~row _ cells

two diff methods

per row

$$row[i] = col[0] \cdot cell_{i,0} + col[1] \cdot cell_{i,1} + col[2] \cdot cell_{i,2}$$

$$row[i] = \sum_{j=0}^{N-1} col[j] \cdot cell_{i,j}$$