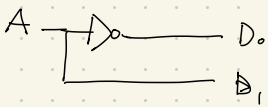


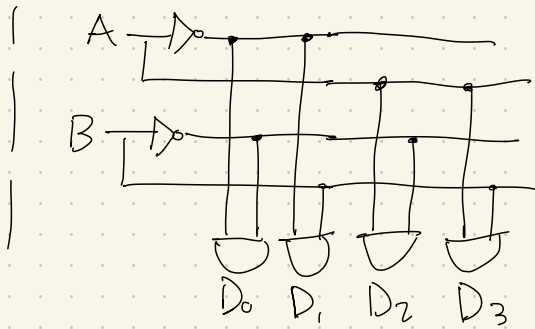
# DECODERS

1 to 2



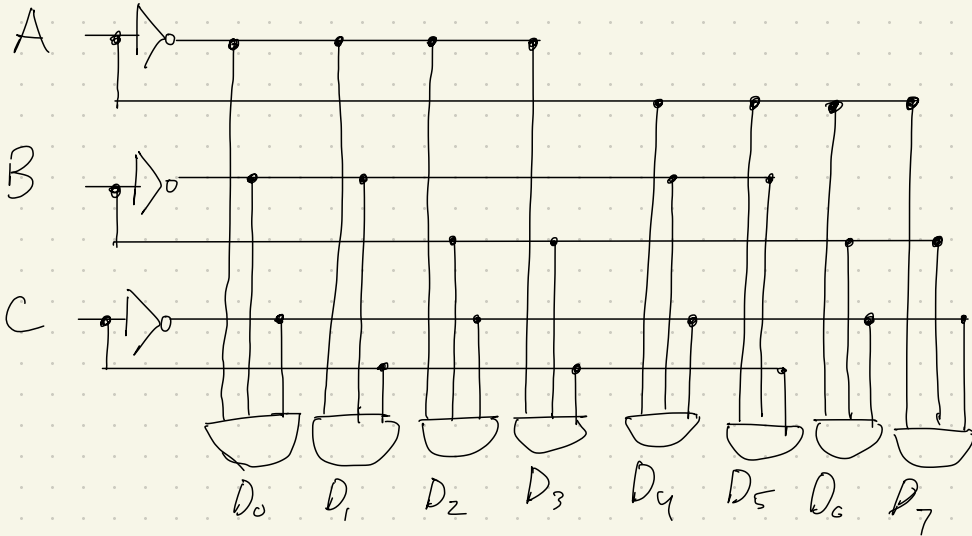
A	D <sub>0</sub>	D <sub>1</sub>
0	1	0
1	0	1

2 to 4



A	B	D <sub>0</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

3 to 8



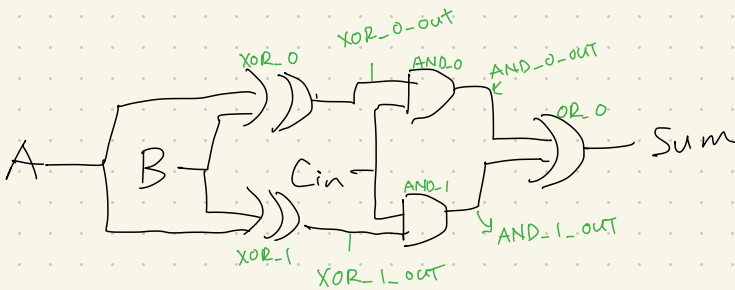
A	B	C	D <sub>0</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	D <sub>7</sub>
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

$D_0 \rightarrow \overline{A}\overline{B}\overline{C}$   
 $D_1 \rightarrow \overline{A}\overline{B}C$   
 $D_2 \rightarrow \overline{A}B\overline{C}$   
 $D_3 \rightarrow \overline{A}BC$   
 $D_4 \rightarrow A\overline{B}\overline{C}$   
 $D_5 \rightarrow A\overline{B}C$   
 $D_6 \rightarrow AB\overline{C}$   
 $D_7 \rightarrow ABC$

# ADDER\_1

Cin	a	b	Cout	Sum
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

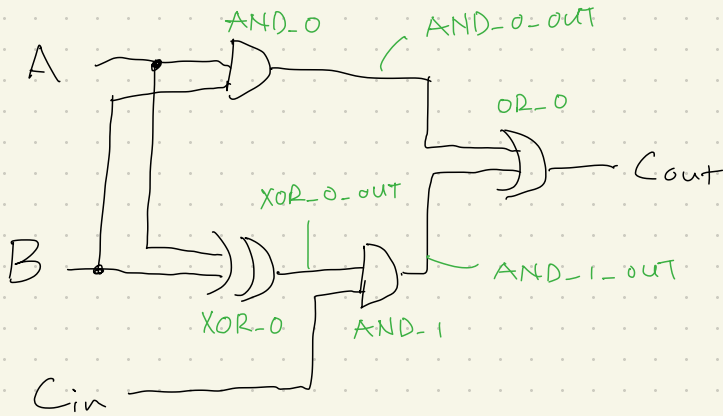
$$\begin{aligned}
 \text{Sum} &= \overline{\text{Cin}} \overline{\text{A}} \text{B} + \overline{\text{Cin}} \text{A} \overline{\text{B}} + \text{Cin} \overline{\text{A}} \overline{\text{B}} + \text{Cin} \text{A} \text{B} \\
 &= \overline{\text{Cin}} (\underbrace{\overline{\text{A}} \text{B} + \text{A} \overline{\text{B}}}_{\text{XOR}}) + \text{Cin} (\underbrace{\overline{\text{A}} \overline{\text{B}} + \text{A} \text{B}}_{\text{XNOR}})
 \end{aligned}$$



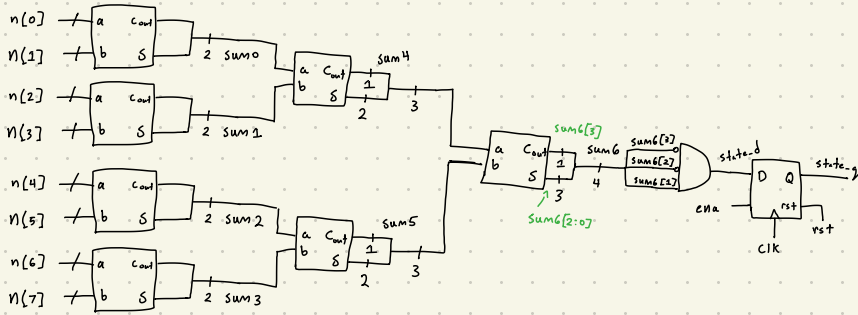
$$C_{out} = \overline{C_{in}} AB + C_{in} \overline{A} B + C_{in} A \overline{B} + C_{in} AB$$

$$AB [\cancel{C_{in}} + C_{in}] + C_{in} \underbrace{[\overline{A} B + A \overline{B}]}_{XOR}$$

$$= AB + C_{in} \& (A \oplus B)$$



# 8-bit Summation



sum_neighbors		
0	0000	0
2	0001	0
2	0010	1
3	0011	1
4	0100	0
5	0101	0
6	0110	0
7	0111	0
8	1000	0

$$\bar{A}\bar{B}\bar{C}\bar{D}Q + \bar{A}\bar{B}\bar{C}D$$

A → sum6[3]

B → sum6[2]

C → sum6[1]

D → sum6[0]

Q → state-g