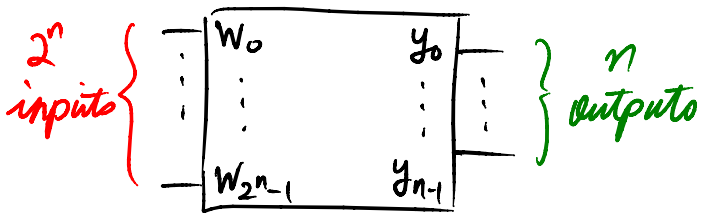
Arithmetic Circuits

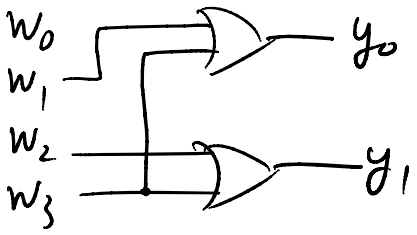
① Encoder → performs the opposite function of a decoder
→ used to reduce the number of bits needed to represent given information



2^n-to-n binary encoder

4-to-2 binary encoder

W_3	W_2	W_1	W_0	y_1	y_0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1



→ Piority encoders — indicate the highest priority input
— indicate if any input has been set

W_3	W_2	W_1	W_0	y_1	y_0	z
0	0	0	0	d	d	0
0	0	0	1	0	0	1
0	0	1	X	0	1	1
0	1	X	X	1	0	1
1	X	X	X	1	1	1

intermediate value

$i_0 = \overline{W_3}\,\overline{W_2}\,\overline{W_1}\,W_0$

$i_1 = \overline{W_3}\,\overline{W_2}\,W_1$

$i_2 = \overline{W_3}\,W_2$

$i_3 = W_3$

$y_1 = i_2 + i_3$

$y_0 = i_1 + i_3$

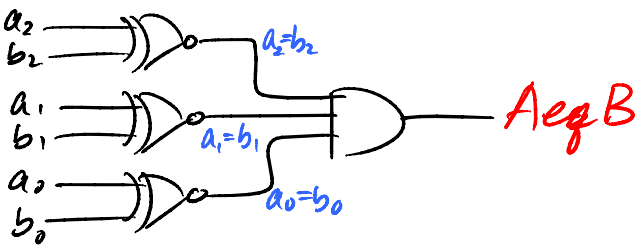
$z = i_0 + i_1 + i_2 + i_3$

Arithmetic Comparator Circuit

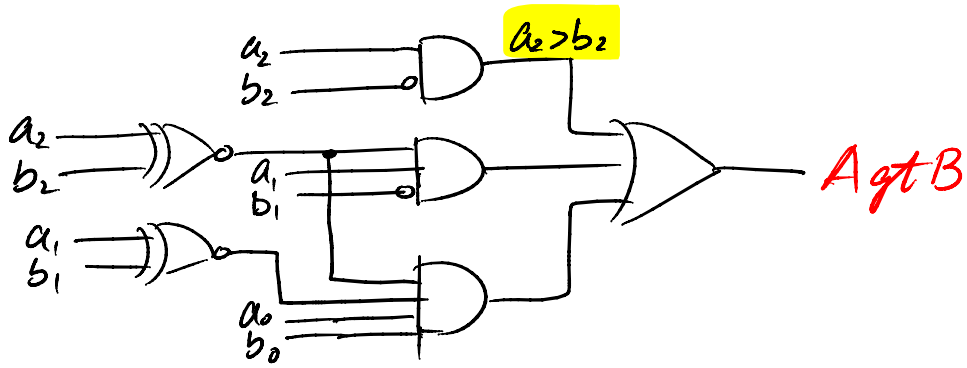
Two three-bit numbers $A = a_2 a_1 a_0$ and $B = b_2 b_1 b_0$

How to compare A and B? ⇒ AeqB, AgtB, AltB

AeqB if $a_2 = b_2$ and $a_1 = b_1$ and $a_0 = b_0$



AgtB if $a_2>b_2$ or , or



AltB if $\overline{AeqB + AgtB}$