

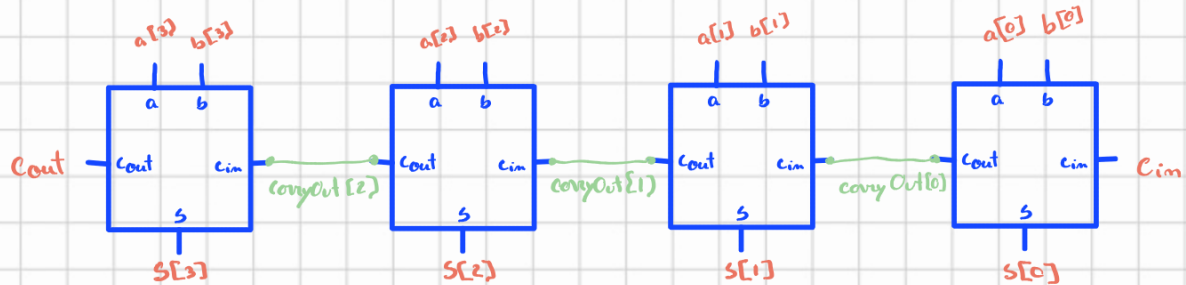
c <sub>in</sub>	a	b	S	c <sub>out</sub>
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

ab \ c <sub>in</sub>	00	01	11	10
0	0	1	0	1
1	1	0	1	0

$$\begin{aligned}
 S &= \bar{a}\bar{b}c_{in} + \bar{a}b\bar{c}_{in} + ab\bar{c}_{in} + a\bar{b}c_{in} \\
 &= c_{in}(\bar{a}\bar{b} + ab) + \bar{c}_{in}(\bar{a}b + a\bar{b}) \\
 &= c_{in}(a \oplus b) + \bar{c}_{in}(a \oplus b) \\
 &= (c_{in} \oplus (a \oplus b)) \\
 &= c_{in} \oplus a \oplus b
 \end{aligned}$$

ab \ c <sub>in</sub>	00	01	11	10
0	0	0	1	0
1	0	1	0	1

$$\begin{aligned}
 c_{out} &= bc_{in} + ab + ac_{in} \\
 &= c_{in}(a + b) + ab
 \end{aligned}$$



$$1001_2 = 9_{10}$$

$$0011_2 = 3_{10}$$

$$op = 000:$$

$$9 + 3 = 12$$

$$1100$$

$$op = 100:$$

$$\begin{array}{r} 9 \ 3 \\ 9 \ 3 \\ \hline 0 \end{array}$$

$$0000$$

$$op = 001:$$

$$9 - 3 = 6$$

$$0110$$

$$op = 101:$$

$$\begin{array}{r} \text{AND} \ 1001 \\ \quad 0011 \\ \hline 0001 \end{array}$$

$$op = 010:$$

$$9 \times 3 = 27$$

$$11011$$

$$op = 110:$$

$$\begin{array}{r} \text{OR} \ 1001 \\ \quad 0011 \\ \hline 1011 \end{array}$$

$$op = 011:$$

$$\begin{array}{r} 9 \ 3 \\ 9 \ 3 \\ \hline 0 \end{array} \quad 0011$$

$$op = 111:$$

$$\begin{array}{r} \text{XOR} \ 1001 \\ \quad 0011 \\ \hline 1010 \end{array}$$



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