3-to-8 Decoder

1(a).

Input			Output							
Z	Y	X	Do	D1	D2	D3	D4	D5	D6	D7
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

Priority Encoder

1(b).

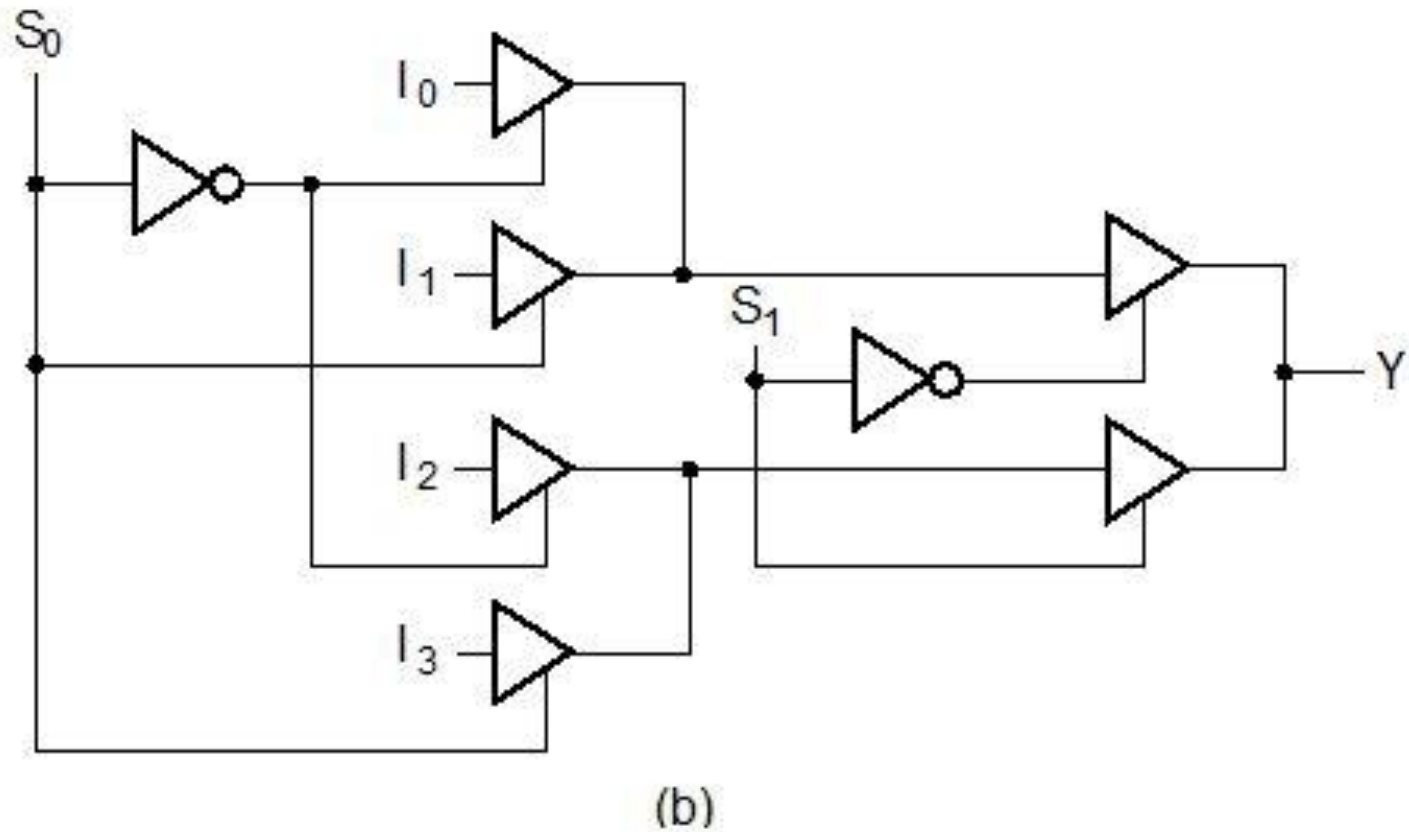| Inputs				Outputs		
D0	D1	D2	D3	Y1	Y0	V
0	0	0	0	×	×	0
1	0	0	0	0	0	1
×	1	0	0	0	1	1
×	×	1	0	1	0	1
×	×	×	1	1	1	1

Priority encoder with 4 inputs (D3, D2, D1, D0) - highest priority to most significant 1 present - Code outputs Y1, Y0 and V where V indicates at least one 1 present.
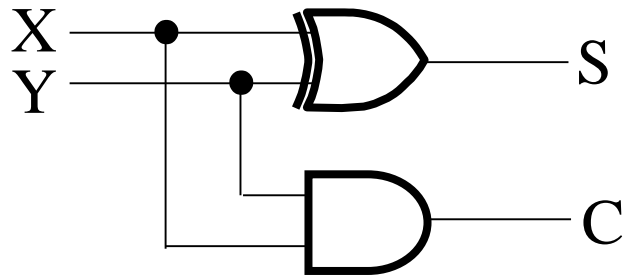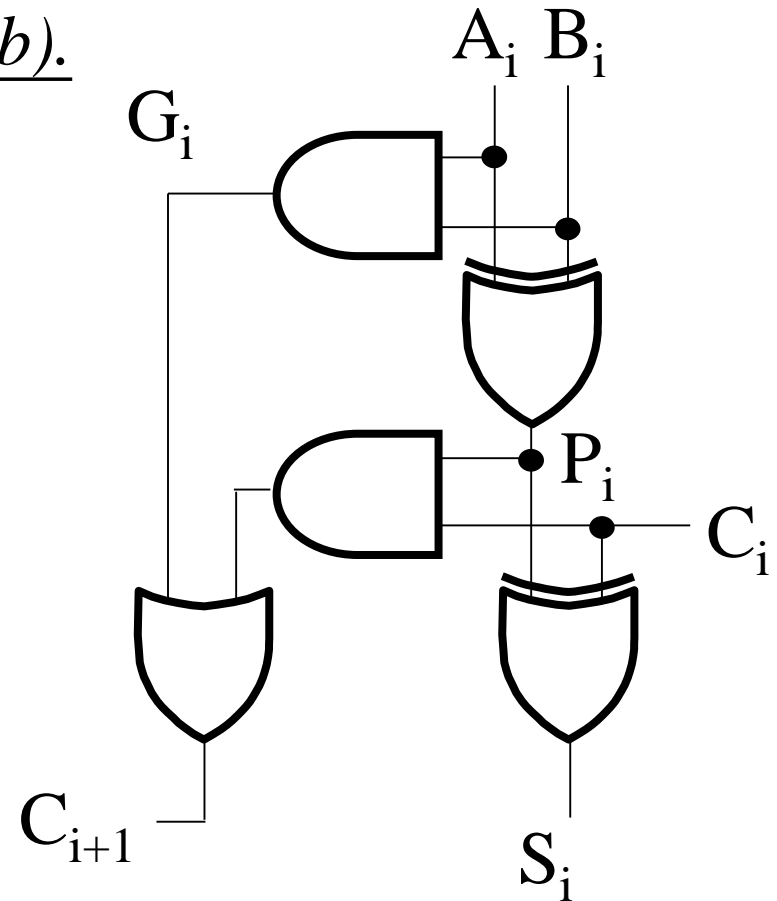
4-to-1 Multiplexer

2&3.

4-to-1 Multiplexer(con.)

(b)

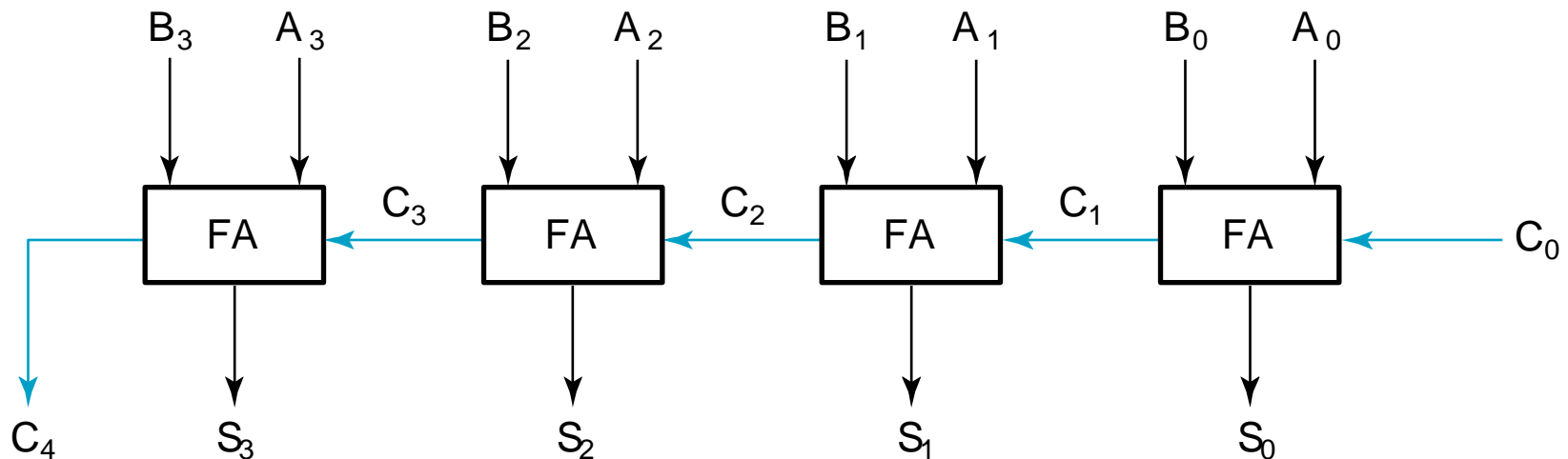# Half-Adder   # Full Adder

4(a).

4(b).

4-bit Ripple-Carry Binary Adder

4(c).

- **A four-bit Ripple Carry Adder made from four 1-bit Full Adders:**

unsigned binary number substraction

5.

    (a) X-Y =0010001,

    (b) Y-X=-0010001

Unsigned 2's Complement Subtraction Example 1

5(a).

- **Find $1010100_2 - 1000011_2$**

$$1010100 \qquad\qquad {}^{1}1010100$$

$$-\ \underline{1000011} \quad \xrightarrow{\text{2's comp}} \quad +\ \underline{0111101}$$

$$0010001$$

- **The carry of 1 indicates that no correction of the result is required.**
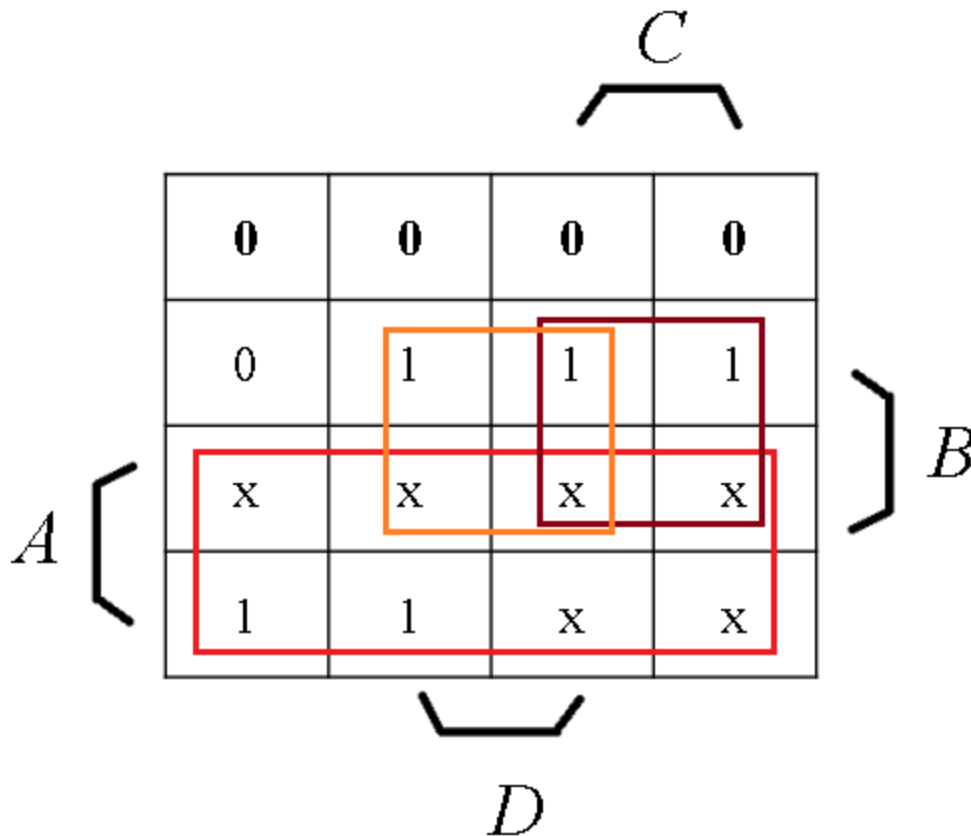
Unsigned 2's Complement Subtraction Example 2

5(b).

- **Find $1000011_2 - 1010100_2$**

$$\begin{array}{r} 1000011 \\ -\ \underline{1010100} \end{array} \xrightarrow{\text{2's comp}} \begin{array}{r} ^0 1000011 \\ +\ \underline{0101100} \\ 1101111 \end{array} \xrightarrow{\text{2's comp}}$$

$$0010001$$

- **The carry of 0 indicates that a correction of the result is required.**

- **Result $= -\ (0010001)$**

unsigned binary number substraction

$$W(A,B,C,D) = A+BD+BC$$