

# Architecture des ordinateurs

## Cours 4 - Les Fonctions Combinatoires Fondamentales

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# Introduction

Circuits logiques combinatoires :

- L'additionneur binaire
- Le comparateur
- Le décodeur
- Le codeur
- Le multiplexeur

# Addition

$$\begin{array}{r} \phantom{+} \phantom{0} \\ + \phantom{0} \phantom{0} \\ \hline 0 \phantom{0} \phantom{0} \end{array}$$

$$\begin{array}{r} \phantom{+} \phantom{0} \\ + \phantom{0} \phantom{1} \\ \hline 0 \phantom{1} \phantom{1} \end{array}$$

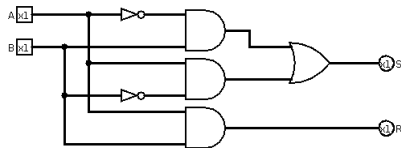
$$\begin{array}{r} \phantom{+} \phantom{1} \\ + \phantom{0} \phantom{0} \\ \hline 0 \phantom{1} \phantom{1} \end{array}$$

$$\begin{array}{r} \phantom{+} \phantom{1} \\ + \phantom{0} \phantom{1} \\ \hline 1 \phantom{0} \phantom{0} \end{array}$$

# Demi-additionneur

$A$	$B$	$S$	$R$
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

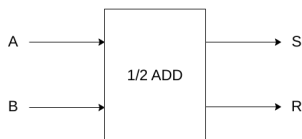
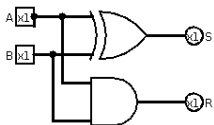
$$S = A'B + AB'$$
$$R = AB$$



# Demi-additionneur

$$S = A'B + AB' = A \oplus b$$

$$R = AB$$



# L'addition

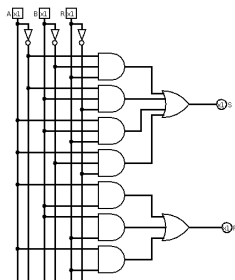
$$\begin{array}{rcccccccccc}
 & & R_{n-2} & \leftarrow & R_{n-1} & \leftarrow & \dots & \leftarrow & R_0 & \leftarrow & \\
 & & A_{n-1} & \uparrow & A_{n-2} & \uparrow & \dots & \uparrow & A_1 & \uparrow & A_0 \\
 + & & B_{n-1} & \uparrow & B_{n-2} & \uparrow & \dots & \uparrow & B_1 & \uparrow & B_0 \\
 \hline
 = & R_{n-1} & S_{n-1} & R_{n-2} & S_{n-2} & & \dots & R_1 & S_1 & R_0 & S_0
 \end{array}$$

# Additionneur complet

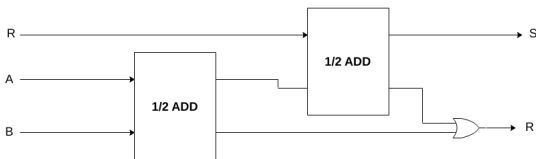
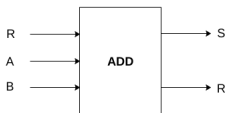
$A_i$	$B_i$	$R_{i-1}$	$S_i$	$R_i$
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

$$S = A'B'R + A'BR' + ABR + AB'R'$$

$$R = AB + BR + AR$$

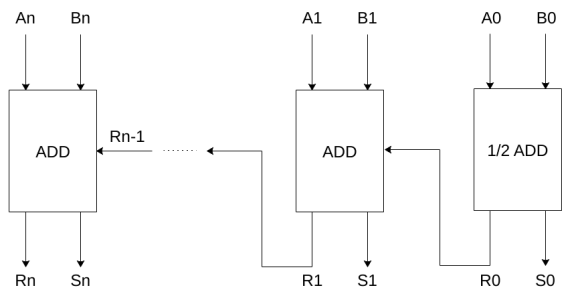


# Additionneur complet





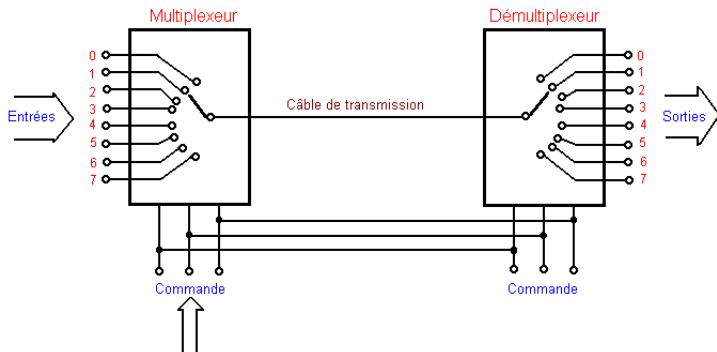
# Additionneur complet



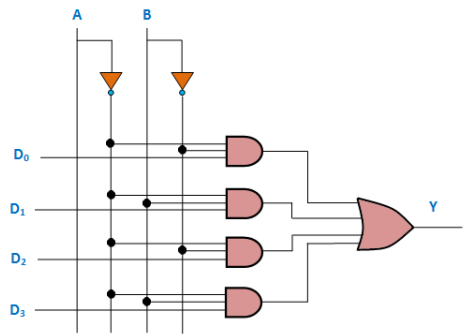
# Comparateur à 2 bits



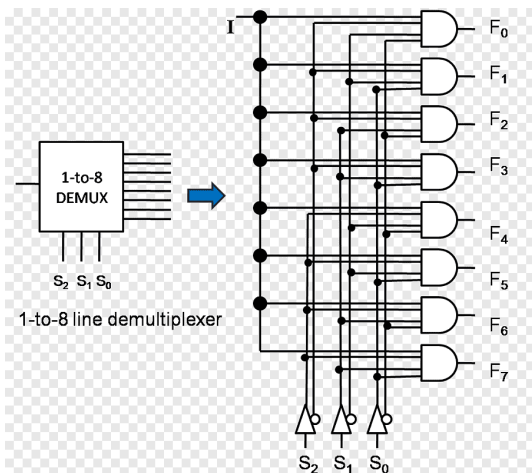
# Multiplexeur - Démultiplexeur



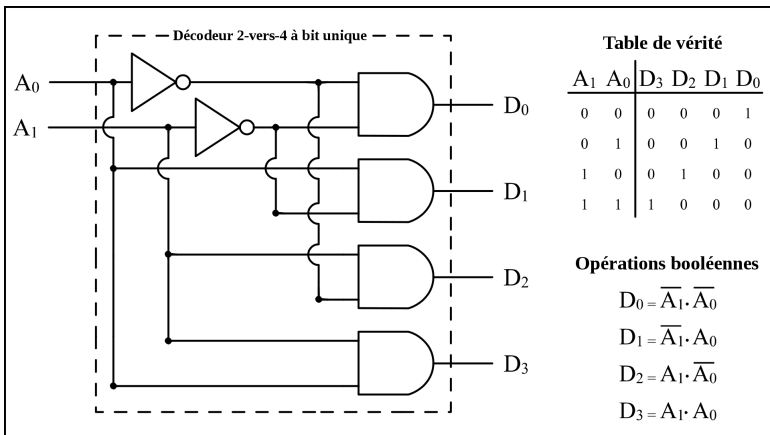
# Multiplexeur



# Démultiplexeur



# Décodeur



# Codeur

$E_0$	$E_1$	$E_2$	$E_3$	$E_4$	$E_5$	$E_6$	$E_7$	$S_0$	$S_1$	$S_2$
0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	1	0	0	0	0	1	0	0
0	0	1	0	0	0	0	0	1	0	1
0	1	0	0	0	0	0	0	1	1	0
1	0	0	0	0	0	0	0	1	1	1

$$S_0 = E_0 + E_1 + E_2 + E_3$$

$$S_1 = E_0 + E_1 + E_4 + E_5$$

$$S_2 = E_0 + E_2 + E_4 + E_6$$

