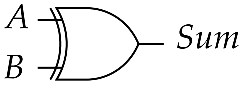
BINARY ADDITION

	1 1
2 8 +	1 1 1 0 0 +
2 2	1 0 1 1 0
5 0	1 1 0 0 1 0

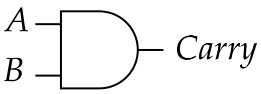
Carry in		A		B		Carry	Sum
		0	+	0	=	0	0
		0	+	1	=	0	1
		1	+	0	=	0	1
		1	+	1	=	1	0
1	+	0	+	0	=	0	1
1	+	0	+	1	=	1	0
1	+	1	+	0	=	1	0
1	+	1	+	1	=	1	1

XOR (*A*, *B*)

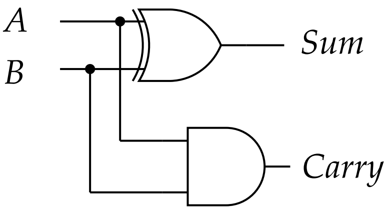


Carry in		A		B		Carry	Sum
		0	+	0	=	0	0
		0	+	1	=	0	1
		1	+	0	=	0	1
		1	+	1	=	1	0
1	+	0	+	0	=	0	1
1	+	0	+	1	=	1	0
1	+	1	+	0	=	1	0
1	+	1	+	1	=	1	1

AND (*A*, *B*)

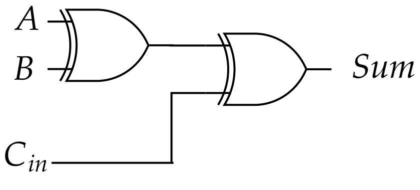


Half Adder



Carry in		A		B		Carry	Sum
		0	+	0	=	0	0
		0	+	1	=	0	1
		1	+	0	=	0	1
		1	+	1	=	1	0
1	+	0	+	0	=	0	1
1	+	0	+	1	=	1	0
1	+	1	+	0	=	1	0
1	+	1	+	1	=	1	1

Inverted



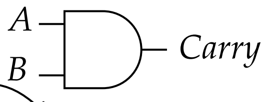
$XOR((A \; XOR \; B)\,,\; C_{in})$

A B Carry Sum

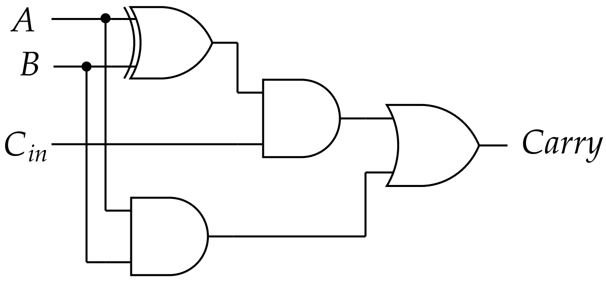
$0 + 0 = 0\ \ 0$
$0 + 1 = 0\ \ 1$
$1 + 0 = 0\ \ 1$
$1 + 1 = 1\ \ 0$

Carry in

$\boxed{1 + 0 + 0 = 0}\ 1$
$1 + 0 + 1 = 1\ \ 0$
$1 + 1 + 0 = 1\ \ 0$
$\boxed{1 + 1 + 1 = 1}\ 1$



$AND\ (A, B)$

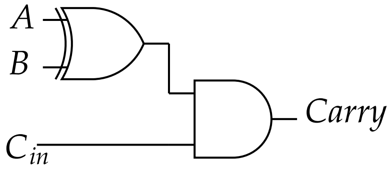


A B Carry Sum

$0 + 0 = 0\ \ 0$
$0 + 1 = 0\ \ 1$
$1 + 0 = 0\ \ 1$
$1 + 1 = 1\ \ 0$

Carry in

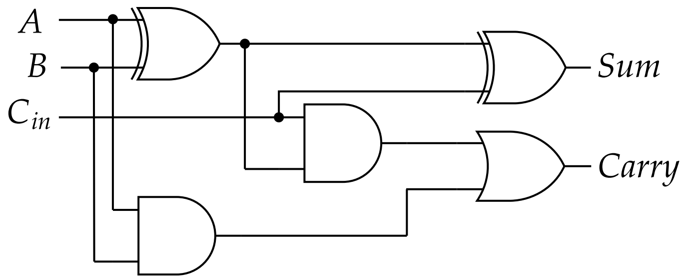
$1 + 0 + 0 = 0\ \ 1$
$1 + 0 + 1 = 1\ \ 0$
$1 + 1 + 0 = 1\ \ 0$
$1 + 1 + 1 = 1\ \ 1$



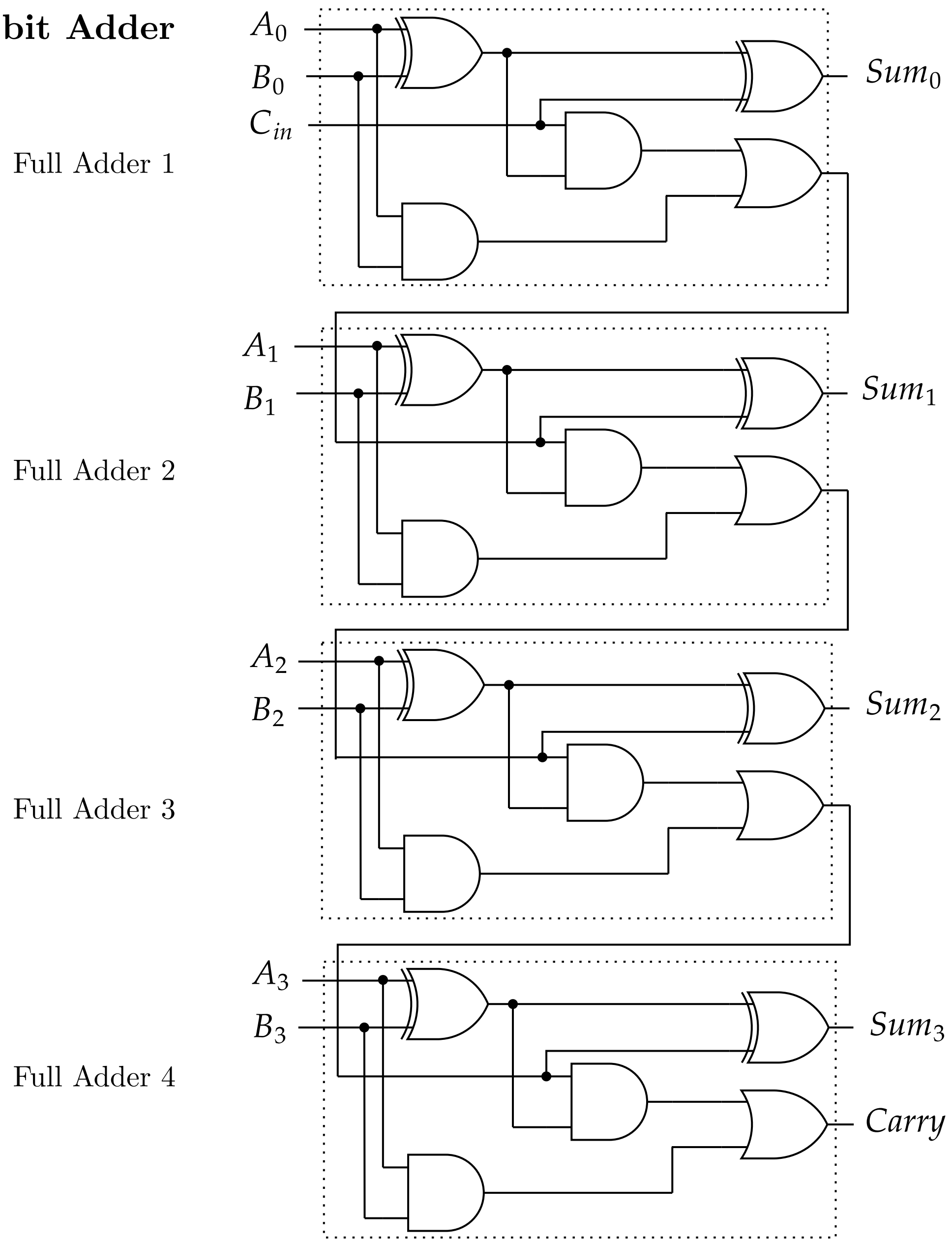
$AND\ (XOR\ (A, B),\ C_{in})$

$XOR\ (A, B)$

Full Adder



4 bit Adder



4 bit Addition

	C_{in3}	C_{in2}			
	1	1			
	A_3	A_2	A_1	A_0	
	1	1	1	0	+
	B_3	B_2	B_1	B_0	
	1	0	1	1	
1	1	0	0	1	
$Carry$	Sum_3	Sum_2	Sum_1	Sum_0	