

add

$$0 + 0 = 0$$

$$1 + 0 = 1$$

$$0 + 1 = 1$$

$$1 + 1 = 10$$

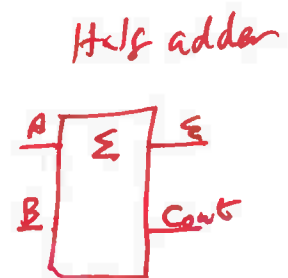
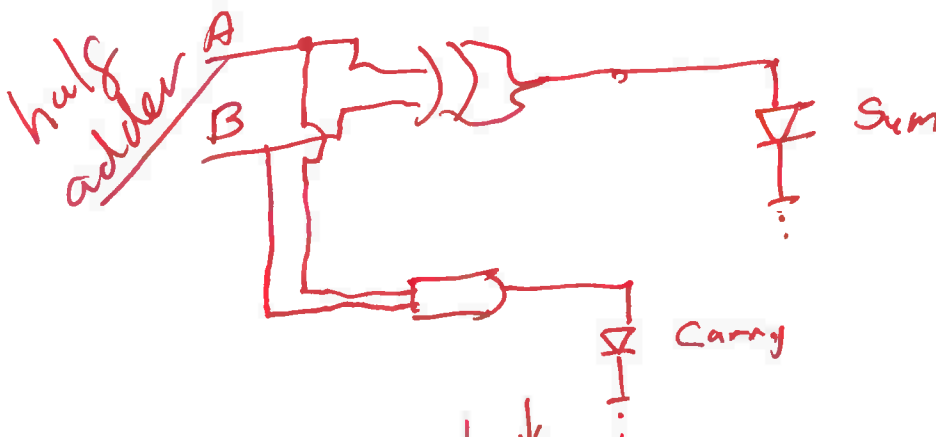
2 1 place

dec

$$\begin{array}{r} 19 \\ + 1 \\ \hline 10 \end{array}$$

A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

↑ xor ↑ and

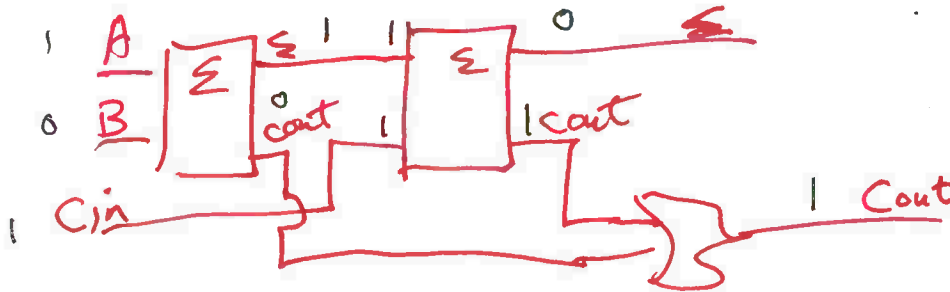


bin
add

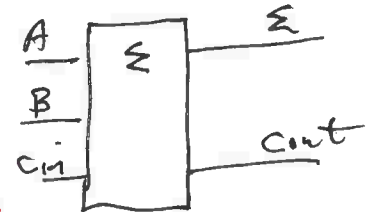
$$\begin{array}{r} 1011 \\ + 1001 \\ \hline 10100 \end{array}$$

↑ Cout

Full adder



Full adder



A. $A_n A_{n-1} A_{n-2} A_{n-1} A_0$

B. $A_n B_n B_{n-1} B_0$

$C_{out} \dots \Sigma_B \Sigma_2 \Sigma_1 \Sigma_0$
 $\uparrow \qquad \qquad \qquad \uparrow$
 MSB LSB

$$\begin{array}{r}
 5 \\
 - 3 \\
 \hline
 2
 \end{array}$$

	0 0 0 0 0 0 1	5
	0 0 0 0 0 0 1	3
1 st comp	1 1 1 1 1 1 0	
	+	
	1 1 1 1 1 1 0	
	↑	
	sign bit	
	0 0 0 0 0 1 0	
	+ 1 1 1 1 1 1 0	
	0 0 0 0 0 1 0	← 2

inv every bit

rep of -3 in 2nd comp

$$\begin{array}{r}
 3 \\
 - 5 \\
 \hline
 -2
 \end{array}$$

	0 0 0 0 0 0 1	3
	0 0 0 0 1 0 1	5
1 st comp	1 1 1 1 1 0 1	
	+	
	1 1 1 1 1 0 1	
2 nd comp	1 1 1 1 1 0 1	

-5 in 2nd comp

	0 0 0 0 0 1 1	3
	+ 1 1 1 1 1 0 1	-5
	1 1 1 1 1 1 0	-2

check 2nd comp again!

	0 0 0 0 0 0 1	
	+	
	0 0 0 0 0 1 0	← 2

$$\begin{array}{r}
 69 \\
 -42 \\
 \hline
 27
 \end{array}$$

	128	64	32	16	8	4	2	1	
	0	1	0	0	0	1	0	1	← 69
	0	0	1	0	1	0	1	0	← 42
	1	1	0	1	0	1	0	1	← 1 ^s comp
+							1		
	1	1	0	1	0	1	1	0	-42
									2 ^s comp

69	69
-42	64
	5
	42
	32
	10
	8
	2
	2

1	1	1	0	1	0	1	1	0	← -42
+	0	1	0	0	0	1	0	1	← 69
	0	0	0	1	1	0	1	1	27

1
2
8
16
<u>27</u>