

① overflow in 2's complement

1 ①

1000
↓
MSB
-8

011
+3
-2⁴ = -16

1111
8421
= 15

= -1

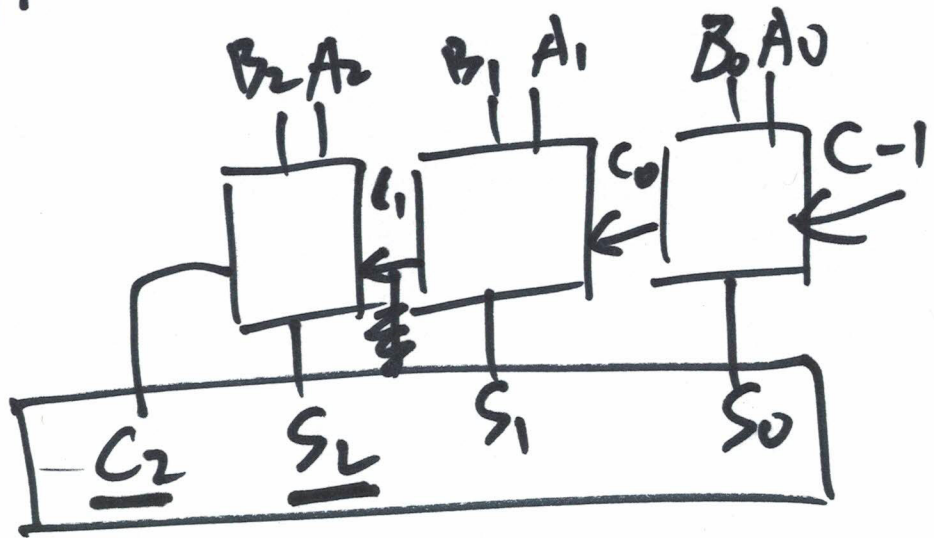
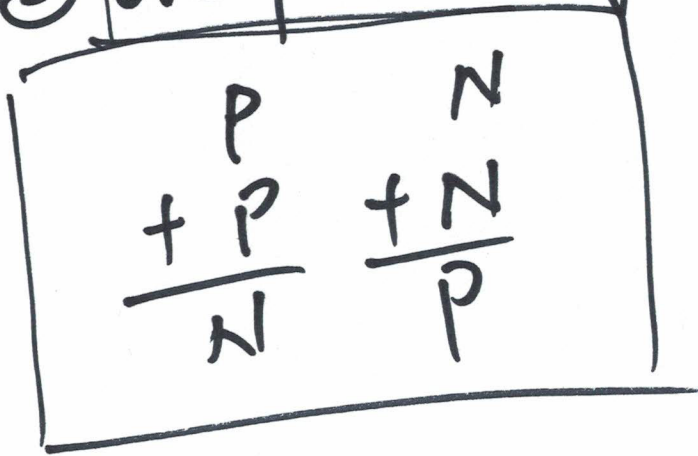
~~11011~~

1 = -1
11 = -1
111 = -1
1...1 = -1
1 million
is
10 = -2
110 = -2
1...10 = -2

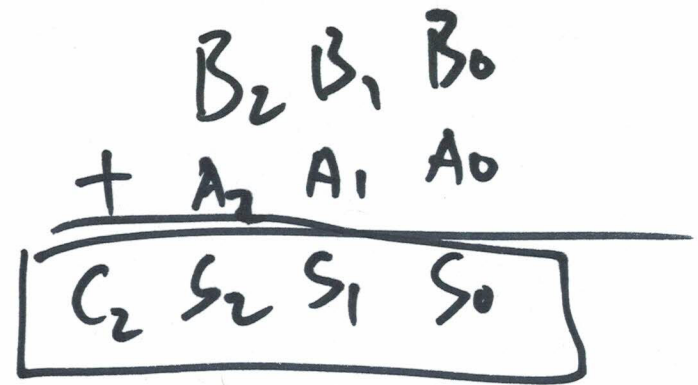
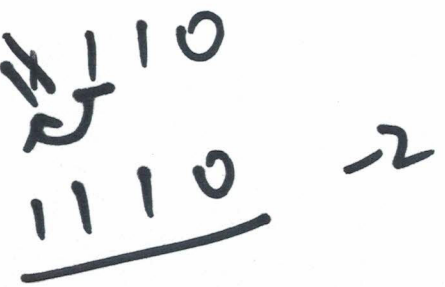
1101
= -8 + 4 + 1 = -3
-16 + 8 + 4 + 1
= -3

①

② overflow only happens:

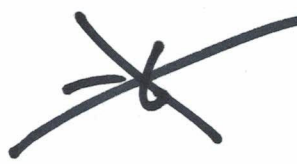


Discard the carry
Duplicate the MSB



②

1	1	1	1	N	-	1
+	0	1	1	P		3
!	0	1	0	P		2



X	0	1	0	
	0	0	1	0

				2
--	--	--	--	---

1	1	1	N	-	5	
+	1	0	0	N		-5
	1	0	1	P		-5

overflow

-8 + 3 = -5

0	1	1	1	P		
+	0	1	1	P		
0	1	1	0	N		

overflow

③

2's complement for fractional numbers

$\boxed{+3}$ 2's complement $\rightarrow 100 + 1 = \underline{101}$ -3

101

0.1₍₂₎ 2's complement $\rightarrow 1.0 + 0.1 = \underline{1.1}$

0.5 $\rightarrow -1 + 0.5 = -0.5$

0.01₍₂₎ 2's complement $\rightarrow 1.00 + 0.01$

$= 1.01$

$-1 + 0.5 + 0.25$

$= -0.25$

~~$1 \div 2 = 0.5$~~
 ~~$1 \div 4 = 0.25$~~
 $= 0.25$

$1_{(2)} = 1_{(10)}$

$1_{(2)} \times 2 = 10_{(2)}$

$1_{(2)} \times 2 \times 2 = 100_{(2)}$

$1_{(10)} \times 10 = 10_{(10)}$

$1_{(10)} \times 10 \times 10 = 100_{(10)}$

$1_{(2)} \div 2 = 0.1_{(2)}$