Asn 4 — Brandon Anderson

1/ 0110 6
0011 +3
1001 9

2/ 1110 0001 -2
0111 0010 +7
1↖0101 -2 5

This addition did not result in an overflow, because an overflow can only occur when adding together two positive numbers or adding two negative numbers.

3/ When an overflow does occur, the output is not arithmetically correct. The processor should signal an overflow has occured and that the output cannot be trusted (an error code).

4/ 0xBA 1011 1010 0100 0110 = -70
0x7F 0111 1111 = 127
0x3B 1↖0011 1011 57
0x3B.

No, this addition does not result in an overflow because a negative number is being added to a positive number.

5/ 1110 0010 = -2
1001 0111 = +-7
1↖0111 -9

Yes, this addition results in an overflow because a negative was added to a negative and the output was positive. Also, the addition exceeded the range of -8 to 7.

6)

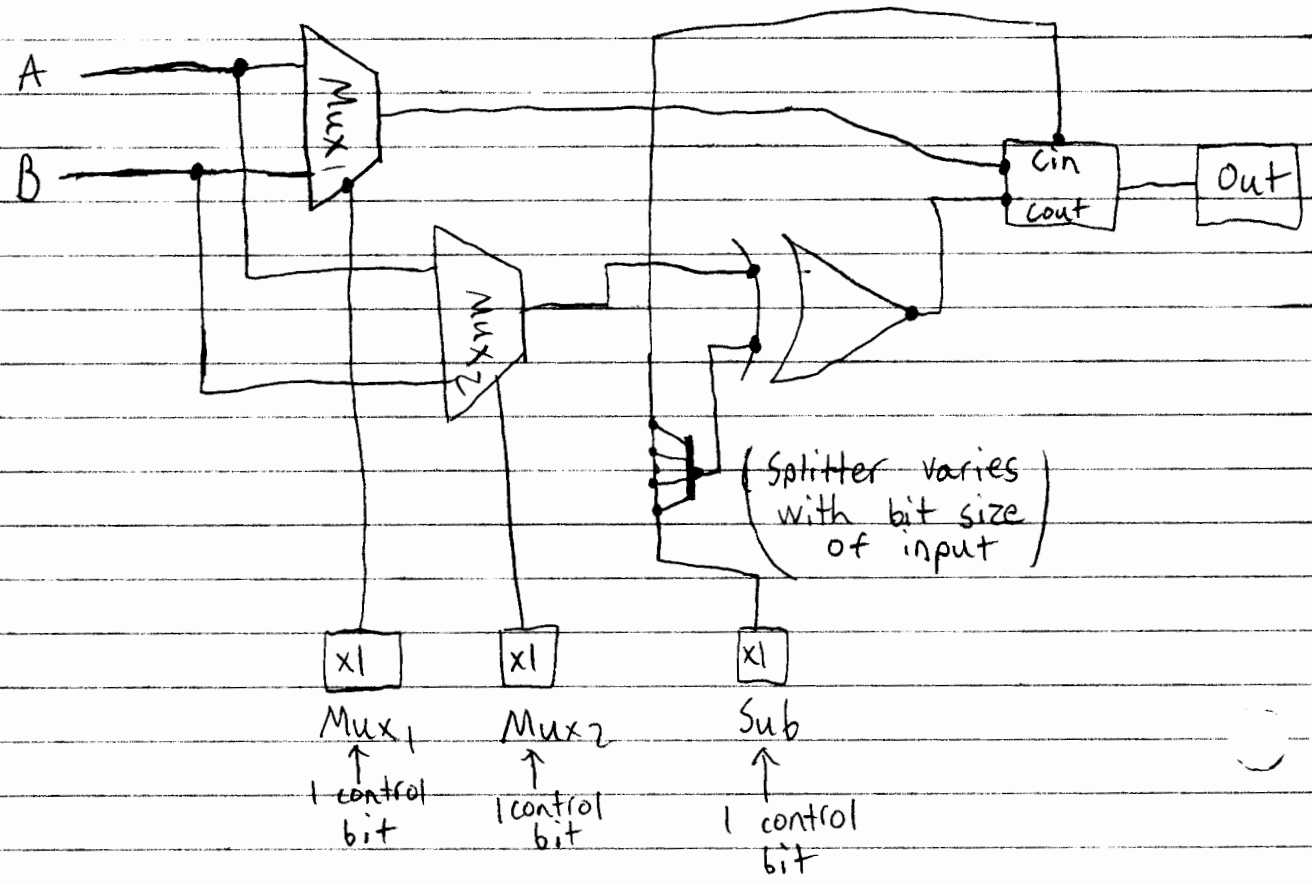
A	B	Cin	Sum
X	Y	Cin	If $(X+Y+Cin) > 2^8-1$: $(X+Y+Cin)-(2^8-1)$
			If $(X+Y+Cin) < -(2^8)$: $(X+Y+Cin)+2^8$
			Else : $(X+Y+Cin)$

7)

Sa	Sb	Ssum	Ovfl
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

$\overline{Sa}\,\overline{Sb}\,Ssum \oplus Sa\,Sb\,\overline{Ssum}$

8)



10) The first circuit uses an 8-bit Int Negate circuit which is composed of 7-And Gates and 8-Xor Gates (A total of 15 gates). The latter's circuit uses a Bitwise Not circuit which is only composed of 8-Xor Gates, so the latter gate saves 7-Gates.

11) The Sub signal is connected to the Cin Signal because in order to subtract, you need to add the negative of a number. (Ie $A-B = A+(-B)$) To do this, B must be inverted which is done by the inverted (controlled bitwise Not) and then 1 must be added to B (because of two's complement) which is done by the Sub going into Cin.

$A-B \rightarrow A + (-B+1)$

↑ ← Sub into Cin

↑ inverter

12) The Borrow signal signifies that a larger input was subtracted from the other input. (ie $A<B$; $A-B$, $-8--2$, $5-7$, etc)

This says that the sum will always be a negative number.