

Addition overflow in 2's compliment representation

8 bits 2's compliment representation
 $-128 \leq N \leq 127$

Discard

addition
 $10000001 = -127$
 $10000001 = -127$

 $100000010 = 2$ overflow!!

(2's compliment of 10000001 is $01111111 = 127$
 therefore $10000001 = -127$)

$11000001 = -63$
 $+ 11000001 = -63$ $-63 + (-63) = -126$

 $110000010 = -126$ no overflow!!

(2's compliment of 10000010 is $01111110 = 126$
 therefore $10000010 = -126$)

Carry out of signed bit position **not equal to**

Carry into signed bit position

10
 $10000001 = -127$
 $+ 10000001 = -127$

 $100000010 = 2$ overflow!!

Carry out of signed bit position is equal to

Carry into signed bit position

11

11000001 = -63

+ 11000001 = -63

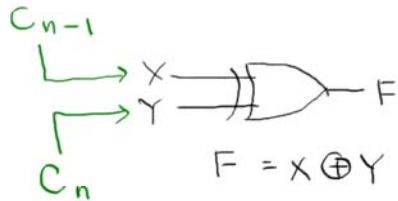
110000010 = -126 no overflow!!

Discard

For addition (in 2's compliment representation),

- Overflow can only happen if both numbers have the same sign
- There is overflow if carry out of the signed bit position is not equal to carry into the signed bit position

overflow if
 carry into sign bit position \neq carry out of sign bit pos.



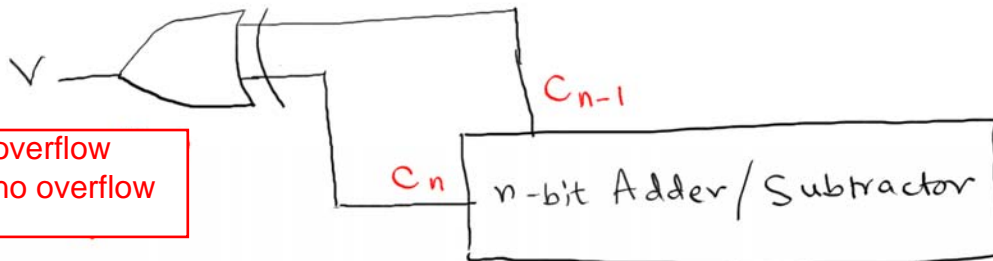
X	Y	F
0	0	0
0	1	1
1	0	1
1	1	0

\rightarrow overflow

10000000 \rightarrow -128

2's complement = 1's complement + 1
 \rightarrow carry into signed bit position.
 01111111 \rightarrow 1's complement
 +1

 10000000
 overflow



V = 1 - overflow
 V = 0 - no overflow