$$\begin{array}{r} 53 \\ +\ 22 \\ \hline 75 \end{array} \qquad \begin{array}{r} 1\ 1\ \ \\ 00110101 \\ +\ 00010110 \\ \hline 01001011 \end{array}$$

$64 + 8 + 2 + 1 = 75$

$$\begin{array}{r} 48 \\ +\ 40 \\ \hline 88 \end{array} \qquad \begin{array}{r} \ 1\ \ \ \\ 00110000 \\ +\ 00101000 \\ \hline 01011000 \end{array}$$

$64 + 16 + 8 = 88$

$$\begin{array}{r} 200 \\ +\ 100 \\ \hline 300 \end{array} \qquad \begin{array}{r} (1)\ 1\ \ \ \ \ \ \ \\ 11001000 \\ +\ 01100100 \\ \hline 00101100 \end{array}$$

$32 + 8 + 4 = 44$

Sign and magnitude

Sign bit 0 $+$, 1 $-$

$+5$	00000101	$0000\ 0000$
-5	10000101	$1000\ 0000$

sign | magnitude

$7 + 5 = 12$ $\qquad -7 + 5 = -2$

$$\begin{array}{r} 5 \\ \\ \\ \end{array} \qquad \begin{array}{r} (1)\ 1\ 1\ 1\ 1\ 1\ 1\ 1 \\ 00000101 \leftarrow \\ +\ 11111011 \leftarrow \\ \hline 00000000 \leftarrow \end{array}$$

-5 $\quad$ 0xFB

11111011

00000100

$+\ 1$

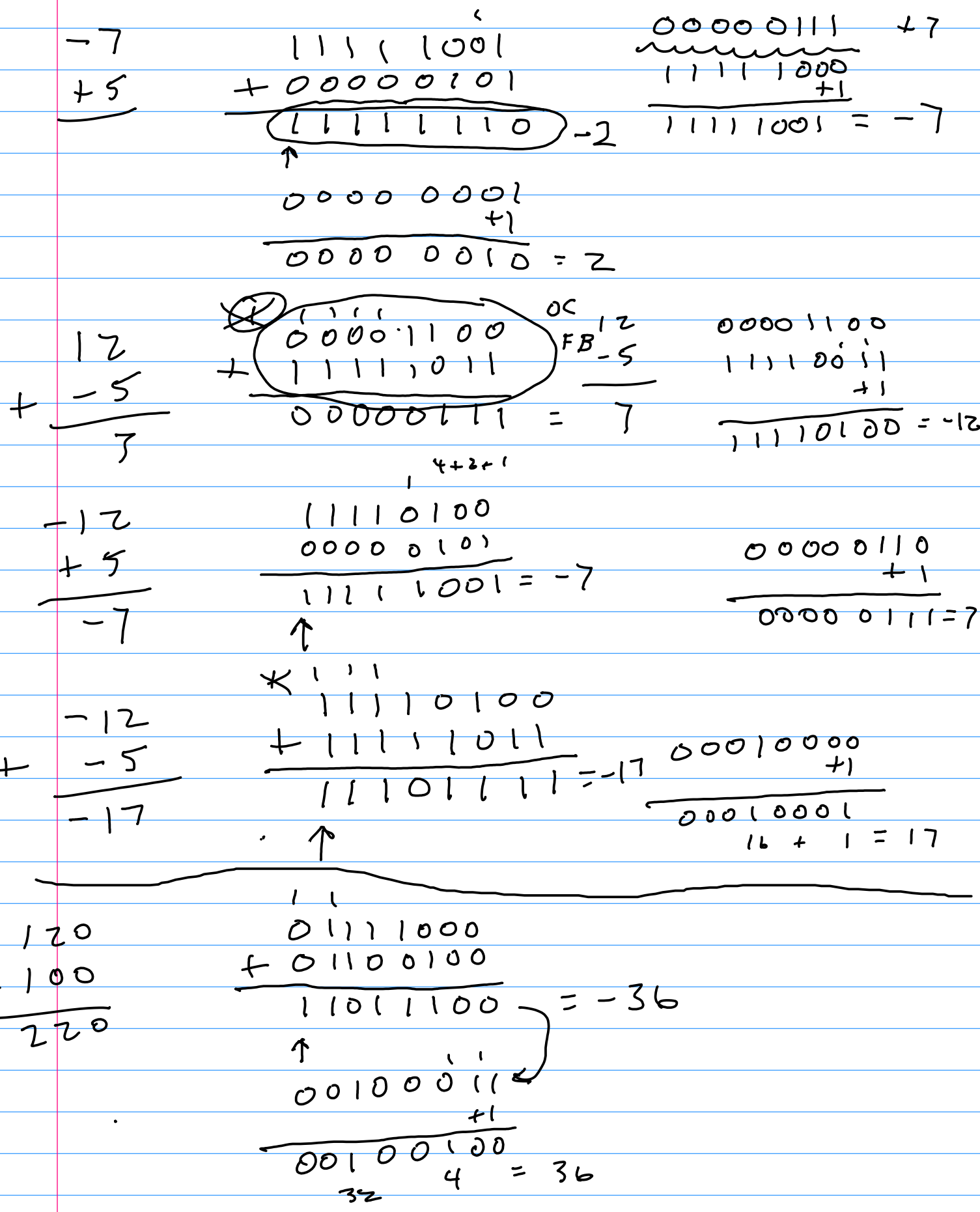
$00000101 \rightarrow +5$

Sign bit 0 $+$, 1 $-$

Two's Complement

To "take the two's complement" of an integer:

1) reverse all bits
2) add 1



1000 0000 = -128

0111 1111
+1
1000 0000

0111 1111 +127 0x7F
+1
1000 0000 = -128

-5 1111 1011 8 bits

+5 0000 0101 8 bits

+5 0000 0000 0000 0101 16 bits

-5 1111 1111 1111 1011 = -5
0000 0000 0000 0100
+1
0000 0000 0000 0101 = 5

8-bit

Negative? Positive?

01101001	Pos.
00010000	Pos
11011100	Neg.
10000010	Neg.

↑

8-bit

4C	Pos
7D	Pos
82	Neg
C1	Neg

16-bit

C04A	Neg
7ZA0	Pos
DB1Z	Neg
41AB	Pos