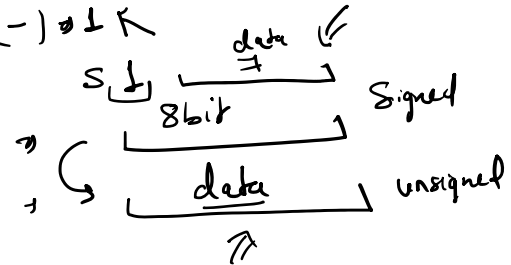


$\overline{1's}$ $\overline{2's}$ \rightarrow unsigned \rightarrow $\boxed{101011}$ \rightarrow Sign X \leftarrow
 \rightarrow data
 \rightarrow magnitude

$+10 \rightarrow +20$
 $(-10) \rightarrow (-20)$

Signed \rightarrow $\overset{0}{\underset{\text{msb}}{\downarrow}} \boxed{101011}$ +ve
 \rightarrow Sign magnitude

$(+) \rightarrow 0$
 $(-) \rightarrow 1$



1's Complement
2's Complement

S	Unsigned	S.N	1's	2's
0 0 0	0	$\rightarrow +0$	+0	+0
0 0 1	1	$\rightarrow +1$	+1	+1
0 1 0	2	$\rightarrow +2$	+2	+2
0 1 1	3	$\rightarrow +3$	+3	+3
1 0 0	4	$\rightarrow -0$	-3	-4
1 0 1	5	$\rightarrow -1$	-2	-3
1 1 0	6	$\rightarrow -2$	-1	-2
1 1 1	7	$\rightarrow -3$	-0	-1

(+) \checkmark
 (-) \checkmark

-1
 $\rightarrow 001$
 $\rightarrow 111$
 -2
 $\rightarrow 010$
 $\rightarrow 110$



3 bit Unsigned

$$0 \leftrightarrow 7$$

$$0 \leftrightarrow \boxed{2^n - 1}$$

$$0 \leftrightarrow 2^3 - 1$$

$$\rightarrow 0 \leftrightarrow 7$$



3 bit Signed

$$\rightarrow - \leftrightarrow 0$$

$$\rightarrow 0 \leftrightarrow (-0)$$

0 0 0 0

$$\rightarrow 0 \leftrightarrow +$$

$$0 \leftrightarrow (3)$$

4 bit

Signed

$$\rightarrow -7 \leftrightarrow (-0)$$

Range

$$\boxed{-(2^{n-1} - 1) \text{ to } +(2^{n-1} - 1)}$$

$$\rightarrow (+0) \leftrightarrow (7)$$

1's Complement $\rightarrow -(2^{n-1} - 1) \text{ to } (2^{n-1} - 1)$
 \downarrow + 1 add \downarrow + same

2's Complement $-(2^{n-1})$ to $(2^{n-1}-1)$
 $-(2^{n-1})$ to $(2^{n-1}-1)$

C int 3 signed $-(2^{n-1})$ to $(2^{n-1}-1)$
 char 3 $-(2^{n-1})$ to $(2^{n-1}-1)$

(-2^8) represent bit 2's

$$-(2^{n-1}) \leq -2^8$$

$$2^{n-1} \geq 2^8$$

$$n-1 \geq 4.7$$

$$n \geq \lceil 5.7 \rceil$$

$$n = 6$$

$$\begin{aligned} &-(2^{6-1}) \quad \text{6 bit} \\ &\quad \quad \quad \text{to 31} \\ &\quad \quad \quad \text{4 bit} \\ &\quad \quad \quad \text{4} \\ &\quad \quad \quad \text{8} \\ &\quad \quad \quad \text{8} \\ &\quad \quad \quad \text{8} \end{aligned}$$