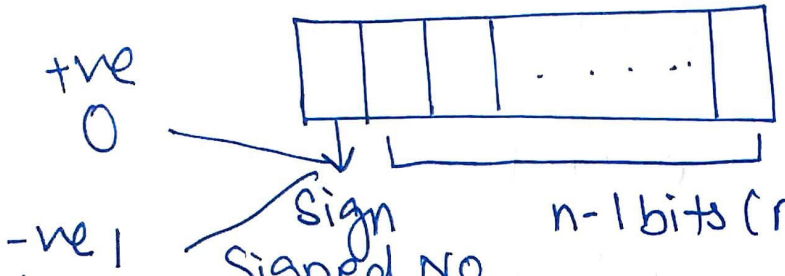
Signed Magnitude Number representation

Signed Magnitude representation :-



Signed No

↳ This can be represented by 3 different methods

i) Signed Magnitude 2) 1's Comp 3) 2's Comp

↳ Range $-(2^{n-1}-1)$ to $+(2^{n-1}-1)$

Unsigned

$5 \leftarrow 0101 \rightarrow +5$

$9 \quad 1001 \rightarrow -1$

Signed.

↳ $n = 4$

$-(2^{4-1}-1)$ to $(2^{4-1}-1)$

$-(8-1)$ to $(8-1)$

-7 to 7

of Signed

↳ Advantage :- Easy to read and write

↳ Total nos. $-(2^{n-1}-1)$ to $(2^{n-1}-1)$

Total nos $\rightarrow 2^n \rightarrow 2^4 \rightarrow 16$

~~But~~ total 2^{n-1} representation $\rightarrow 2^{4-1}$

$\Rightarrow 15$

↳ $\boxed{(-1)\, a_{n-1} \sum_{i=0}^{n-2} a_i 2^i}$

↳ Dis :- Arithmetic opns require sign & mag

4bits

Decimal	Signed Magnitude	1's Complement	2's Complement
+7	0111	0111	0111
+6	0110	0110	0110
+5	0101	0101	0101
+4	0100	0100	0100
+3	0011	0011	0011
+2	0010	0010	0010
+1	0001	0001	0001
+0	0000	0000	0000
-0	1000	1111	0000
-1	1001	1110	1111
-2	1010	1101	1110
-3	1011	1100	1101
-4	1100	1011	1100
-5	1101	1010	1011
-6	1110	1001	1010
-7	1111	1000	1001

Signed Mag

1101 → -5

01011 → +11

1100 → -4

-6 → 1110

-17 → 110001

+23 → 010111

1010

$1\times2^3 + 0\times1 + 1\times2 + 0\times2^0$

$+2+0$

1010

$(-1)(1)0\times2^2 + 1\times2^1 + 0\times2^0$

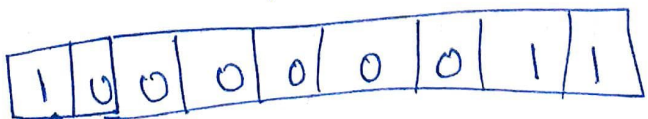
$(-1)(1)\ 0+2+0$

$=(-2)$

Dis of Signed no representation

i) +0 & -0 diff representation.

Signed Extension → Smaller no is larger space
rest padded with zero.



111

111 → -3

1011 → -3

10011 → -3