Unsigned Number: The numbers without any +ve or -ve sign are known as unsigned number.

→ These Number represent only the Magnitude

Signed Number: are used to represent negative numbers

In a binary system, Digit 0 is used for +ve sign and 1 for the -ve sign.

(A) → The Most Significant bit is the sign bit followed by the magnitude bits.

(B) → The Number may be written in 4bits, 8 bits, 16 etc.

(C) → In every case, the leading bit represents the sign and the remaining bits represent the magnitude.

Q. Express in 16-bit signed binary System (a) +8 (b) -8 (c) 165 (d) -165

Ans (a)

2	8	
2	4	0
2	2	0
2	1	0
	0	1

LSB ↑ MSB

→ The binary number is 1000

→ for 16 bit system, we use 16 bit, 0 (which is used for +ve) in the leading position, 1000 in the next 4 bits and 0 in the remaining 12 positions,

→ So the signed 16-bit binary system is:

+8 = 0000.0000 0000 1000
(sign bit)

(b) In the leading bit, we will have 1 (to represent the -ve sign)

-8 = 1000 0000 0000 1000

c)

2	165	
2	82	1
2	41	0
2	20	1
2	10	0
2	5	0
2	2	1
2	1	0
	0	1

So the number is ⇒ [1 0 1 0 0 1 0 1]

using 0 in the leading bit (for +ve sign)

→ The 16-bit signed binary number is

$$+165 = 0000\ 0000\ 1010\ 0101$$

(d) using 1 in the leading bit (for -ve sign)

$$\therefore -165 = 1000\ 0000\ 1010\ 0101$$

Binary Arithmetic

① Binary Addition ⇒

0 + 0 = 0

0 + 1 = 1 + 0 = 1

1 + 1 = 10, 1+1 equal to 0 with a carry of 1 to next higher column

1 + 1 + 1 = 11

↳ i.e 1+1+1, equal 1 with a carry of 1 to next higher column

② Binary Subtraction ⇒

Rules for BS:

0 − 0 = 0

1 − 0 = 1

1 − 1 = 0

10 − 1 = 1