**Signed numbers:**

There are three ways in which signed binary numbers may be expressed:

* + Signed magnitude (SM)
	+ One’s complement and
	+ Two’s complement.

In an 8-bit word, signed magnitude representation places the absolute value of the number in the 7 bits to the right of the sign bit.

Ex: in **8-bit signed magnitude(SM),**  positive 3 is: 00000011

 Negative 3 is: 10000011

Ex: in 8-bit **one’s complement**, positive 3 is: 00000011

 Negative 3 is: 11111100

Ex: Adding 1 gives us -3 in **two’s complement** form: 11111101

Ex:convert using SM method**(01011001)2** = +(1 \* 26 + 0 \* 25 + 1 \* 24 + 1 \* 23 + 0 \* 22 + 0 \* 21 + 1 \* 20)

 = + (64 + 0 + 16 + 8 + 0 + 0 + 1)

 = **(+89)10**

Ex: convert using SM method **(10011100)2** = - (0 \* 26 + 0 \* 25 + 1 \* 24 + 1 \* 23 + 1 \* 22 + 0 \* 21 + 0 \* 20)

 = - (0 + 0 + 16 + 8 + 4 + 0 + 0)

 = **(-28)10**

**7´s and 8´s complements in octal :**

 7´s = 7 – each digit

 8´s = 7´s + 1

***EX:*** 7777

 - 2415

 is 7´s comp. 5362

 +1

 5363 is 8´s comp.

***EX:*** Perform 75268 - 31428 using 8's comp.:

 7777

 -3142

 4635 + 1 = 4636

 1 1

 7526

 + 4636

  12 – 8 = 4

 11 - 8 = 3

 12 - 8 = 4

 1 4364 the result

***H.W.*** Perform the following using 8's complement:

 5458 – 148 =

 67768 – 43378 =

**15´s and 16´s complements in hexadecimal :**

 ***EX***: Find 15´s and 16´s comp. of ( 1 F A D )16

 15 15 15 15

 - 1 F A D

 E 0 5 2 15´s comp.

 1 +

 E 0 5 3 16´s comp.

 ***EX***: Perform A B E D – 1 F A D using 16's comp. :

  1 1

 A B E D

 + E 0 5 3

 16 – 16 = 0

 20 – 16 = 4

 24 – 16 = 8

 1 8 C 4 0 the result

 ***H.W.***:Perform the following using 16's complement :

 F E E D16 – D A F 316 = ANS: 23FA16

 9 8 A E16 – 1 F E E16 =