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 $\mathbf{(01011001)_2} = +(1 * 2^6 + 0 * 2^5 + 1 * 2^4 + 1 * 2^3 + 0 * 2^2 + 0 * 2^1 + 1 * 2^0)$

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

$= \mathbf{(+89)_{10}}$

Ex: convert using SM method $\mathbf{(10011100)_2} = - (0 * 2^6 + 0 * 2^5 + 1 * 2^4 + 1 * 2^3 + 1 * 2^2 + 0 * 2^1 + 0 * 2^0)$

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

$= \mathbf{(-28)_{10}}$

7´s and 8´s complements in octal :

7´s = 7 – each digit

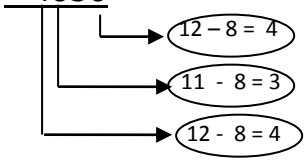
8´s = 7´s + 1

EX: 7777
- 2415
5362 is 7´s comp.
+1
5363 is 8´s comp.

EX: Perform 7526_8 - 3142_8 using 8's comp.:

7777
-3142
4635 + 1 = 4636

1 1
7526
+ 4636



1 4364 the result

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

$545_8 – 14_8$ =

$6776_8 – 4337_8$ =

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. :

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  1 1
  A B E D
+ E 0 5 3
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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 :

$F\ E\ E\ D_{16} – D\ A\ F\ 3_{16} =$ ANS: $23FA_{16}$

$9\ 8\ A\ E_{16} – 1\ F\ E\ E_{16} =$