Sign-magnitude representation: a sign bit + magnitude bit(s).

One's Complement representation (reverse): the interim step to finding the two's complement.

Two's complement representation: allows us to represent signed numbers in binary.

It is valid for **signed** numbers**.** A **positive** number has same values in sign-magnitude representation, one's Complement representation and two's Complement representation

1. Sign and Magnitude Representation

- the first bit always represents the sign of the number. i.e. 0 for a positive number and 1 for a negative number.
- the remaining bits (n-1) represent the magnitude of the number in binary

2. One's Complement

All bits in a byte are inverted by changing each 1 to 0 and each 0 to 1. But the MSB (Most Significant Bit) can be used to determine the sign of the number.(i.e. 0: positive; 1: negative)

If the number is positive

- Convert the number to binary
- Set the number to specific bit size

If the number is negative

- Convert the number to binary
- Set the number to specific bit size
- Get the sign magnitude of that value
- Get the complement of that value

3. Two's Complement

Add 1 to the one's complement (LSB: Least Significant Bit) when the number is negative

4. Exercises. Using 8 bit numbers, present all bits in the format of sign-magnitude, one's complement, and two's complement.

(1) (+25)D (2) (-25)D (3) (+101011)B (4) (-101011)B

5. Calculate 1-1 with formats of s_m, 1's and 2's.

5.1

5.2

5.3

6. Students activities.

(1) (-65)D (2) 65-25 (3) 25-65

Decimal	Signed Magnitude	Signed One's Complement	Signed Two'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	–
-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