N1. unsigned: $0_{10} \longrightarrow 000000_2$
[0; 63] $13_{10} \longrightarrow 001101_2$
          $24_{10} \longrightarrow 011000_2$
          $63_{10} \longrightarrow 111111_2$

signed: $16_{10} \longrightarrow 010000_2$
[-32; 31] $-2_{10} \longrightarrow 111110_2$ $+2 \rightarrow 000010$ $+32 \rightarrow 100000$
          $31_{10} \longrightarrow 011111_2$ reverse 111101   reverse 011111
          $-32_{10} \longrightarrow 100000_2$ $+ \qquad 1$ $+ \qquad 1$
                                  $\overline{111110}$ $\overline{100000}$

N2.   given   unsigned   signed   draft:

  $000101_2 \longrightarrow$ 5_{10} 5_{10}
                              -1: 101010
  $101011_2 \longrightarrow$ 43_{10} -21_{10} 010101 → 21

  $111111_2 \longrightarrow$ 63_{10} -1_{10} -1: 111110
                              000001 → 1
  $100000_2 \longrightarrow$ 32_{10} -32_{10}
                                  -1: 011111
                                  100000 → 32

N3. $7_{10} \longrightarrow 00000111_2 \longrightarrow 0x07$ (or 07_{16})

    $240_{10} \longrightarrow 11110000_2 \longrightarrow 0xF0$

    $171_{10} \longrightarrow 10101011_2 \longrightarrow 0xAB$ A 10 1010
                                  B 11 1011
    $126_{10} \longrightarrow 01111110_2 \longrightarrow 0x7E$ C 12 1100
                                  D 13 1101
                                  E 14 1110
                                  F 15 1111

N4. $0x3C \longrightarrow 00111100_2$

    $0x7E \longrightarrow 01111110_2$

    $0xFF \longrightarrow 11111111_2$

    $0xA5 \longrightarrow 10100101_2$

N5. $00111100_2 \rightsquigarrow 11000011 + 1 = 11000100_2$

    $01111110_2 \rightsquigarrow 10000001 + 1 = 10000010_2$

    $11111111_2 \rightsquigarrow 00000000 + 1 = 00000001_2$

    $10100101_2 \rightsquigarrow 01011010 + 1 = 01011011_2$

№6.   0x DEADBEEF

	Big - Endian

adress: 0x100 0x101 0x102 0x103
value: DE, AD, BE, EF

↗
most
significant
byte

Little - Endian

0x100 0x101 0x102 0x103
EF, BE, AD, DE

← less significant
byte

№7.

			zero-extended	sign-extended
7_{10}	→	00111_2	00000111_2	00000111_2
15_{10}	→	01111_2	00001111_2	00001111_2
-16_{10}	→	10000_2	00010000_2	11110000_2
-5_{10}	→	11011_2	00011011_2	11111011_2

№8.   unsigned:

$$7 \longrightarrow \overset{1\,1\,1}{0111}$$
$$9 \longrightarrow \underset{}{+\ 1001}$$
$$\overline{10000_2}$$

↙ 4 bits

$$\begin{bmatrix} 0000_2 \text{ is } 0 \\ 10000_2 \text{ is } 16 \end{bmatrix}$$

↖ 5 bits

signed:

$$4 \longrightarrow 0100$$
$$-5 \longrightarrow +\ 1011$$
$$\overline{1111_2} \text{ (which is } -1)$$

№8. * ⑯ 1) x & (x-1) — turning off the rightmost 1-bit

• x-1 → all the bits after the rightmost 1-bit are inverted

ex: 01011000 - 1 = 01010111

• x & (x-1) → all the bits stay the same up to the rightmost 1-bit, which "turns off"

ex: 01011000
AND   01010111
        ────────
        01010000

2) x | (x+1) - turning on the rightmost 0-bit

• x+1 → all the bits after the rightmost 0-bit are inverted

ex: 10100111 + 1 = 10101000

- $x\ |\ (x+1)$ ⟶ all bits remain unchanged, the rightmost 0-bit "turns on"

  ex: $\quad$ 10100111
  $\quad$ OR 10101000
  $\quad$ ——————
  $\quad\quad$ 10101111

3) $x\ |\ (x-1)$ – turning on the trailing 0's

   - $x-1$ ⟶ all the bits after the rightmost 1-bit are inverted

     ex: $10101000 - 1 = 10100111$

   - $x\ |\ (x-1)$ ⟶ trailing 0's of the original number "turn on", all other bits stay the same

   ex: $\quad$ 10101000
   $\quad$ OR 10100111
   $\quad$ ——————
   $\quad\quad$ 10101111

---

(12) $x = x \wedge y;$ ⟶ $\quad x = x \text{ XOR } y$

$y = x \wedge y;$ ⟶ $\quad y = x \text{ XOR } \underbrace{(y \text{ XOR } y)}_{=\ 0} = x \text{ XOR } 0 = x$

$x = x \wedge y;$ ⟶ $\quad x = x \text{ XOR } y \text{ XOR } x = \underbrace{(x \text{ XOR } x)}_{0} \text{ XOR } y = y$

that is, x and y are swapped

example: $\quad$ Let $\quad x = 10101111$
$\quad\quad\quad\quad\quad\quad\quad y = 00010011$

$\quad\quad\quad\quad$ then after $\quad x = x \wedge y; \quad\quad x = 10111100$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad y = 00010011$

$\quad\quad\quad\quad\quad\quad$ after $\quad y = x \wedge y; \quad\quad x = 10111100$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad y = 10101111$

$\quad\quad\quad\quad\quad\quad$ after $\quad x = x \wedge y; \quad\quad x = 00010011$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad y = 10101111$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ x and y are swapped now