

✓1

Unsigned:

$$0 \rightarrow 000000 \quad // \quad 0 = 0$$

$$13 \rightarrow 001101 \quad // \quad 1 + 4 + 8 = 13$$

$$24 \rightarrow 011000 \quad // \quad 8 + 16 = 24$$

$$63 \rightarrow 111111 \quad // \quad 1 + 2 + 4 + 8 + 16 + 32 = 63$$

Signed:

$$16 \rightarrow 010000 \quad // \quad 16 = 16$$

$$-2 \rightarrow 111110 \quad // \quad (2)_{10} = (0)_2 \Rightarrow (\text{invert}) 111101 \Rightarrow \underline{+1}$$

$$31 \rightarrow 011111 \quad // \quad 1 + 2 + 4 + 8 + 16 = 31$$

$$-32 \rightarrow 100000 \quad // \quad (32)_{10} = (100000)_2 \Rightarrow (\text{invert}) \Rightarrow \underline{+1}$$

✓2

Formulas:

$$\text{Unsigned: } A = \sum_{i=0}^{b-1} x_i \cdot 2^i, \text{ where } b = \# \text{ of bits}$$

$$\text{Signed: } B = A - x_{b-1} \cdot 2^b$$

	Unsigned	Inverse	Signed
000101	$1 + 4 = 5$	—	5
101011	$1 + 2 + 8 + 16 = 27$	010100	$010101 = -21$
111111	63	000000	$000001 = -1$
100000	32	011111	$100000 = -32$

✓3

$7 \rightarrow 00000007 \quad // \quad 16^0 \cdot 7 = 7$
 $240 \rightarrow 000000F0 \quad // \quad 16^1 \cdot 15 = 240$
 $171 \rightarrow 000000AB \quad // \quad 16^1 \cdot 10 + 16^0 \cdot 11 = 171$
 $126 \rightarrow 0000007E \quad // \quad 16^1 \cdot 7 + 16^0 \cdot 14 = 126$

✓4

$0x3C \rightarrow 00111100$
 $0x7E \rightarrow 01111110$
 $0xFF \rightarrow 11111111$
 $0xA5 \rightarrow 10100101$

✓5

Inverse

110000011
 100000001
 000000000
 01011010

Negation (+1)

11000100
 10000010
 00000001
 01011011

✓6

$0xDEADBEF \rightarrow$ Little-Endian: $EFBEADDE$
 \rightarrow Big-Endian: $DEADBEF$

✓7

Num, dec	Num, binary	Zero-extension	Sign-extension
7	00111	00000111	00000111
15	01111	00001111	00001111
-16	10000	00010000	11110000
-5	11011	00011011	11111011

✓8

- ① Unsigned $7+9 = 0111 + 1001 = \underline{10000}$ Overflow
- ② Signed $4+(-5) = 0100 + 1011 = 1111$