Acos HW2

N1

a) $0_{10} = 000000_2$

$13_{10} = 8+4+1 = 001101_2$

$24_{10} = 16+8 = 011000_2$

$63_{10} = 64_{10} - 1 = 1000000_2 - 0000001_2 = 111111_2$

b) $16_{10} = 010000_2$ $\quad -2_{10} = \overline{2_{10}} + 1 = \overline{000010} + 1 = 111101 + 1 = 111110_2$

~~31 10~~ $31_{10} = 16+8+4+2+1 = 011111_2$ $\quad -32_{10} = 100000_2$

N2

a) Unsigned:

- $000101_2 = 4+1 = 5_{10}$
- $101011_2 = 32+8+2+1 = 43_{10}$
- $111111_2 = 32+16+8+4+2+1 = 63_{10}$
- $100000_2 = 32_{10}$

b) Signed

- $000101_2 = 4+1 = 5_{10}$
- $101011_2 = -32+8+2+1 = -32+11 = -21_{10}$
- $111111_2 = -32+16+8+4+2+1 = -32+31 = -1$
- $100000_2 = -32$

N3

$7_{10} = 07_{16}$ $\quad 240_{10} = 15 \cdot 16 = F0_{16}$ $\quad 171_{10} = 10 \cdot 16 + 11 = AB_{16}$

$126_{10} = 7 \cdot 16 + 14 = 7E_{16}$

N4

- $0x3C_{16} = \underbrace{0011}_{3}\underbrace{1100}_{C}{}_2$
- $0x7E_{16} = \underbrace{0111}_{7}\underbrace{1110}_{E}{}_2$
- $0xFF_{16} = 11111111_2$
- $0xA5 = \underbrace{1010}\underbrace{0101}_2$

N5

$-(00111100) = 11000011_2 + 1_2 = 11000100_2$

~~$-(00$~~ $-(01111110_2) = 10000001_2 + 1_2 = 10000010_2$

$-(011111111)_2 = 100000000_2 + 1 =$ ~~100000000_2~~ 100000001_2

$-(010100101)_2 = 101011010_2 + 1_2 = 101011011_2$

N6

Big: $\underbrace{DE}\ \underbrace{AD}\ \underbrace{BE}\ \underbrace{EF}$

Little: $\underbrace{EF}\ \underbrace{BE}\ \underbrace{AD}\ \underbrace{DE}$

№7

Number:	Sign:	Zero:
$7_{10} = 0111_2$	00000111_2	00000111_2
$15_{10} = 1111_2$	11111111_2	00001111_2
$-16_{10} = 10000$ (It is not 4-bit .... :( )	11110000_2	00010000_2
$-5_{10} = 1011_2$	11111011_2	00001011_2

№8

$7_{10} = 0111_2$ $\quad 9_{10} = 1001_2$ $\quad\quad 4_{10} = 0100_2$ $\quad -5_{10} = \cancel{1010_2}\ 1011_2$

$$\begin{array}{r} 0111 \\ +\,1001 \\ \hline 10000 \end{array} \quad 10000_2 \qquad\qquad \begin{array}{r} 0100 \\ +\,1011 \\ \hline 1111_2 \end{array} \quad 1111_2$$

№9

- 12 from class work:

From discrete maths course we know that: 1) $A \oplus A = 0$
2) $A \oplus 0 = A$

Thus:

$x = x \oplus Y$

$y = x \oplus Y = x \oplus Y \oplus Y = x \oplus 0 = x$

$x = x \oplus Y = x \oplus Y \oplus x = Y \oplus 0 = Y$

- 16 from class work:

1) Let's pretend $x = \ldots\ldots 10000\ldots$ (the rightmost 1-bit; n-th position). Then, $x-1 = \ldots\ldots 01111\ldots$ (n-th position)

and $x \& (x-1) = \ldots\ldots 000000\ldots$ (n-th position.)

2) Let's pretend $x = \ldots\ldots 0111111\ldots$ (the rightmost 0-bit; n-th position). Then, $x+1 = \ldots 1000000\ldots$ (n)

$x | (x+1) = \ldots\ldots 111111\ldots$ (n-th pos.)

3) Let's assume $x = \ldots\ldots 10000\ldots$ (n), $x-1 = \ldots\ldots 0111\ldots$ (n)

$x | (x-1) = \ldots\ldots 111111$ (n)