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CSC 1301

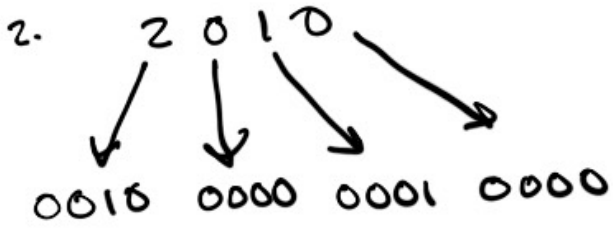
Homework #3

1.  $0010111 = 23$

$0010111$



$$\begin{array}{r} 1101000 \\ + \phantom{0000000} 1 \\ \hline 1101001 = -23 \end{array}$$



3.  $0110$

A) ↓ ↓ ↓ ↓

⊕  $4 + 2 + 0 = 6$

B)  $0110111$

↓ ↓ ↓ ↓ ↓ ↓ ↓

⊕  $64 + 32 + 8 + 4 + 2 + 1 = 111$

④ A)

		384			400			406	
0	1	1	0	0	1	0	1	1	0
-512	256	128	64	32	16	8	4	2	1

B) 0110010110

$$\begin{array}{r}
 0110010110 \\
 \downarrow \\
 1001101001 \\
 + \phantom{0000000000} 1 \\
 \hline
 1001101010
 \end{array}$$

⑤ A)

$$\begin{array}{ccccccc}
 1 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \\
 \downarrow & \downarrow & & \downarrow & & \downarrow & & \\
 128 & + & 64 & + & 16 & + & 2 & = \boxed{210}
 \end{array}$$

$$\begin{array}{ccccccc}
 0 & 1 & 0 & 1 & 1 & 0 & 0 & 1 \\
 & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 & 64 & + & 16 & + & 8 & + & 1 = \boxed{89}
 \end{array}$$



1) a) 11010010

$$\begin{array}{ccccccc} & \downarrow & \downarrow & \downarrow & \downarrow & & \\ -128 & +64 & +16 & +2 & & = & \boxed{-46} \\ & -64 & -48 & & & & \end{array}$$

b) 01011001

$$\begin{array}{ccccccc} & \downarrow & \downarrow & \downarrow & \downarrow & & \\ \oplus & 64 & +16 & +8 & +1 & = & \boxed{89} \\ & 80 & & & & & \end{array}$$

2's complement

10101111

$$\begin{array}{ccccccc} & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ -128 & +32 & +8 & +4 & +2 & +1 & = \boxed{-81} \\ & -96 & -88 & -84 & -82 & & \end{array}$$

sign magnitude

10101111

$$\begin{array}{ccccccc} & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ \ominus & 32 & +8 & +4 & +2 & +1 & = \boxed{-47} \end{array}$$

1010 1111 unsigned binary

↓ ↓ ↓

128 + 32 + 15 = 175

binary arithmetic

$$\begin{array}{r} 11001 \\ + 00101 \\ \hline 11110 \end{array}$$

$$\begin{array}{r} 1111 \\ - 0101 \\ \hline 10100 \end{array}$$

## hexadecimal arithmetic

82CD  
↓ ↓ ↓ ↓  
1000 0010 1100 1101

+ 1982  
↓ ↓ ↓ ↓  
0001 1001 1000 0010

1000 0010 1100 1101  
+ 0001 1001 1000 0010  
-----  
1001 1001 0011 1111  
└─┘ └─┘ └─┘ └─┘  
9 C 4 F

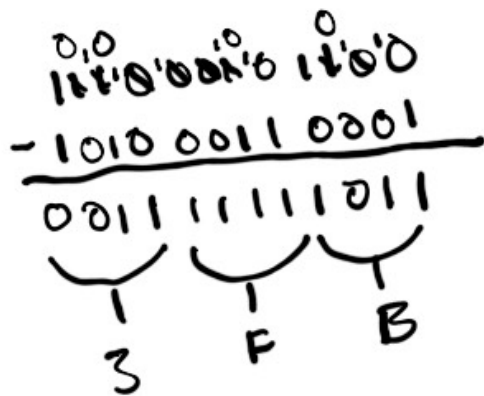
9C4F

A31  
 ↙   ↓   ↘  
 1010 0011 0001

+ E2C  
 ↙   ↓   ↘  
 1110 0010 1100

1 1 1 1 0 0 0 1 1 0 0 0 1  
 + 1 1 1 0 0 0 1 0 1 1 0 0  
 -----  
 1 1 0 0 0 0 1 0 1 1 1 0 1  
 ↓   ⌒   ⌒   ⌒  
 1   8   5   D

185D



3FB

Bonus

$$\begin{array}{cccccccccccc} 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & . & 1 & 0 & 1 & 0 \\ \downarrow & & \searrow & \downarrow & \downarrow & \downarrow & & & \downarrow & & & \downarrow & \downarrow & & \\ 2048 & + & 512 & + & 128 & + & 32 & + & 8 & + & 2 & + & \frac{1}{2} & + & \frac{1}{8} \end{array}$$

$$2730 \frac{5}{8}$$



$2730.625$