



Title: homework #1

Date: 9 / 7 / 21

#1

a) 10 bit smallest unsigned number : 0 $\Rightarrow (0000000000)_2$

10 bit largest unsigned number : $2^{10-1} \Rightarrow 1023 \Rightarrow (1111111111)_2$

b) 10 bit smallest signed number : $-2^{9-1} \Rightarrow -512 \Rightarrow (1000000000)_2$

10 bit largest signed number : $2^{9-1}-1 \Rightarrow 511 \Rightarrow (1111111111)_2$

#2 F9AS H \rightarrow B, B \rightarrow O

$$(F \quad 9 \quad A \quad 5)_{16} \rightarrow (001111100110100101)_2$$

$$(1111 \quad 1001 \quad 1010 \quad 0101)_2 \quad (1 \ 7 \ 4 \ 6 \ 4 \ 5)_8$$

#3 39.375 D \rightarrow B, B \rightarrow H

$$39.375 \cdot 2^3 \Rightarrow 315$$

$$\begin{array}{r} 315 \\ \hline 2 \end{array} \begin{array}{r} 157 \quad 1 \\ \hline 2 \end{array} \begin{array}{r} 78 \quad 1 \\ \hline 2 \end{array} \begin{array}{r} 39 \quad 0 \\ \hline 2 \end{array} \begin{array}{r} 19 \quad 1 \\ \hline 2 \end{array} \begin{array}{r} 9 \quad 1 \\ \hline 2 \end{array} \begin{array}{r} 4 \quad 1 \\ \hline 2 \end{array} \begin{array}{r} 2 \quad 0 \\ \hline 2 \end{array} \begin{array}{r} 1 \quad 0 \\ \hline 2 \end{array} \begin{array}{r} 0 \quad 1 \\ \hline \end{array}$$

(100111.011)

0110 1100

6 C

(6C)₁₆

#4 (11010.1001)₂, (18.5)₁₆, (37.24)₈

11010.1001

$$(1 \cdot 2^4) + (1 \cdot 2^3) + (0 \cdot 2^2) + (1 \cdot 2^1) + (0 \cdot 2^0) + (1 \cdot 2^{-1}) + (0 \cdot 2^{-2}) + (0 \cdot 2^{-3}) + (1 \cdot 2^{-4})$$

$$(26.5625)_{10}$$

18.5

$$\underbrace{(1 \cdot 16^1) + (8 \cdot 16^0) + (5 \cdot 16^{-1})}_{(24.3125)_{10}}$$

(37.24)₈

$$(3 \cdot 8^1) + (7 \cdot 8^0) + (2 \cdot 8^{-1}) + (4 \cdot 8^{-2})$$

$$\underbrace{(31.3125)}_{(31.3125)_{10}}$$



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#5 add and multiply 1101 111

a) add b) multiply

$$\begin{array}{r}
 111 \\
 + 1101 \\
 \hline
 10100
 \end{array}
 \qquad
 \begin{array}{r}
 1101 \\
 - 111 \\
 \hline
 1101
 \end{array}
 \qquad
 \begin{array}{r}
 11010 \\
 - 110100 \\
 \hline
 1011011
 \end{array}$$

#6 obtain 1's and 2's Complement of the following binary numbers.

a) 10101011	b) 01001110	c) 00000000
$01010100 \Rightarrow 1's$	$10110010 \Rightarrow 1's$	$11111111 \Rightarrow 1's$
$+ \quad \quad \quad 1$	$+ \quad \quad \quad 1$	$+ \quad \quad \quad 1$
<hr/> $01010101 = 2's$	<hr/> $10110010 \Rightarrow 2's$	<hr/> $10000000 \Rightarrow 2's$

#7 Convert decimal +34, -54, -23, and +25 to binary using enough digits. Then binary equivalent, and convert to decimal to check.

$$\begin{array}{rcl}
 (+54)_{10} = (00110110)_2 & (+54) + (+25) = (+79)_{10} & (+54) + (-25) = (+29)_{10} \\
 (-54)_{10} = 11001001 & \begin{array}{r}
 00110110 \\
 + 00011001 \\
 \hline
 01001111
 \end{array} & \begin{array}{r}
 00110110 \\
 + 00110110 \\
 \hline
 00001100
 \end{array} \\
 & 79 & 29 \\
 & \hline & \hline
 \end{array}$$

$$\begin{array}{r}
 (-54) + (-25) = (-79) \\
 \begin{array}{r}
 \begin{array}{r}
 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \\
 + & 1 & 1 & 0 & 0 & 1 & 1 & 1 \\
 \hline
 & 1 & 0 & 1 & 1 & 0 & 0 & 1 \\
 + & 1 & & & & & & 1 \\
 \hline
 & 1 & 0 & 1 & 1 & 0 & 0 & 0
 \end{array}
 \end{array}$$



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#8 Convert 256 and 323 to BCD codes and perform addition

2 5 6 3 2 5
0010 0101 0110 0011 0010 0101

$$\begin{array}{r}
 0010 \ 0101 \ 0110 \\
 + 0011 \ 0010 \ 0101 \\
 \hline
 0101 \ 0111 \ 1011 \\
 1 \hline
 0110 \\
 0101 \ 10000001
 \end{array}
 \quad
 \begin{array}{r}
 256 \\
 + 323 \\
 \hline
 581
 \end{array}
 \quad
 \begin{array}{l}
 \text{Check:} \\
 5 \ 8 \ 1 \\
 0101 \ 1000 \ 0001
 \end{array}$$

#9 Convert 8Ce3 to ascii codes, append an odd parity to each letter at the left

8 = 5 6 : 0011 1000	0	000111000	00100 0011	1011000101	100110011
C = 6 7 : 0100 0011	0				
e = 101 = 0110 0101	1	0'56 , 0'67, 1'101, 1'31			
3 = S1 = 0011 0011	1				

#10 4A EF 68 6E 20 C4 EF ES ;convert to bit for and decode the ascii, determine parity used.

4A	0100 1010	J
EF	1110 1111	O
68	0110 1000	h
6E	0110 1110	n
20	0010 0000	
C4	1100 0100	D
EF	1110 1111	O
ES	1110 0101	e