

ECE 1410 Binary and Hexadecimal Homework

1. Convert the following UNSIGNED binary numbers into their decimal equivalents.

a. $\underline{111} = 4 + 2 + 1 = \boxed{7}$

b. $\underline{1001001} = 64 + 8 + 1 = \boxed{73}$

c. $\underline{101.101} = 4 + 1 + \frac{1}{2} + \frac{1}{8} = \boxed{5\frac{5}{8}}$

d. $\underline{0.1111} = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} = \boxed{\frac{15}{16}}$

2. Convert the following UNSIGNED decimal numbers into their binary equivalents.

a. $247 = \frac{255}{-8} = \boxed{11110111}$

b. $113 = \frac{128}{64} \frac{32}{16} \frac{8}{4} \frac{2}{1} = \boxed{01110001}$

c. $20.5 = \frac{20}{0.5} = \boxed{10100.1}$

d. $11.75 = \frac{11}{0.75} = \boxed{1011.11}$

3. Convert the following 8-bit UNSIGNED binary numbers into their decimal equivalents.

a. $\underline{00110011} = 32 + 16 + 2 + 1 = \boxed{51}$

b. $\underline{10101010} = 128 + 32 + 8 + 2 = \boxed{170}$

c. $\underline{10001000} = 128 + 8 = \boxed{136}$

4. Convert the following 8-bit SIGNED binary numbers into their decimal equivalents.

a. $\underline{00110011} = 32 + 16 + 2 + 1 = \boxed{51}$

b. $\underline{10101010} = -(64 + 16 + 4 + 2) = \boxed{-86}$

c. $\underline{10001000} = -(8 + 16 + 32 + 64) = \boxed{-120}$

5. Convert the following decimal numbers to 8-bit SIGNED binary numbers.

a. $37 = \frac{0}{128} \frac{0}{64} \frac{1}{32} \frac{0}{16} \frac{0}{8} \frac{1}{4} \frac{0}{2} \frac{1}{1} = \boxed{00100101}$

b. $79 = \frac{0}{128} \frac{1}{64} \frac{0}{32} \frac{0}{16} \frac{1}{8} \frac{1}{4} \frac{1}{2} \frac{1}{1} = \boxed{01001111}$

c. $-43 = \frac{0}{128} \frac{0}{64} \frac{1}{32} \frac{0}{16} \frac{1}{8} \frac{0}{4} \frac{1}{2} \frac{1}{1} = \boxed{11010101}$

d. $133 = \frac{1}{128} \frac{0}{64} \frac{0}{32} \frac{0}{16} \frac{0}{8} \frac{1}{4} \frac{0}{2} \frac{1}{1} = \boxed{\text{Overflows; not possible}}$

6. Convert the following 8-bit UNSIGNED binary numbers into their hexadecimal equivalents.

Hexadecimal equivalents.

a. $0011^3 0011^3 = 33$

b. $1010^A 1010^A = AA$

c. $1000^4 1000^8 = 88$

7. Convert the following 8-bit SIGNED binary numbers into their hexadecimal equivalents.

a. $0011|0011 = 33$
 b. $1010|1010 = AA$
 c. $1000|1000 = 88$

8. Convert the following 8-bit hexadecimal numbers into their SIGNED and UNSIGNED decimal equivalents.

UNSIGNED decimal equivalents.

a. $0x23 = 0010\ 0011 = 32 + 3 = \boxed{35}$

b. $0x8C = 1000\ 1000$

c. $0xEF = 1110\ 1111$

$\times \begin{array}{r} 11 \\ 16+1 \end{array} = 17 \rightarrow \begin{array}{r} 1110\ 1111 \\ 0001\ 0000 \\ \hline 1111\ 1111 \end{array}$

$\begin{array}{r} 1111\ 1111 \\ 0111\ 0100 \\ \hline 1110\ 1111 \end{array} + 4 = \boxed{-17}$

Convert the above to binary addition.

9. Perform the following 8-bit binary additions. Convert the answers to decimal for both SIGNED and UNSIGNED representations. Also, convert answers to hexadecimal.

decimal for both SIGNED and UNSIGNED representations. Also, convert the answers to hexadecimal.

a. $01110111 + 00001111$

b. $01010101 + 00100111$

c. $11100110 + 00101010$

d. $11001001 + 11100010$

10. Perform the following 8-bit binary subtractions. Convert the answers to decimal for both SIGNED and UNSIGNED representations. Also, convert the answers to hexadecimal.

Answers to hexadecimal

a. $01110111 - 00001111 = 104 = 0 \times 68$

b. $01010101 - 00100111 = 46 = 0 \times 2E$

c. $11100110 - 00101010 = 68 = 0 \times BC$ (signed)

d. $11001001 - 11100010 = 188 = 0 \times BC$ (unsigned)

unsigned does not work
signed = -25 = $0 \times E7$ (checked)

1 = 201
32 + 7 = 39

316
x15
180
160
240 + 2 = 242

11100110
160
240 + 2 = 242

20011010 = -26 - 42 = -68

16
x14
64
160
224 + 6 = 230
188

32
+10
42

11001001
70011010
00110111 = -55

16
x9 + 7 = 55

01000100
10411011 = 10111100

00011001
11100110
11001111
E 7

128 + 32 + 16 = 176

176
+ 8 + 4 = 188

16
x14
64
160
224 + 6 = 230
188

32
+10
42

11001001
70011010
00110111 = -55

16
x9 + 7 = 55

01000100
10411011 = 10111100

00011001
11100110
11001111
E 7