CSE 351 Section 1 – Number Bases and Working in C [Solutions]

Hi there and welcome to section! ☺

Numerals

A *numeral* is a symbolic representation of a number. For the purposes of this class, we will define a numeral as a sequence of digits (symbols).

Binary	Decimal	Hex
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

Number Bases

If we have an n-digit numeral $d_{n-1}d_{n-2}\ldots d_0$ in base b, then the value of that numeral is $\sum_{i=0}^{n-1} \boldsymbol{d_i\, b^i}$, which is just fancy notation to say that instead of a 10's or 100's place we have a b's or b^2's place.

The most common bases we will use in this class are 2, 10, and 16, which are called binary, decimal, and hexadecimal (or hex), respectively. In base b, each digit d_i can only be one of b fixed symbols (0-1 for binary, 0-9 for decimal, etc.).

The table on the right shows the equivalent numerals for the numbers 0 through 15 in these three major number bases. We differentiate between these bases by using the prefix '`0b`' for binary and '`0x`' for hexadecimal.

Exercises:

1. Complete the table below by converting the numbers into the other two common bases. You may leave the "Decimal" column unsimplified.

Binary	Decimal	Hexadecimal
0b10010011	$2^7 + 2^4 + 2^1 + 2^0 = 147$	0x93
0b10110	$1\times16^1 + 6\times16^0 = 22$	0x16
0b111111	63	0x3F
0b100100	$2^5 + 2^2 = 36$	0x24
0b110000110000	$12\times16^2 + 3\times16^1 = 3120$	0xC30
0b0	0	0x0
0b101110101101	$11\times16^2 + 10\times16^1 + 13\times16^0 = 2989$	0xBAD
0b110110101	437	0x1B5