CSC 230 Lab 1 Number Systems

lab1.txt is due at 5:00pm on January 12th, 2018

I. Lab Environment

- Need a cardkey to access the lab and the building. The cardkey can be purchased at the bookstore for a non-refundable $10 fee.
- Need a csc account to access the course website and computers in the lab. Email itsupport@csc.uvic.ca if you have difficulties to log on to the machines in the lab.
- ECS 249 is the only lab with hardware/software provided for this course. Suggest you start your assignment early.
- **"H"** drive is your network space on the CSC server. Store all your work in H drive and keep a back up copy using other portable devices (such as a flash memory or a floppy disk). Files stored in the C drive might be erased over night.
- Printing credit can be purchased on line at https://www.csc.uvic.ca/PrintPagePurchasing/

II. Number Systems

In the computer system, we need to know how many bits (storage space) are used. For example, let's count the number of students in the lab. In decimal number system, we just need two digits. In binary number system, how many bits do we need? Let's do counting up in decimal, binary and hexadecimal. Here is the conversion table:

Decimal (2 digits)	Binary (5 bits)	Hexadecimal (2 digits)
0	0b0**0000**	0x0**0**
1	0b0**0001**	0x0**1**
2	0b0**0010**	0x0**2**
3	0b0**0011**	0x0**3**
4	0b0**0100**	0x0**4**
5	0b0**0101**	0x0**5**
6	0b0**0110**	0x0**6**
7	0b0**0111**	0x0**7**
8	0b0**1000**	0x0**8**
9	0b0**1001**	0x0**9**
10	0b0**1010**	0x0**A**
11	0b0**1011**	0x0**B**
12	0b0**1100**	0x0**C**
13	0b0**1101**	0x0**D**
14	0b0**1110**	0x0**E**
15	0b0**1111**	0x0**F**
16	0b10000	0x10
17	0b10001	0x11
18	0b10010	0x12
19	0b10011	0x13
20	0b10100	0x14
21	0b10101	0x15
22	0b10110	0x16
23	0b10111	0x17
24	0b11000	0x18

III. Exercises

1. Why did we use 5 bits in the table above? Can we use only 4-bits instead?
2. How many different values can be represented by 6 bits?
3. There are 163 students registered in CSc 230, what is the minimum number of bits needed to represent this number in binary (assume it is an unsigned number)?
4. Convert the following positive integer numbers:
    a. 0b100,1101 to decimal
    b. 63 to binary
    c. 27 to binary
    d. 323 to binary
    e. 1012 to binary
    f. 1012 to octal
    g. 0x1E to decimal:
    h. 0x1E to octal:
    i. 0x66 to decimal:
    j. 0x1F5 to decimal
    k. 0x1170 to decimal
    l. 39 to hexadecimal
    m. 51 to hexadecimal
    n. 158 to hexadecimal
    o. 1032 to hexadecimal

5. Convert negative integer numbers using 2's complement notation
    a. -63 to binary and then to Hex
    b. -45 to binary and then to Octal
    c. -13 to binary
    d. 0b10,1011 to decimal
    e. 0b10,110 to decimal
    f. 0b00,1110 to decimal
    g. 0b11,0100 to decimal

6. What are the minimum and maximum values represented by a 4-bit binary number: a) as an unsigned number? B) as a 2's complement number? How about 8 bits, 16 bits, 12 bits?
7. What is the result of bit-wise AND operation of: 0b1011,0010 with 0b1111,0000?
8. What is the result of logical Shift-Left operation on 0b0101,1100? What will the result of logical Shift-right? (Page 283 in your textbook by T. S. Margush)
9. What is the result when bit-wise XOR and mask of 0b1111,1111 are applied on byte 0b1011,0100?
10. What is the mask to be used if we want to clear bits 2,3,5 and 7 of a byte?

Download lab1.txt. Write your answers and submit lab1.txt via conneX. You must click the "Submit" button. Write your name, student number at the top. Due at 5:00pm on January 12th, 2018