

Lab 1

The following assignment is intended to be completed during your assigned lab period. At the end of the lab session, turn in all pages to your lab instructor. For this lab, you may choose your partners, but you will be assigned to a group for all future labs.

Group names and usernames

Name	Username
Murphy Malcolm	murphv

Problem 1: Conversion from Binary [12 points, On paper]

Convert the following Binary into Decimal, Hex, and Octal.

Binary: 0010 1101 1111

Decimal: _____

Hexadecimal: _____

Octal: (for fun... not graded) _____

Problem 2: Masking Bits in a Binary Number [9 points, Autograded]

For this problem, you will need to set up your IDE.

Then, download the starter code for Lab 1:

wget <https://eecs370.github.io/labs/lab1.tar.gz>

When you finish this problem, submit your C file to the [Autograder \(https://autograder.io/\)](https://autograder.io/).

Write a function `int extract(int a)` that extracts bits 7 through 4 of the given integer **a**.

Example:

```
int a = 0x2020;    // ... 0010 0000 0010 0000
int result = extract(a);
//result should = 0b0010
```

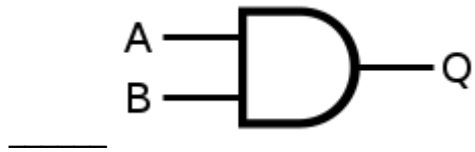
No handwritten response required.

Problem 3: Logic [15 points, On paper]

Answer the following questions. If you haven't taken EECS 270, you might find [the Wikipedia article on "Logic Gate"](#) helpful.

- a. Assume `a` is an 8-bit unsigned integer in C (usually "unsigned char") with `a=15`. What is the value of `!a` ? What is the value of `~a` ?

b. Match the logic gate to the truth table



A:

A	B	Q
F	F	T
F	T	F
T	F	F
T	T	F



B:

A	B	Q
F	F	F
F	T	T
T	F	T
T	T	T



C:

A	B	Q
F	F	F
F	T	F
T	F	F
T	T	T



D:

A	B	Q
F	F	F
F	T	T
T	F	T
T	T	F

- c. Write equations for the below gates. Use * for AND, + for OR, ! for NOT, and () to specify order of operations. Use no other symbols.

i. Example equation: $A * B$

ii. Equation: _____

iii. Equation: _____



- d. Draw gates which represent $X = A + (B * !C)$.

Problem 4: Debugging [13 points, Show your instructor]

In this class, you will need to use a debugger while working on your project. In general, staff will not be able to provide adequate help in office hours if you are not able to set breakpoints in your code, step through execution line by line, and view object values during execution. Any debugging interface (an IDE like XCode or VSCode, or a terminal interface like GDB) is fine. Please read through [EECS 280's Setup Tutorial \(https://eecs280staff.github.io/tutorials/\)](https://eecs280staff.github.io/tutorials/) and attend office hours in the first week if you need help setting up a debugger.

What debugging interface will you be using? [5]

Configure your programming environment to compile and run the following code (hint: try modifying the Makefile from problem 2):

```
#define ARR_SIZE 5

typedef struct My_Struct {
    int i;
    char c;
} My_Struct;

int main() {
    My_Struct my_arr[ARR_SIZE];
    for(int i=0; i<ARR_SIZE; i++) {
        my_arr[i].i = (i << 4) * 3 - (2 << i);
        my_arr[i].c = my_arr[i].i;
    }

    my_arr[2].c = 'a';
    return 0;
}
```

Show your instructor your debugging environment where execution is paused directly **before** `my_arr[2].c = 'a'` and your debugger has displayed the previous value of `my_arr[2].c`. You should not modify the code to insert any print statements, rather the debugger should be displaying the value. [8]

Instructor Check-off Signature: _____

Problem 5: Lab Survey *[1 point]*

Everyone in your group, please fill out the [lab survey](#) (QR code) which will help us form groups for later assignments. It should take ~2 minutes to complete.

