

UNCA CSCI 235
Exam 1 Solution Fall 2018
15 October 2018

This is a closed book and closed notes exam. Communication with anyone other than the instructor is not allowed during the exam. **Furthermore, calculators, cell phones, and any other electronic or communication devices may not be used during this exam.** Anyone needing a break during the exam must leave their exam with the instructor. Cell phones or computers may not be used during breaks.

This exam must be turned in before 6:55 PM.

Name: _____

Problem 1 (30 points) C expressions

In the left column, there are twenty tricky and not-so tricky C expressions. Write their values in the right column. Express your answers in simple base 10 expressions, such as 235 or -235. You may assume that all of these numbers are stored in 16-bit two's complement representation, the usual short.

0123	83
0xab	171
9 >> 3	1
9 << 3	72
20 / 5 * 11	44
20 * 5 / 11	9
25 & 19	17
25 && 19	1
25 19	27
25 19	1
25 ^ 19	10
25 != 19	1
~25	-26
! -3	0
235 * (201 != 202)	235

Problem 2 (16 points) Decimal to two's complement conversion

Convert the following four signed decimal numbers into **six-bit two's complement** representation. Some of these numbers may be outside the range of representation for **six-bit two's complement** numbers. Write "out-of-range" for those cases.

-32 100000	-19 101101
32 <i>out-of-range</i>	63 <i>out-of-range</i>

Problem 3 (16 points) Q4.4 to decimal conversion

Convert the following four Q4.4 *two's complement* numbers (four fixed and four fractional bits) into signed decimal representation.

00110010	3.125
01001001	4.5625
10010010	-6.875
11111111	-0.0625

Problem 4 (12 points) Decimal to Q4.4 conversion

Convert the following three signed decimal numbers into Q4.4 *two's complement* numbers (four fixed and four fractional bits). If you can't express the number exactly, give the nearest Q4.4 representation.

-2.35

11011010

$$-8 + 4 + 1 + 0.5 + 0.125 = -2.375$$

0.4

00000110

$$0.25 + 0.125 = 0.375$$

7.5

01111000

$$4 + 2 + 1 + 0.5 = 7.5$$

Problem 5 (4 points) Tools of the trade

Answer two of the following three questions.

What text editor have we used to write C code in this class?

nano

What program have we used to compile C code in this class? (There are two possible answers.)

make or gcc

What is argc?

Variable name generally used as the first argument to main. It is the number of arguments passed to the program.

Problem 6 (22 points) C Programming

Write a program that reads (use `scanf`) a bunch of integers from a terminated standard input stream and counts and then prints (use `printf`) how many of these integers are (a) between 0 and 100 inclusively or (2) less than 0 or greater than 100. Your output must have neatly formatted lines as illustrated below.

```
Number within range:    1040
```

```
Number outside range:   986
```

The input is totally unformatted and only contains integers. In the following sample input, three numbers are within the range and four are outside the range.

```
    235    2018    7
64        64    7   -200
```

Here's two lines to get you started:

```
#include <stdio.h>
int main(int argc, char *argv[]) {
    int inRange = 0 ;
    int outRange = 0 ;
    int value ;
    while(scanf("%d", &value) == 1) {
        if (0 <= value && value <= 100) {
            ++inRange ;
        } else {
            ++outRange ;
        }
    }
    printf("Number within range:  %4d", inRange) ;
    printf("Number outside range: %4d", outRange) ;
}
```