

# Code Jam 3

Names:

Complete the following exercises in 40 minutes. This activity is open book, open computer. All work should be your own group.

## Question 1

### Unsigned integers

Compute the results of the following decimal expressions using *unsigned* 4-bit integers. Indicate whether there is overflow. Express your final answer in hexadecimal. Show your work.

Expression	Result	Overflow or not?
$5 \ll 3$		yes/no
$1 \wedge 5$		yes/no

5 - 6		yes/no
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## Signed integers

Compute the results of the following decimal expressions using *signed* 4-bit integers. Indicate whether there is overflow. Express your final answer in hexadecimal. Show your work.

Expression	Result	Overflow or not?
$7 \gg 1$		yes/no
$1 \mid -5$		yes/no
$-2 + 5$		yes/no

## Floating-point

Consider the following floating-point number in hexadecimal format

0x C0 30 00 00

A) What is the above number in binary?

B) Using your answer from part A, label which bits represent the sign, the exponent, and the significant bits.

C) What decimal value does the above number correspond to? Show your work.

## Question 3

Consider the following struct. Draw the contents and layout of a variable of this struct type, assuming the variable is placed in memory starting at address 0xffffeeA0.

```
struct foo {
    char name[8];
    unsigned int flag;
    float max;
    float min;
};
```

## Question 4

Write a program, `scramble.c`, that swaps the 2nd and 3rd bits of every character in a message.

```
$ ./scramble
Please enter a phrase: lol
scramble: joj

$ ./scramble
Please enter a phrase: joj
scramble: lol

$ ./scramble
Please enter a phrase: What does the cat say?
scramble: Whar bocu rhc ear uay?

$ ./scramble
Please enter a phrase: Whar bocu rhc ear uay?
scramble: What does the cat say?
```

Last updated 2022-03-17 11:18:38 -0400