Notes

Review:

- `scanf()`
- SAFE string functions
- file I/O, structs
- ***.h** files and ***.c** files
- Makefiles

Review recent quizzes!

CS221
C and Systems Programming

Practice

One of the Key Skills everyone must learn in this class is how to do BIT OPERATIONS. Today I'll do some demos, we'll do a contest, and you'll do a Quiz. Then time for the project.

LOOK AT chars.c

Bit operations in C

1	1	1	0	0	0	1	1
0	0	0	0	1	1	1	1
0	0	0	0	0	0	1	1
1	1	1	0	1	1	1	1
1	1	1	0	1	1	0	0
0	0	0	1	0	0	1	1
1	0	0	1	1	0	0	0
1	1	1	0	0	1	1	0

```
char val1 = -29;
char val2 = 15;
val1 & val2;
val1 | val2;
val1 ^ val2;
~(val1 ^ val2);
(~(val1 ^ val2)) << 3;
((~(val1 ^ val2)) << 3) >> 2;
```


The right-shift example is only for a SIGNED data type like 'char'

How about longer data types?

```
int x = value();
int y = x & (1<<31);
x = x << 1 | ((y >> 31) & 1);
```

What does this do?

By avoiding using if(), this code can be parallelized to do this on lots of ints at the same time.

Contest…

…then

Quiz

BitOps *showdown…*

```
char: 10 << 4
unsigned char: 10 << 4
12 & 13
15 | 20
-128 >> 7
-128 >> 6
-128 << 6
160 & 48
160 | 96
```

```
3 & -3
3 ^ -3
-16 ^ 12
(3 << 2) & 3
47 & 48
-99 | -9
```