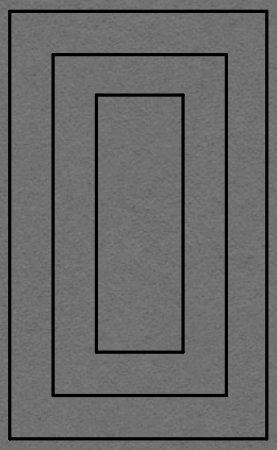
Quiz
Sometimes on Tuesday

Projects
Wednesday 5 p.m / D2L

- Assembly code
  - * decompile (translate)
- Simulating hardware
  - * binary addition (without "+")



languages
* utilize different language s
* Assembly language

hardware
(MIPS)

software

BINARY

* reliable

9 4 2
10^2 10^1 10^0

max value is 10^3-1
base b k-digits b^k-1

Bit a binary digit
Byte 8 bits
nibble 4

LSB least significant bit
worth least (right)
MSB (left)

overflow without carryout

```
  0 1 1 1   1 1 1 1   127
+ 0 0 0 0   0 0 0 1     1
-----------------------
  1 0 0 0   0 0 0 0
```

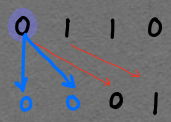
carryout without overflow

```
  1 1 1 1   1 1 1 1    -1
+ 0 0 0 0   0 0 0 1     1
-----------------------
  0 0 0 0   0 0 0 0
```

bit-wise operator

```
    X X X X        &
&   0 1 0 0   mask  && boolean
-----------
    0 X 0 0
```

bits shifting



ith bit in x

a = ((x >> i) & 0x1)

i = out |=(0x1 << i)

14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1