

XOR

Bits and Nybbles

One Bit

$$0 \oplus 0 = 0$$

$$0 \oplus 1 = 1$$

$$1 \oplus 0 = 1$$

$$1 \oplus 1 = 0$$

In book, XOR is \oplus

In Python, XOR is \wedge

One Bit in Python

```
[Sams-MacBook-Pro-3:~ sambowne$ python
Python 2.7.11 (default, Dec 5 2015, 14:44:53)
[GCC 4.2.1 Compatible Apple LLVM 7.0.0 (clang-700.1.76)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
[>>> 0^0
0
[>>> 0^1
1
[>>> 1^0
1
[>>> 1^1
0
[>>> ]
```

Two Bits

$$00 \oplus 00 = 00$$

$$00 \oplus 01 = 01$$

$$01 \oplus 01 = 00$$

$$01 \oplus 11 = 10$$

Two Bits in Python

```
[>>> 0b00 ^ 0b10
2
[>>> bin(0b00 ^ 0b10)
'0b10'
[>>> bin(0b11 ^ 0b10)
'0b1'
[>>>
```

Four Bits

$$0000 \oplus 1000 = 1000$$

$$1100 \oplus 0001 = 1101$$

$$1111 \oplus 1110 = 0001$$

$$0101 \oplus 1010 = 1111$$

Four Bits in Python

```
[>>> bin(0b1100 ^ 0b0010)
'0b1110'
[>>> bin(0b1111 ^ 0b1000)
'0b1111'
[>>>
```

Kahoot!