# Bit Manipulation (Cont'd)

Comp 1002/1402

## Masking and Finding a bit

All zero except the bit to test

```
 1010101x          110011x0
&00000001 Mask    &00000010 Mask
 0000000x          000000x0
```

Note: either the result = Mask or Zero

# Masking and Finding a bit (2)

All ones except the bit(s) to test

```
 1010101x          110011x0
|11111110 Mask    |11111101 Mask
 1111111x          111111x1
```

Note: either the result = all ones or not!

# Masking to clear a bit

All ones except the bit to clear

```
 11101111          11001110
&11111101 Mask    &10111111 Mask
 11101101          10001110
```

Bit is set to zero

# Masking to set a bit

All zeroes except the bit to clear

```
 111011x1          1x001110
|00000010 Mask    |01000000 Mask
 11101111          11001110
```

Bit is set to one

# Masking to flip a bit

All zeroes except the bit to flip

```
 11101101          11001110
^00000010 Mask    ^01000000 Mask
 11101111          10001110
```

Bit is flipped

## Set, Flip, Get groups

Masks can be more than one bit

Bitwise Independence is crucial

Allows arbitrary bits to be manipulated

Inside one integer we can store a database!

## Inside one integer

4 bytes on some machines

Q: Which of the first 32 numbers>1 are prime?

Ans: rightmost bit is 2

**0010 1000 0010 0010 1000 1010 0010 1011**