Cis 1 - Chapter3

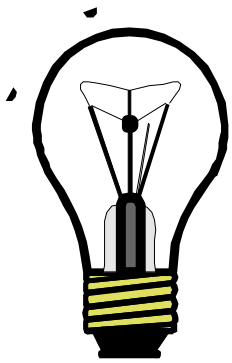
Units of Information Storage

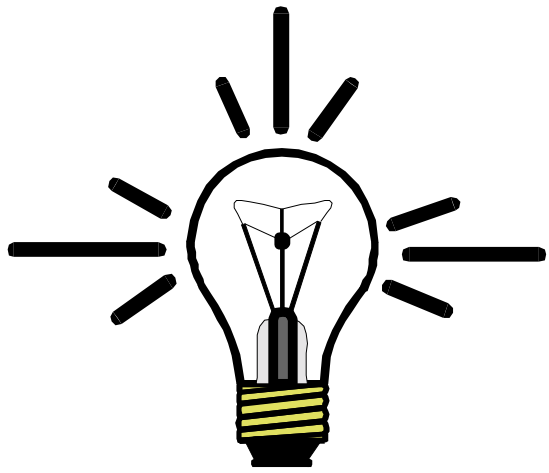
(or *a BIT of this and a BYTE of that*)

Bits

- Bit (Binary Digit) - The smallest unit of information within the computer. The only thing a computer understands.
- Bit has one of two values:

OFF (0) or ON (1)



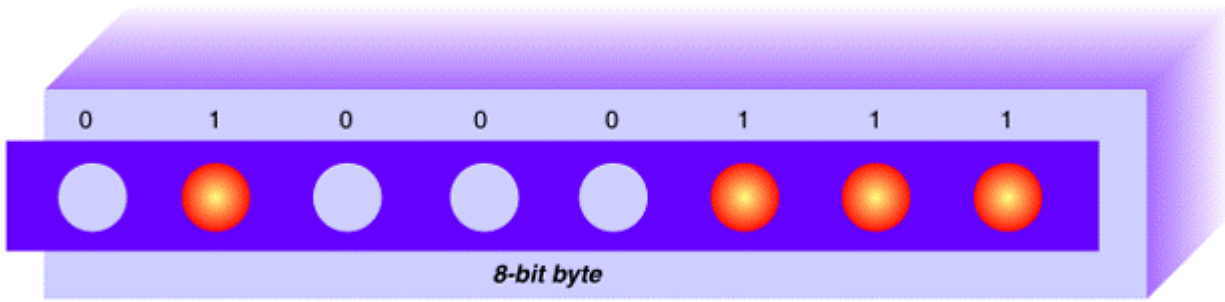


Why do we make computers which use bits (the binary number systems)?

- Bits are very exact - it is either ON or OFF, and it very easy to tell the difference between the two
- Because it works

One bit by itself isn't very much information, so we group them together...

Byte - A collection of 8 bits which represents a character, a number, or other information



A byte has 256 possible combinations.

Why 256?

- **$256 = 2^8$!**
- Each unique 8 bit byte corresponds with a digit, a character (upper or lower case), or a special function
- **ASCII -** (American Standard Code for Information Interchange) specifies which combinations represent which letters or symbols

Counting in Binary

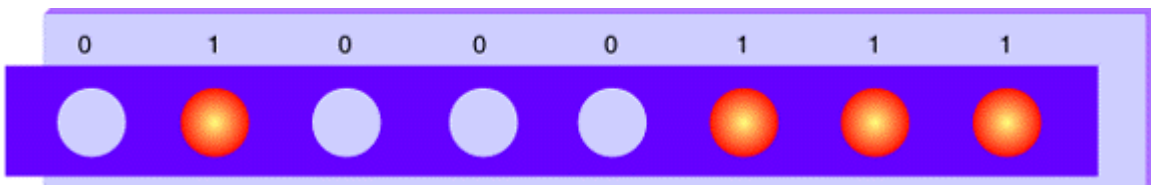
0	00000000
1	00000001
2	00000010
3	00000011
4	00000100
5	00000101
6	00000110
7	00000111
8	00001000
9	00001001
10	00001010
100	01100100

Counting in Binary

Based on Powers of 2…

(Decimal system is Powers of 10)

So, the value of each position is two times the previous position...



What number is shown above?
64+4+2+1 = 71

Notice: 128+64+32+16+8+4+2+1=255
0 = all off 255 = all on
0 - 255 = 256 combinations!

Adding in binary

Why should we know this stuff?

- It is a lot easier than you think
- This is how a computer processes all instructions and data
- Electronic circuits do everything in on’s and off’s, using binary arithmetic

It is all done with on’s and off’s, the only thing a computer understands, within the circuits

Binary Addition

$0 + 0 = 0$

$0 + 1 = 1$

$1 + 0 = 1$

$1 + 1 = 10$ (0 carry 1)

$1 + 1 + 1 = 11$ (1 carry 1)

Examples:

	6	00110
+	4	00100
	10	01010

	23	010111
+	13	001101
	36	100100

What is a file?

File - a collection of bytes

What does this file say? (Use the ASCII Chart!)

01001000	01100101
01101100	01101100
01101111	00100000
01101101	01101111
01101101	

Types of files

Software or program files

- a file which contain the actual instructions which are processed by the CPU
- examples: Windows 95, Macintosh OS, MS Word, Excel, Games, Photoshop

Data files

- a file which contains information used by the software program
- examples: documents, spreadsheets, graphics, sounds

Information Storage Units

kilobyte (K or KB) **-** about one thousand bytes (1,024)

megabyte (M or MB) **-** about one million bytes (1,048,576)

gigabyte (G or GB) **-** about one billion bytes (1,073,741,824)

terabyte (T or TB) **-** about one trillion bytes (1,099,511,627,776)

How many **BYTES*** does it take to...

1 Bit - on or off

1 Byte - 1 letter

2 Kilobytes - 1 typewritten page

100 Kilobytes - low-quality photograph

1 Megabyte - a short novel or a 3.5 inch floppy disk

5 Megabytes - complete works of William Shakespeare or 30 seconds of TV-quality video

10 Megabytes - 1 minute of CD-quality stereo sound

650 Megabytes - a music CD

1 Gigabyte - 10 meters of shelved books

10 Terabytes - the printed colletion of the US Library of Congress

2000 Terabytes - All US academic research libraries

5 million Terrabytes - all words ever spoken by human beings

* All values are approximate