

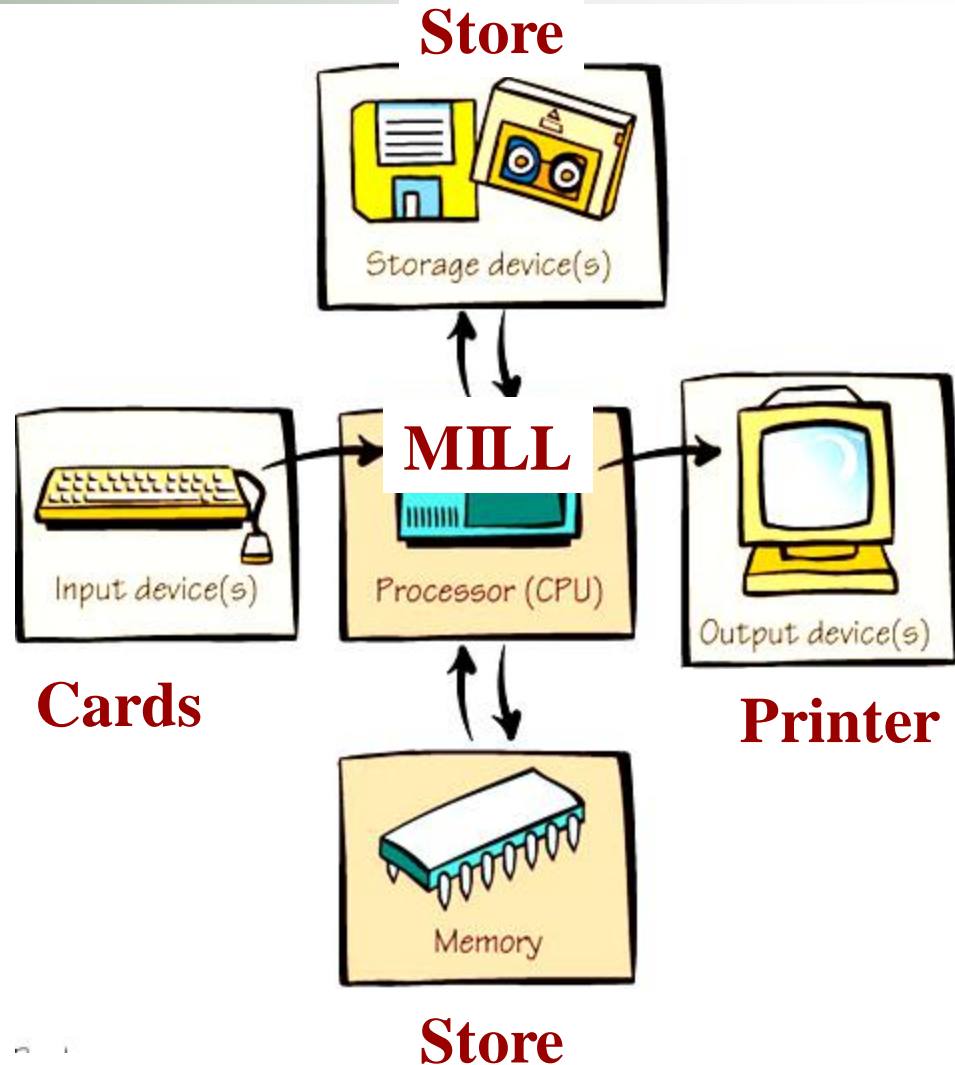
[Goals]

- At the end of this session you will be able to:
 - Convert between base 10, 2, and 16
 - Do addition in base 2

What Computers Do

Four basic functions of computers include:

- Receive input
- Process information
- Produce output
- Store information

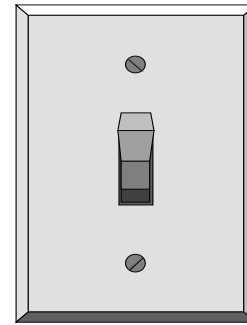


A Bit About Bits

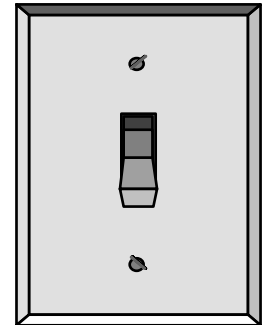
A bit (binary digit)

- is the smallest unit of information
- can have two values 1 and 0.

Binary digits, or bits,
can represent
**numbers, codes,
or instructions.**



On


















Off

Bits as Numbers

Binary number system - a system that denotes all numbers and combinations of two digits.

The binary system uses two digits to represent the numbers 0 and 1.

	Decimal representation	Binary representation
	0	0
	1	1
	2	10
	3	11
	4	100
	5	101
	6	110
	7	111
	8	1000
	9	1001
	10	1010
	11	1011
	12	1100
	13	1101
	14	1110
	15	1111

Stay Cool -- Its Only Ones and Zeros

- 2 -- the magic number in computing

3	2	1	0	Using 10			
	2	4	2				
				$10^0 = 1$			
				$10^1 = 10$			
				$10^2 = 100$			

7	6	5	4	3	2	1	0	Using 2	
1	1	1	1	0	0	1	0		
$2^7 =$	$2^6 =$	$2^5 =$	$2^4 =$	$2^3 =$	$2^2 =$	$2^1 =$	$2^0 =$		
128	64	32	16	8	4	2	1		

[Byte me quick review]

- A Bit contains one piece of information
- A bit can hold one of two values
0 or 1 (a.k.a On or Off)
- A Byte is made up of 8 Bits
- A Byte can hold 256 different values (0 – 255)
- 2 Bytes is the same as 16 bits

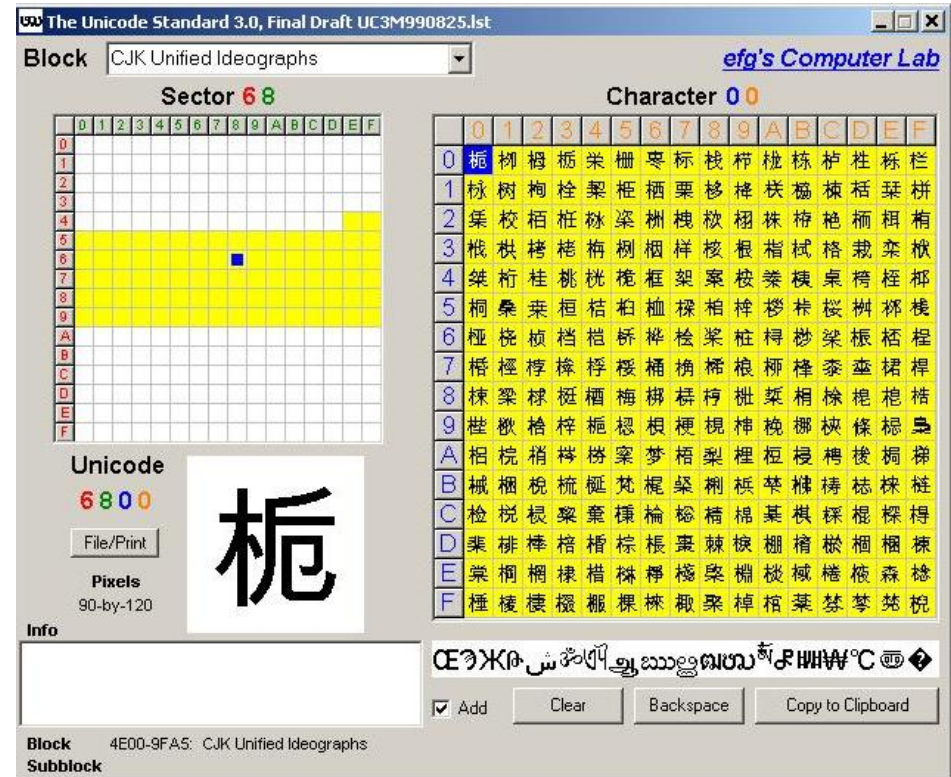
Bits as Codes

ASCII - American
Standard Code for
Information
Interchange -
most widely used
code, represents
each character as
a unique 8-bit
code.

Character	ASCII binary code							
A	0	1	0	0	0	0	0	1
B	0	1	0	0	0	0	1	0
C	0	1	0	0	0	1	1	1
D	0	1	0	0	0	1	0	0
E	0	1	0	0	0	1	0	1
F	0	1	0	0	0	1	1	0
G	0	1	0	0	0	1	1	1
H	0	1	0	0	1	0	0	0
I	0	1	0	0	1	0	0	1
J	0	1	0	0	1	0	1	0
K	0	1	0	0	1	0	1	1
L	0	1	0	0	1	1	0	0
M	0	1	0	0	1	1	0	1
N	0	1	0	0	1	1	1	0
O	0	1	0	0	1	1	1	1
P	0	1	0	1	0	0	0	0
Q	0	1	0	1	0	0	0	1
R	0	1	0	1	0	0	1	0
S	0	1	0	1	0	0	1	1
T	0	1	0	1	0	1	0	0
U	0	1	0	1	0	1	0	1
V	0	1	0	1	0	1	1	0
W	0	1	0	1	0	1	1	1
X	0	1	0	1	1	0	0	0
Y	0	1	0	1	1	0	0	1
Z	0	1	0	1	1	0	1	0
0	0	0	1	1	0	0	0	0
1	0	0	1	1	0	0	0	1
2	0	0	1	1	0	0	1	0
3	0	0	1	1	0	0	1	1
4	0	0	1	1	0	1	0	0
5	0	0	1	1	0	1	0	1
6	0	0	1	1	0	1	1	0
7	0	0	1	1	0	1	1	1
8	0	0	1	1	1	0	0	0
9	0	0	1	1	1	0	0	1

Bits as Codes

Unicode - A 16-bit character encoding scheme allowing characters from Western European, Eastern European, Cyrillic, Greek, Arabic, Hebrew, Chinese, Japanese, Korean, Thai, Urdu, Hindi and all other major world languages, living and dead, to be encoded in a single character set.



- A). $256 \times 2 = 512$ B). 65,536 C). Over 16 million D). 1024 E). 256

[Bits, Bytes, and Buzzwords]

Common terms might describe file size or memory size:

Bit: smallest unit of information

Byte: a grouping of eight bits of information

K: (kilobyte); about 1,000 bytes of information - technically 1024 bytes equals 1K of storage.

[Bits, Bytes, and Buzzwords]

MB: (megabyte); about 1 million bytes of information

Exactly how many K in a MB? 1024

GB: (gigabyte); about 1 billion bytes of information


Exactly how many MB in a GB? 1024

TB: (terabyte); about 1 million megabytes of information

Exactly how many GB in a TB? 1024

[Question]

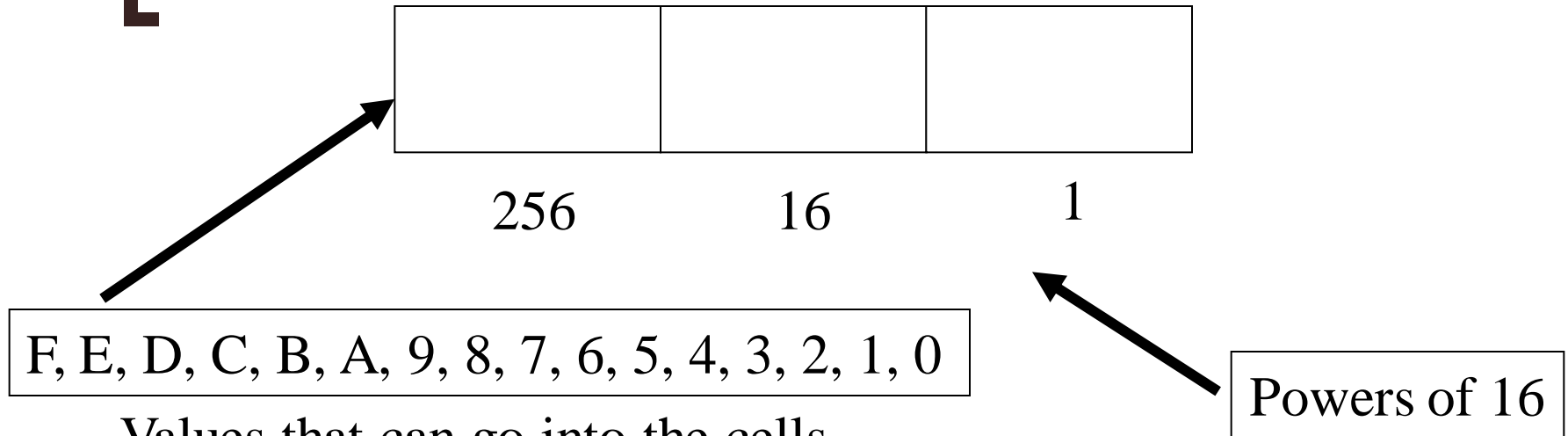
- What is 656_{10} in Binary
- a) 1010010000_2
- b) 1011110000_2
- c) 1010010111_2
- d) None of Above

- 
- What is 11101_2 in Decimal?
 - a) 27
 - b) 28
 - c) 29
 - d) 30
 - e) None of the above

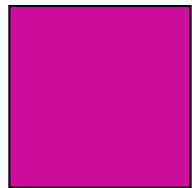
[Question]

- Add $10100110 + 10101011$?
- a) 101011111
- b) 101010001
- c) 101000000
- d) None of Above

Using Base 16 (hexadecimal) notation



Values that can go into the cells



205 of Red

C	D
16	1

13 of Green

O	D
16	1

153 of Blue

9	9
16	1

[Dec-Bin-Hex Table]

Dec	Bin	Hex	Dec	Bin	Hex
0	0	0	8	1000	8
1	1	1	9	1001	9
2	10	2	10	1010	A
3	11	3	11	1011	B
4	100	4	12	1100	C
5	101	5	13	1101	D
6	110	6	14	1110	E
7	111	7	15	1111	F