Exposure CS 2021 for CS1

Chapter 1 Section 1-8 Slides

Introduction to Computer Science: Learning CS & How Computers Work

PowerPoint Presentation
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Section 1.1

Learning the Exposure Way

The “Nothing is Obvious” Story

Imagine a young boy in the Amazon jungles. This boy has always lived in the jungle without any modern conveniences. He has never been in a city; he has never seen a television nor seen a book.

Now imagine that for some unknown reason this young boy travels to Colorado in the Winter time. The little boy stands in a yard somewhere and watches the snow with bewilderment. He is astonished; he does not understand what is falling from the sky.

Another little boy, about the same age, from Colorado, looks at the boy's behavior. The Colorado boy is confused, why is the boy acting so odd?
Obviously it is snowing, so what is the big deal?

Corn Flakes & Iced Tea

Most Americans consider it "obvious" that cold milk is poured on corn flakes. However, in Europe, everybody knows you put warm milk on your cereal.

Most Europeans consider it "obvious" that Tea is to be served warm, preferably hot. They are completely baffled when Texans actually put ICE in their Tea.

Section 1.2

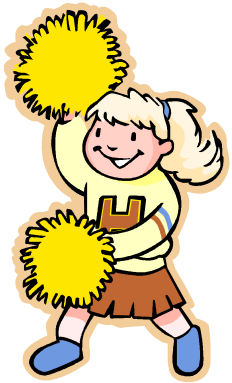
The Exposure Equation

The Exposure Equation

Bewilderment + Exposure = Obvious

Exposure in Extracurricular Activities

- Drill team performance
- Half-time band show
- Football Team blocking
- Basketball free throws
- Baseball batting



The Curious Exposure Discrepancy

Students recognize that only continuous practice will result in a good showing at a brief performance or brief competition.

Many of the same students barely read or practice a topic once for an academic subject.

It appears that preparation for a known, short performance requires practice, but preparation for life receives only minimal effort from many students.

Section 1.3

Getting Started

Computer Fundamentals

First, this is a class in Computer Science, not Computer Literacy or Computer Applications.

The course that you are taking assumes that this is your first formal computer science course.

Furthermore, it is also assumed that you have no knowledge of programming.

If you do know some programming, fine, but it is not a prerequisite.

This means that we should start at

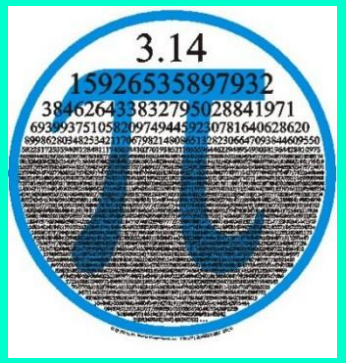
Section 1.4

How Do Computers Work?

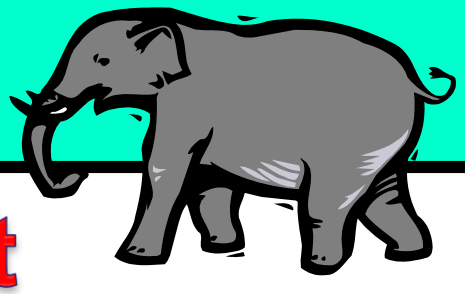
Three Ways Where Computers Beat People

- Computers are faster.

- Computers are more accurate.



- Computers do not forget.



NOTE: Computers do not have intelligence or creativity.

Section 1.5

Communication with Morse Code

Morse Code

A	● ▬
B	▬ ● ● ●
C	▬ ● ▬ ●
D	▬ ● ●
E	●
F	● ● ▬ ●
G	▬ ▬ ●
H	● ● ● ●
I	● ●
J	● ▬ ▬ ▬
K	▬ ● ▬
L	● ▬ ● ●
M	▬ ▬
N	▬ ●
O	▬ ▬ ▬
P	● ▬ ▬ ●
Q	▬ ▬ ● ▬
R	● ▬ ●
S	● ● ●
T	▬

U	● ● ▬
V	● ● ● ▬
W	● ▬ ▬
X	▬ ● ● ▬
Y	▬ ● ▬ ▬
Z	▬ ▬ ● ●

1	● ▬ ▬ ▬ ▬
2	● ● ▬ ▬ ▬
3	● ● ● ▬ ▬
4	● ● ● ● ▬
5	● ● ● ● ●
6	▬ ● ● ● ●
7	▬ ▬ ● ● ●
8	▬ ▬ ▬ ● ●
9	▬ ▬ ▬ ▬ ●
0	▬ ▬ ▬ ▬ ▬

Section 1.6

Storing Data Electronically with 1s & 0s

Early Computers Used Vacuum Tubes

They would turn on and off like light bulbs.

***On* represented a 1.**

***Off* represented a 0.**

Problems with Vacuum Tubes:

- *They were big and bulky.*
- *They would get hot and burn out.*

Bits, Bytes & Codes

- **Bit** is a **bi**nary digi**t** that is either **0** (off) or **1** (on)
- **1 Byte** = **8 bits**
- **1 Nibble** = **4 bits** (½ a byte)
- **1 Byte** has 2^8 or **256** different numerical combinations.
- **ASCII** uses 1 byte (code values **32-127**) to store 1 character.
- **Unicode** uses between 1 and 4 bytes to store a character.
- **UTF-8** is the most common encoding system for Unicode and allows up to **1,112,064** different characters.

Holding One Byte of Information in 1945

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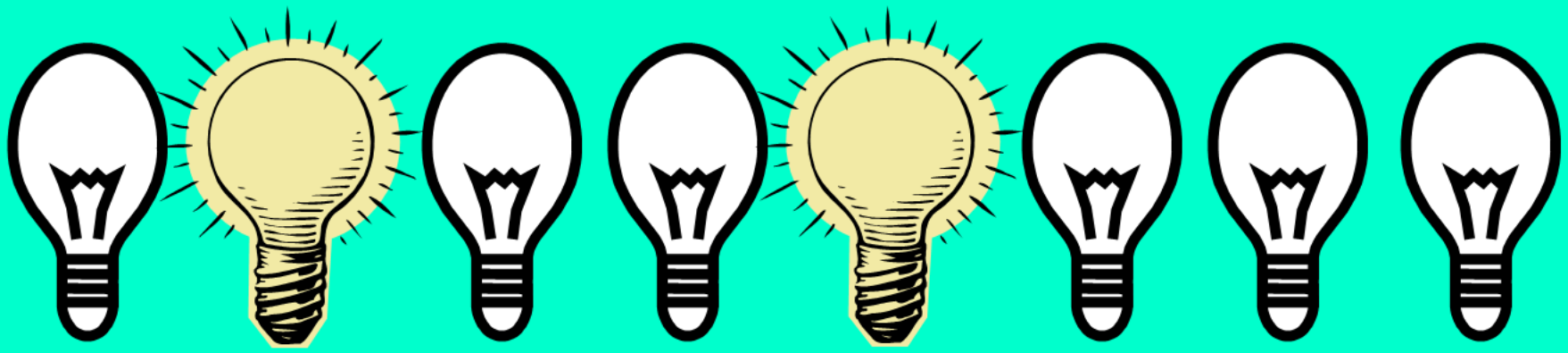
Electronic Memory



off	on	off	off	on	off	off	off

0	1	0	0	1	0	0	0

Decimal (Base-10) Number System

The number system that we use is called the *decimal* number system or base-10.

It is called "base-10" because it has 10 digits (0 – 9).

Rumor has it that people developed a base-10 system, because of our ten fingers.

Consider the base-10 number 2,345,678

10^6	10^5	10^4	10^3	10^2	10^1	10^0
1,000,000	100,000	10,000	1,000	100	10	1
2	**3**	**4**	**5**	**6**	**7**	**8**

Binary (Base-2) Number System

The number system used by computers is the *binary* number system or base-2.

Only the digits 0 and 1 are used.

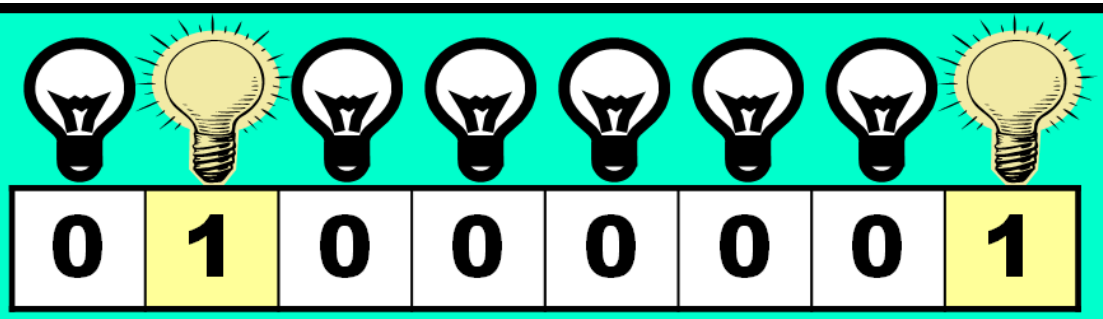
Remember that modern computers use electricity, which is either on or off. 1 means on. 0 means off.

Consider the base-2 number 01000001

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
0	**1**	**0**	**0**	**0**	**0**	**0**	**1**

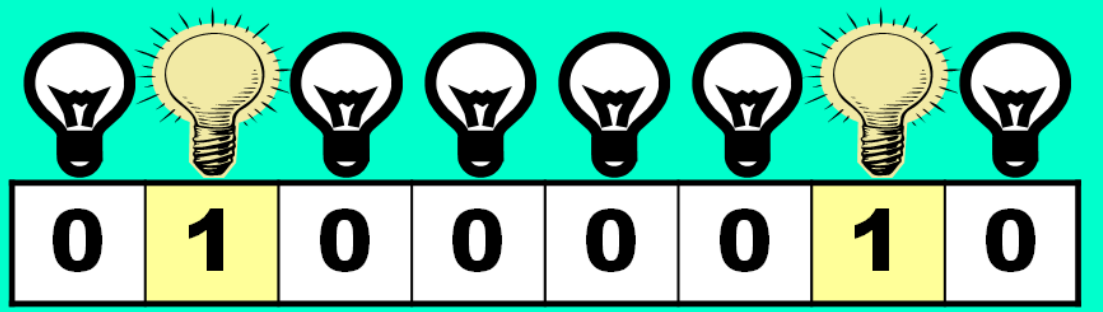
Can you tell that this is equal to the base-10 number 65?

Three Combinations of 8 Light Bulbs



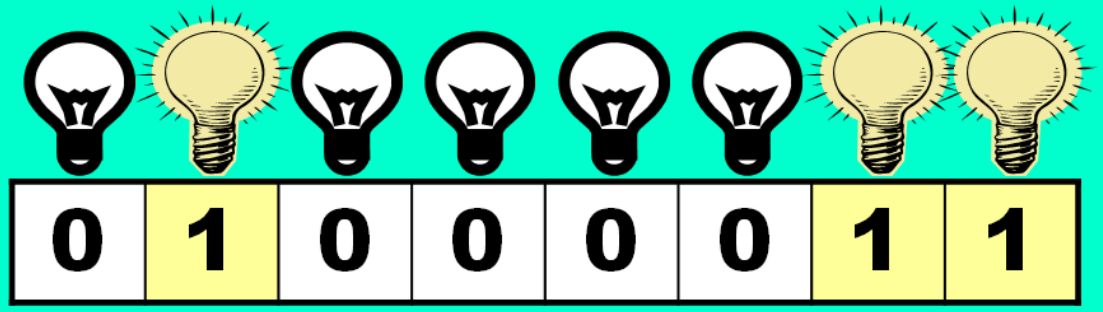
01000001 (base-2) =

65 (base-10) or char **A**



01000010 (base-2) =

66 (base-10) or char **B**



01000011 (base-2) =

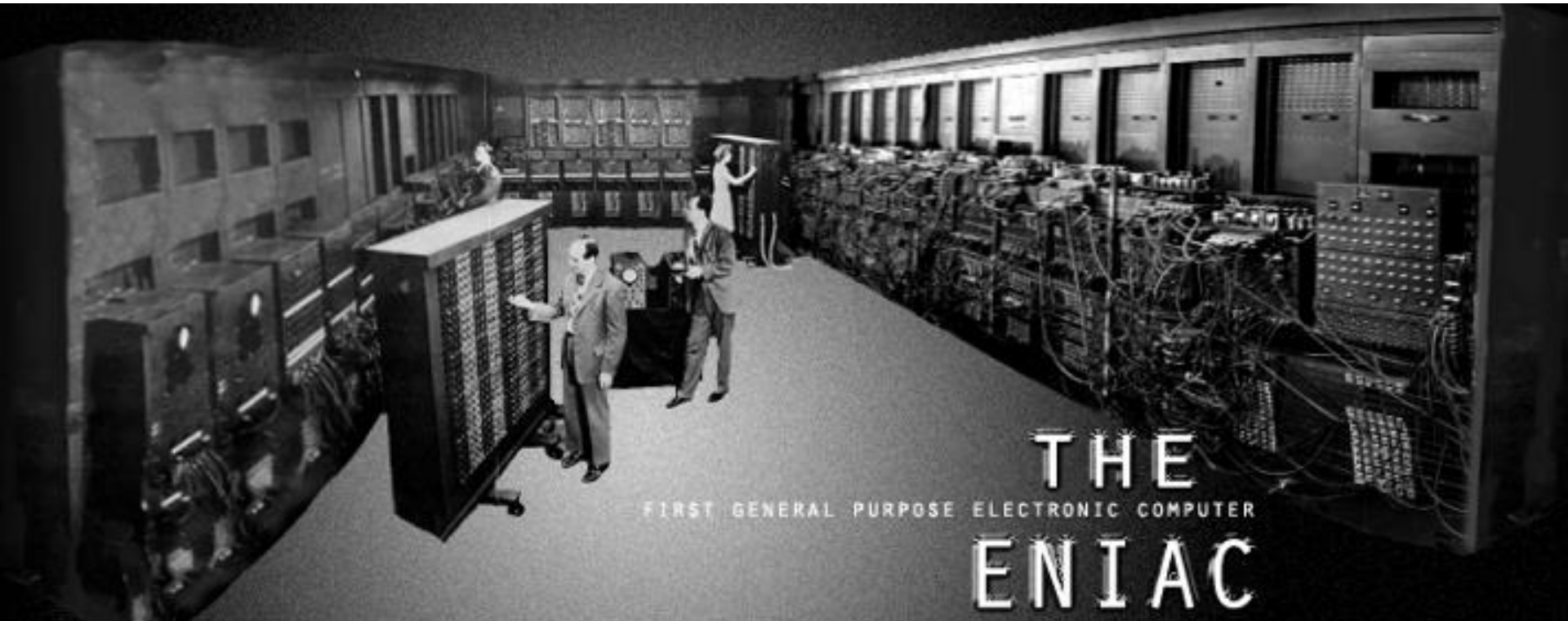
67 (base-10) or char **C**

ENIAC 1946

The ENIAC was the first electronic general purpose computer.

With over 17,000 vacuum tubes, the machine was the size of a gymnasium and cost $500,000.

This was the first computer used to calculate the value of π.



Section 1.7

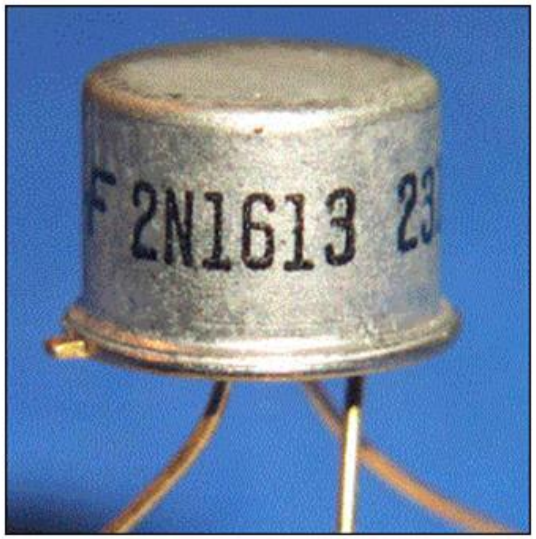
Memory and Secondary Storage

The Win-Win-Win with Transistors

Transistors have major advantages over Vacuum Tubes:

- *They are much smaller.*
- *They do not get hot and burn out.*

This lead to the invention of *integrated circuits* and later *microchips*, which allowed modern computers to become much smaller and considerably less expensive.



Motherboard & Computers Chips

motherboard

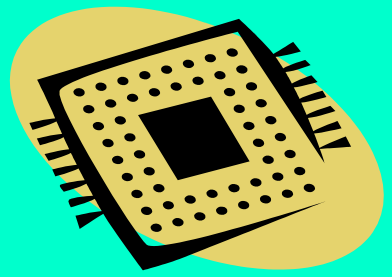
The main board with all the primary computer components. Has several computer chips attached:

Read Only Memory (ROM)

This chip stores permanent information for the computer.

Random Access Memory (RAM)

This chip stores temporary information for the computer.



Central Processing Unit (CPU)

This chip is the “brains” of the computer.

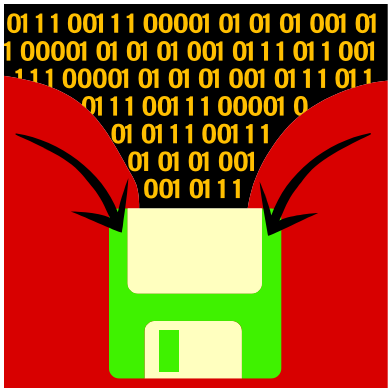
Measuring Memory

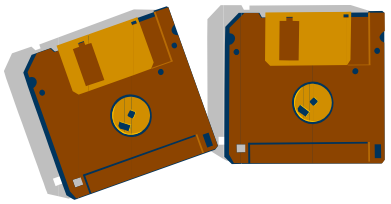
KB	Kilo Byte	1 thousand bytes	1,000
MB	Mega Byte	1 million bytes	1,000,000
GB	Giga Byte	1 billion bytes	1,000,000,000
TB	Tera Byte	1 trillion bytes	1,000,000,000,000
PB	Peta Byte	1 quadrillion bytes	1,000,000,000,000,000
EB	Exa Byte	1 quintillion bytes	1,000,000,000,000,000,000
ZB	Zetta Byte	1 hexillion bytes	1,000,000,000,000,000,000,000
YB	Yotta Byte	1 septillion bytes	1,000,000,000,000,000,000,000,000

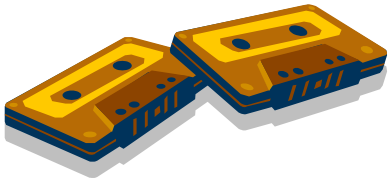
Note: Technically, a kilobyte is exactly 2^{10} or 1024 bytes.

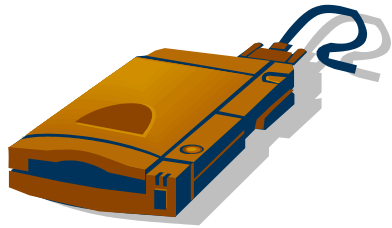
Secondary Storage Devices

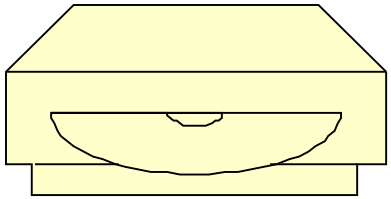
Since RAM is lost when the computer is turned off, files must be saved to some secondary storage device for later use.

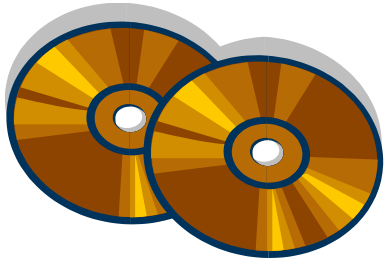












Analog vs. Digital

Analog Devices	Digital Devices
Measures continuously. 	Measures in increments. 
Copies are not as good as the original. 	Copies are IDENTICAL to the original. 

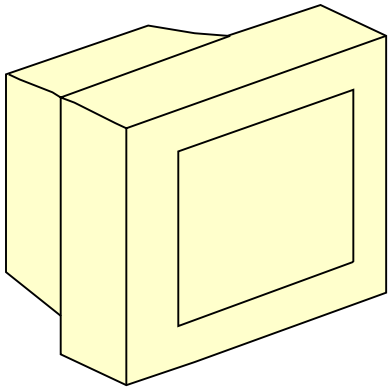
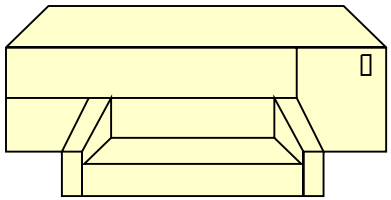
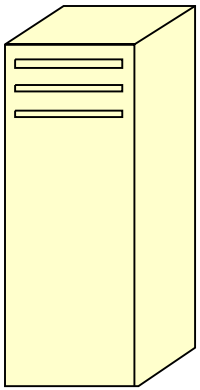
Section 1.8

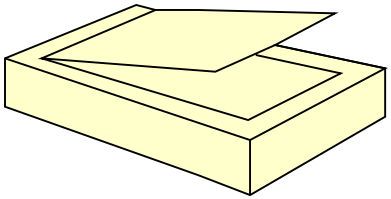
Hardware & Software

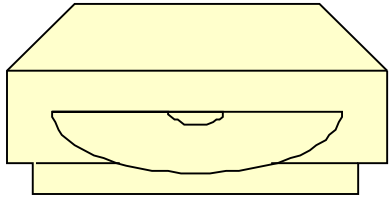
Hardware

Hardware **refers to physical pieces of computer equipment.**

This included the main computer system unit, as well as all of the peripherals (things that plug into the computer.)





Software

Software **provides instructions to a computer.**

The most important aspect of this course is to learn how to give correct and logical instructions to a computer with the help of a programming language.

Software falls into two categories:

- **System Software**
- **Application Software.**

Applications Software **refers to the instructions that the computer requires to do something specific for you.**

Word Processors **and** ***Electronic Spreadsheets*** **are the two most common** ***applications*** **for a computer.**

System Software **refers to the instructions that the computer requires to operate properly.**

The major operating systems are Windows, UNIX, Linux & the MAC OS.