TOPIC 1 :
Introduction to Computer System

Lesson Outcome

Computer Definition

Overview and History of Computers

Basic Components of the Von Neumann Architecture

Electronic Data and Instructions

System Unit: System board, microprocessor, RAM & ROM

Input/Output devices

Introduction

- People are using computers everywhere: at work, at school, and at home.
- Example streaming videos, teaching, and learning using computers.
- Computers technology changes rapidly, and users must keep up with the changes to remain digitally literate.
- Computer literacy or Digital literacy involves having a current knowledge and understanding of computers, mobile devices, the web, and related technologies.

Computer Definition

Computer Definition

- Is an electronic device, operating under the control of instructions stored in its own memory, that can accept data, process the data according to specified rules, produce results, and store the results for future use.

Computer Definition

- A computer consists of two major components which are hardware (electronic devices) and software (instructions/programs). The software is stored in the computer's own memory.

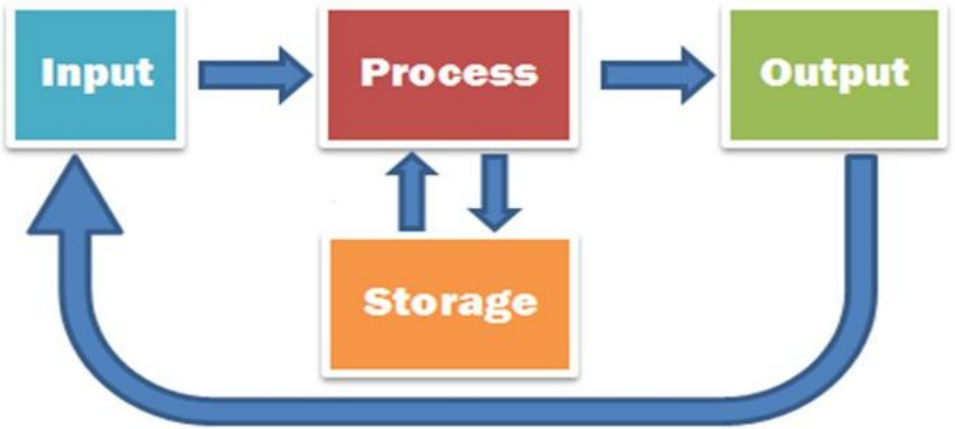
Computer Definition

- Device that processes data to create information (ex: input, output, storage and processing devices)

- Step-by-step instructions that tell the computer how to do its work.
- It is also called a program.
- It's purpose to convert data to useful information

Computer Definition

- Computer receives data, processes, produce output, and store information

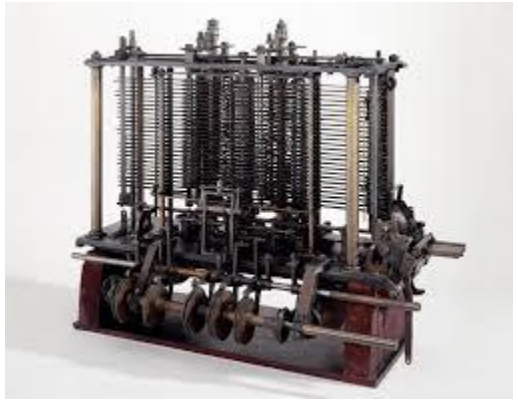


Computer

Computers are categorized into several types:

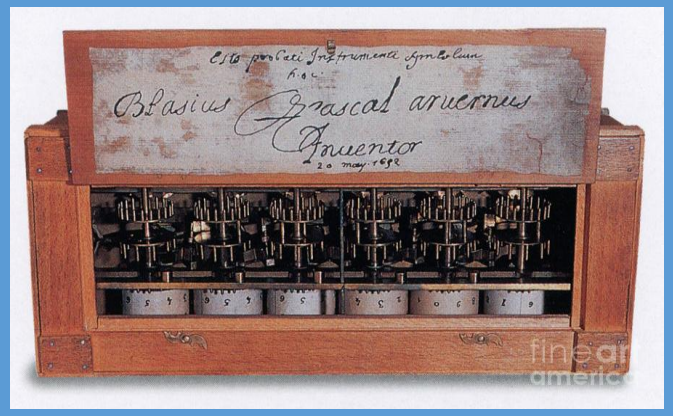
- A **personal computer** can perform all of its input, processing, output, and storage activities by itself.
- A **mainframe** is a large, expensive, powerful computer that can handle hundreds or thousands of connected users simultaneously
- A **midrange computers** or **servers** are computers with processing capabilities less powerful than a mainframe computer yet more powerful than a personal computer.
- A **supercomputer** is the fastest, most powerful computer and capable of processing more than one quadrillion instructions in a single second

Overview and History of Computers

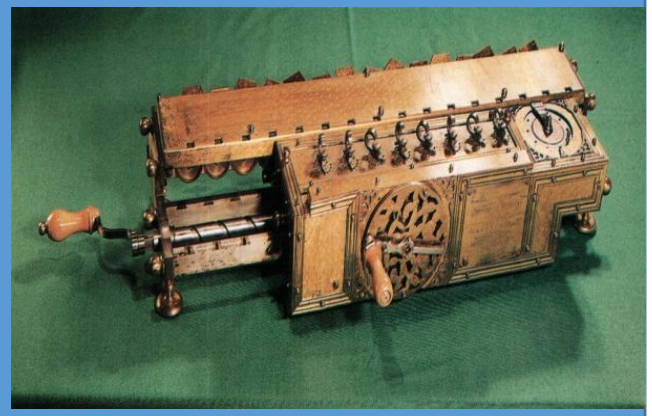


0th Generation

Period	Technology	Inventor/invention
1642 - 1940	Mechanical Era	**Blaise Pascal (1623-1662)** was the son of a tax collector and a mathematical genius. He designed the first mechanical calculator (Pascaline) based on gears. It performed “+” and “-”.
		Gottfried von Leibnitz (1646-1716) was a German mathematician and built the first calculator to do “*” and “/” (Stepped Reckoner). It was not reliable due to accuracy of contemporary parts.
		Charles Babbage (1792-1872) “Analytical Engine” Had 4 components – the store (memory), the mill (computation unit), the input section (punched card reader), the output section (punched & printed outputs)
		John V.Atanasoff and Clifford Berry ABC (Atanasoff-Berry Computer) First totally electronic digital computer

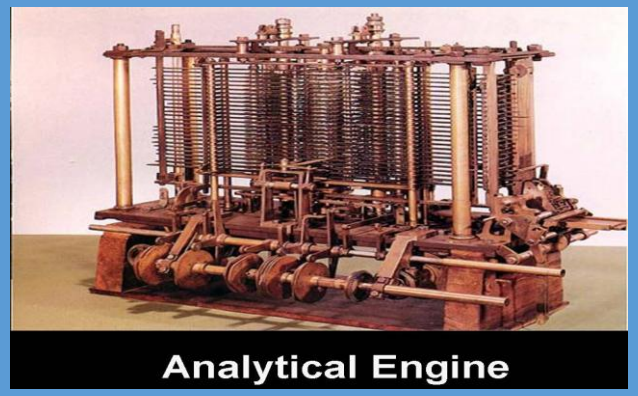


Blaise Pascal

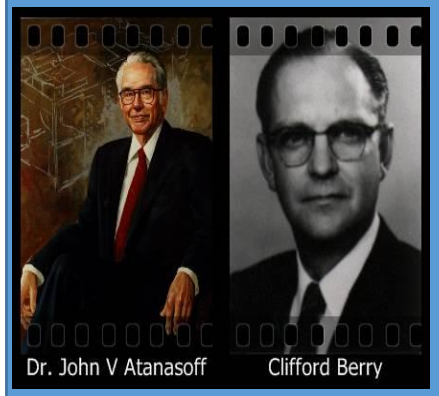


Gottfried von Leibnitz

Charles Babbage



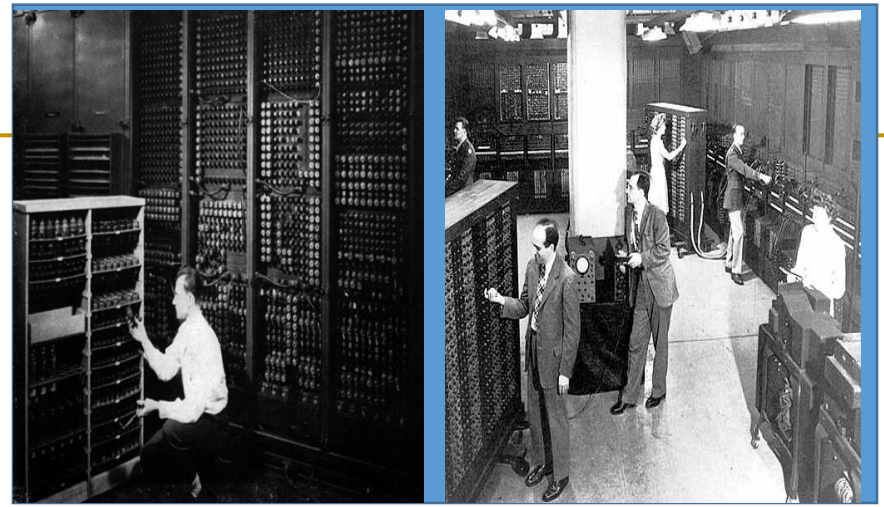
John V.Atanasoff and Clifford Berry



1st Generation

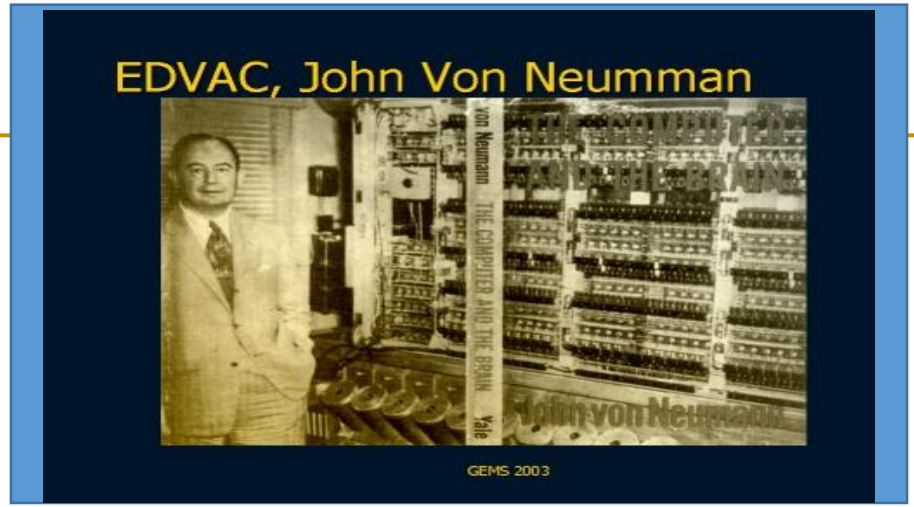
Period	Technology	Inventor/invention	Main Features	Types of computer

1940 - 1955	Vacuum tube
	• Use vacuum tubes for circuitry & magnetic drums for memory
	• Vacuum tubes
	  • Size is bulky/very large
	  • Made from glass
	  • Fragile
	  • Short-lived (heat-burned out)
	  • Use a great deal of electricity–very expensive
	• Computers relied on machine language & could only solve one problem at a time
	• Input: punched cards & paper tape
	• Output: displayed on printouts
		• ENIAC (Electronic Numerical Integrator and Computer)
		• John W.Mauchly and J. Presper Eckert
		• First programmable, all-electronic digital and general purpose computer
		• EDVAC, IAS and UNIVAC I (first commercially available computer)
			• Vacuum tube technology
			• Unreliable
			• Supported machine language only
			• Very costly
			• Generated lot of heat
			• Slow input and output devices
			• Huge size
			• Need of A.C.(Alternating current)
			• Non-portable
			• Consumed lot of electricity
				• ENIAC
				• EDVAC
				• IAS
				• UNIVAC
				• IBM-701
				• IBM-650



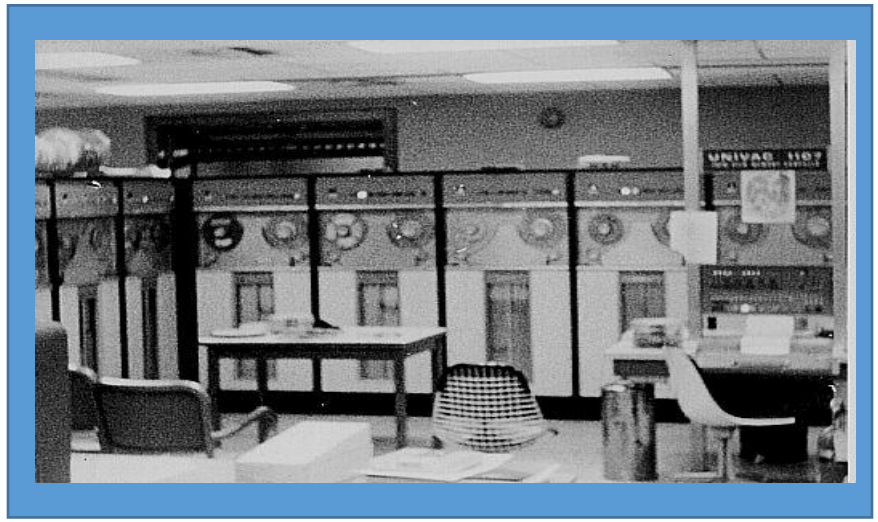
ENIAC

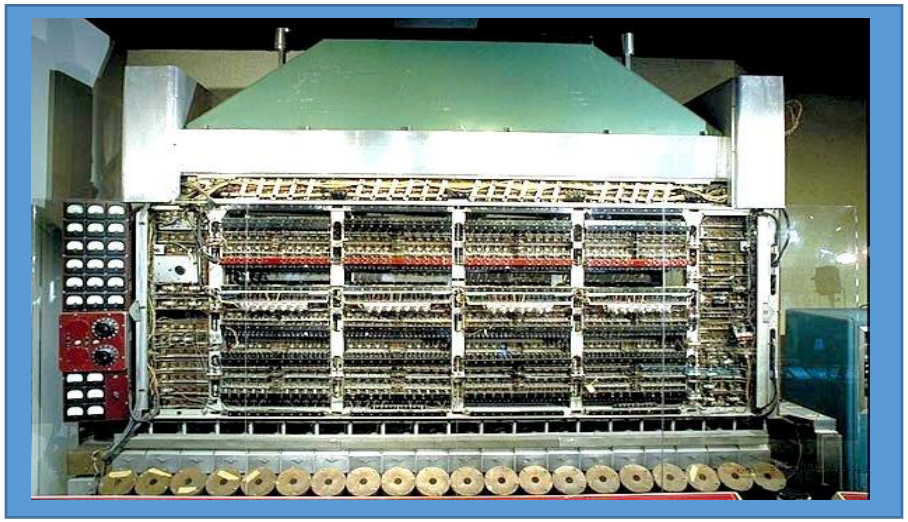
UNIVAC



EDVAC

IAS Machine

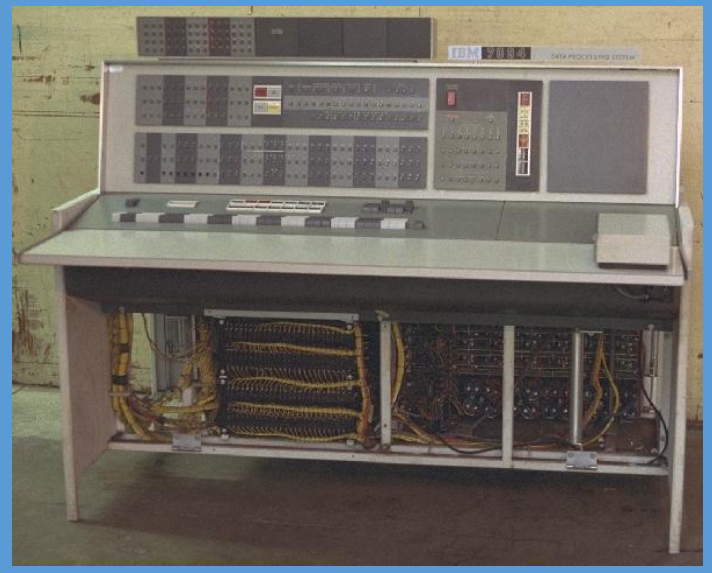




2nd Generation

Period	Technology	Inventor/invention	Main Features	Types of computer
1955-1965	Transistor	• Made of specially treated silicon which controlled the flow of electric current • Generated less heat & wouldn't burn out • Allow computers to become smaller, faster, cheaper, & more energy-efficient than before ∴ more reliable than vacuum tubes • Use assembly languages - allow programmers to specify instructions in words	• Use of transistors • Reliable in comparison to first generation computers • Smaller size as compared to first generation computers • Generated less heat as compared to first generation computers • Consumed less electricity as compared to first generation computers • Faster than first generation computers • Still very costly • A.C. needed • Supported machine and assembly languages	• IBM 1620 • IBM 7094 • CDC 6600 • CDC 3600 • UNIVAC 1108

IBM 7094



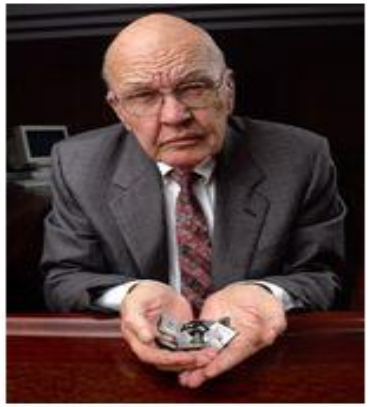
CDC 6600

3rd Generation

Period	Technology	Inventor/invention	Main Features	Types of computer
1965 - 1980	Integrated Circuit based	• The computers of third generation used integrated circuits (IC's) in place of transistors. A single IC has many transistors, resistors and capacitors along with the associated circuitry. The IC was invented by Jack Kilby. This development made computers smaller in size, reliable and efficient. In this generation remote processing, time-sharing, multi-programming operating system were used. High-level languages (FORTRAN-II TO IV, COBOL, PASCAL PL/1, BASIC, ALGOL-68 etc.) were used during this generation.	• More reliable in comparison to previous two generations • Smaller size • Generated less heat • Faster • Lesser maintenance • Still costly • A.C needed • Consumed lesser electricity • Supported high-level language	• IBM-360 series • Honeywell-6000 series • PDP(Personal Data Processor) • IBM-370/168 • TDC-316

The Third Generation – Integrated Circuits (1965–1980)

- Integrated circuits were co-invented by Jack Kilby and Robert Noyce in 1958



- Jack Kilby demonstrated it half a year before Noyce on September 12th
  - @ Texas Instruments
  - Got Nobel Prize in physics in 2000
  - Germanium based
  - Demonstrated continuous sine wave

- Rober Noyce
  - @ Fairchild Seminconductors (Co-Founder)
  - Silicon based
  - 1968 he and Gordon Moore founded Intel

4th Generation

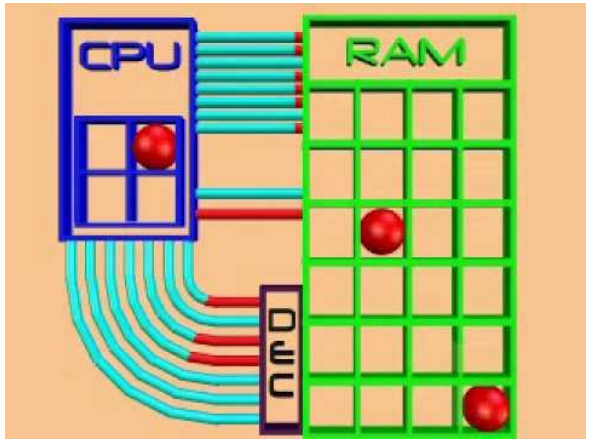
Period	Technology	Inventor/invention	Main Features	Types of computer

1980 - Present	Very Large Scale Integration (VLSI) microprocessor based
	- thousands of transistors were integrated into one single chip
		• Microprocessors *(VLSI)
		  • Thousands of ICs built onto a single chip
		  • Could be mass produced (PCs)
		• Computers become even smaller & more powerful
		• GUIs, mouse, handheld devices
		• Open architecture
		  • The hardware design was made available to anyone
		  • Anyone could write software or build hardware
			• VLSI technology used
			• Very cheap
			• Portable and reliable
			• Use of PC's
			• Very small size
			• Pipeline processing
			• No A.C. needed
			• Concept of internet was introduced
			• Great developments in the fields of networks
			• Computers became easily available
				• DEC 10
				• STAR 1000
				• PDP 11
				• CRAY-1(Super Computer)
				• CRAY-X-MP(Super Computer)

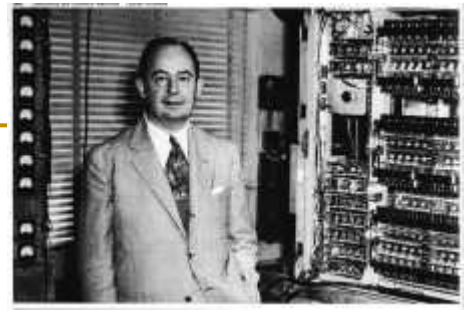
5th Generation

Period	Technology	Inventor/invention	Main Features	Types of computer
Present - Beyond	Ultra Large Scale Integration (ULSI) Technology - integrating or embedding millions of transistors on a single silicon semiconductor microchip	1) Artificial Intelligence • Goal: to develop devices that respond to natural language input & are capable of learning & self-organize • Robotics • Nano-technology • Anything smaller than Microtechnology 2) Age of Connectivity • Release of WWW standards in 1991 ∴possible to connect computers all over the world • Shift towards technology that focuses on mobility (wireless revolution)	• (ULSI) technology • Development of true artificial intelligence • Development of Natural language processing • Advancement in Parallel Processing • Advancement in Superconductor technology • More user friendly interfaces with multimedia features • Availability of very powerful and compact computers at cheaper rates	• Desktop • Laptop • NoteBook • UltraBook • ChromeBook

Basic Components of the Von Neumann Architecture



Von Neumann Architecture



- John Von Neumann proposed Von Neumann Architecture.
- A genius who spoke many languages, was an expert in the physical sciences & mathematics, & had a total recall of everything he ever heard, saw, or read
- A consultant on the Electronic Numerical Integrator and Computer (ENIAC) project
- Proposed significant improvements over the ENIAC design
  - EDVAC and IAS (Institute for Advanced Study)
- Create a computer system that would be much easier to re-program

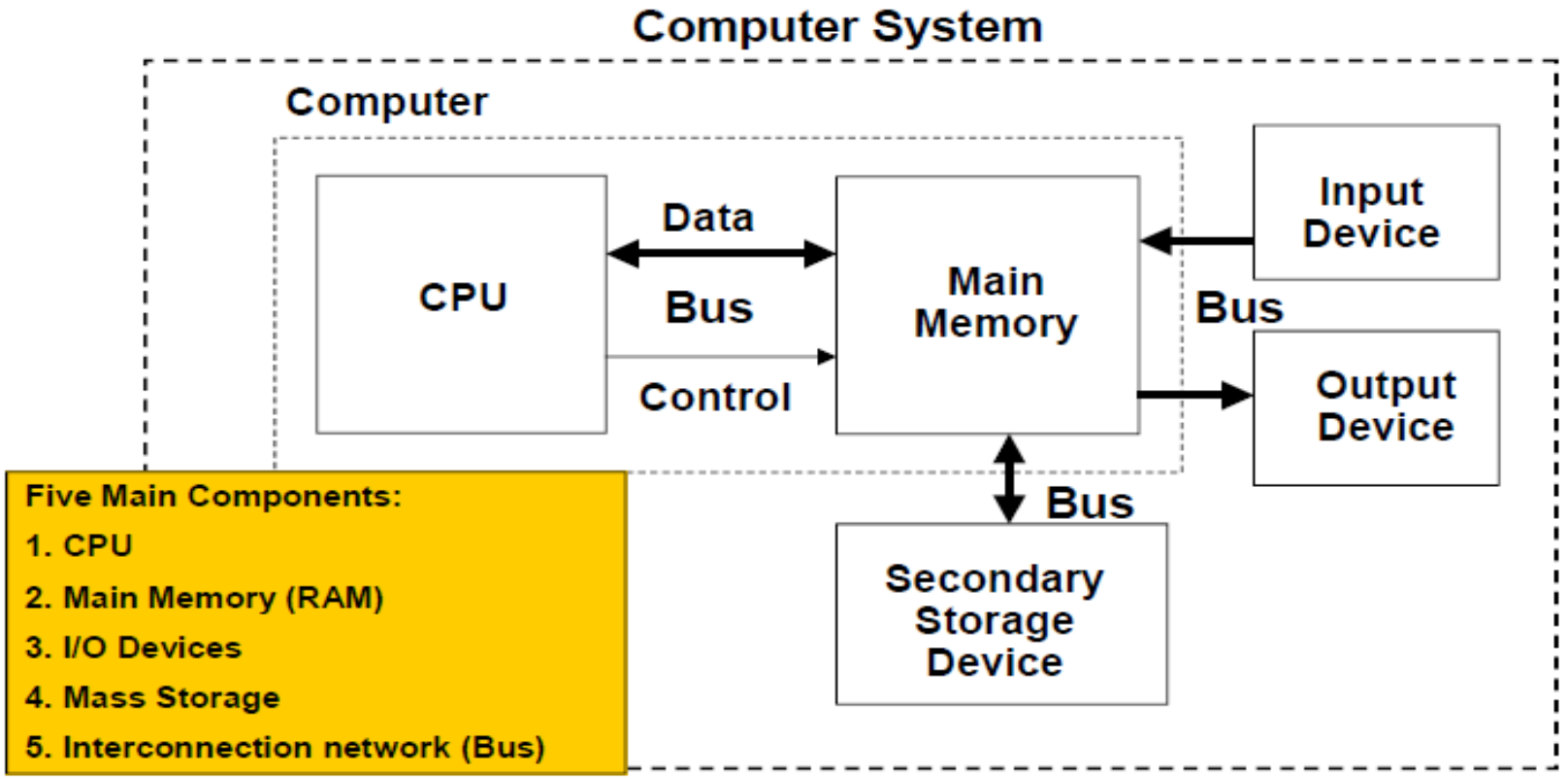
Von Neumann Architecture

THE PRINCIPLES :

- Data & instructions are both stored in the main memory while being processed
- Sequential processing of instructions
- Binary data processing
- Consists of CPU, memory, & I/O system

Basic components of Von Neumann Architecture

- A more complete view of the computer *system architecture that* integrates interaction (human or otherwise) consists of:



Basic components of Von Neumann Architecture

- A central processing unit (CPU); it contains the control unit (CU), arithmetic/logic unit (ALU) and Interface unit

  - **ALU: arithmetic/logic unit**
    - Performs arithmetic and Boolean logical calculations
  - **CU: control unit**
    - Controls processing of instructions
    - Controls movement of data within the CPU
  - **Interface unit**
    - Moves instructions and data between the CPU and other hardware components
    - Bus: bundle of wires that carry signals and power between different components

Basic components of Von Neumann Architecture

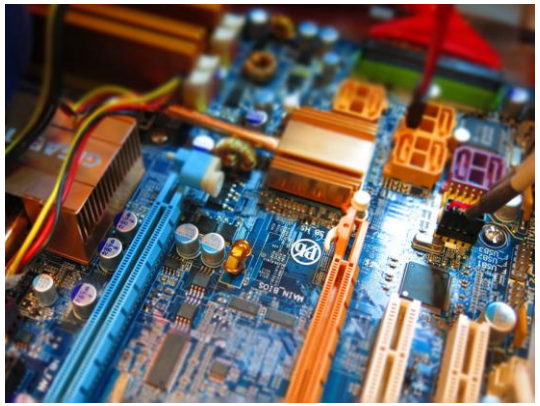
- **Memory**: Short-term storage for CPU calculations, holds both instructions and data of a computer program
- **Input devices**: keyboard, mouse, scanner, punch cards
- **Output devices**: monitor, printer, fax machine
- **Storage**: hard drive, optical media, diskettes, magnetic tape
- **Bus**: a bundle of wires that carry signals and power between different components

Basic components of Von Neumann Architecture

- In the von Neumann architecture, a small set of circuits can be driven to perform very different tasks, depending on the software program, which is executed.

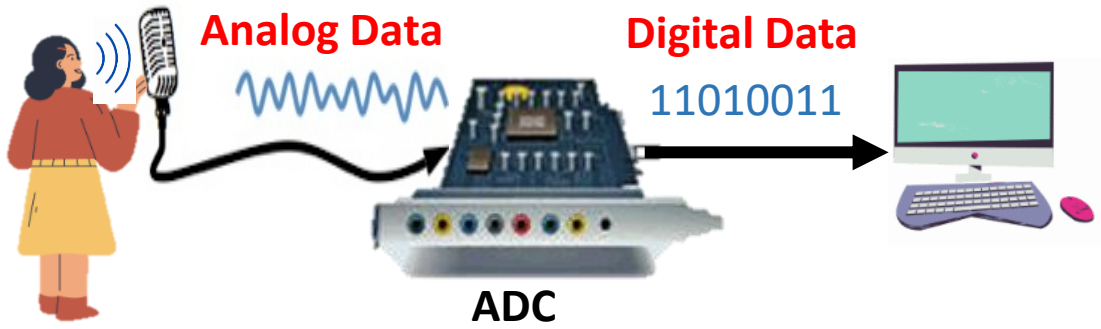
  - The primary function of a CPU is to execute the instructions fetch from the main memory.
  - An instruction tells the CPU to perform one of its basic operations.
  - The CU is the one which interprets the instruction to be executed and which ‘tells’ the different other components of what to do.
  - The CPU includes a set of registers, which are temporary storage devices typically used to hold

Electronic Data and Instructions



Electronic Data and Instructions

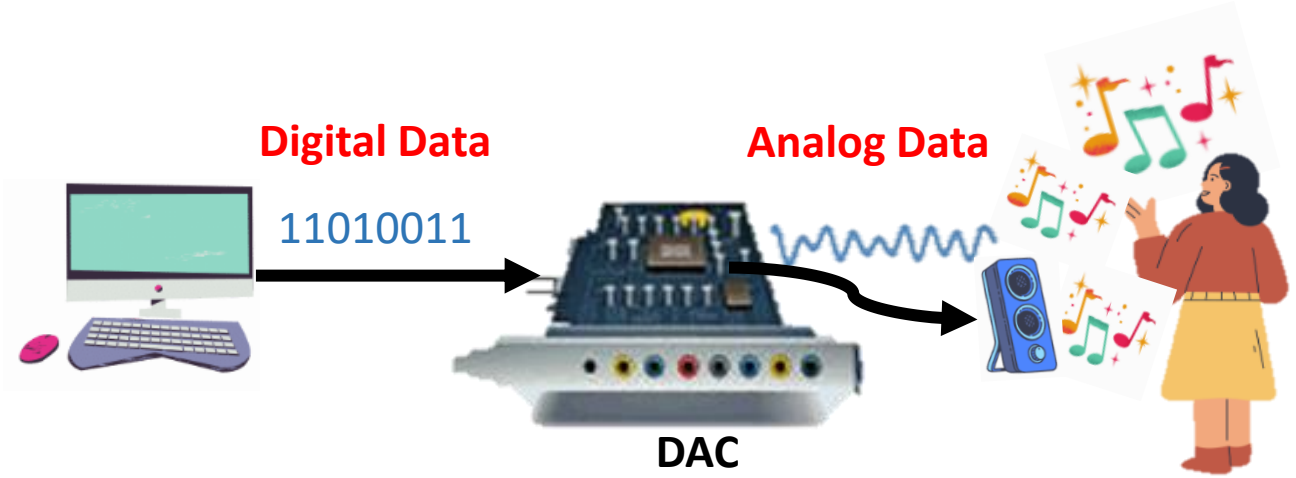
- Data can be analog or digital.
  - ***Analog data*** are continuous and take continuous values.
    - Example: the sounds made by a human voice, take on continuous values. When someone speaks, an analog wave is created in the air. This can be captured by a microphone and converted to an analog signal or sampled and converted to a digital signal.



ADC Converts Analogue Data To Signal

Electronic Data and Instructions

- ***Digital data*** have discrete states and take discrete values.
  - Example, data are stored in computer memory in the form of 0s and 1s. They can be converted to a digital signal or modulated into an analog signal for transmission across a medium.

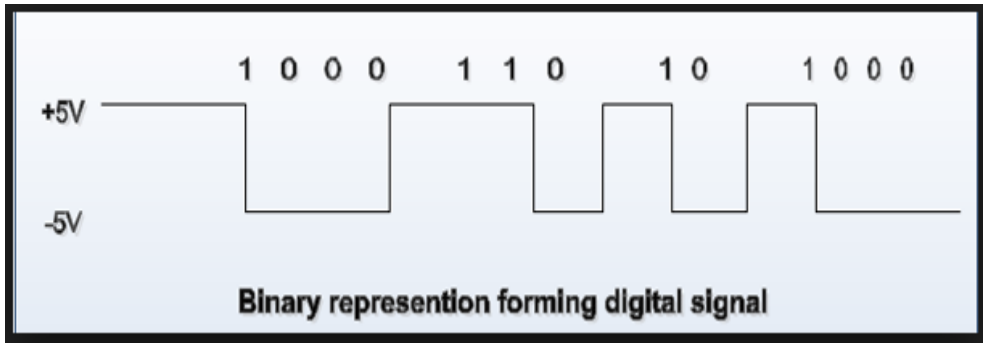


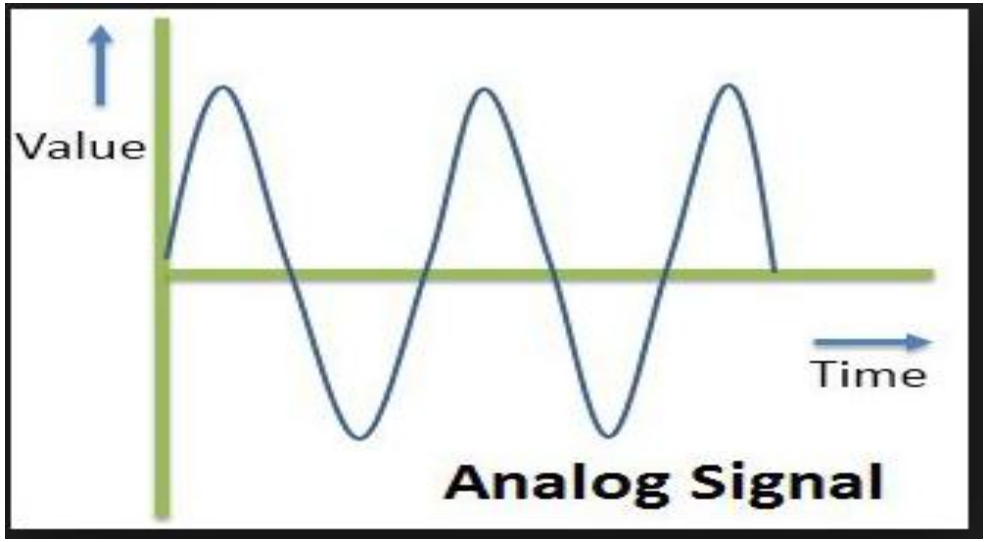
DAC

DAC Converts digital data to analog

Electronic Data and Instructions

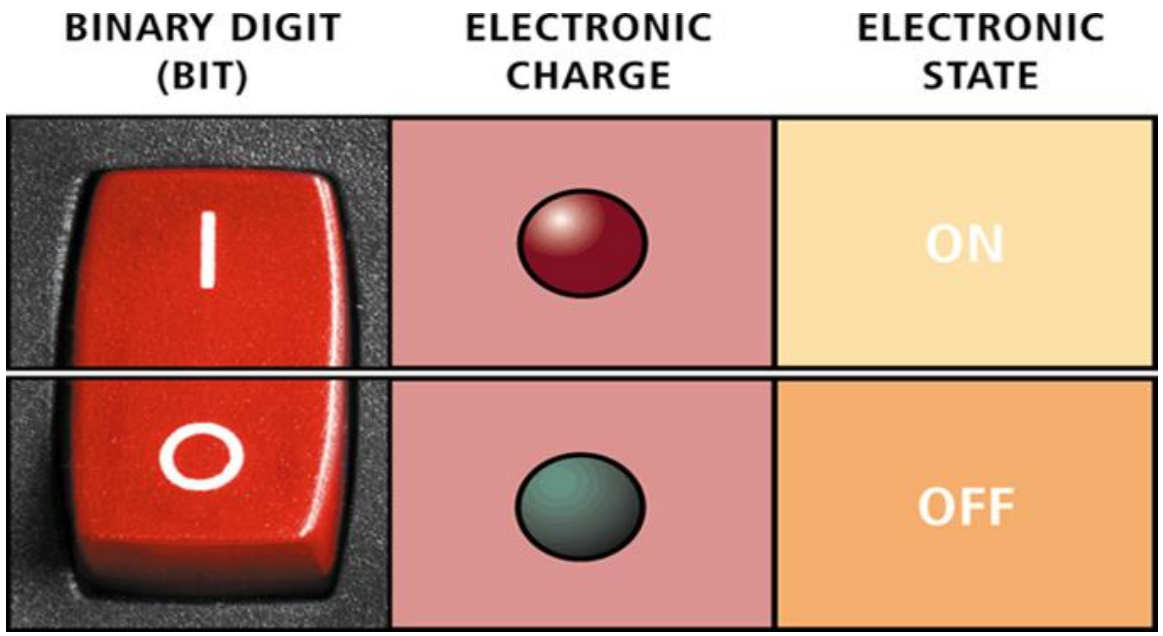
- Digital electronic signals
  - in one of two states: on(1) or off(0)
  - Recognized by computers
- Analog signals
  - Continuous signals vary in strength and quality
  - Created by voices
- Conversion must take place from analog to digital before processing can occur





Numeric Representation

- Two-state binary system consists of only two digits called bits
  - On = 1; negative charge
  - Off = 0; no charge

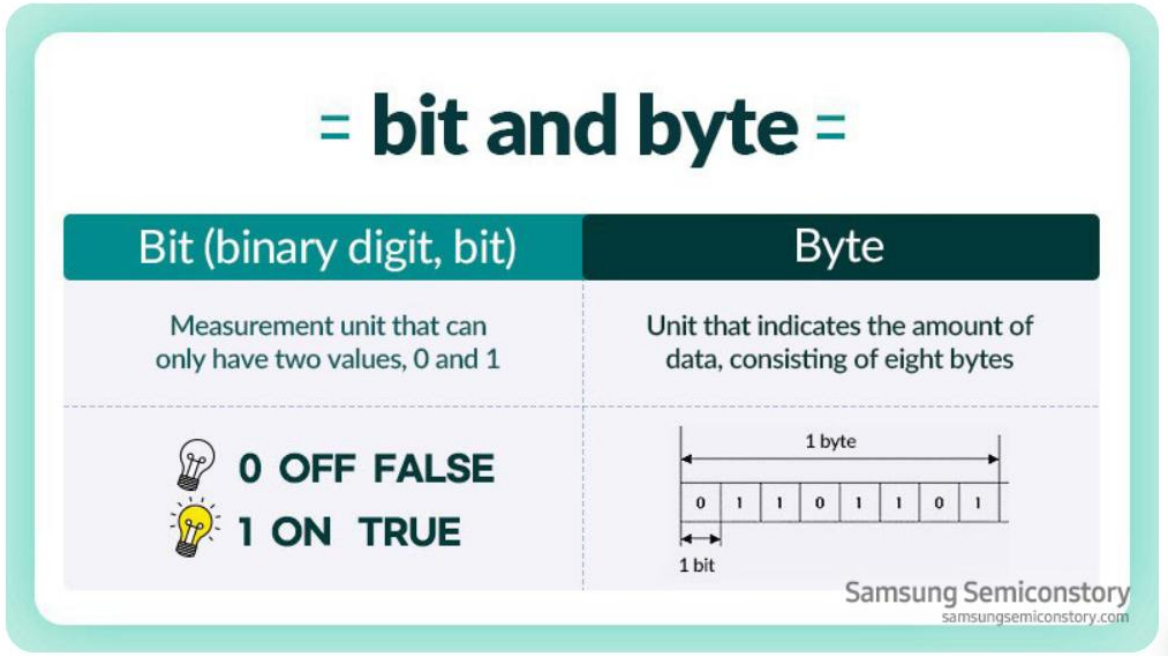


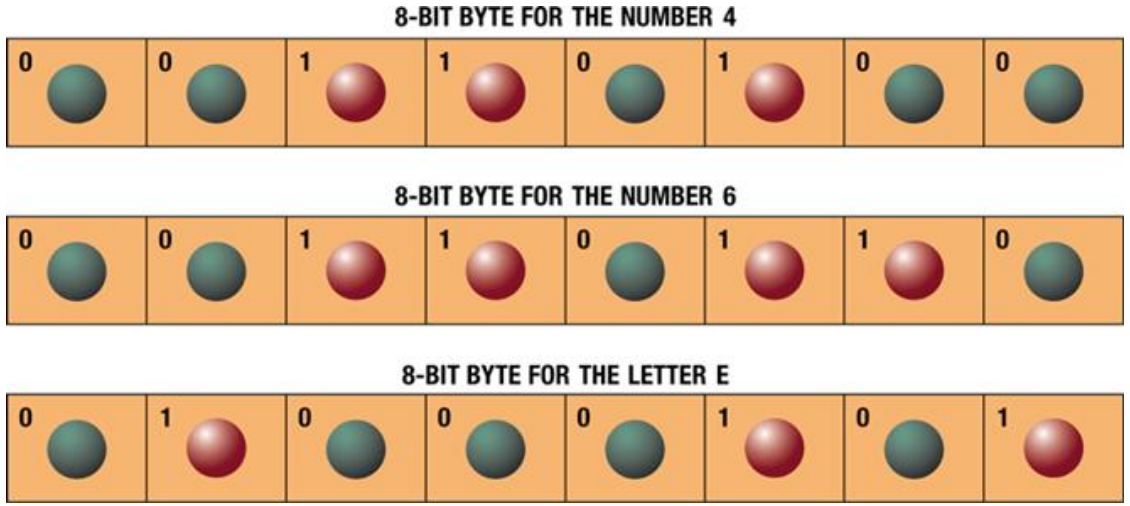
Decimal	Binary	Hex
00	00000000	00
01	00000001	01
02	00000010	02
03	00000011	03
04	00000100	04
05	00000101	05
06	00000110	06
07	00000111	07
08	00001000	08
09	00001001	09
10	00001010	0A
11	00001011	0B
12	00001100	0C
13	00001101	0D
14	00001110	0E
15	00001111	0F

Numeric Representation

- Binary code forms the **basis for all digital information processing and data transfers**.
- **Byte = 8 bits** grouped together as a unit. A byte represents a single character in the computer
- **Hexadecimal system**
  - Uses 16 digits to represent binary numbers

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F)





Character Encoding

- Character encoding standards – *a unique sequence of the binary representation of a particular letter, number, or special character*.
- It is used to facilitate communication among computers by using a common language code.
- Types of Character Encoding:

ASCII

- American Standard Code for Information Interchange (ASCII)
- the most widely used coding scheme to represent data
- Used by personal computers

EBCDIC

- Extended Binary Coded Decimal Interchange Code (EBCDIC)
- Used by mainframe computers

Unicode

- New encoding due to explosion of the Internet
- Uses 16 bits
- Recognized by virtually all computer systems

Character Encoding

- **ASCII**
  - **American Standard Code for Information Interchange (ASCII)**
  - the most widely used coding scheme to represent data
  - Used by personal computers
  - ASCII is a **7-bit character set containing 128 characters**
  - It contains the numbers from 0-9, the upper and lower case English letters from A to Z, and some special characters.
  - The character sets used in modern computers, in HTML, and on the Internet, are all based on ASCII

ASCII	SYMBOL	ASCII	SYMBOL
00110000	0	01001110	N
00110001	1	01001111	O
00110010	2	01010000	P
00110011	3	01010001	Q
00110100	4	01010010	R
00110101	5	01010011	S
00110110	6	01010100	T
00110111	7	01010101	U
00111000	8	01010110	V
00111001	9	01010111	W
01000001	A	01011000	X
01000010	B	01011001	Y
01000011	C	01011010	Z
01000100	D	00100001	!
01000101	E	00100010	
01000110	F	00100011	#
01000111	G	00100100	$
01001000	H	00100101	%
01001001	I	00100110	&
01001010	J	00101000	(
01001011	K	00101001	)
01001100	L	00101010	*
01001101	M	00101011	+

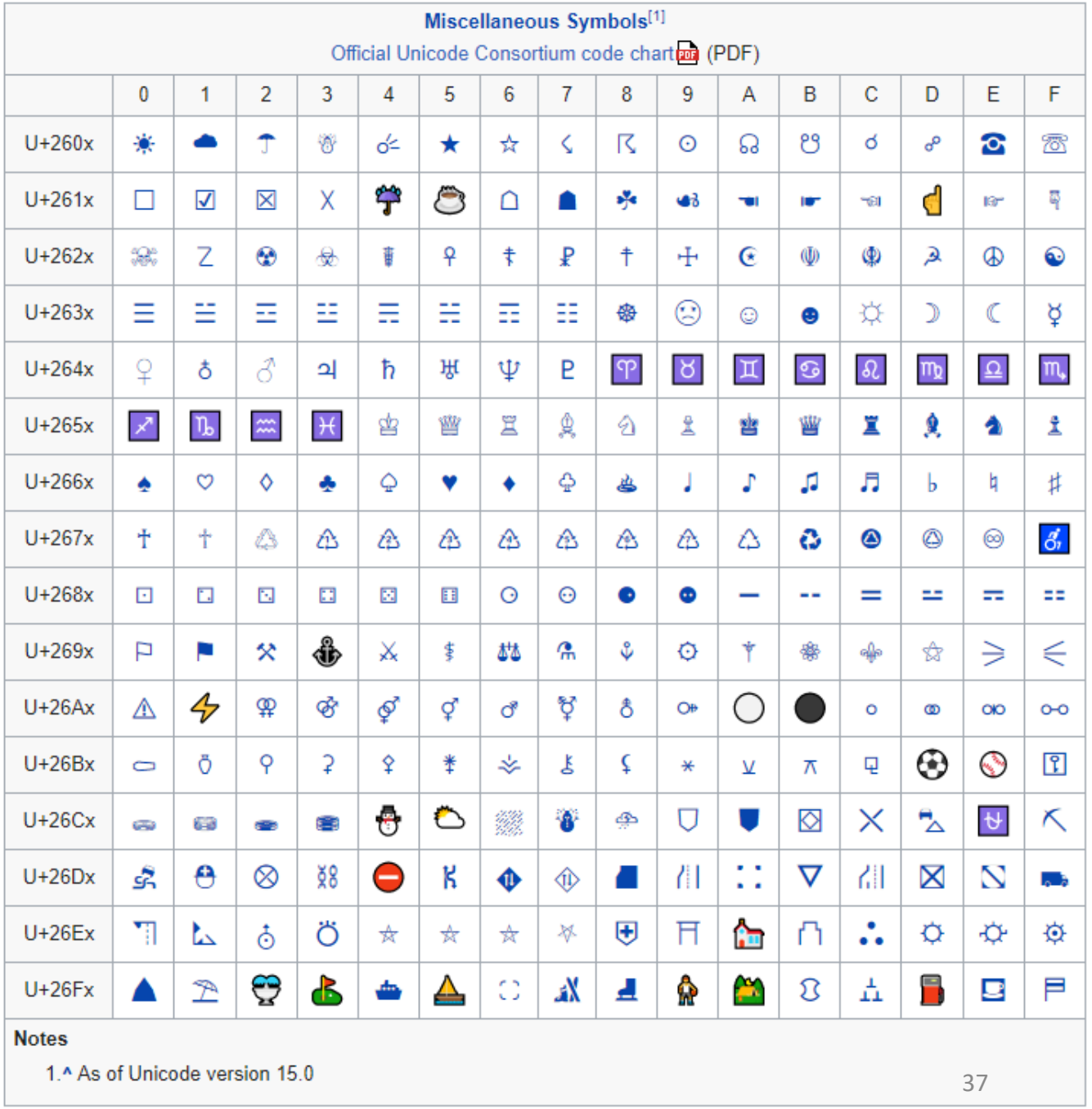
Character Encoding

- **EBCDIC**
  - **Extended Binary Coded Decimal Interchange Code (EBCDIC)** (pronounced “ebb see dick”)
  - is an **8-bit characters**, allows 256 (2 to the power of 8) possible bit combinations.
  - mainly used on IBM mainframe and IBM midrange computer operating systems.
  - It descended from the code used with punched cards and the corresponding 6-bit binary-coded decimal code used with most of IBM's computer peripherals of the late 1950s and early 1960s.
  - It is supported by various non-IBM platforms

Character	EBDIC Bit Configuration
A	1100 0001
B	1100 0010
C	1100 0011
D	1100 0100
E	1100 0101
F	1100 0110
G	1100 0111
H	1100 1000
I	1100 1001
J	1101 0001
K	1101 0010
L	1101 0011
M	1101 0100
N	1101 0101
O	1101 0110
P	1101 0111
Q	1101 1000
R	1101 1001

Character Encoding

- **Unicode**
  - New encoding due to explosion of the Internet
  - is an information technology standard for the consistent encoding, representation, and handling of text expressed in most of the world's writing systems.
  - Uses **16 bits**
  - Recognized by virtually all computer systems



Miscellaneous Symbols[1]

Official Unicode Consortium code chart (PDF)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
U+260x	☀	☁	☂	☃	☄	★	☆	☇	☈	☉	☊	☋	☌	☍	☎	☏
U+261x	☐	☑	☒	☓	☔	☕	☖	☗	☘	☙	☚	☛	☜	☝	☞	☟
U+262x	☠	☡	☢	☣	☤	☥	☦	☧	☨	☩	☪	☫	☬	☭	☮	☯
U+263x	☰	☱	☲	☳	☴	☵	☶	☷	☸	☹	☺	☻	☼	☽	☾	☿
U+264x	♀	♁	♂	♃	♄	♅	♆	♇	♈	♉	♊	♋	♌	♍	♎	♏
U+265x	♐	♑	♒	♓	♔	♕	♖	♗	♘	♙	♚	♛	♜	♝	♞	♟
U+266x	♠	♡	♢	♣	♤	♥	♦	♧	♨	♩	♪	♫	♬	♭	♮	♯
U+267x	♰	♱	♲	♳	♴	♵	♶	♷	♸	♹	♺	♻	♼	♽	♾	♿
U+268x	⚀	⚁	⚂	⚃	⚄	⚅	⚆	⚇	⚈	⚉	⚊	⚋	⚌	⚍	⚎	⚏
U+269x	⚐	⚑	⚒	⚓	⚔	⚕	⚖	⚗	⚘	⚙	⚚	⚛	⚜	⚝	⚞	⚟
U+26Ax	⚠	⚡	⚢	⚣	⚤	⚥	⚦	⚧	⚨	⚩	⚪	⚫	⚬	⚭	⚮	⚯
U+26Bx	⚰	⚱	⚲	⚳	⚴	⚵	⚶	⚷	⚸	⚹	⚺	⚻	⚼	⚽	⚾	⚿
U+26Cx	⛀	⛁	⛂	⛃	⛄	⛅	⛆	⛇	⛈	⛉	⛊	⛋	⛌	⛍	⛎	⛏
U+26Dx	⛐	⛑	⛒	⛓	⛔	⛕	⛖	⛗	⛘	⛙	⛚	⛛	⛜	⛝	⛞	⛟
U+26Ex	⛠	⛡	⛢	⛣	⛤	⛥	⛦	⛧	⛨	⛩	⛪	⛫	⛬	⛭	⛮	⛯
U+26Fx	⛰	⛱	⛲	⛳	⛴	⛵	⛶	⛷	⛸	⛹	⛺	⛻	⛼	⛽	⛾	⛿

Notes

1.^ As of Unicode version 15.0

System Unit: System board, Microprocessor, RAM & ROM

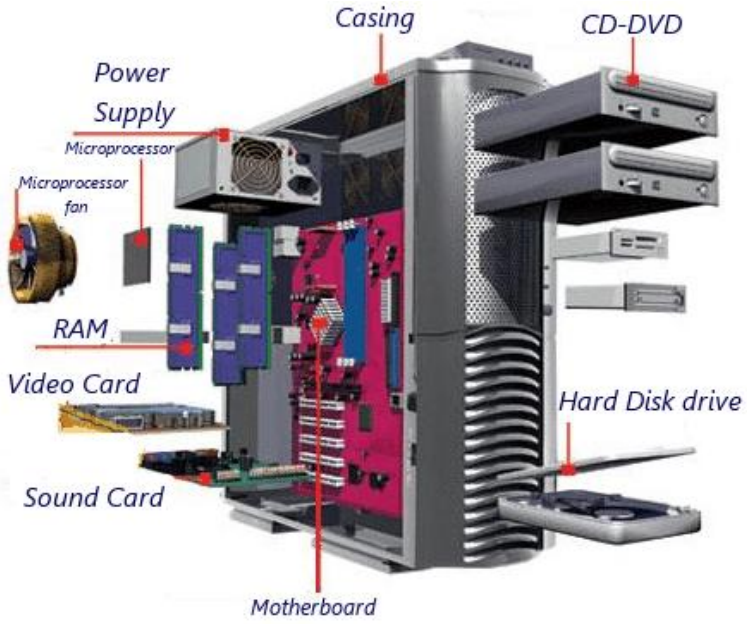
System Unit

System Chassis

- Container that houses most of the electronic components that make up a computer system

System Unit

- Contains system's electronic components and selected secondary storage devices



System Unit Types

- Desktops
  - System unit is in a separate case
    - Tower Units
    - All-in-Ones
      - All components including the monitor
- Laptops
  - Portable and much smaller
    - Ultrabooks – laptop and tablet in one
    - Gaming – high-end graphics

System Unit Types

- Tablets
  - Mini tablet
- Smartphone
  - Most popular device – handheld computer
  - Extend the capabilities of cell phones
- Wearables
  - Contain embedded computers

Components

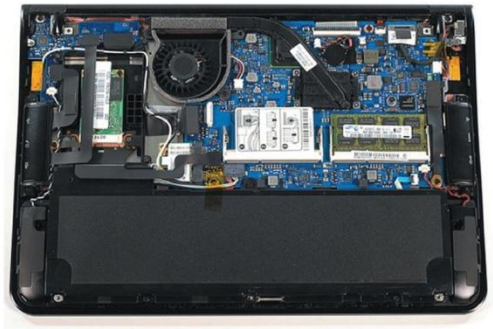
Although all devices come in many shapes and sizes they have similarities such as :

- System boards
- Microprocessors
- Memory

Desktop

Tablet

Smartphone

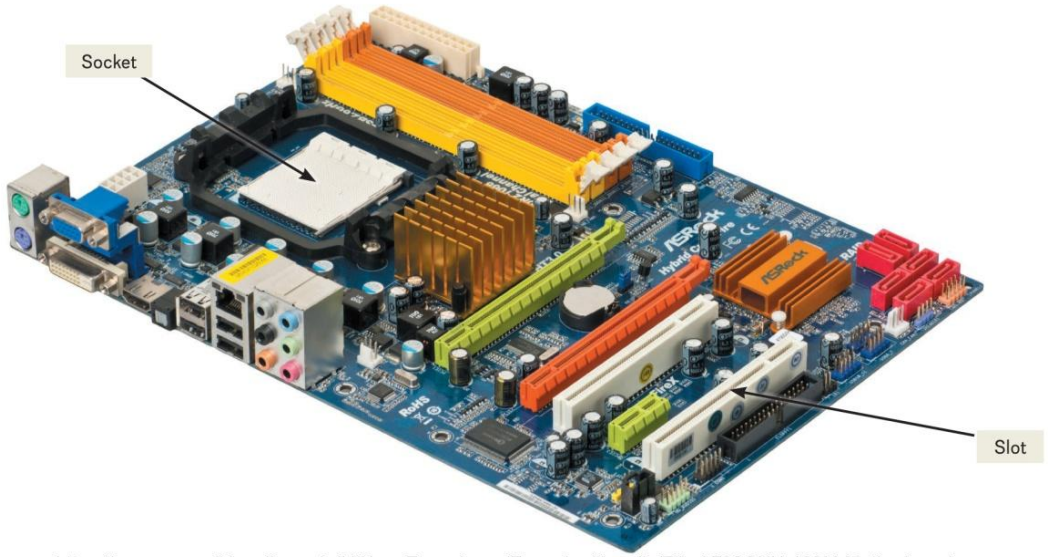


Laptop

Wearable

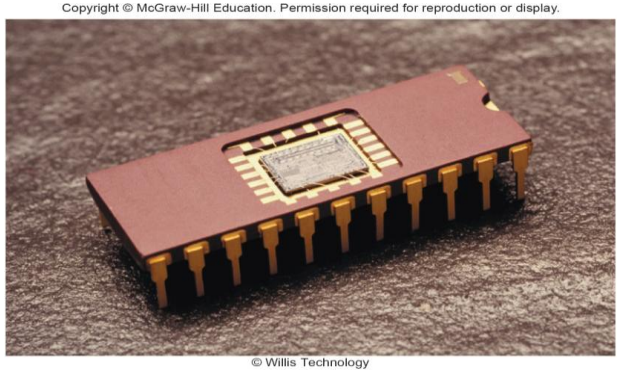
System Board

- System board or main board or motherboard controls communication for the entire computer system
- All components and devices connect to the system board
- Data path and traffic monitor
  - Allows various components to communicate efficiently with one another



https://commons.wikimedia.org/wiki/User:Evan-Amos/Everyday#/media/File:A790GXH-128M-Motherboard.com

Sockets and Chips



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The system board contains a variety of electronic components

- Sockets – the connection point for chips
- Chips
  - Tiny circuit boards etched onto squares of silicon
  - Also called silicon chip, semiconductor, or integrated circuit
  - Mounted on chip carriers

Slots and Bus Lines

Additional system board components:

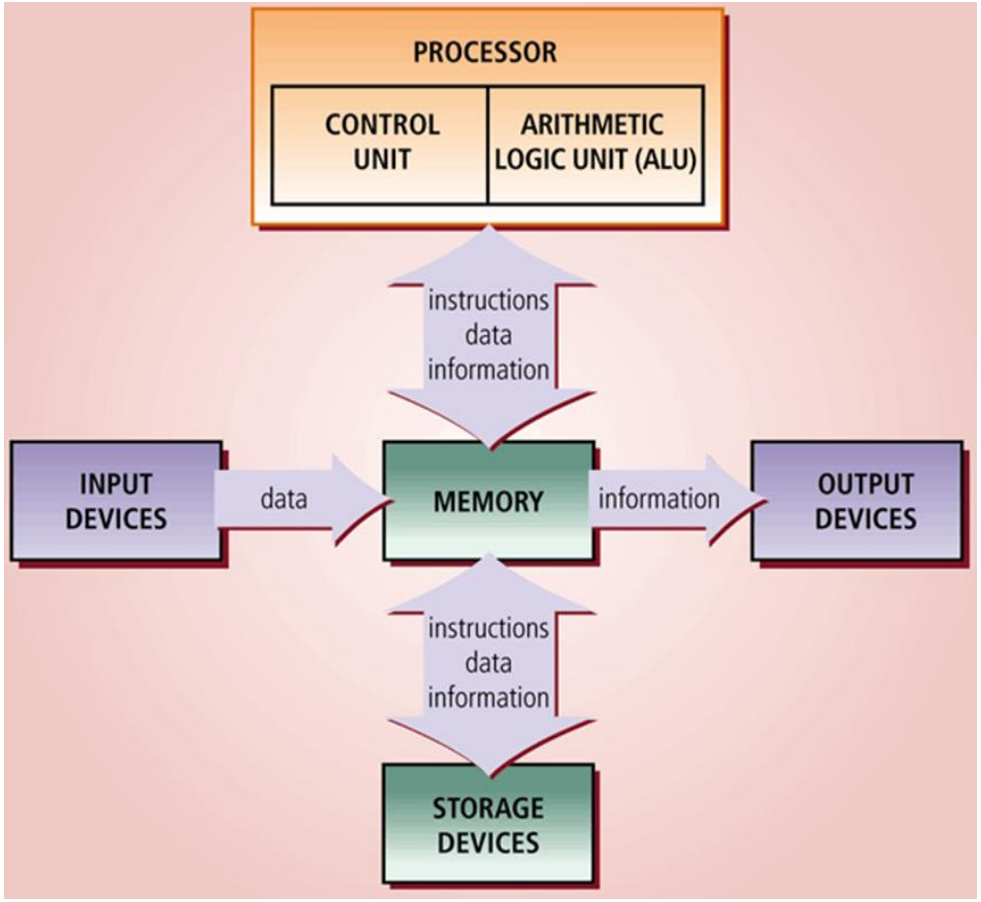
- Slots
  - Provide a connection point for specialized cards or circuit boards
  - Provide expansion capabilities for the computer
- Bus lines
  - Connecting lines that provide pathways to support communication among electronic components

Microprocessor

- Central Processing Unit (CPU) or Processor
  - Contained on a single chip called a Microprocessor
  - Brains of the computer

- Two Basic Components of the CPU
  - Control unit
    - Tells the computer system how to carry out a program's instruction
  - Arithmetic-logic unit (ALU)
    - Performs arithmetic and logical operations

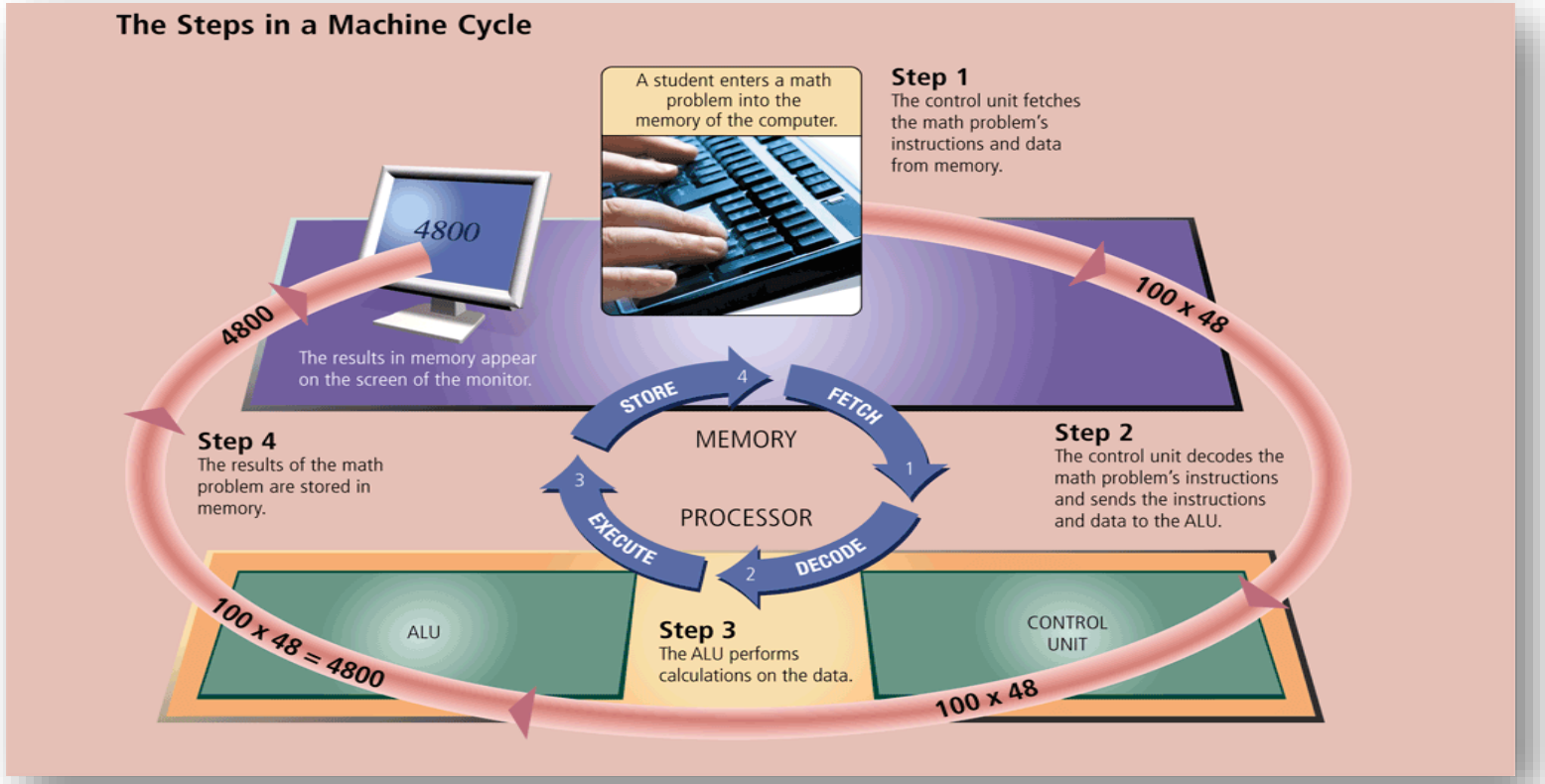
Relationship between Memory, Processor, Storage, Input, and Output Devices



- When a user starts a program, its instruction is transferred from a storage device to memory.
- Data needed by programs enters memory from either an input device or a storage device.
- The control unit interprets and executes instructions in memory, and the ALU performs calculations on the data in memory.
- Resulting information is stored in memory, from which it can be sent to an output device or a storage device for future access, as needed.

Processor Machine Cycle

For every instruction, a processor repeats a set of four basic operations, which comprise a machine cycle.



FETCH

DECODE

EXECUTE

STORE

Microprocessor Chips

- Chip capacities are expressed in word size
  - Word is the number of bits that can be processed at one time: 16, 32 or 64
- Clock Speed
  - Processing speed or the number of times the CPU fetches and processes data or instructions in a second
  - Also called clock rate.
  - It is measured in gigahertz(GHz), or billions of beats per second.
  - The faster the clock speed, the faster the computer can process information and execute instructions

Unit	Speed
Microsecond	Millionth of a second
Nanosecond	Billionth of a second
Picosecond	Trillionth of a second
Femtosecond	Quadrillionth of a second

Multicore Chips

- Multicore Processors
  - Two or more separate and independent CPUs within a system unit
    - Quad-core supports 4 core processes

- Parallel Processing
  - Computer's ability to divide tasks into parts that can be distributed across each core
  - Windows 8 and Mac OS X support parallel processing

Processor	Manufacturer
A-Series	AMD
Cortex-A series	ARM
Edison	Intel
i7	Intel

Memory

- Holding area for data, instructions, and information
- Contained on chips connected to the system board
- **Stores three basic** categories of items:

  - ❖ The operating system and other system software
  - ❖ Application programs
  - ❖ Data being processed and the resulting information

- Three well-known **types of memory chips**:

  1. Random Access Memory(RAM)
  2. Read Only Memory (ROM)
  3. Flash Memory

Memory

- The system unit contains two types of memory:

Volatile memory

Loses its contents when power is turned off

Example includes **RAM, cache memory and virtual**

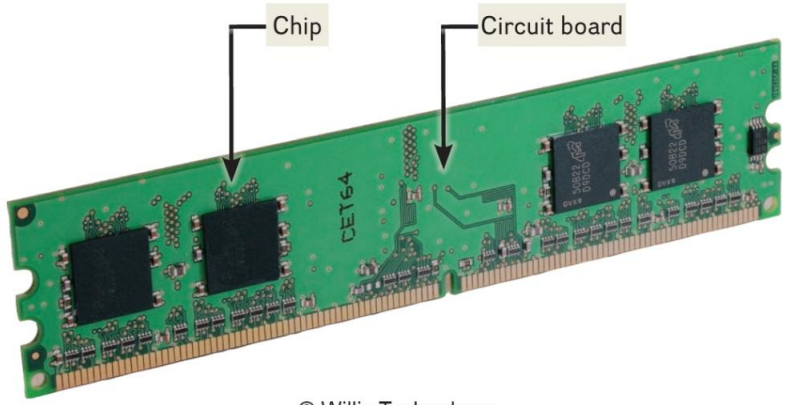
Non volatile memory

Does not lose contents when power is removed

Examples include **ROM** and **flash memory**

Random Access Memory (RAM)

- **Random Access Memory (RAM)** chips hold programs and data that the CPU is presently processing
  - Volatile or temporary – contents are lost when the computer is powered off



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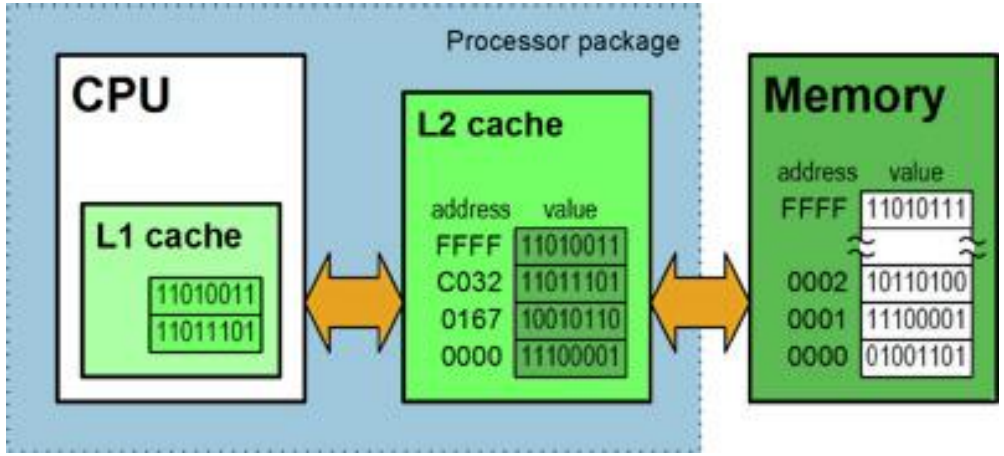
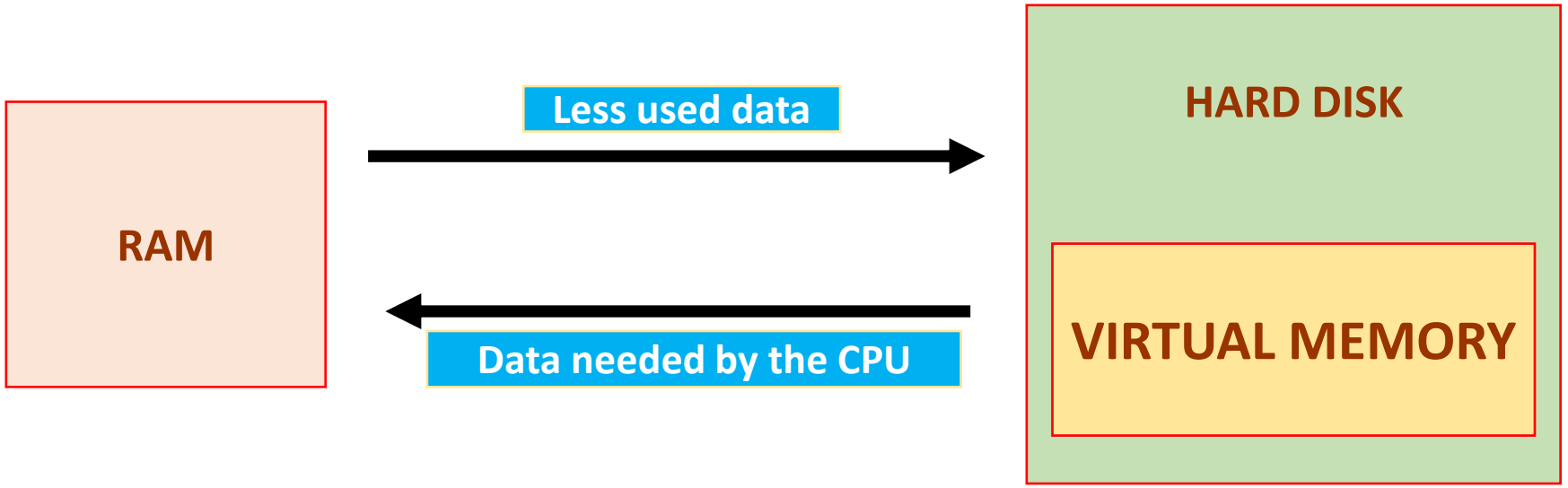
Random Access Memory (RAM)

- **Cache memory** – temporary, high-speed holding area between the memory and CPU
  - Additional RAM can be added using an expansion module called a DIMM (Dual in-line memory module)



Random Access Memory (RAM)

- **Virtual Memory**
  - a **memory** management capability that uses hardware and software to allow a computer to compensate for physical **memory** shortages by temporarily transferring data from **Random Access Memory (RAM)** to disk storage.



Random Access Memory (RAM)

- Each location in memory has an address
- Memory is expressed in bytes - memory size is measured in **kilobytes** (**KB** or **K**), **megabytes** (**MB**), **gigabytes** (**GB**), or **terabytes** (**TB**)

Memory Sizes

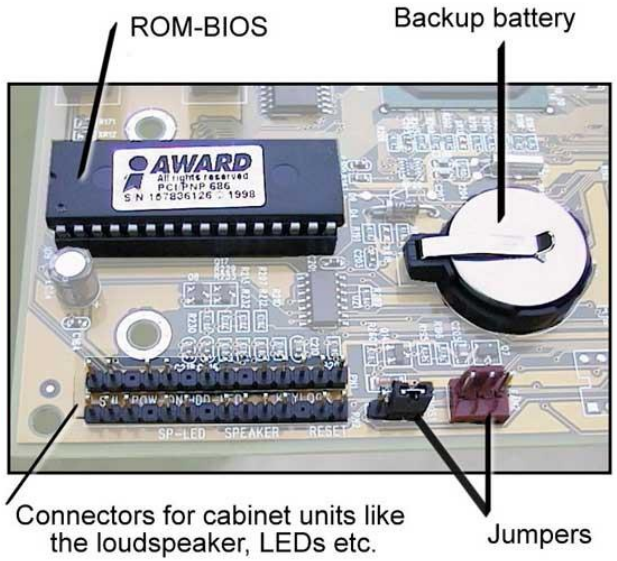
Term	Abbreviation	Approximate Number of Bytes	Exact Number of Bytes	Approximate Number of Pages of Text
Kilobyte	KB or K	1 thousand	1,024	1/2
Megabyte	MB	1 million	1,048,576	500
Gigabyte	GB	1 billion	1,073,741,824	500,000
Terabyte	TB	1 trillion	1,099,511,627,776	500,000,000

Read-only Memory(ROM)

- Read-only memory (ROM)
  - Information stored by the manufacturer
  - Non-volatile and cannot be changed
- CPU can read, or retrieve data and programs in ROM but the computer cannot change ROM
- Contain special instructions
  - Start the computer
  - Access memory
  - Handle keyboard input

Flash Memory

- Flash memory combines of the features of:
  - RAM, it can be updated
  - ROM, it is non-volatile
  - Contains startup information(**BIOS** - basic input/output system)
    - Amount of RAM
    - Type of keyboard, mouse, and secondary storage devices connected.



Input / Output devices

Input Output Devices

Data that gets into the computer is called Input and information comes out in the form of output

- Input devices are hardware components that allow users to enter data and instructions into a computer or mobile devices

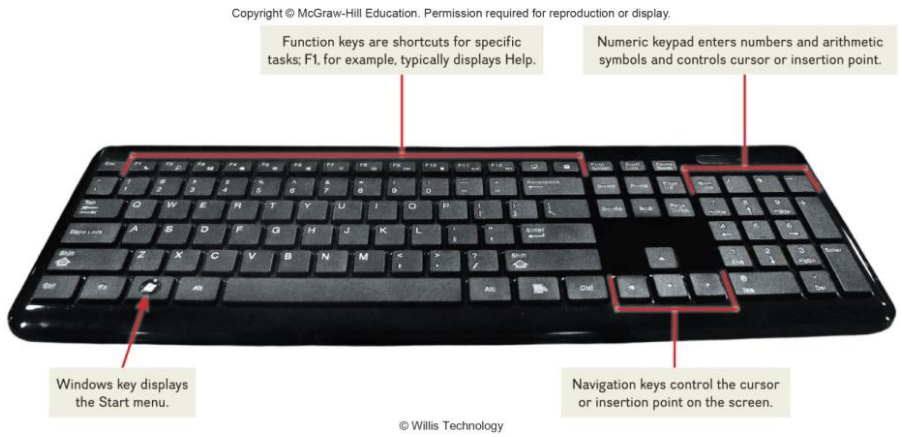
- Output devices are any hardware components that convey information from a computer or mobile device to one or more people

Input Devices

- Allows you to enter data and instructions into a computer
- Users allow to input data such as text, images, graphics, sound, audio, and video
- Examples:
  - Keyboard
  - Pointing devices
  - Gaming controller
  - Scanning devices
  - Readers devices
  - Character and Mark Recognition Readers
  - Image Capturing devices
  - Audio Input devices
  - Biometrics Authenticates Devices

Keyboard Entry

- Keyboards
  - Traditional keyboards
  - Laptop keyboards
  - Virtual keyboards
  - Thumb keyboards



Pointing Devices

Provide an intuitive interface by accepting pointing gestures and converting them into machine-readable input. Examples of devices are:

- Mouse
- Touch Screen – smartphone & computers screen
- Stylus / Tablet - Uses handwriting recognition software

Gaming Controllers

- Provide input to computer games
- Joysticks use pressure and direction of the stick
- Gaming mice are similar to a mouse but high precision
- Game pads use both hands
- Motion sensing device control games by user movement

Scanning Devices

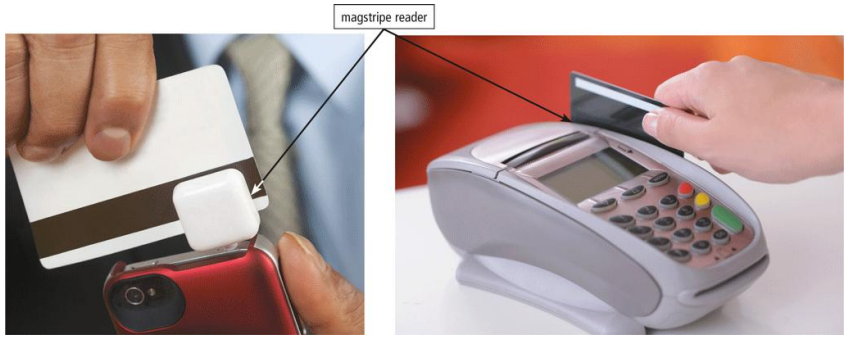
Scanners convert scanned data into a form the system unit can process

- Optical scanners
  - Flatbed scanners
  - Document scanners
  - Portable scanners
  - 3D scanners

Courtesy of Canon-Europe

Readers Device

- Magnetic card reader
  - Information read from the strip when swiped through a reader
  - Smart cards hold additional security information
  - Interpret encoded information that is stored on debit, credit, and identification cards

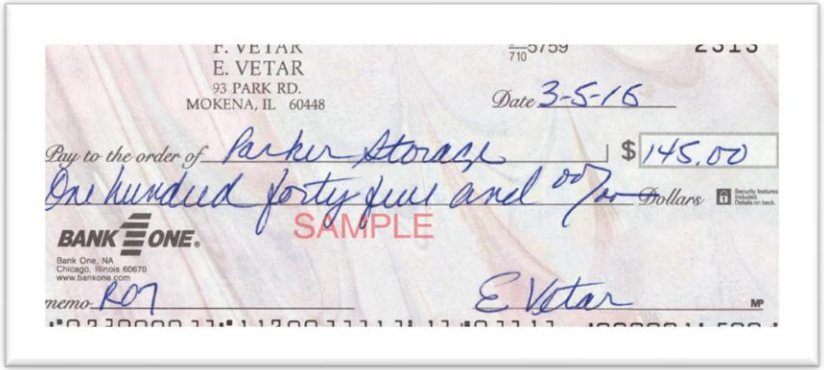


- Bar code reader
  - Contain photo-electric cells that scan or read bar codes, or the zebra-striped marks printed on product containers

Character and Mark Recognition Readers

Recognize special characters and marks

- Character and mark recognition devices
  - Magnetic-ink character recognition (MICR)
    - Used by banks to read encoded characters on checks
  - Optical-character recognition (OCR)
    - Reads preprinted characters such as wand scanners
  - Optical-mark recognition (OMR)
    - Sense the presence of absence of marks used for test scoring



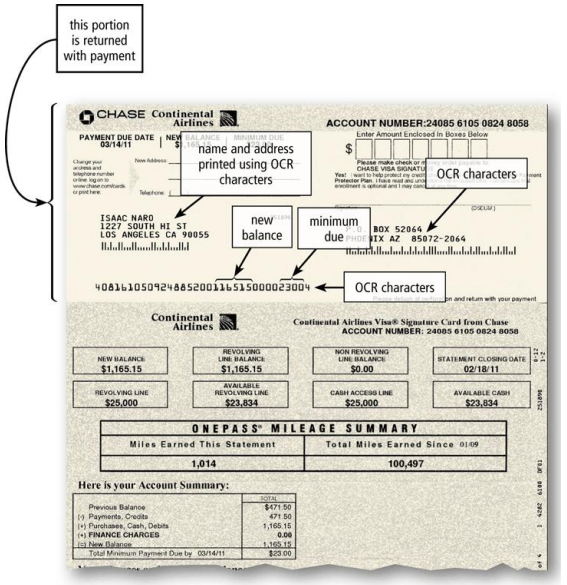


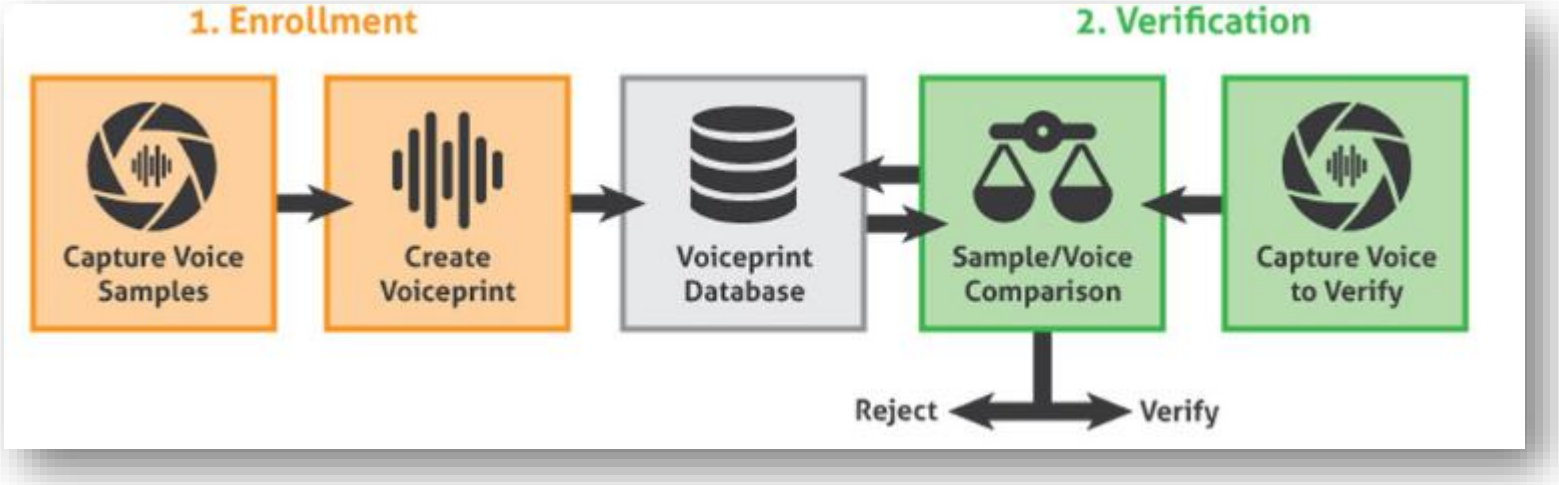
Image Capturing Devices

Create or capture original images

- Digital Camera
  - Capture images digitally and store in memory
- Web Cams
  - are specialized digital video cameras that capture images and send them to a computer for broadcast over the Internet.

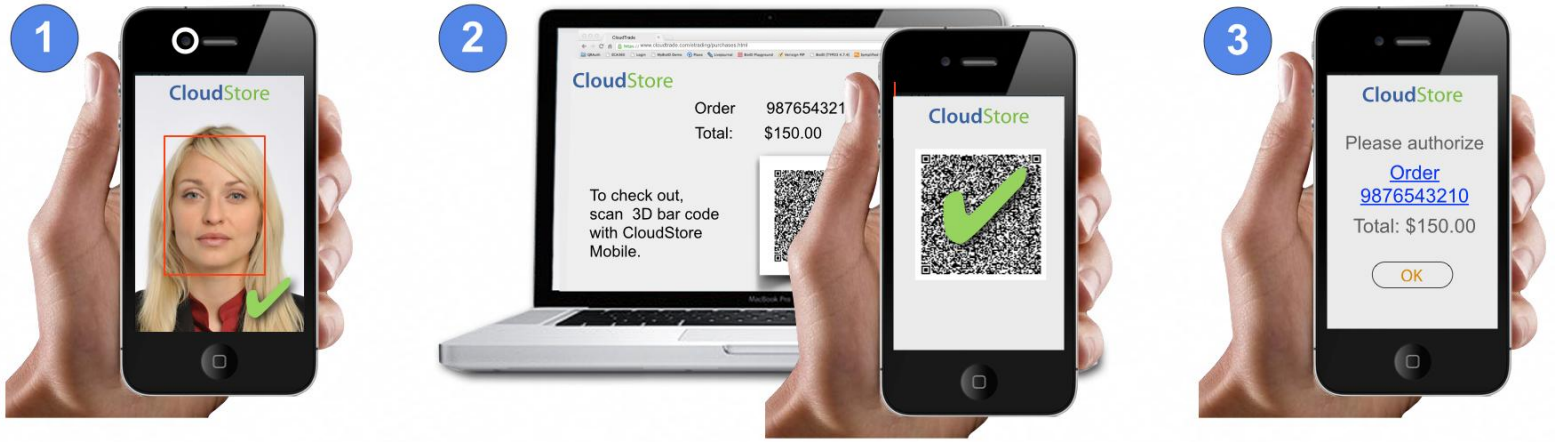
Audio-Input Devices

- Voice recognition systems
  - Use a microphone, sound card, and special software
  - Users can operate computers and create documents using voice commands
  - Included in many smart phones
    - Siri in iPhones
    - Cortana in Windows phones
    - Google Now in Google phones



Biometrics Authenticates Devices

- A **biometric device** authenticates a person's identity by translating a personal characteristic into a digital code that is compared with a digital code in a computer or mobile device verifying a physical or behavioral characteristic
- Biometrics scanner can scan a person's fingerprint, voice, face, hand, iris, and retina.



Output Devices

- Hardware component that conveys information to one or more people
- Display processed data or information
- Examples:
  - Monitors
  - Interactive whiteboard
  - Data projector
  - Printers

Monitors

Known as screens or display screens and present visual images of text and graphics

- Output referred to as soft copy
- Features
  - Clarity
  - Resolution/pixels
  - Dot pitch
  - Contrast ratios
  - Size
  - Aspect ratio
- Example : Flat–panel monitors and curve monitor

Monitors

High-definition television (HDTV)

- Advance form of digital television, which work with digital broadcast signals, transmits digital sound, support wide screen and provide high resolution.

Smart Television

- Is an internet-enabled HDTV form which enable you to connect to the Internet and/or watch television shows.

Interactive Whiteboard & Data Projector

Interactive whiteboard

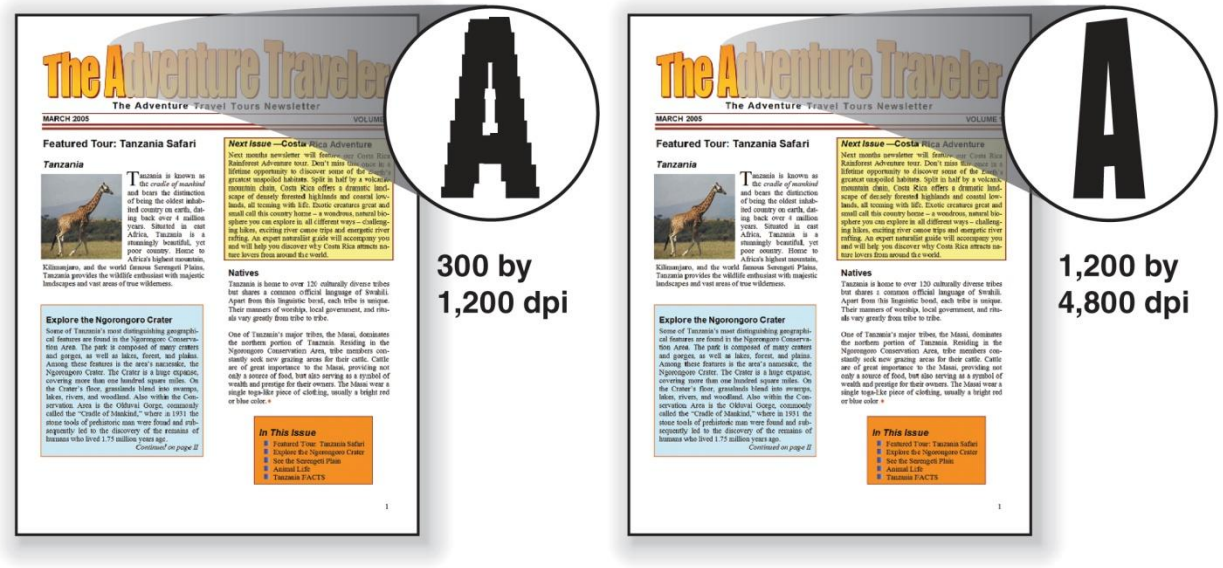
- An interactive whiteboard is a touch-sensitive device, resembling a dry-erase board, that displays the image on a connected computer screen

Data Projector

- A data projector is a device that projects the text and images displayed on a computer or mobile device screen on a larger screen so that an audience can see the image clearly

Printers

- Translates information that has been processed by the system unit
- A **printer** produces text and graphics on a physical medium
- Output referred to as hard copy
- Features
  - Resolution
  - Color
  - Speed
  - Memory
  - Duplex printing



Printers

PRINTER TYPE

NONIMPACT

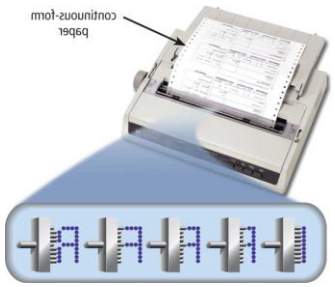
A **nonimpact printer** forms characters and graphics on a piece of paper without actually striking the paper

- Ink-jet printers
- Photo printers
- Laser printers
- Thermal printers
- Mobile printers
- Plotters
- Large-format printers

IMPACT

Impact printers form characters and graphics on a piece of paper by striking a mechanism against an inked ribbon that physically contacts the paper

- Dot-matrix printer
- Line printer
- Daisy-wheel printer



OTHERS

- All in one printer
- 3D printer
- Cloud printer
- Braille Printer

Combination Input and Output Devices

- Headsets
  - Combine a microphone and headphones

- Drones or unarmed aerial vehicles
  - Take input from a controller and send back video and sound to the user

Summary

This topic explains

- The definition of computers
- The overview and history of computer generations from 0^{th} Generation to 5^{th} Generation(present).
- The basic components of the Von Neumann Architecture.
- Electronic data and instructions in computers.
- The system unit in computers; the system board, microprocessor, RAM, and ROM.
- The input and output devices of computer hardware.

Exercises

1. Define the term computer.

2. List three (3) types of characters encoding

3. Describe the roles of the processor and memory.

4. Identify methods for typing on a smartphone.

The End