What is Computer definition?

"**A computer is a programmable electronic machine designed to take input, perform prescribed arithmetic and logical operations at fast speeds, and provide the output of these operations.**"

The term '**COMPUTER**' is an acronym for 'Common Operating Machine Purposely Used for Technological and Educational Research'.

The term 'Computer' is derived from the Latin word '**computare**', which is defined as- "to calculate", "to count" or 'to sum up", etc. In other words, "a computer is a device that performs computation".

Note- The first mechanical computer was designed in 1837 by **Charles Babbage**. It was called '**Analytical Engine**'. It was the first general-purpose computer. Charles Babbage is known as the father of the computer.

Basic Functions of Computer

There are four basic functions of the computer: **Input, Processing, Output, and Storage**.

Input

The data is entered into the computer with the help of input devices. Like other electronic devices, a computer takes data in raw form (binary form). The user can enter the data in several formats such as the collection of letters, numbers, images, etc. The input devices convert the data in the binary form so that the computer can read the data.

Some of the main input devices of computer systems are listed below:
- Keyboard
- Mouse
- Joystick
- Scanner
- Trackball
- Light pen

Processing

The processing is the core functionality of the computer system. It is the internal process where the data is processed according to the instructions given to the computer. The data is executed sequentially and sent for further processing.

The processing speed may vary in different computer systems as the speed mainly depends upon factors like which type of Motherboard, **CPU (Central Processing Unit)** or **RAM (Random Access Memory)** you are using.

Output

The output is the information provided by the computer after the entire processing. It is also known as the result that can be stored in the storage devices for further use. The output devices retrieve the processed data from the computer and convert the data into a human-readable form.

The widely used output devices of computer systems are listed below:

- Monitor
- Printer
- Projector
- Speakers

Storage

Storage is a crucial part of the computer system. It is used to store data or instructions before and after processing.

Generally, storage is divided into the following types:

- Primary Storage

Primary storage devices store the inputted data and immediate calculation results. The data stored in primary storage is temporary and will be lost if they are disconnected from the power source. **Random Access Memory** is an example of primary storage.

- Secondary Storage

Secondary storage devices are used to store the data permanently for future use. The data stored in the secondary storage devices is secure even if there is no power supply. **Hard Disk Drive** is the widely used secondary storage.

Advantages of Computer

The main advantages of the system are listed below:

- Amazing Speed
- Accuracy
- Huge Storage
- Multitasking Support
- Data Security
- Automation
- Reduced Cost

Disadvantages of Computer

The main disadvantages of the computer system are listed below:

- Unemployment
- Health Issues
- Cyber Crimes
- Virus and Hacking Attacks
- Improper Use
- Spread of False or Inappropriate Content
- Negative Impact on the Environment

Computer Software

Computer software is a group of programming instructions designed to instruct the computer to perform specific tasks. Typically, a computer system is useless without software. There are two types of computer software, as mentioned below:

System Software

System software connect the user and the hardware of the computer to interact with each other. System software provide the basic functionalities required to operate the computer system. These types of software provide an environment or platform for the other software to work on. System software run in the background.

Example: Operating systems (e.g., Windows, Linux, Android, etc.), Device Drivers, Firmware, and Utility software.

Application Software

Application software are customized software designed for personal use. These types of software help users for performing basic tasks such as online research, setting an alarm, designing, or even playing games. The application software runs in the frontend and mostly used by the end-users. Therefore, these are also called '**end-user programs**'.
Example: Word Processors, Multimedia Software, Web Browsers, Graphics Software, Photoshop Software, etc.

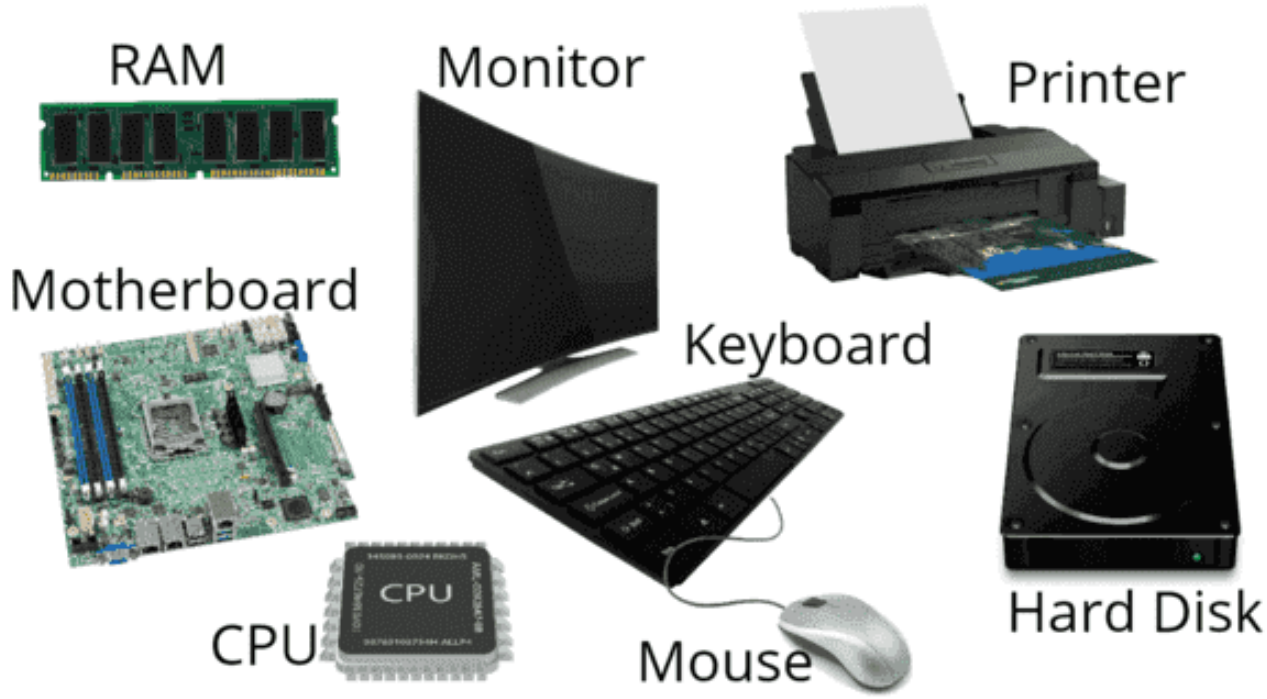
Computer Hardware

Computer hardware are the physical components or parts that jointly form a computer system. There are different types of hardware. Depending on the structure of the computer system, hardware can be installed inside or outside of the computer physical body.

Components of the Computer Hardware

The basic components of the computer hardware are listed below:

- Monitor
- Keyboard
- Mouse
- CPU (Central Processing Unit)
- Motherboard
- RAM (Random Access Memory)
- Hard Disk Drive
- Printer, etc



Generations of Computer

Each generation of computers is a major technological development in technology a computer is/was being based on. Initially, the term 'generation of computer' was used to distinguish between different hardware technologies. At present, the term concludes both the hardware and software. More precisely, the term 'generation' is the development that changes the way computers operate. There can be different changes like making the device smaller, cheaper, more smart or powerful, etc.

There are five generations of the computer, which are listed below with approximate period:

First Generation (1946 - 1959) **Based on**- Electronic Valves (Vacuum Tubes). **Example** - ENIAC, EDVAC, UNIVAC, etc.

Second Generation (1959 – 1965) **Based on**- Transistors. **Example**- IBM 1620, IBM 1400 and 7000 series, CDC 3600, etc.

Third Generation (1965 – 1971) **Based on**- Integrated Circuits (ICs). **Example**- IBM 360, IBM 370, PDP, etc.

Fourth Generation (1971 – 1980) **Based on**- Very Large Scale Integrated (VLSI) Circuits. **Example**- DEC 10, STAR 1000, CRAY-1 and CRAY-X-MP, etc.

Fifth Generation (1980 – Present)

The period of fifth generation is 1980-till date. In the fifth generation, VLSI technology became ULSI (Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components.

This generation is based on parallel processing hardware and AI (Artificial Intelligence) software. AI is an emerging branch in computer science, which interprets the means and method of making computers think like human beings. All the high-level languages like C and C++, Java, .Net etc., are used in this generation.

AI includes −

- Robotics
- Neural Networks
- Game Playing
- Development of expert systems to make decisions in real-life situations
- Natural language understanding and generation

The main features of fifth generation are −

- 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

Some computer types of this generation are −

- Desktop
- Laptop
- NoteBook
- UltraBook
- ChromeBook

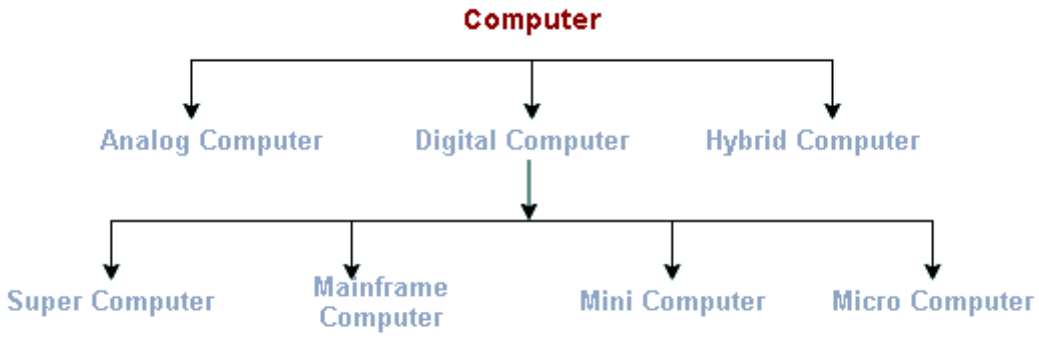
Uses of Computer

As we have discussed above, the computer is the need for the digital era. It is helping people to complete their tasks in hours that were before taking several days or months. Here, we have explained the most important uses of the computer system:

- can store important data.
- can communicate with people around the world.
- used for the educational system.
- used for office works like data entry, support, development, etc.
- used in banking, finance, and marketing.
- used in government sectors.
- used in sports.
- used for Press and publishing.
- used for entertainment.

Classification of Computer

According to usage and functionalities, computers can be classified as:



Classification of the Computer

Analog Computer – The computers used to process analog data (continuously varying data) are called 'Analog Computers'. Analog computers are the most complicated machines for computation and process control. Examples of continuous data are pressure, temperature, voltage, weight, and speed, etc.

Digital Computer – Digital computers are personal computers. These are the widely used computers. These are commonly used for processing the data with a number using digits by utilizing the binary number system. These computers are intended to perform arithmetic and logical operations at a very high rate.

Hybrid Computer – Hybrid computers are the combination of analog computers and digital computers. These are as fast as analog computers and include memory and precision as digital computers.

Types of Computer

Supercomputer – Supercomputers are large and require huge space for the installation. They are the fastest and most expensive computers compared to others. They are used for performing huge complex calculations.

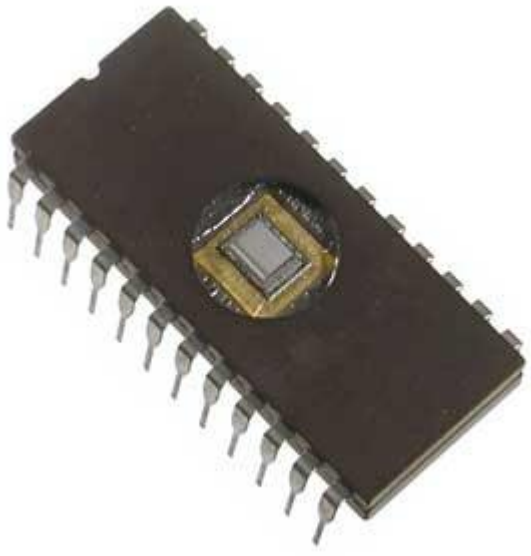
Mainframe Computer – Mainframe Computers are smaller than supercomputers, still, they comparatively huge. These are not as fast as supercomputers. These are expensive as well as take huge space for the entire setup. Mainframe computers can store huge amounts of data and they are capable to handle large calculations. These computers are usually found in banks and educational sectors.

Microcomputer – Microcomputers are inexpensive and support multi-user platform. These types of computers are mostly used by small organizations. Microcomputers are slower compared to supercomputers and mainframe computers. Microcomputers are called Personal Computer (PC).

Mini Computer – Mini computers are cheaper and easy to carry. Notebook and Tablet are examples of minicomputers.

ROM

ROM stands for **Read Only Memory**. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as **bootstrap**. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven. These chips generally have memory size of 4 to 8 MB.



Let us now discuss the various types of ROMs and their characteristics.

MROM (Masked ROM)

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs, which are inexpensive.

PROM (Programmable Read Only Memory)

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program. Inside the PROM chip, there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

EPROM (Erasable and Programmable Read Only Memory)

EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes. Usually, an EPROM eraser achieves this function. During programming, an electrical charge is trapped in an insulated gate region. The charge is retained for more than 10 years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use, the quartz lid is sealed with a sticker.

EEPROM (Electrically Erasable and Programmable Read Only Memory)

EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of reprogramming is flexible but slow.

Advantages of ROM

The advantages of ROM are as follows −

- Non-volatile in nature
- Cannot be accidentally changed
- Cheaper than RAMs
- Easy to test
- More reliable than RAMs
- Static and do not require refreshing

- Contents are always known and can be verified

RAM

RAM (Random Access Memory) is the internal memory of the CPU for storing data, program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be accessed randomly but it is very expensive.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup Uninterruptible Power System (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

RAM is of two types −

- Static RAM (SRAM)
- Dynamic RAM (DRAM)

Static RAM (SRAM)

The word **static** indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on a regular basis.

There is extra space in the matrix, hence SRAM uses more chips than DRAM for the same amount of storage space, making the manufacturing costs higher. SRAM is thus used as cache memory and has very fast access.

Characteristic of Static RAM

- Long life
- No need to refresh
- Faster
- Used as cache memory
- Large size
- Expensive
- High power consumption

Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually **refreshed** in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small. All DRAMs are made up of memory cells, which are composed of one capacitor and one transistor.

In DRAM, data is stored in the form of charge on a capacitor.

Characteristics of Dynamic RAM

- Short data lifetime
- Needs to be refreshed continuously
- Slower as compared to SRAM
- Used as RAM
- Smaller in size
- Less expensive
- Less power consumption

%.....%

Secondary Storage Devices

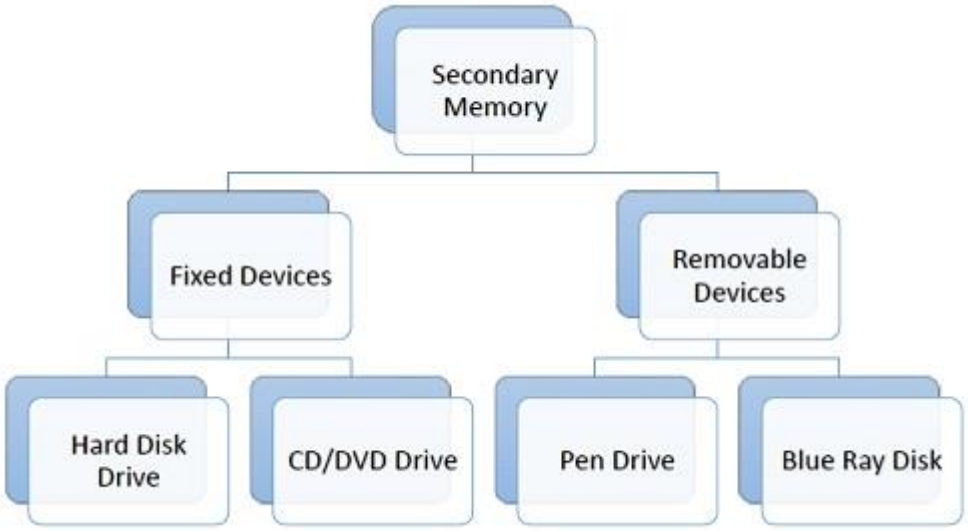
You know that processor memory, also known as primary memory, is expensive as well as limited. The faster primary memory are also volatile. If we need to store large amount of data or programs permanently, we need a cheaper and permanent memory. Such memory is called **secondary memory**. Here we will discuss secondary memory devices that can be used to store large amount of data, audio, video and multimedia files.

Characteristics of Secondary Memory

These are some characteristics of secondary memory, which distinguish it from primary memory −

- It is non-volatile, i.e. it retains data when power is switched off
- It is large capacities to the tune of terabytes
- It is cheaper as compared to primary memory

Depending on whether secondary memory device is part of CPU or not, there are two types of secondary memory – fixed and removable.



Let us look at some of the secondary memory devices available.

Hard Disk Drive

Hard disk drive is made up of a series of circular disks called **platters** arranged one over the other almost ½ inches apart around a **spindle**. Disks are made of non-magnetic material like aluminum alloy and coated with 10-20 nm of magnetic material.

Standard diameter of these disks is 14 inches and they rotate with speeds varying from 4200 rpm (rotations per minute) for personal computers to 15000 rpm for servers. Data is stored by magnetizing or demagnetizing the magnetic coating. A magnetic reader arm is used to read data from and write data to the disks. A typical modern HDD has capacity in terabytes (TB).

CD Drive

CD stands for **Compact Disk**. CDs are circular disks that use optical rays, usually lasers, to read and write data. They are very cheap as you can get 700 MB of storage space for less than a dollar. CDs are inserted in CD drives built into CPU cabinet. They are portable as you can eject the drive, remove the CD and carry it with you. There are three types of CDs −

- **CD-ROM (Compact Disk – Read Only Memory)** − The data on these CDs are recorded by the manufacturer. Proprietary Software, audio or video are released on CD-ROMs.
- **CD-R (Compact Disk – Recordable)** − Data can be written by the user once on the CD-R. It cannot be deleted or modified later.
- **CD-RW (Compact Disk – Rewritable)** − Data can be written and deleted on these optical disks again and again.

DVD Drive

DVD stands for **Digital Video Display**. DVD are optical devices that can store 15 times the data held by CDs. They are usually used to store rich multimedia files that need high storage capacity. DVDs also come in three varieties – read only, recordable and rewritable.

DVD memory size:- 4.7GB

Pen Drive

Pen drive is a portable memory device that uses solid state memory rather than magnetic fields or lasers to record data. It uses a technology similar to RAM, except that it is non-volatile. It is also called USB drive, key drive or flash memory.

Blu Ray Disk

Blu Ray Disk (BD) is an optical storage media used to store high definition (HD) video and other multimedia filed. BD uses shorter wavelength laser as compared to

CD/DVD. This enables writing arm to focus more tightly on the disk and hence pack in more data. BDs can store up to 128 GB data.

Single Layer BD: 25GB

Double Layer BD: 50GB