

20 What is a Computer?

- Computer is a machine, which capable of carry out sequence of arithmetic and logical operations.
- Computer is capable of running multiple applications which created by users /programmers in order to come up with range of tasks.
- In modern day computer is a very smart device which capable of doing almost everything as user wished.

History of the Computer ...

- The history of computing has begun from people because they have used different materials to do certain calculations.
- By the time, when numbers get larged the above method was not practical.
- As a result of that 4000 years ago, Chinese invented the device called abacus.
- Improving abacus 1642 Blaise Pascal has invented a called Pascaline, which capable of performing addition and subtraction.

- In 1820's Sir Charles Babbage also known as father of modern computer has invented a device called different engine which capable of performing simple calculations.

Q10. What is the version of the latest windows operating system?

* Windows 11

02) Name two other PC based operating systems.

* Linux based on computing and parallel processing.

* Ubuntu package files have now disappeared

* Mint OS naitoluokan mukaan ab et aloitetaan

③ What is the latest technology that you know/heard?

* Artificial Intelligence for a Future of All.

* Blockchain is a decentralized open source technology.

* Internet of things

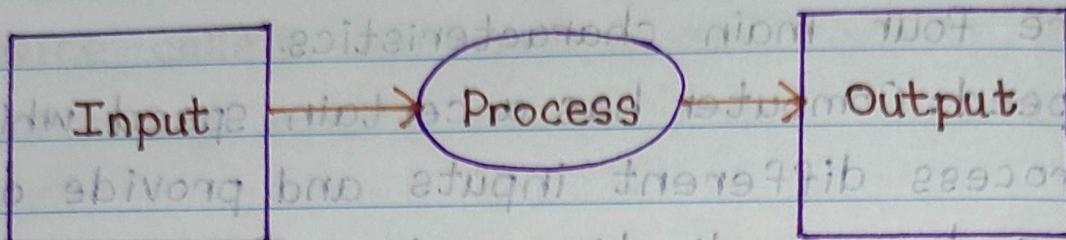
Characteristics of a Computer

- When considering about the computer there are four main characteristics.
- **Speed:** Computer has a certain speed which process different inputs and provide outputs based on application nature. The speed of the computer mainly decided by RAM and CPU (Central Processing Unit).
- **Versatility:** Computer can be used for different purposes based on user's requirement.
- **Intelligent:** Computer can make its own decisions based on user input valids.
- **Memory:** Computer can be used to store data, permanently and temporally.

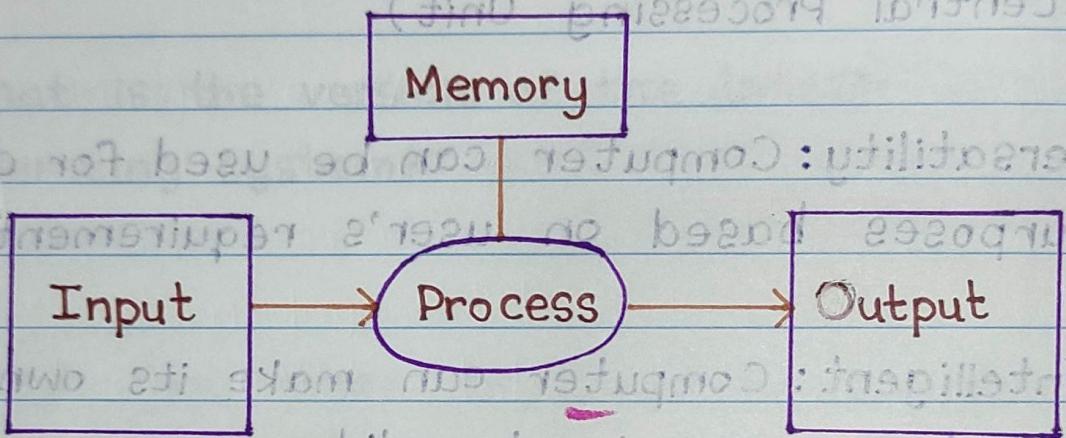
Computer vs Machine

- When comparing a computer and machine the main difference which can identify is memory. When considering about a typical machine, it is there to provide a one particular output. But in computer since it has a memory it is capable of providing different outputs after processing data.

Architecture of typical machine



Architecture of a Computer



- ④ List down specifications you consider when purchasing a laptop for study purposes.

- * RAM (8GB)
- * SSD (256 GB)
- * HDD
- * Processor (i3 or i5)

Parts of a Computer

- Computer consists with two main components which known as hardware and software.

- All tangible devices in a computer are known as Hardware Components.

Ex: Cables, RAM, Motherboard etc.

- All intangible parts of the computer are known as Software Components.

Ex: MS Office package, Web browser, OS etc.

Motherboard

- It is the main hardware component in computer.

- This circuit board will combine all other hardware components together and it will work as a one unit.

- Motherboard contains different ports for all necessary hardware components and depending on the versions of the motherboard features will enhance.

No: _____

- Positional values are starting from the left hand side symbol also known as least significant bit and weightage will be base value to the 0^{th} power.

The weightage of each position can be represented as follows:

10^5	10^4	10^3	10^2	10^1	10^0
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Binary Number System

- Digital devices are working with digital signals to represent instructions which provided by users.
- Digital signals are being created by varying voltage values.
- The easiest way of creating this voltage difference is known as two state process which having ON and OFF values.
- In computing ON value is called as binary 1 and OFF value represent binary 0.
- Which means all digital devices are working with binary number system.

In any given binary number a single unit is known as a bit.

- By combining 8 bits 1 byte of information has been created.

- In any given binary number there are two bits which known as,

① Most significant bit (MSB)

* MSB is the leftmost bit in the given binary number.

② Least significant bit (LSB)

* LSB is the rightmost bit of the given binary number.

1	1	0	1	0
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MSB

LSB

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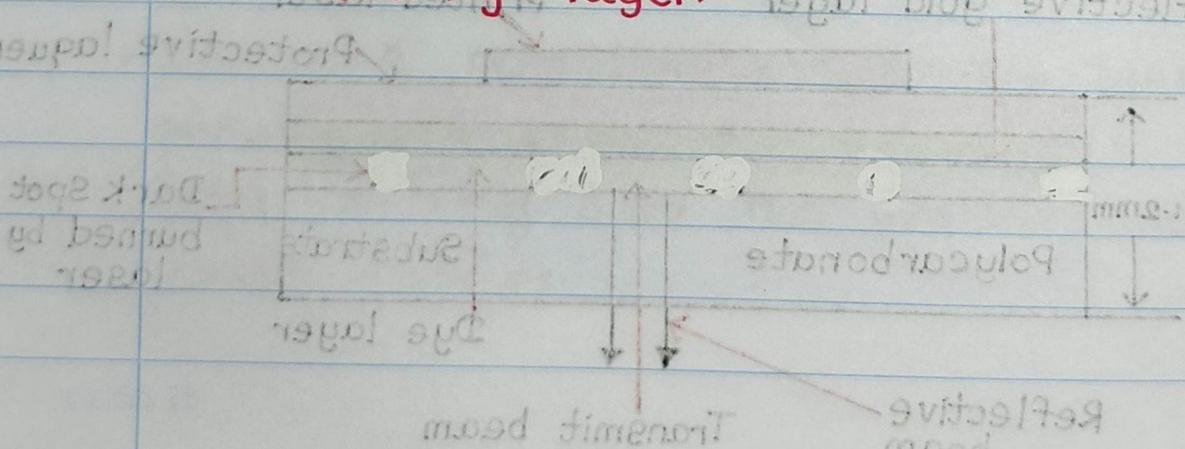
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Data Storing inside CD-RW

- CD-RW does not contain a dye layer.
- Instead of that it uses a data storing layer which can burn.
- When storing data burner will switch on and create small holes which known as pits on data storing layer.
- Pits represent binary 0 when storing data.
- Unburnt areas of the data storing layer is known as land areas.
- Land areas are representing binary 1 when storing data.
- Burner will switch ON/OFF according to the binary pattern and recreate pits and lands accordingly.

- Cross Section**
- When formatting CD-RW all land areas will burn and make out and even surface on data storing layer.

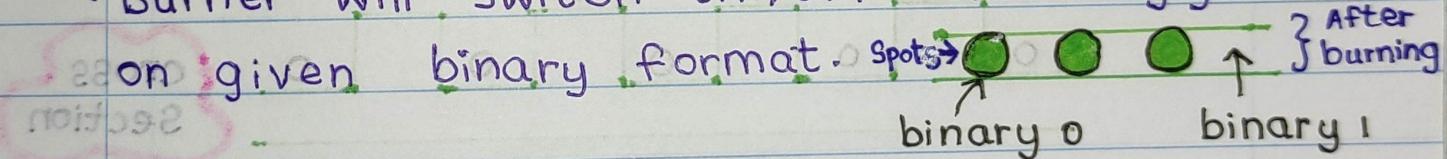


Compact Disk Rewritable (CD-RW)

- CD-RW is capable of burning multiple times to store data in it.
- Once the data is stored, CD-RW allows you to make changes.

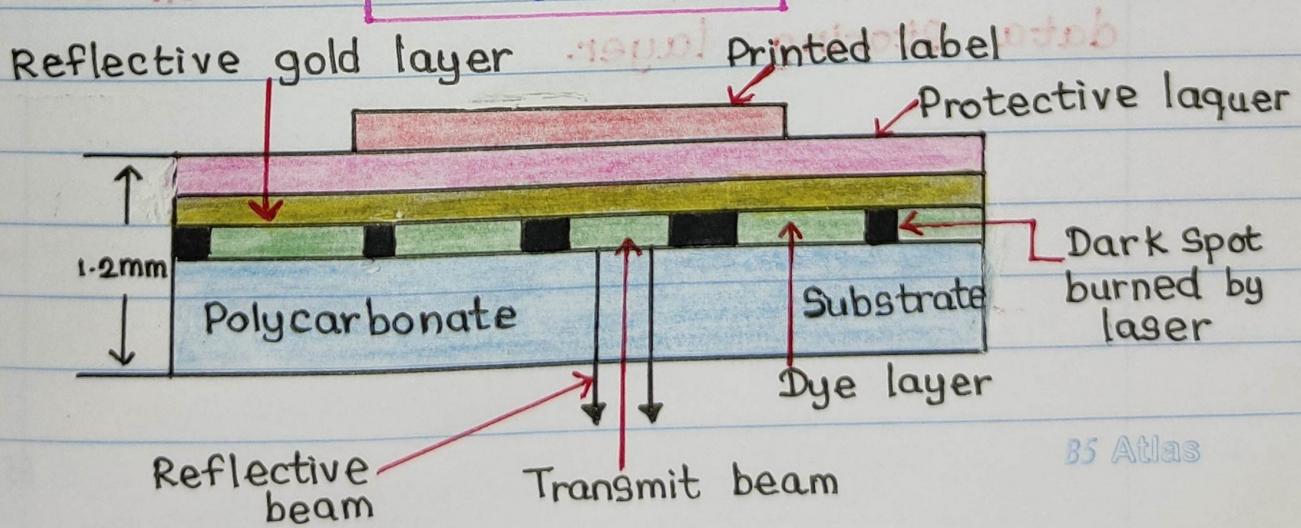
Data Storing inside CD-R

- Store data inside CD-R, dye layer has been used.
- Burner will burn the dye layer and create some dark spots and other areas will remain transparent accordingly.
- Burnt areas represent binary 0 and transparent areas represent binary 1.
- Burner will switch on/off accordingly based on given binary format.



CROSS SECTION

of
CD-R



Optical Disk

- Optical disk are portable secondary storage devices.
- Optical disk is known as the umbrella term of compact disk, digital versatilities and blue-ray disk.
- All above devices are working with a form of a light ray since they known as optical disk.

Compact Disk (CD)

- There are two types of compact disk known as,
 - ① Compact Disk Recordable (CD-R)
 - ② Compact Disk Rewritable (CD-RW)
- Above devices are capable of storing data up to 700 MB or 8 minutes of Audio.

Compact Disk (CD-R) Recordable

- In CD-R recording will become permanent once you have store data in it.
- After storing data you are not allowed to make changes.

(Q.3) A magnetic disk have 20 platters, 2000 tracks on each surface and 30 sectors per track. The capacity of a sector is 4 KB.

(i) Find the capacity of a track.

$$\text{Capacity of a track} = \frac{\text{No. of sectors per track}}{\text{Size of a sector}} \times \text{Size of the sector}$$
$$= 30 \times 4 \text{ KB} \\ = 120 \text{ KB/track}$$

(ii) Find the capacity of a surface.

$$\text{Surface Capacity} = \frac{\text{No. of tracks on Surface}}{\text{Size of a track}} \times \text{Size of a track}$$
$$= 2000 \times 120 \text{ KB/track}$$

(iii) Find the capacity of the total HDD.

$$\text{HDD Capacity} = \frac{\text{No. of surfaces}}{\text{Capacity of a surface}} \times \text{Capacity of a surface}$$
$$= 40 \times 2000 \times 120 \text{ KB/track}$$

(iv) Find the capacity of a cylinder.

$$\text{Cylinder capacity} = \frac{\text{Capacity of a track}}{\text{Number of tracks}} \times \text{Number of tracks} \times \text{Number of surfaces}$$
$$= 120 \text{ KB} \times 40 \times 2000 \times 40$$

HDD Total = 2.2 GB
Amount of platters = 20
Tracks amount = 2000

Amount of Surface: 40
Capacity of a sector: 4 KB

(Q.2) HDD contained with 2.2 GB total capacity (a. P)

HDD contained with 20 platters and sector size is 4 KB. Note that there are 2000 tracks on each surface.

(ii) Find the capacity of a surface.

Surface capacity = No. of tracks on surface \times Size of a track

Capacity of HDD = No. of surfaces \times Size of a Surface

$$2.2 \times 10^6 = 40 \times x$$

$$\underline{2.2 \times 10^6} = x$$

$$\underline{\underline{2.2 \times 10^5}} = x$$

$$4 \times 5000 =$$

$$55000 \text{ KB} = x$$

(iii) Find the capacity of a track and cylinder.

Track capacity = Surface capacity

Tracks amount

$$= \underline{\underline{55000}}$$

$$2000$$

$$= 27.5 \text{ KB}$$

surface

Capacity of the cylinder = Track capacity \times No. of Surfaces

$$= 27.5 \text{ KB} \times 40$$

$$= 1100 \text{ KB}$$

(ii) Find the capacity of the surface.

Surface capacity = No. of tracks on surface \times Size of a track

$$= 4000 \times 40 \text{ KB}$$

$$= 160000 \text{ KB}$$

(iii) Find the capacity of HDD.

HDD capacity = No. of surfaces \times Size of a surface

$$= 10 \times 160000 \text{ KB}$$

$$= 1600000 \text{ KB}$$

$$= 16 \times 10^5 \text{ KB}$$

$$= 1600000 \text{ KB} / 1000$$

$$= 1600 \text{ MB}$$

(iv) Find the capacity of a cylinder.

Cylinder capacity = Capacity of a track \times No. of surfaces

$$= 40 \text{ KB} \times 400 \text{ KB} = 16000 \text{ KB}$$

$$= 16000 \text{ KB} / 1000 = 16 \text{ MB}$$

Storing data inside HDD

- Each platter have two data storing surfaces.
- Each platter have two dedicated read, write heads.
- R/W heads will store, read data on each surface.
- Platters will get rotate in a certain RPM level and R/W head will rotate all over the axis and cover the full surface.

page (3) Last image

- In above diagram there are three platters and six data storing surfaces.

Hard Disk Drive - HDD

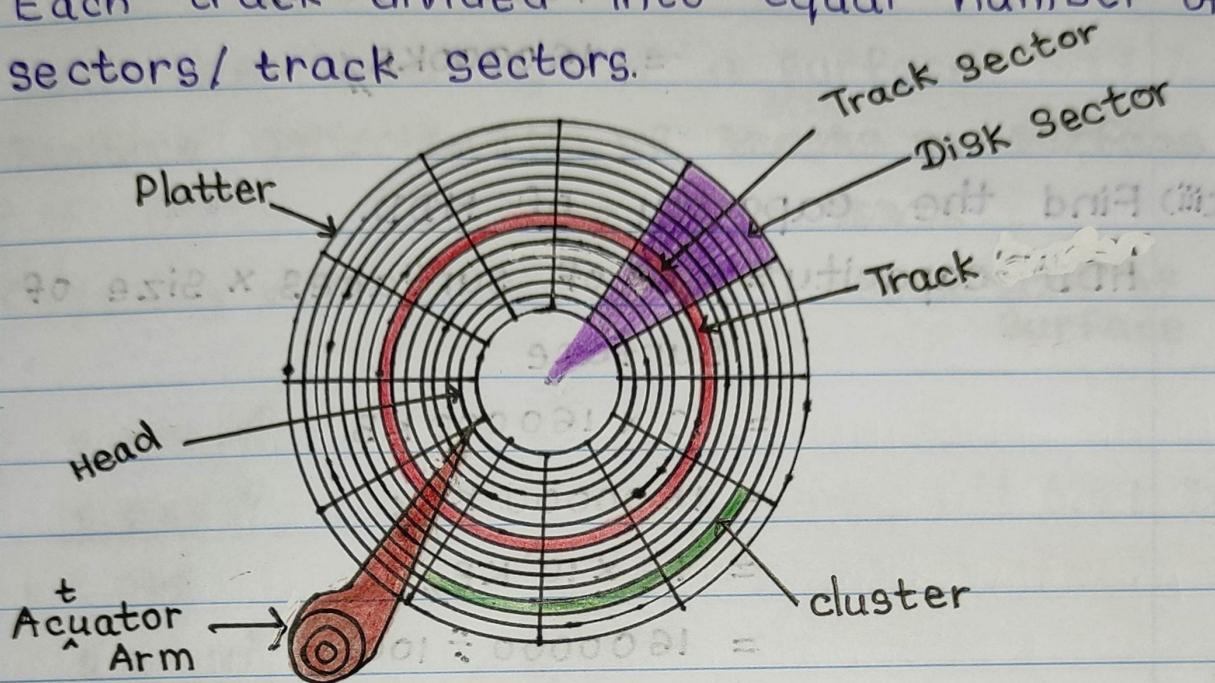
- The main data storing component in the computer is known as Hard disk.
- The conventional hard disk drive contain with number of disks, which stacked on top of each other.
Ex: CMOS, RAM, ROM, Cache, Memory, Hard disk, Floppy disk, CD, DVD, etc.
- By using Read / Write head data will be stored and retrieved.
- In modern day, Solid state drives are being used as hard disk which has more speed than conventional disk.
- SSD contains with number of chips where it capable of storing data.

Central Processing Unit

- CPU is considered as the brain of the computer where it will do all logical and arithmetic operations.
- The speed of your computer mainly decided by CPU.

HDD Calculations

- Each surface of HDD are divided into equal number of tracks.
- Each track divided into equal number of sectors/ track sectors.



- Above & Segregation happens when the HDD formatted for the first time, depending on the size of HDD tracks & sectors will get created.

(Q.1) A magnetic disk have 5 platters, 4000 tracks on each surface and 20 sectors per track. The capacity of a sector is 2KB.

(i) Find the capacity of a track.

Capacity of the track = No. of sectors per track
x Size of the Sector

$$= 20 \times 2\text{KB}$$

$$= 40\text{ KB/}$$

READ ONLY MEMORY (ROM)

- Data inside ROM is not possible to update frequently.
- Because of that data light system boot up program will store inside ROM.
- ROM data will get change only if you are update the operating system.

CACHE MEMORY

- Frequently requested data will store inside cache memory.
- In computer architecture cache memory is placed between CPU and RAM.

Secondary Storages

- Storages which doesn't have direct contact with CPU are known as secondary storages.
- Those storages will contacts with CPU via primary storage.

Hard Disk Drive (HDD)

- HDD is a main secondary storage of the computer.
- HDD contains multiple disks with stack on top of each other.
- By changing the diameter of each disk will vary in the physical size of HDD.

Computer Memory Management

Computer Storage Devices

- Computer storage devices are categorized into 2 main sections.
- ① Primary Storages
- ② Secondary Storages
- Above classification has been done based on the communication with CPU and storage devices.

Primary Storages

- These storages has direct contact with central processing unit.

① Random Access Memory (RAM)

② Read Only Memory (ROM)

③ Cache Memory

RANDOM ACCESS MEMORY (RAM)

- RAM is a volatile memory which has direct contact with CPU.
- All the applications which runs in a one given time will get loaded to RAM.
- Because of that higher capacity of a RAM is capable of implementing number of software's at a given time.

Numerical Value Representation

Method 01 - BCD (Binary Coded Decimal)

- This is the first number representation technique which introduced 4-bit binary

to represent decimal numbers.

- In BCD, the digits in the given number will take separately and come up with the binary equivalent separately for each digit.

- When representing the binary equivalent, four digits of binaries should use.

- The major drawback in BCD is the sign of the number cannot represent which means for positive and negative number, it will give a common value.

Example:

1522 ASCII value will cover 1522.

1 → 0001 binary byte has 4 bits from right

5 → 0101

2 → 0010

2 → 0010

0001010100100010,

Character - Number Representations.

Character Representations.

- As human, we are engaging with computer using high-level language which means all inputs are human readable.
- Computer can understand only the machine language. Because of that, high-level language should convert to machine language.
- When representing characters in softwares like word, powerpoint, notepad etc. It uses the ASCII value representation.
- In ASCII representation each input will consider as a character input and represented by using the relevant ASCII value.
- Each ASCII value will convert into a binary format, and stored inside the computer.

0100 0100 1010 1000

Octal Number System

: ~~skipped~~

- Numbers which are represented in the base of 8 are known as octal numbers.
- In octal numbers system 8 different symbols are being used to represent an octal number. *... no conversion of Octal to Decimal*
- When working with octal number system, always make sure to write down the base value at the end.
- In octal number system there's a possibility of converting an octal to binary, and binary to octal directly.

Decimal to Octal Conversion...

- The given decimal value needs to be divided by 8 (base value) and come up with the answer and remain value. $\frac{8}{8} \leftarrow 1$ $8x1 + 8x8$
- If the answer is still divisible by 8, continue the process until you get a value from 0 to 7 to the answer column.

Number Systems

A technique to represent a numerical value is known as number system.

There are different type of number systems which available and those can be use in relevant occasions based on the requirement.

Each number system is working with positional value system, and the positional value will depend on the base value.

Decimal Number System

- This number system is known as based 10 number system which means there are 10 different symbols have been used to represent a number.

Example: Consider about 456,

In 456, value of 4 is 4 hundreds or 400 or

* Value of 4 is 4 hundreds or 400 or

* Value of 5 is 5 tens or 50 or 5×10 or

5×10^1

* Value of 6 is 6 units or 6 or 6×1 or 6×10^0

means that $456 = 400 + 50 + 6$.

Q2) Compare and contrast computer with typical machine. You may use appropriate diagrams if needed.

- Both devices are working with source of input.
- Both devices will provide output at the end of the process.
- Computer can process store but a machine can't store because it doesn't have a memory.
- Machine provides only a particular output.
- But computer can provide many outputs at the same time.

Q3) Explain the contribution of the CPU to the computer.

- CPU is the brain of the computer. It includes Control Unit and Arithmetic logic Unit. The speed of the computer is maintained by the CPU.

Softwares

Computer softwares are mainly categorizing into:

① **System Software:** System software is known as the operating system of your computer. The main responsibility of system software is to combine hardware components all together and works as a one unit.

Examples: Windows, Linux, etc.

② **Application Software:** Application softwares are also known as third-party softwares which runs on top of the OS. Depending on the OS, application software will be changed.

a) Explain what is meant by a computer in your own work.

• Computer is a machine. It has four main characteristics. They are,

01. Speed
02. Versatility
03. Intelligent
04. Memory

Types of Processors

- Depending on number of cores which contain inside the processor. Processors can be categorized.
- If a processor contains a single core, a one given thread can be execute at a given time.
- When increasing number of cores in the processor, number of threads which can runs parrarelly will also get increased.
- Hardware Components in the computer can be divided into input and output devices.

Monitor

- Monitor is the main output device of the computer and it consists with pixels.
- If you have higher pixel rate you will have more resolution which means a clear image.
- There are two types of monitors known as CRT and Flat panel displays.

- CPU get attached to the motherboard and on top of it there will be a cooling system such as fan or a liquid cooling system.

Architecture of CPU

