T3 SKILLS CENTER

Foundation Day
30-09-2023

T3 कौशल केंद्र

TWKSAA COMPUTER FUNDAMENTALS

- आप एक सागर हो बहते नदी का जल नहीं आप एक बदलाव हो भटकाव की कोई राह नहीं
- उस रास्ते पर चलो जिस रास्ते पर भीड़ कम हो (हर काम हो कुछ अलग)
- देश की मिट्टी से करो आप इतना प्यार जहाँ जाओ वहाँ मिले खूब इज्जत और सम्मान
- छह दिन कीजिए अपना काम एक दिन कीजिए त्वक्सा को दान
- त्वक्सा एक चिंगारी हैं हर जगह जलना हम सब की जिमेवारी हैं

Er. Rajesh Prasad • **Motive: - New (RID PMS & TLR)**

"त्वक्सा कंप्यूटर फंडामेंटल के इस पुस्तक में आप कंप्यूटर के संबंध में सभी बुनियादी अवधारणाएँ सीखेंगे। मुझे आशा है कि इस पुस्तक को पढ़ने के बाद आपके ज्ञान में वृद्धि होगी और आपको कंप्यूटर विज्ञान के बारे में और अधिक जानने में रुचि होगी"

"In this TWKSAA computer fundamentals book you will learn all basic concept regarding computer. I hope after reading this book your knowledge will be improve and you will get more interest to know more thing about computer Science".

"Skill कौशल एक व्यक्ति के पास उनके ज्ञान, अनुभव, तत्वशास्त्रीय योग्यता, और प्रैक्टिकल अभियांत्रिकी के साथ संचित नौकरी, व्यापार, या अन्य चुनौतीपूर्ण परिस्थितियों में सक्रिय रूप से काम करने की क्षमता को कहते हैं। यह व्यक्ति के द्वारा सीखी जाने वाली कौशलों की प्रतिभा, क्षमता और निपुणता को संक्षेप में व्यक्त करता है"।

TWKSAA RID MISSION

(Research)	(Innovation)	(Discovery)
अनुसंधान करने के महत्वपूर्ण कारण:	**नवीनीकरण करने के महत्वपूर्ण कारण:**	**खोज करने के महत्वपूर्ण कारण:**
1. नई ज्ञान की प्राप्ति	1. प्रगति के लिए	1. नए ज्ञान की प्राप्ति
2. समस्याओं का समाधान	2. परिवर्तन के लिए	2. ज्ञान के विकास में योगदान
3. तकनीकी और व्यापार में उन्नति	3. उत्पादन में सुधार	3. अविष्कारों की खोज
4. विकास को बढ़ावा देना	4. प्रतिस्पर्धा में अग्रणी होने के लिए	4. समस्याओं का समाधान
5. सामाजिक प्रगति	5. समाज को लाभ	5. समाज के उन्नति का माध्यम
6. देश विज्ञान और प्रौद्योगिकी का विकास	6. देश विज्ञान और प्रौद्योगिकी के विकास।	6. देश विज्ञान और तकनीक के विकास

"T3 Skills Center is a Learning Earning and Development Based Skill Center."

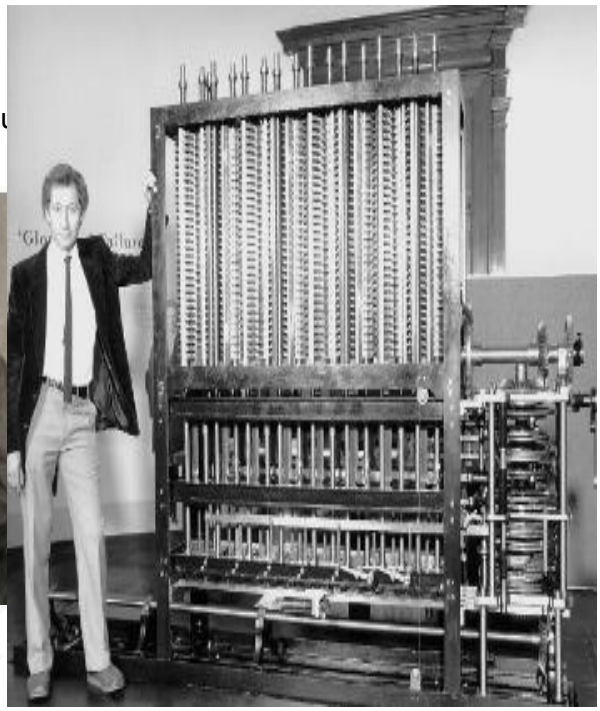
T3 कौशल केंद्र एक सीखने कमाई और विकास आधारित कौशल केंद्र है।

Index

❖ What is computer?

- Computer is a programmable electronic device that accepts raw data as a input and process it with a set of instruction(program) to produce the result as output.
- Computer word is derived from the Latin language **"compute".** Which means calculate. in Hindi 'संगणक'.
- The father of computer is **"Charles Babbage"**
- 14 June 1822 he claimed to have made a compu

which was able to calculate only numbers,



Charles Babbage / Nationality

British

Charles Babbage, (born December 26, 1791, London, England—died October 18, 1871, London), English mathematician and inventor who is credited with having conceived the first automatic digital computer.

❖ Computer full form

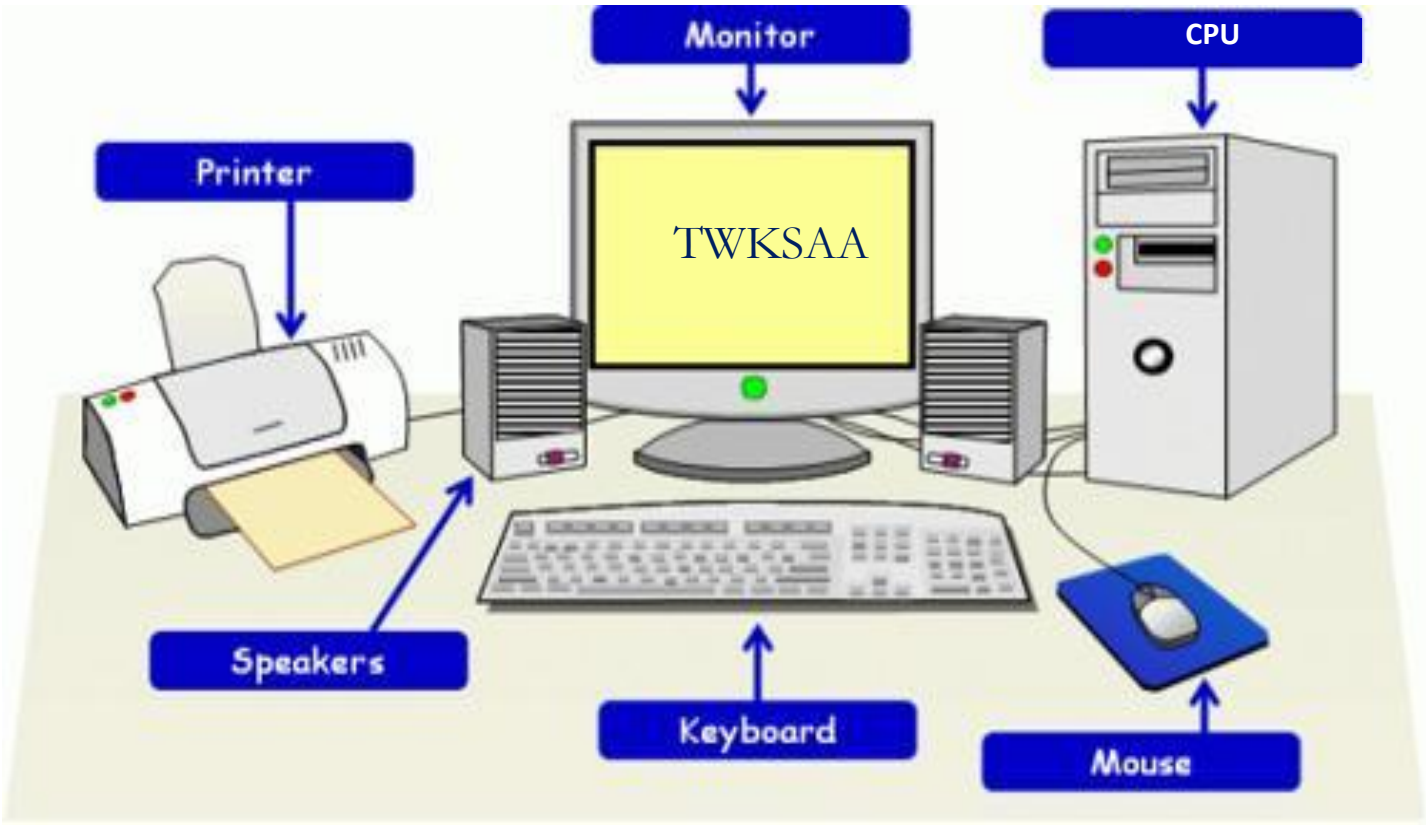
- C - Common - सामान्य
- O - Operator - चलाना
- M - Machine - यंत्र
- P - Particular - बिषेश रुप से
- U - Use - प्रयोग
- T - Trade/Technical - व्यावसाय/तकनीक
- E - Education - शिक्षा
- R - Research - खोज

Commonly Operated Machine Particularly Used for Technical and Educational Research

अपने ग्राहक को जानोआमतौर पर तकनीकी और शैक्षिक अनुसंधान के लिए विशेष रूप से संचालित मशीन

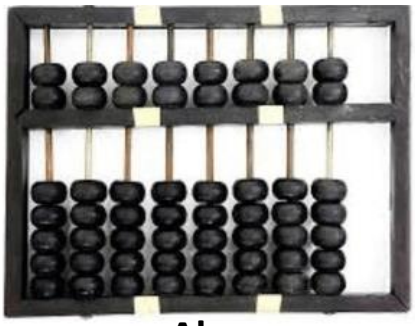
❖ What is Computer system?

- The Hardware and software of the computer are joined together to make a computer system.



❖ History of Computer:

- The first counting device was used by the primitive people. They used sticks, stones and bones as counting tools.



ry of computer begins with the birth of abacus which is believed to be the puter. It is said that Chinese invented Abacus around 4,000 years ago.

- It was a wooden rack which has metal rods with beads mounted on them. The beads were moved by the abacus operator according to some rules to perform arithmetic calculations.

Abacus

- It was a manually-operated calculating device which was invented by John Napier (1550-1617) of Merchiston. In this calculating tool, he used 9 different ivory strips or bones marked with numbers to multiply and divide. So, the tool became known as "Napier's Bones. It was also the first machine to use the decimal point.

Napier's Bones

John Napier / Nationality

Scottish

John Napier, Napier also spelled Neper, (born 1550, Merchiston Castle, near Edinburgh, Scotland—died April 4, 1617, Merchiston Castle), **Scottish** mathematician and theological writer who originated the concept of logarithms as a mathematical device to aid in calculations.

Blaise Pascal

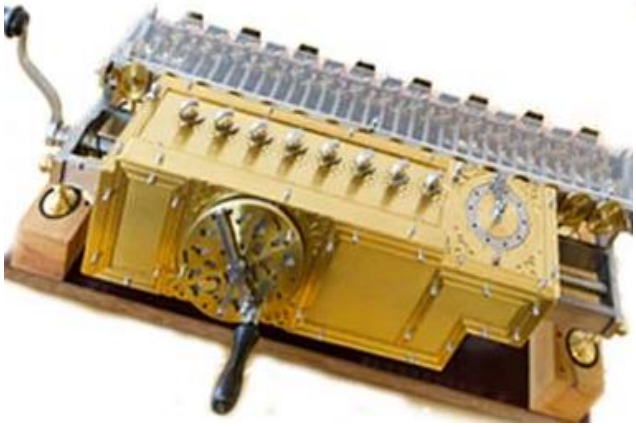
1623 - 1662

- Father of Modern Calculators
- Pascal's works in Mathimatics
- Pascal's works in Physics
- Pascal's works in Philosophy

❖ Pascaline:

- Pascaline is also known as Arithmetic Machine or Adding Machine. It was invented between 1642 and 1644 by a French mathematician-philosopher Biaise Pascal. It is believed that it was the first mechanical and automatic calculator.

❖ Stepped Reckoner or Leibnitz wheel:



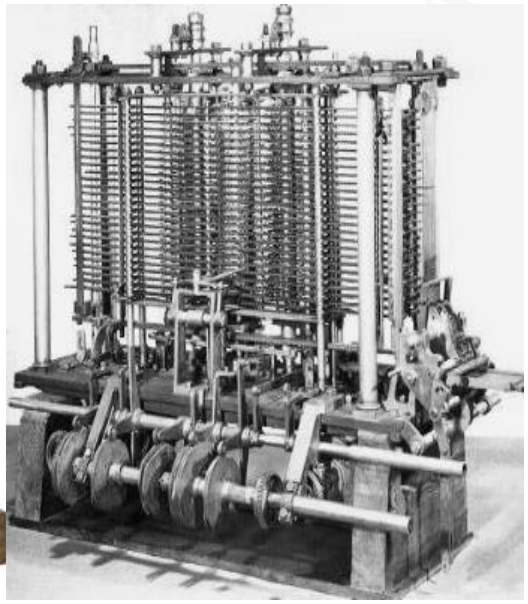
- Gottfried Wilhelm von Leibniz
  - Birth
    - July 1, 1646
  - Well known as a
    - Mathematician
    - Philosopher
  - Death
    - November 14, 1716

❖ Stepped Reckoner or Leibnitz wheel:

- It was developed by a German mathematician-philosopher Gottfried Wilhelm Leibnitz in 1673. He improved Pascal's invention to develop this machine. It was a digital mechanical calculator.

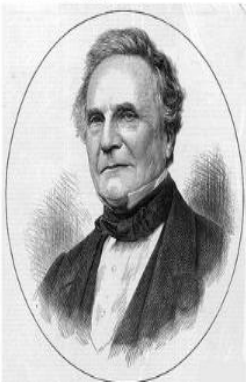
Difference Engine

Analytical Engine



Charles Babbage

- 1791-1871
- English
- Mathematician and Philosopher
- Originated the concept of a programmable computer



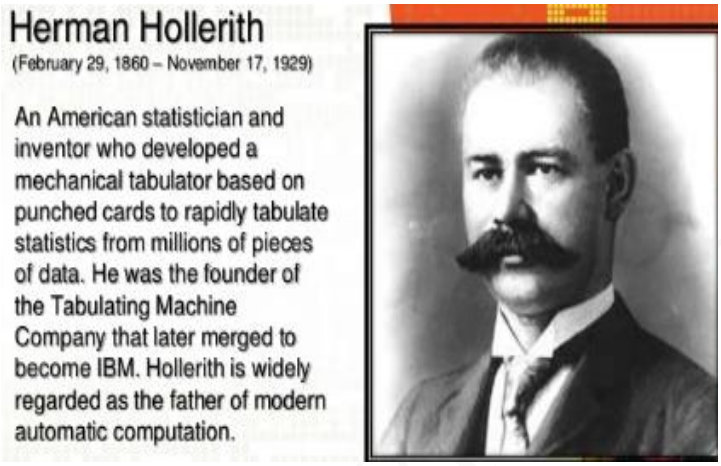
❖ Difference Engine:

- In the early 1820s, it was designed by Charles Babbage who is known as "Father of Modern Computer". It was a mechanical computer which could perform simple calculations. It was a steam driven calculating machine designed to solve tables of numbers like logarithm tables.

❖ Analytical Engine :

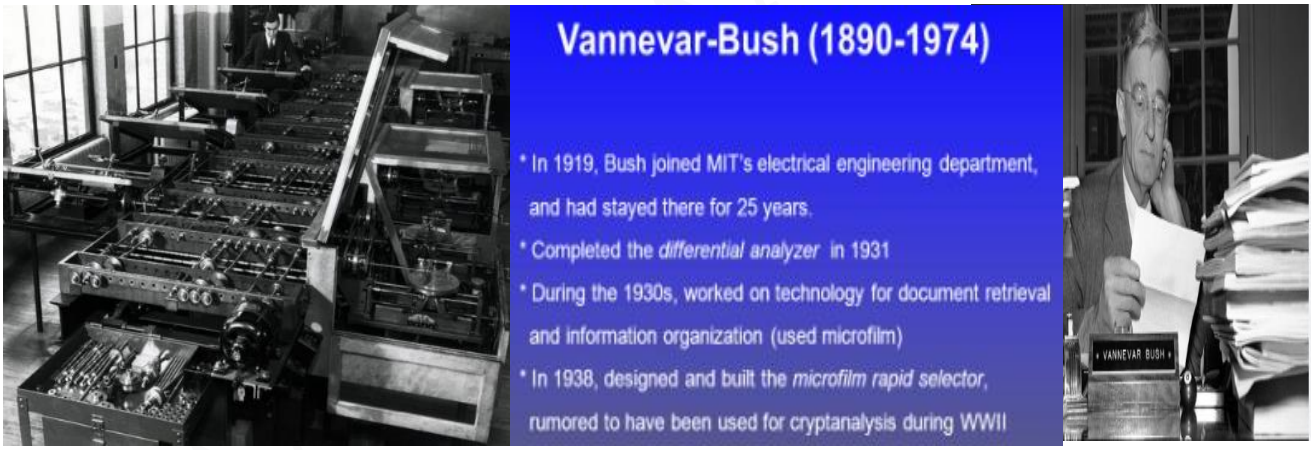
- his calculating machine was also developed by Charles Babbage in 1830. It was a mechanical computer that used punch-cards as input. It was capable of solving any mathematical problem and storing information as a permanent memory.

❖ Tabulating Machine :



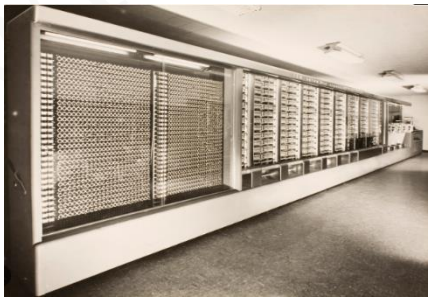
- It was invented in 1890, by Herman Hollerith, an American statistician. It was a mechanical tabulator based on punch cards. It could tabulate statistics and record or sort data or information. This machine was used in the 1890 U.S. Census. Hollerith also started the Hollerith's Tabulating Machine Company which later became International Business Machine

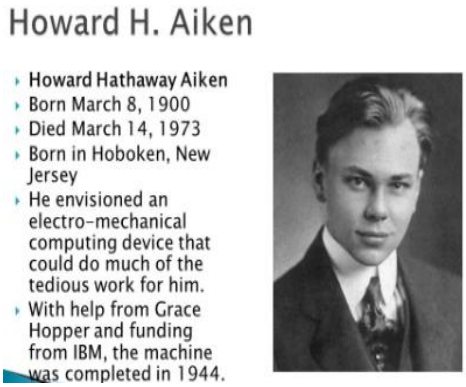
❖ Differential Analyzer :



- It was the first electronic computer introduced in the United States in 1930. It was an analog device invented by Vannevar Bush. This machine has vacuum tubes to switch electrical signals to perform calculations. It could do 25 calculations in few minutes.

Mark I





- The next major changes in the history of computer began in 1937 when Howard Aiken planned to develop a machine that could perform calculations involving large numbers. In 1944, Mark I computer was built as a partnership between IBM and Harvard. It was the first programmable digital computer.

GENERATIONS OF COMPUTERS

❖ First Generation Computers (1946-1959)

- First generation computers were slow, huge and expensive. vacuum tubes were for CPU and memory. These computers were depended on batch operating system and punch cards. Magnetic tape and paper tape were used for output and input devices.**1st generation computers: -** ENIAC, EDVAC UNIVACI, IBM-701 IBM-650

❖ Second Generation Computers (1959-1965)

- The second generation was the era of transistor computers. These computers used transistors which were cheap, compact and consuming less power. magnetic cores were used for primary memory and magnetic disc and tapes used for secondary storage. Assembly language and programming languages like COBOL and FORTRAN, and Batch processing and multiprogramming operating systems were used in these computers.
- **2nd generation computers: -** IBM 1620, IBM 7094, CDC 1604, CDC 3600, UNIVAC 1108

❖ Third Generation Computers (1965-1971)

- The third-generation computers used integrated circuits (ICs) instead of transistors. The computers became more reliable, efficient and smaller in size. used remote processing, time-sharing, multi programming as operating system. high-level programming languages like FORTRON-II TO IV, COBOL, PASCAL PL/1, ALGOL-68.
- 3rd generation computers: - IBM-360 series, Honeywell-6000 series, PDP (Personal Data Processor).

❖ Fourth Generation Computers (1971-1980)

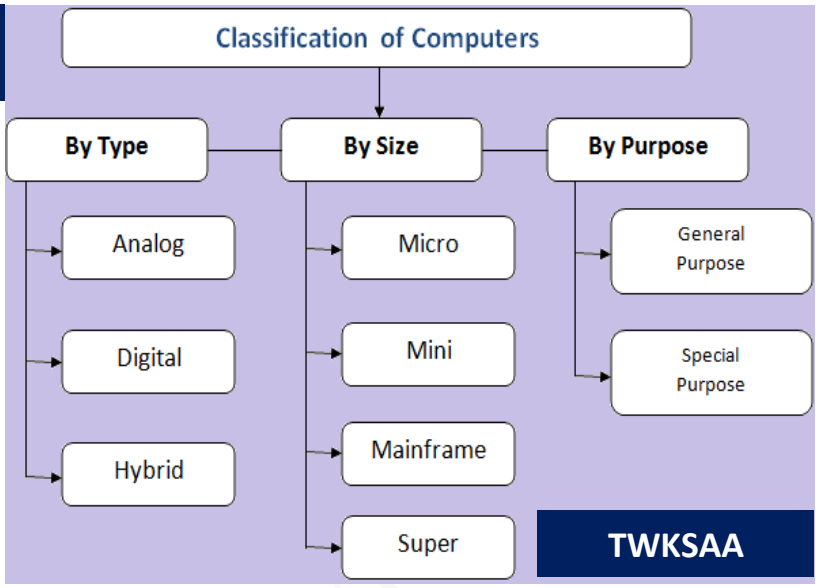
- The fourth-generation computers used very large scale integrated (VLSI) circuits. chip containing millions of transistors and other circuit elements. computers used real time, time sharing and distributed operating system. The programming languages like C, C++, DBASE.
- 4th generation computers. DEC 10, STAR 1000, PDP 11, CRAY-1(Super Computer), CRAY-X-MP (Super Computer)

❖ Fifth Generation Computers (1980-Till now)

- In fifth generation computers, VLSI technology was replaced with ULSI (Ultra Large-Scale Integration). It made possible the production of microprocessor chips with ten million electronic components. Used parallel processing hardware and AI (Artificial Intelligence) software. Programming languages used like C, C++, Java, .Net, Python, go, C#, Ruby etc.5th generation computers: -Desktop, Laptop, Notebook, Ultrabook, Chromebook

Types of Computers:

1) Based on Application
2) Based on purpose
3) Based on size and capacity



❖ Based on Application

1. Analog computer
2. Digital computer
3. Hybrid Computer

1.Analog computer

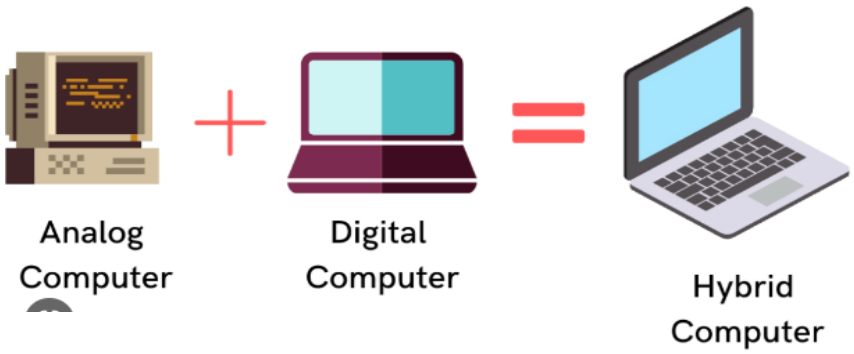
- Analogue computers are designed to process analogue data. Analogue data is continuous data that changes continuously & cannot have discrete values. It is used where don't need exact values always such as speed, temperature, pressure and current.

2.Digital computer

- Digital computer is designed to perform calculations and logical operations at high speed. It accepts the raw data as input in the form of digits or binary numbers (0 and 1) and processes it with programs stored in memory to produce output. All modern computers like laptops, desktops including smartphones that we use at home or office are digital computers.

3.Hybrid computer

- Hybrid computer has features of both analogue and digital computer.



❖ Based on purpose

1) General purpose computer
2) Special purpose computer

❖ Based on size and capacity

1) Micro computer
2) Mini computer
3) Main frame computer
4) Super computer

1.Micro computer

- Microcomputer is also known as a personal computer. It is a general-purpose computer that is designed for individual use. It has microprocessor CPU, memory, storage, I/O unit.
- Ex: -Laptop & desktop computers

2.Mini or Miniframe Computer

- A minicomputer lies between mainframe and microcomputer. It consists of two or more processors and can support 4 to 200 users at one time. Miniframe computers are used in institutes and Company.

3.Main frame Computer

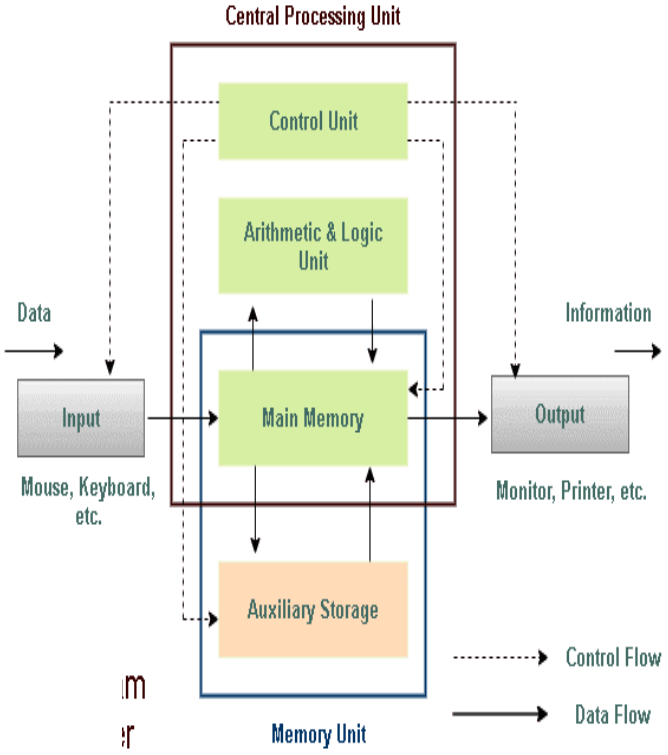
- it is a large computer capable of rapidly processing massive amounts of data at high speeds. it's large organizations for critical applications like bulk data processing.

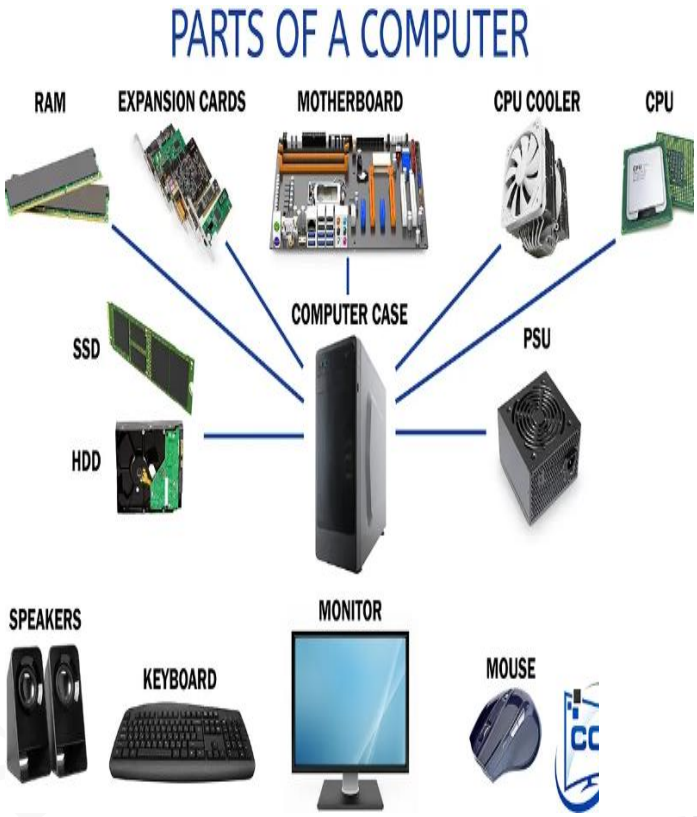
4.Super Computer

- Supercomputers are the biggest and fastest computers. They are designed to process huge amount of data. A supercomputer can process trillions of instructions in a second. It has thousands of interconnected processors. It's used in scientific and engineering applications such as weather forecasting, scientific simulations and nuclear energy research. The first supercomputer was developed by Roger Cray in 1976.

Components of Computer:

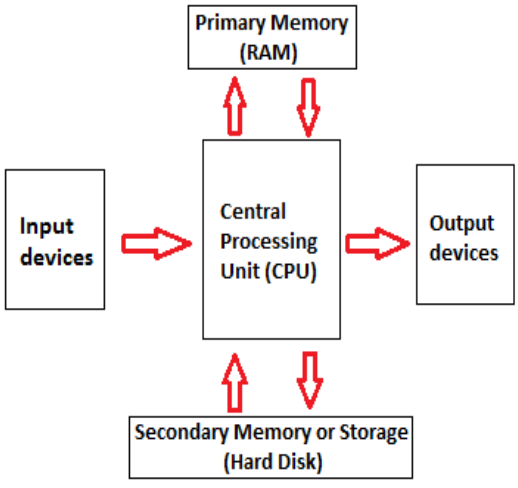
Components of Computer:

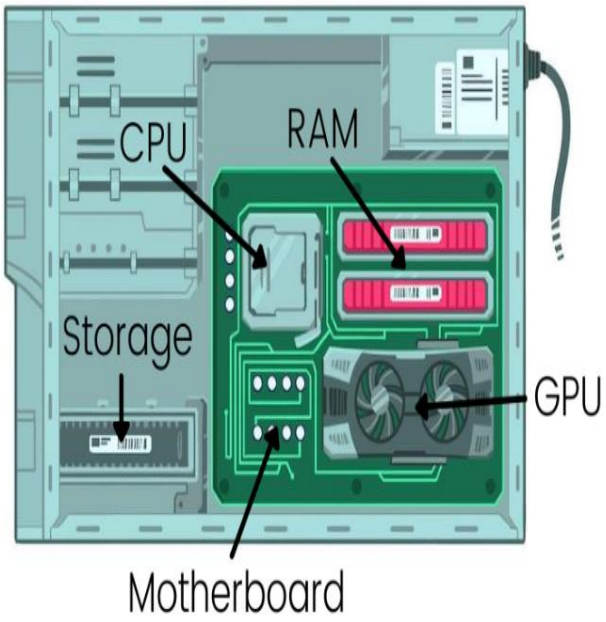




There are 5 main components of computer

1.Input Devices
2.CPU
3.Output Devices
4.Primary Memory
5.Secondary Mem





❖ Input device:

❖ Input device is that part of the computer through which we enter data, instructions and some special information into the computer.

❖ Input device name: -

- Keyboard
- Mouse
- Joy Stick
- Light pen
- Track Ball
- Scanner
- Graphic Tablet
- Microphone
- Magnetic Ink Card Reader
- Optical Character Reader
- Bar Code Reader
- Optical Mark Reader (OMR)

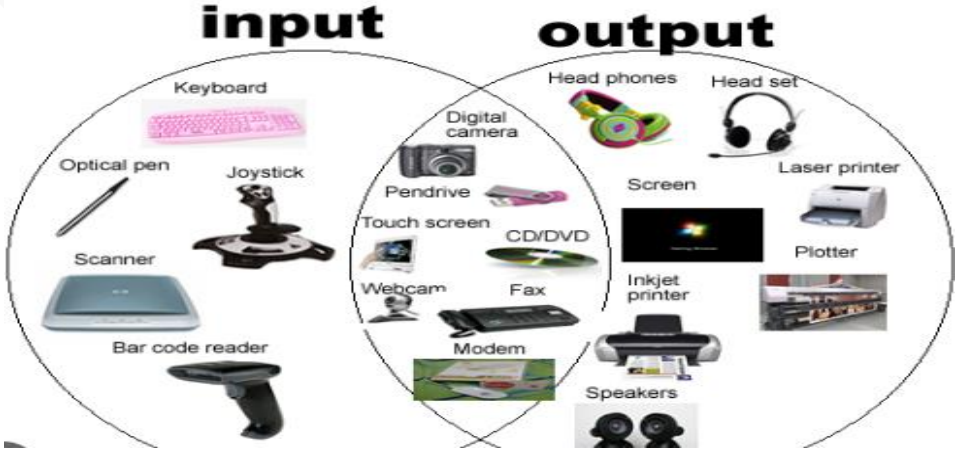
❖ Output device Name:

-Output device is the device through which we can see and understand the process data.

❖ Output Device Name: -

- Monitor
- Printer
- Headphones
- Computer Speaker
- Projector
- GPS
- Sound card
- Video card
- Braille reader
- Plotter
- Touchscreen

❖ Common input and output device Name

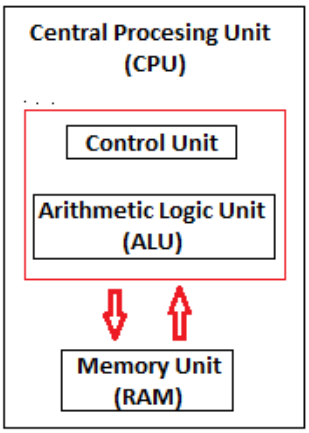


❖ Central Processing Unit (CPU):

- A Central Processing Unit is also called a processor, central processor, or microprocessor. It carries out all the important functions of a computer. It receives instructions from both the hardware and active software and produces output accordingly. It stores all important programs like operating systems and application software. CPU also helps Input and output devices to communicate with each other.

CPU is installed or inserted into a CPU socket located on the motherboard.

CPU has three components:

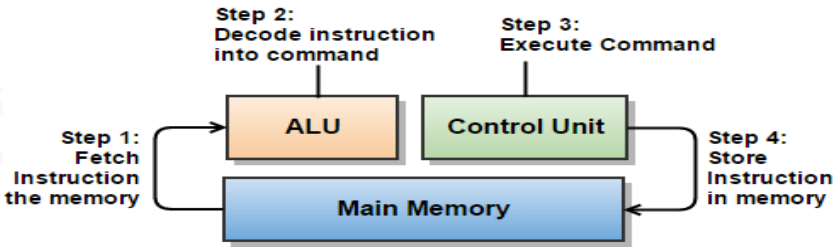


1.Control Unit: - It is circuitry in control unit, which makes use of electrical signals to instruct computer system for executing already stored instructions. It takes instructions from memory & then decodes & executes these instructions.

2.ALU: - ALU: It is the arithmetic logic unit, which performs arithmetic and logical functions. Like addition, subtraction, multiplication division, and comparisons. Logical functions include selecting, comparing, and merging data.

3.Memory Unit: - It is called Random access memory (RAM). It temporarily stores data, programs, and intermediate and final results of processing.

Control Unit

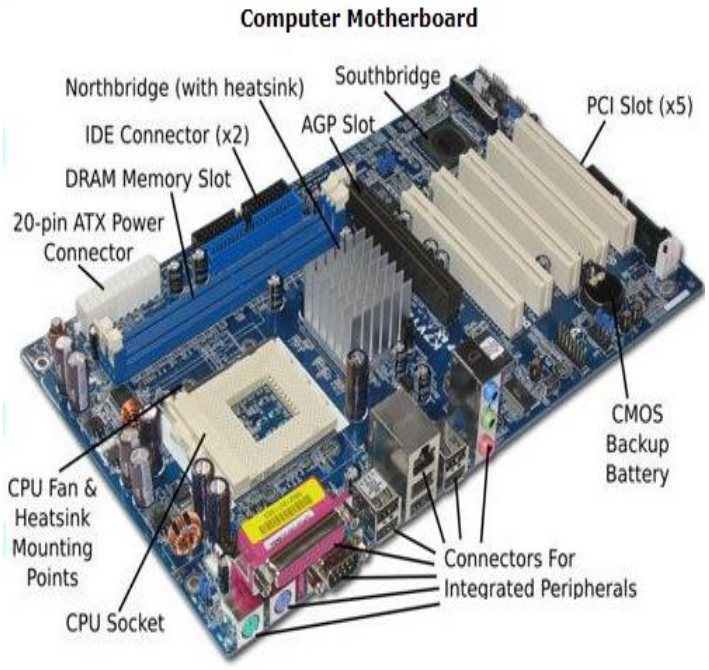


Computer Hardware: -

-It is all physical components of a computer system, including the devices connected to it.

Computer Hardware Parts: -

1.Motherboard
2.Monitor
3.Keyboard
4.Mouse etc.



1.Motherboard

- The motherboard is a circuit board that holds together almost all parts of a computer except input and output devices. All crucial hardware like CPU, memory, hard drive, and ports for input and output devices are located on the motherboard.
- **Components of Motherboard**
- CPU Slot, RAM Slot, Expansion Slot, Capacitor, Inductor (Coil), Northbridge, USB Port, PCI Slot, AGP Slot, Heat Sink, Power Connector, battery

2.Monitor

-Monitor is the display unit of a computer. The monitor is also known as a visual display unit (VDU).

Types of Monitors:

1.CRT Monitor: It has "cathode ray tubes" which produce images in form of video signals. Its main components are electron gun assembly, deflection plate assembly, glass envelope, fluorescent screen, and base.

2.LCD Monitor: It is a flat panel screen. It uses liquid crystal display technology to produce images on the screen.

3.LED Monitor: It is an advanced version of an LCD monitor.

4.Plasma Monitor: It uses plasma display technology that allows it to produce high resolutions of up to 1920 X 1080, wide viewing angle, a high refresh rate, outstanding contrast ration, and more.

3.Keyboard

- It is the most important input device of a computer. It is designed to allow you input text, characters, and other commands into a computer, desktop, tablet, etc.
- It comes with different sets of keys to enter numbers, characters, and perform various other functions like copy, paste, delete, enter, etc.
- **Types of Keyboards:**
  1.QWERTY Keyboards
  2.AZERTY Keyboards
  3.DVORAK Keyboards

Wireless keyboard

4.Mouse

- It is designed to control or move pointer (cursor) in a GUI (graphical user interface). It allows to point or select objects on computer's display screen.
- **Types of Mouse: -** Trackball, Mechanical, Optical, Wireless Mouse, etc.
- ***Functions of mouse:-***

1.Move the cursor: - to move the cursor on the screen.

2.Open or execute a program: It allows to open a folder or document and execute a program.

3.Select: It allows to select text, file, or any other object.

4.Hovering: Hovering is an act of moving the mouse cursor over a clickable object. During hovering over an object, it displays information about the object without pressing any button of the mouse.

5.Scroll: It allows to scroll up or down while viewing a long webpage or document.

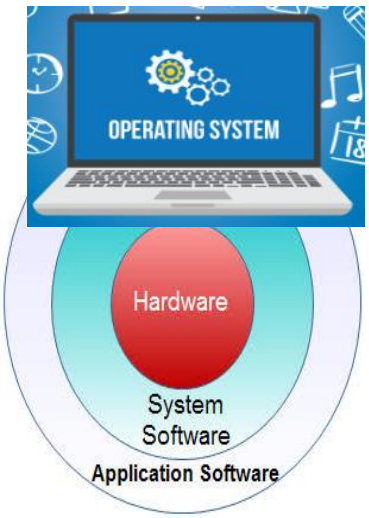
Wireless Mouse

Parts of a mouse:

1.Two buttons:
2.Scroll Wheel:
3.Motion Detection Assembly:
4.Battery:

Computer Software -

-It is a set of programs or instructions that enables or instructs hardware to perform a specific task.

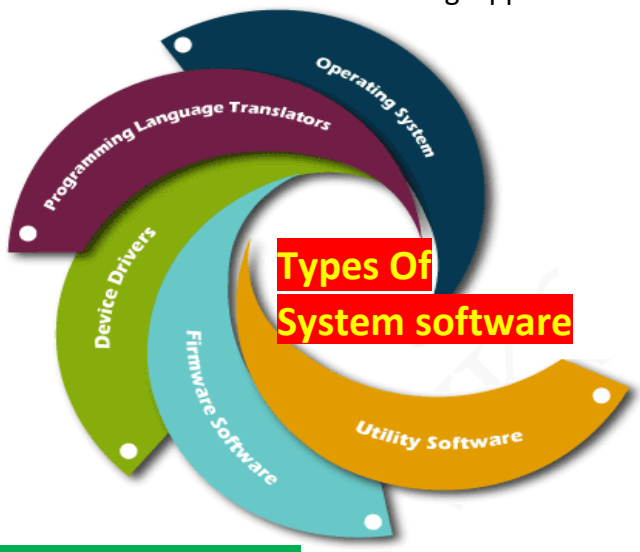


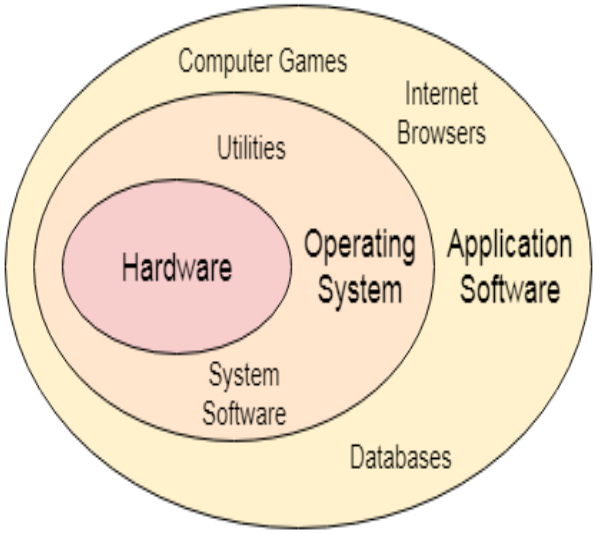
Types of Software -

1.system software
2.application software
3.programming software

1.System Software

- System software is main software in the computer. When turn on computer, it activates hardware, controls and coordinates their functioning. application Software are also controlled by system software.

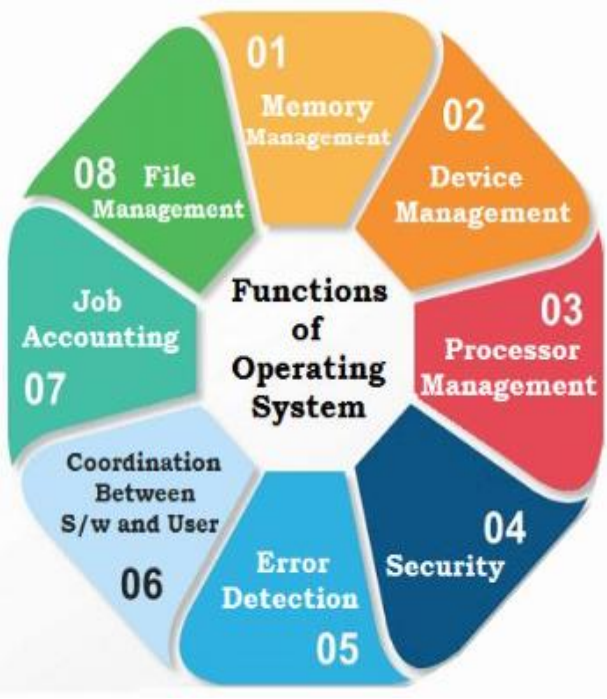




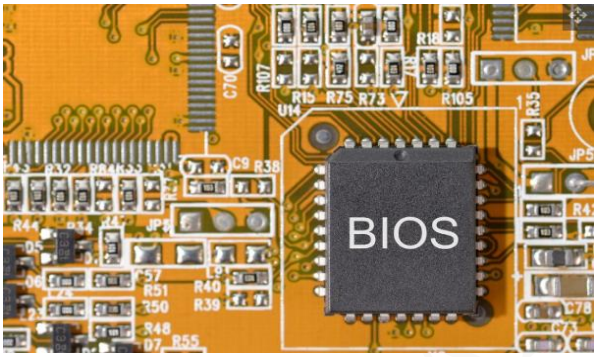
Operating System: -

- it is defined as an interface between user and hardware It is a set of Program. It is responsible for the execution o all the processes, Resource Allocation, CPU management File Management and many other tasks.

Example: -



BIOS: -



- It stands for basic input output system. It is a type of system software, which is stored in Read Only Memory (ROM) located on the motherboard. However, in advanced computer systems, it is stored in flash memory. BIOS is the first software that gets activated when you turn on your computer system.

Boot Program: -

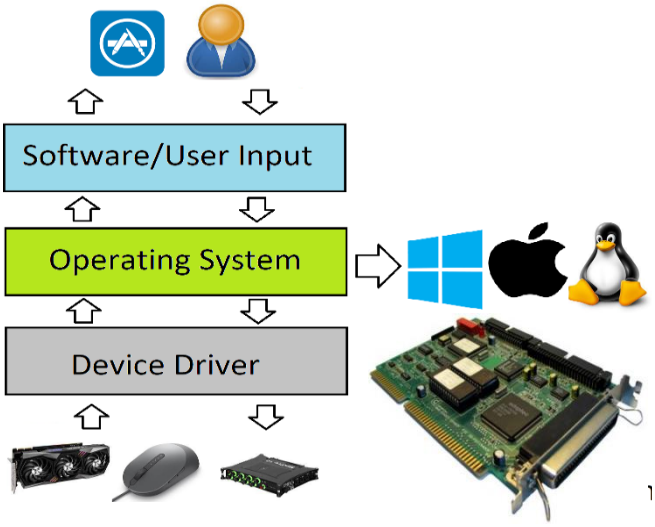
- Boot refers to starting up a computer. When we switch on computer, the commands in the ROM are executed automatically to load the boot program into memory and execute its

Assembler: -

- It plays the role of a converter as it receives basic computer instructions and converts them into a pattern of bits. The processor uses these bits to perform basic operations.

Device Driver: -

- A device driver: This system software controls hardware devices connected to a computer.



2.Application Software

- Application software is a set of programs designed to perform a specific task. It does not control the working of a computer as it is designed for end-users.

Example of Application Software

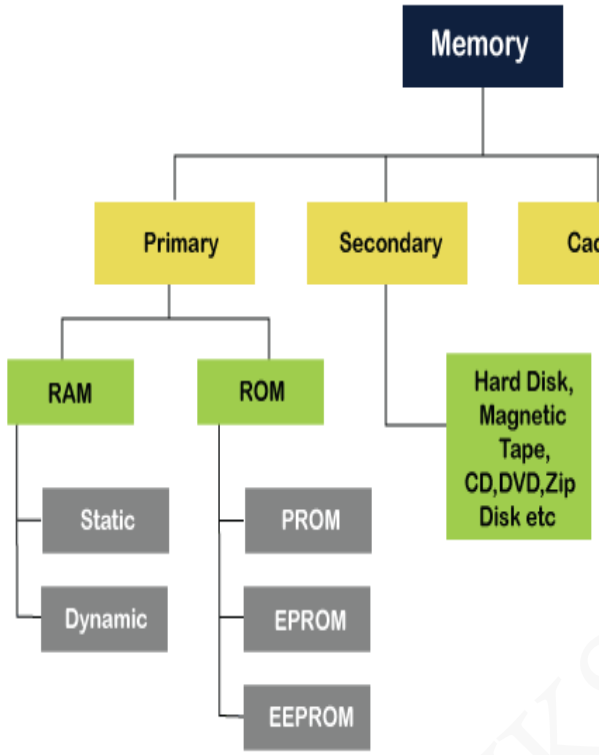
3.Programing Software

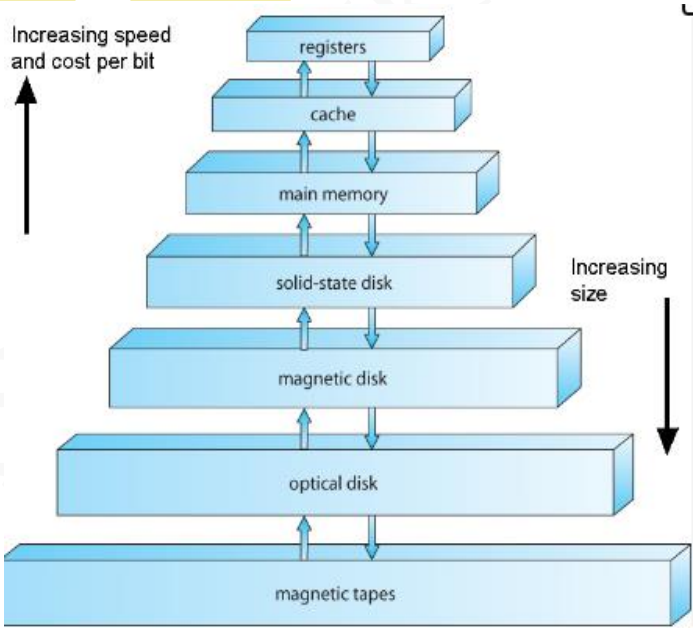
- It is a set or collection of tools that help developers in writing other software or programs. It assists them in creating, debugging, and maintaining software or programs or applications.
- It's to helps translate programming language such as Java, C++, Python, etc., into machine language code.
- it is not used by end-users.

➢ **Eclipse:** java language editor. **Coda:** programming language editor for Mac. **Notepad++:** open-source editor for windows. **Sublime text:** It is a cross-platform code editor for Linux, Mac, and Windows.

Computer Memory -

- The computer memory holds the data and instructions needed to process raw data and produce output. Computer memory is a storage space in the computer, It is used to store data/information





Computer memory is two types:

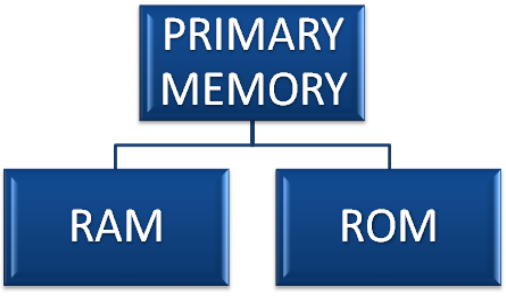
1.Volatile (RAM)
2.Non-volatile (ROM).

But, According to space or location, Computer Memory is four types:

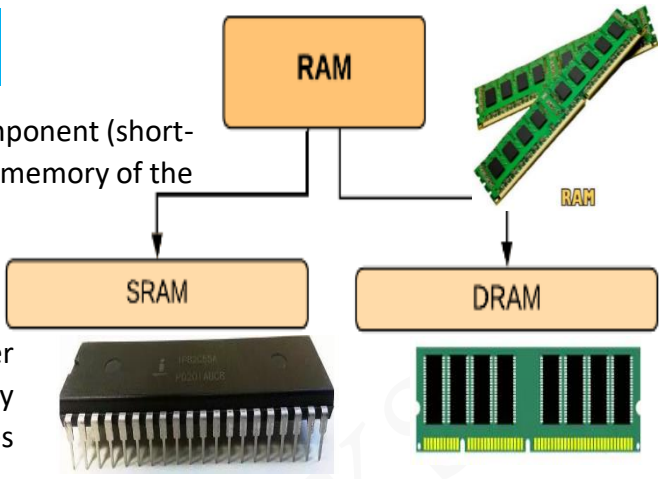
1.Primary memory
2.Secondary memory
3.Cache memory
4.Register memory

1.Primary Memory: -

- Primary Memory (also known as main memory) is the component of the computer that holds data, programs and instructions that are currently in use. Primary Memory is located on the motherboard.



1).RAM (Random Access Memory)



- Ram is a volatile memory. It is temporary storage component (short-term memory) of a computer. Or RAM is the internal memory of the CPU for storing data, program, and program result.

SRAM (Static Random Access Memory)

- It is a type of RAM that retains data as long as power is supplied. the data stored in SRAM is automatically deleted. SRAM stores data bit by bit and it's uses latching circuitry to store data bit by bit.

Types of SRAM

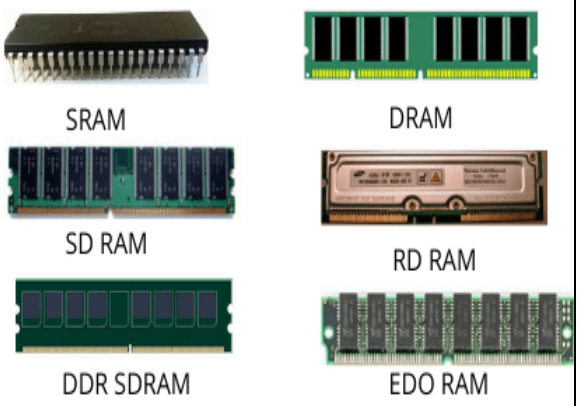
1.Asynchronous
2.Synchronous
3.Pseudo SRAM
4.Non-Volatile SRAM

DRAM (Dynamic Random Access Memory)

- It is a type of ram that consists of a memory cell made up of transistors and capacitors.

Types of SRAM

1.SDRAM (Synchronous Dynamic RAM)
2.RD RAM (Rambus DRAM)
3.DDR SDRAM (Double Data Rate Synchronous DRAM)
(DDR1 SDRAM, DDR2 SDRAM, DDR3 SDRAM, DDR4 SDRAM, DDR5 SDRAM)
4.FPM DRAM (Fast Page Mode DRAM)
5.VRAM (Video Random Access Memory)
6.EDO RAM (Extended Data Out)

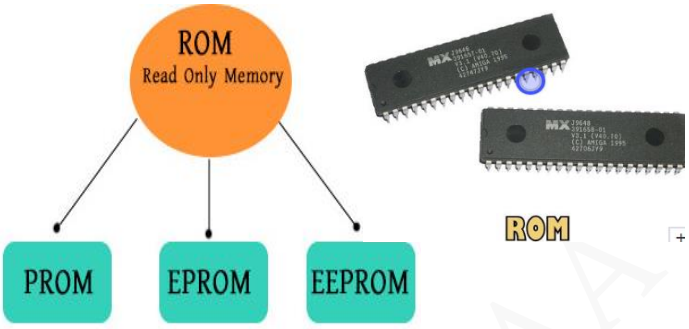


Difference between SRAM and DRAM

SRAM	DRAM
Stores data till the power is supplied	Stores data only for few milliseconds even when power is supplied
Uses an arry of 6 transistors for each memory cell	Uses a single transistor and capaitor for each memory cell
Does not refreshes the memory Cell	Needs to refresh the memory cell after each reading of the capacitor
Data access is faster	Data acces is slower
Consume more power	Consume less power
Low density/less memory per chip	High density/more memory per chip
Cost per bit is high	Cost per bit is low

2).ROM (Read only Memory): -

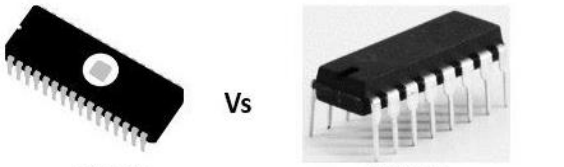
- It is a non-volatile memory. It means it does not lose data or programs that are written on it at the time of manufacture. So it is a permanent memory that contains all important data and instructions needed to perform important tasks like the boot process.



PROM (Programmable Read Only Memory)

EROM (Erasable Programmable ROM)

EEROM (ElectricallyErasable PROM)

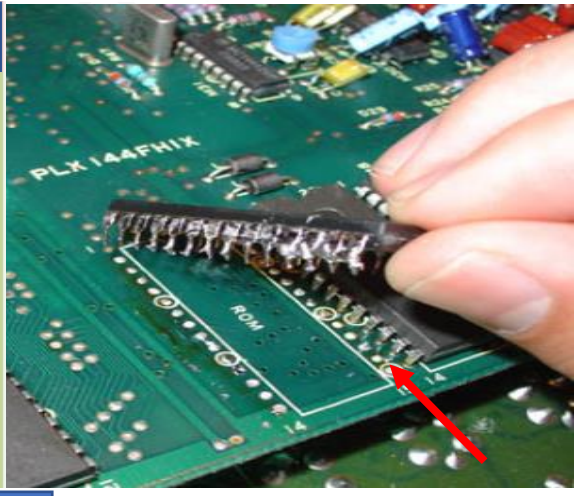


EPROM
Erasable Programmable Read-Only Memory

EEPROM
Electrically Erasable Programmable Read-Only Memory

Difference between PROM, EPROM & EEPROM

- PROM:
  - Programmable ROM
  - User can store programs only once.
  - User can make micro code program can be made that are needed mostly.
  - The process of making program in PROM is called 'Burning'.
  - Example: CD-R
- EPROM:
  - Erasable PROM
  - Information can be removed by ultra violet rays.
  - Information can be re-write after removing previous information.
  - It is cheaper than PROM because it is re-useable.
  - Example: CD(RW)
- EEPROM:
  - Electrically Erasable PROM
  - Information can be removed by electric signals.
  - It is the simplest way to store info in ROM.
  - Now it is used to store BIOS in Memory.
  - Example :Pen Drive



Difference between RAM and ROM

RAM	ROM
1. Temporary Storage.	1. Permanent storage.
2. Store data in MBs.	2. Store data in GBs.
3. Volatile.	3. Non-volatile.
4.Used in normal operations.	4. Used for startup process of computer.
5. Writing data is faster.	5. Writing data is slower.

2.Secondary Memory: -

- The secondary storage devices are built into the computer or connected to the computer are known as a secondary memory. It is also known as external memory or auxiliary storage.
- It is non-volatile, so permanently stores the data.
- The CPU can't directly access the secondary memory. First, the secondary memory data is transferred to primary memory then the CPU can access it.

Example: -

1) Hard Disk
2) Solid-state Drive
3) Pen drive
4) SD Card
5) Compact Disk (CD)
6) DVD etc.

Hard Disk

Solid-state Drive

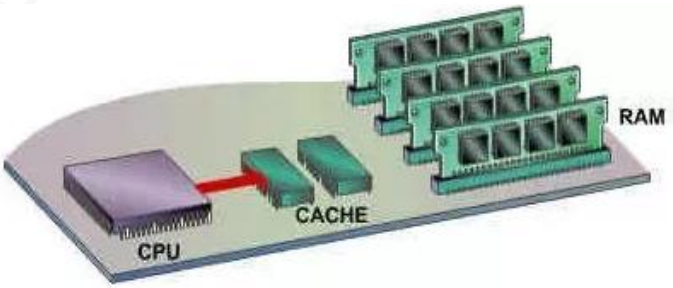
Pen drive

SD Card

Compact Disk (CD)

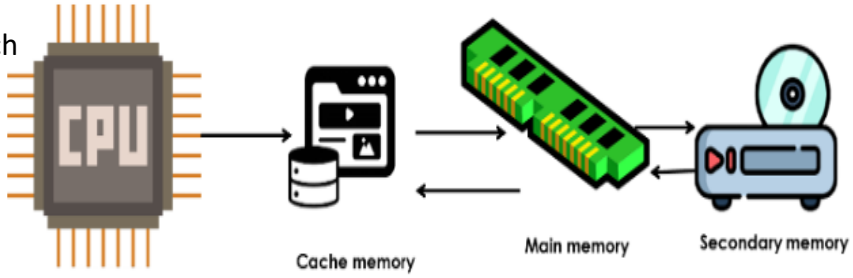
DVD

3.Cache Memory: -



- -Cache memory is a high-speed memory, which is small in size but faster than main memory (RAM).
- -CPU access it more quickly than t primary memory.
- Cache memory can only be accessed by CPU.
- It holds the data and programs which
- are frequently used by the CPU.

When the CPU needs data, it looks first in cache memory.



4. Register Memory: -

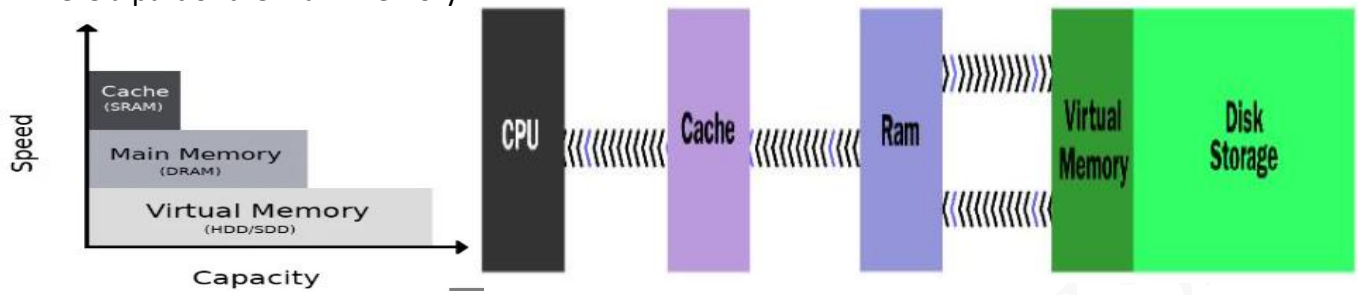
- It is smallest and fastest memory in a computer. It is not a part of main memory and is located in CPU in the form of registers, A register temporarily holds frequently used data, instructions, and memory address that are to be used by CPU. Registers hold a small amount of data around 32 bits to 64 bits.

Types of Register Memory: -

1.Data Register, 2.Program Counter (PC), 3.Instructor Register, 4.Accumulator Register, 5.Address Register, 6.I/O Address Register, 7.I/O Buffer Register

Virtual Memory: -

-Virtual memory is a memory management technique where secondary memory can be used as if it were a part of the main memory.



Memory Unit: -

-Memory units are used to measure and represent data.

1) Bit: The computer memory units start from bit. A bit is the smallest memory unit to measure data stored in main memory and storage devices. A bit can have only one binary value out of 0 and 1.

2) Byte: It is the fundamental unit to measure data. It contains 8 bits or is equal to 8 bits. Thus a byte can represent 2*8 or 256 values.

3) Kilobyte (KB): A kilobyte contains 1024 bytes.

4) Megabyte (MB): A megabyte contains 1024 kilobytes.

5) Gigabyte (GB): A gigabyte contains 1024 megabyte.

6) Terabyte (TB): A terabyte contains 1024 gigabytes.

Computer Virus: -

-Computer viruses are unwanted software programs or pieces of code that interfere with the functioning of the computer. They spread through contaminated files, data, and insecure networks.

Types of Computer Virus:

1.Overwrite Virus: -It is simplest computer virus that overwrites the code of the host computer system's file with its own malicious code.

2.Append Virus: - this virus appends its malicious code to the end of the host program's file.

3. Macro Virus-It's alters or infects the macros of a document or data file.

4. Boot Virus :- it's alters boot sector program stored in hard disk or any other storage device.

5. Resident Virus :- it's stays permanently in the primary memory (RAM) of the computer.

6. Multipartite Virus :- it's spreads and infects in multiple ways. It infects both the boot sector and the executable files stored on the hard drive simultaneously. Etc……

NUMBER SYSTEM

1) Binary Number:

- Binary number system, is a base-2 numeral system that uses two symbols**: 0 and 1.**
- It's the foundation of digital technology and computing.
- Binary is fundamental in modern computing because digital devices, such as computers and microcontrollers, use binary to process and store data.
- All data, including text, images, sound, and videos, is ultimately represented in binary form within these devices.
- it directly corresponds to the on and off states of electronic switches and represents information using two distinct states.
- (0, 1) $( )_2$ {Base or Radix)

Example: 0, 1, 01, 10, 1110, 10101011, 111001110101 etc.

2) Decimal Number:

- The decimal number system, also known as the base-10 number system, is a positional numeral system that uses ten symbols (0, 1, 2, 3, 4, 5, 6, 7, 8, and 9) to represent numbers.
- It's the most common number system used by humans in everyday life.
- The decimal system is essential for everyday arithmetic, commerce, science, and a wide range of applications.
- (0,1…..9) $( )_{10}$ {Base or radix)

Example: 0,1,2,4,5,6,7,8,9,10,11,12,13,14, 15……..

3) Octal Number:

- The octal number system, also known as base-8, is a positional numeral system that uses eight symbols (0, 1, 2, 3, 4, 5, 6, and 7) to represent numbers.
- The octal system was more commonly used in computing systems that were based on multiples of 3 (as opposed to the binary system's base-2).
- However, octal has largely been replaced by hexadecimal (base-16) in modern computing due to its compatibility with binary and its more compact representation.
- **(0,1,2…….7) $( )_{8}$ {Base or radix}**

Example: 0,1,2,3,4,5,6,7,10, 11,…17,20,21……..27,30,31…….

4) Hexadecimal Number:

- Hexadecimal number system, often referred to as "hex" or base-16, is a positional numeral system that uses sixteen symbols: 0-9 for values 0 to 9, and A-F (or a-f) for values 10 to 15.
- The hexadecimal system is widely used in computing and digital systems as a concise way to represent binary data and memory addresses.
- Hexadecimal is often used in programming and computer science because it provides a more compact representation of binary data, and it's easier to work with when converting between binary and other number systems.
- (0 …….9, A,B,C,D,E,F) $( )_{16}$ {Base or Radix}

Example: 0, 1, 2, 3, 4, 5, 6, 7,8, 9, A, B, C, D, E, F, 1a,1b,1c …….. et

HOW A COMPUTER WORKS?

1. **Power On:** When you press the power button, electricity flows into the computer's components, including the motherboard, CPU and other peripherals.
2. **Basic Input/Output System (BIOS):** The computer's BIOS performs a Power-On Self-Test (POST) to ensure that all essential hardware components are functioning correctly
3. **Boot Process:** The BIOS locates and loads the bootloader from the computer's storage device The bootloader, in turn, starts the operating system.
4. **Operating System (OS) Load:** The operating system (e.g., Windows, macOS, Linux) is loaded into the computer's RAM . RAM is volatile memory, meaning its contents are erased when the computer is turned off.
5. **User Interaction:** Once the operating system is loaded, you can interact with the computer through a graphical user interface (GUI) or a command-line interface (CLI).
6. **Program Execution:** When you open an application or run a program, the CPU fetches the necessary instructions from the program stored on the storage device into RAM.
7. **CPU Execution:** The CPU, also known as the brain of the computer, decodes and executes the instructions one by one, performing arithmetic and logical operations as needed.
8. **Data Processing:** As the CPU executes the program's instructions, it processes and manipulates data stored in the RAM
9. **Input and Output (I/O):** If the program requires user input or produces output, the data is sent to and from input/output devices such as the keyboard, mouse, monitor, and other peripherals.
10. **Storage:** During program execution, temporary data and results are stored in the RAM for fast access. However, for long-term storage, data is saved to non-volatile storage devices such as the hard drive, solid-state drive, or cloud storage.
11. **Control Flow:** The CPU keeps track of the order in which instructions are executed, utilizing control flow mechanisms like conditional statements (if-else) and loops.
12. **Interrupts:** While the CPU is executing instructions, it can receive hardware or software interrupts. These are signals that temporarily pause the current task to handle urgent events, such as input from the keyboard or network activity.
13. **Multi-tasking:** Modern operating systems support multi-tasking, allowing multiple programs to run concurrently.
14. **Termination:** When a program completes its task or is closed by the user, it releases the resources it was using, and its data is removed from RAM.
15. **Shut Down:** When you decide to turn off the computer, the OS saves essential system configurations and data to the storage device and gracefully shuts down.

keyboard shortcuts along with their functions

- **Ctrl + C: Copy -** Copies the selected text or item to the clipboard.
- **Ctrl + X: Cut -** Cuts the selected text or item and copies it to the clipboard.
- **Ctrl + V: Paste** - Pastes the contents of the clipboard at the current cursor position.
- **Ctrl + Z: Undo -** Reverses the last action.
- **Ctrl + Y: Redo -** Reverses the last undo action.
- **Ctrl + A: Select All -** Selects all text or items in the current context.
- **Ctrl + F: Find -** Opens the Find dialog to search for specific text or content.
- **Ctrl + S: Save -** Saves the current document or file.
- **Ctrl + P: Print -** Opens the Print dialog to print the current document or file.
- **Ctrl + N: New -** Creates a new document or file in the current application.
- **Ctrl + O: Open -** Opens an existing document or file in the current application.
- **Ctrl + B: Bold -** Applies bold formatting to the selected text.
- **Ctrl + I: Italic -** Applies italic formatting to the selected text.
- **Ctrl + U: Underline -** Applies underline formatting to the selected text.
- **Ctrl + E: Center Align -** Aligns the selected text or content to the center.
- **Ctrl + L: Left Align -** Aligns the selected text or content to the left.
- **Ctrl + R: Right Align -** Aligns the selected text or content to the right.
- **Ctrl + Home:** Move to the beginning of the document or page.
- **Ctrl + End:** Move to the end of the document or page.
- **Ctrl + Tab:** Switch between open tabs or documents in an application.
- **Ctrl + Shift + Tab:** Reverse switch between open tabs or documents.
- **Alt + Tab:** Switch between open applications (Windows) or open documents (macOS).
- **Ctrl + Shift + Esc:** Open Task Manager (Windows) - Allows you to manage running processes and applications.
- **Ctrl + Shift + T:** Reopen Closed Tab - Restores the last closed tab in a web browser.
- **Ctrl + D: Bookmark -** Adds the current page or location as a bookmark in a web browser.
- **Ctrl + W: Close Tab or Window -** Closes the current tab or window in a web browser or application.
- **Ctrl + Shift + N:** New Incognito/Private Window - Opens a private browsing window in a web browser.
- **Ctrl + Shift + Delete:** Clear Browsing Data - Opens the option to delete browsing history, cookies, and cache in a web browser.
- **Alt + F4: Close Application -** Closes the active window or application.
- **Windows Key + D:** Show Desktop (Windows) - Minimizes all open windows and shows the desktop.
- **Windows Key + L:** Lock Computer (Windows) - Locks the computer screen, requiring a password to log back in.
- **Windows Key + R:** Run Command (Windows) - Opens the Run dialog to execute commands.

- **Windows Key + E:** Open File Explorer (Windows) - Opens the file explorer to browse files and folders.
- **Windows Key + Print Screen:** Take a Screenshot (Windows) - Captures the entire screen and saves it to the Screenshots folder.
- **Ctrl + Shift + S: Save As** - Opens the Save As dialog to save a file with a new name or in a different location.
- **Ctrl + Shift + C: Copy Formatting -** Copies the formatting of the selected text and applies it elsewhere.
- **Ctrl + Shift + V: Paste Formatting -** Applies the copied formatting to the selected text.
- **Ctrl + Shift + Arrow keys: Select Text -** Expands the selection of text in the direction of the arrow key.
- **Ctrl + Backspace: Delete Previous Word** - Deletes the word to the left of the cursor.
- **Ctrl + Delete: Delete Next Word -** Deletes the word to the right of the cursor.
- **Ctrl + Shift + Arrow keys (in Excel): Select Cells -** Expands the selection of cells in the direction of the arrow key.
- **Ctrl + Shift + +: Insert Rows or Columns (Excel) -** Inserts rows or columns in an Excel worksheet.
- **Ctrl + -: Delete Rows or Columns (Excel) -** Deletes rows or columns in an Excel worksheet.
- **Ctrl + Shift + L: Apply Filter (Excel) -** Toggles the filter on or off in an Excel worksheet.
- **Ctrl + Page Up:** Move to the previous tab or document in an application (Excel, browser, etc.).
- **Ctrl + Page Down:** Move to the next tab or document in an application (Excel, browser, etc.).
- **Ctrl + Shift + U: Change Case -** Changes the case of the selected text (uppercase, lowercase, title case).
- **Ctrl +]: Increase Font Size - I**ncreases the font size of the selected text.
- **Ctrl + [: Decrease Font Size -** Decreases the font size of the selected text.
- **Ctrl + 0: Zoom to 100% -** Restores the zoom level to 100% in a web browser or application.
- **Ctrl + +/-: Zoom In/Out -** Increases or decreases the zoom level in a web browser or application.
- **Ctrl + 1, 2, 3, etc.: Switch Tabs -** Jumps to the specified tab number in a web browser or application.
- **Ctrl + Shift + Tilde (~):** Switch Language (Windows) - Toggles between different input languages or keyboard layouts.
- **Ctrl + Shift + Space:** Select Text by Word - Expands the selection of text one word at a time.
- **Ctrl + Shift + Enter:** Run as Administrator (Windows) - Opens a program with administrative privileges.
- **Ctrl + Enter: Insert Line Break -** Inserts a line break in a text document or text box.
- **Ctrl + Shift + Enter (in Excel):** Enter Formula as an Array - Completes an array formula in Excel.

- **Ctrl + Alt + Delete:** Task Manager (Windows) - Opens the Task Manager for managing running processes and applications.
- **Ctrl + Alt + Esc:** Switch Applications (Windows) - Cycles through open applications without needing to use Alt + Tab.
- **Ctrl + Alt + Delete + Enter:** Lock Computer (Windows) - Locks the computer screen immediately.
- **Ctrl + Alt + Print Screen:** High Contrast Mode (Windows) - Enables high contrast mode for improved visibility.
- **Ctrl + Alt + Arrow keys (in Excel):** Move to the Edge of Data Region - Moves the cursor to the edge of the data region in an Excel worksheet.
- **Ctrl + Alt + M:** Insert Comment - Inserts a comment in a document or spreadsheet.
- **Ctrl + Alt + Del: Soft Reboot (Windows) -** Opens a menu to shut down, restart, or log off the computer

❖ Research(अनुसंधान):

- अनुसंधान (Research) एक प्रणालीकरण कार्य होता है जिसमें विशेष विषय या विषय की नई ज्ञान एवं समझ को प्राप्त करने के लिए सिद्धांतिक जांच और अध्ययन किया जाता है। इसकी प्रक्रिया में डेटा का संग्रह और विश्लेषण, निष्कर्ष निकालना और विशेष क्षेत्र में मौजूदा ज्ञान में योगदान किया जाता है। अनुसंधान के माध्यम से विज्ञान, प्रोधोगिकी, चिकित्सा, सामाजिक विज्ञान, मानविकी, और अन्य क्षेत्रों में विकास किया जाता है। अनुसंधान की प्रक्रिया में अनुसंधान प्रश्न या कल्पनाएँ तैयार की जाती हैं, एक अनुसंधान योजना डिज़ाइन की जाती है, डेटा का संग्रह किया जाता है, विश्लेषण किया जाता है, निष्कर्ष निकाला जाता है और परिणामों को उचित दर्शाने के लिए समाप्ति तक पहुंचाया जाता है।

❖ Innovation(नवीनीकरण): -

- Innovation (इनोवेशन) एक विशेषता या नई विचारधारा की उत्पत्ति या नवीनीकरण है। यह नए और आधुनिक विचारों, तकनीकों, उत्पादों, प्रक्रियाओं, सेवाओं या संगठनात्मक ढंगों का सृजन करने की प्रक्रिया है जिससे समस्याओं का समाधान, प्रतिस्पर्धा में अग्रणी होने, और उपयोगकर्ताओं के अनुकूलता में सुधार किया जा सकता है।

❖ Discovery (आविष्कार):

- Discovery का अर्थ होता है "खोज" या "आविष्कार"। यह एक विशेषता है जो किसी नए ज्ञान, अविष्कार, या तत्व की खोज करने की प्रक्रिया को संदर्भित करता है। खोज विज्ञान, इतिहास, भूगोल, तकनीक, या किसी अन्य क्षेत्र में हो सकती है। इस प्रक्रिया में, व्यक्ति या समूह नए और अज्ञात ज्ञान को खोजकर समझने का प्रयास करते हैं और इससे मानव सिविलाइजेशन और विज्ञान-तकनीकी के विकास में योगदान देते हैं।

Note: अनुसंधान विशेषता या विषय पर नई ज्ञान के प्राप्ति के लिए सिस्टमैटिक अध्ययन है, जबकि आविष्कार नए और अज्ञात ज्ञान की खोज है।

TWKSAA RID MISSION

(Research)	(Innovation)	(Discovery)
अनुसंधान करने के महत्वपूर्ण कारण:	**नवीनीकरण करने के महत्वपूर्ण कारण:**	**खोज करने के महत्वपूर्ण कारण:**
1. नई ज्ञान की प्राप्ति	1. प्रगति के लिए	1. नए ज्ञान की प्राप्ति
2. समस्याओं का समाधान	2. परिवर्तन के लिए	2. ज्ञान के विकास में योगदान
3. तकनीकी और व्यापार में उन्नति	3. उत्पादन में सुधार	3. अविष्कारों की खोज
4. विकास को बढ़ावा देना	4. प्रतिस्पर्धा में अग्रणी होने के लिए	4. समस्याओं का समाधान
5. सामाजिक प्रगति	5. समाज को लाभ	5. समाज के उन्नति का माध्यम
6. देश विज्ञान और प्रौद्योगिकी का विकास	6. देश विज्ञान और प्रौद्योगिकी के विकास।	6. देश विज्ञान और तकनीक के विकास

➢ जो लोग रिसर्च, इनोवेशन और डिस्कवरी करते हैं उन लोगों को ही हमें अपना नायक, प्रतीक एवं आदर्श मानना चाहिए क्योंकि यें लोग हमारे समाज, देश एवं विज्ञान के क्षेत्र में प्रगति, विकास और समस्याओं के समाधान में महत्वपूर्ण भूमिका निभाते हैं।

मैं राजेश प्रसाद एक वीणा उठाया हूँ Research, Innovation and Discovery का जिसका मुख्य उदेश्य हैं आने वाले समय में सबसे पहले New(RID, PMS & TLR) की खोज, प्रकाशन एवं उपयोग भारत की इस पावन धरती से ही हो |

"अगर आप भी Research, Innovation and Discovery के क्षेत्र में रूचि रखतें हैं एवं अपनी प्रतिभा से दुनियां को कुछ नया देना चाहतें तो हमारे इस त्वक्सा रीड मिशन (TWKSAA RID MISSION) से जरुर जुड़ें" |

- **राजेश प्रसाद**