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YOUTH COMPETITION TIMES

COMPUTER CAPSULE

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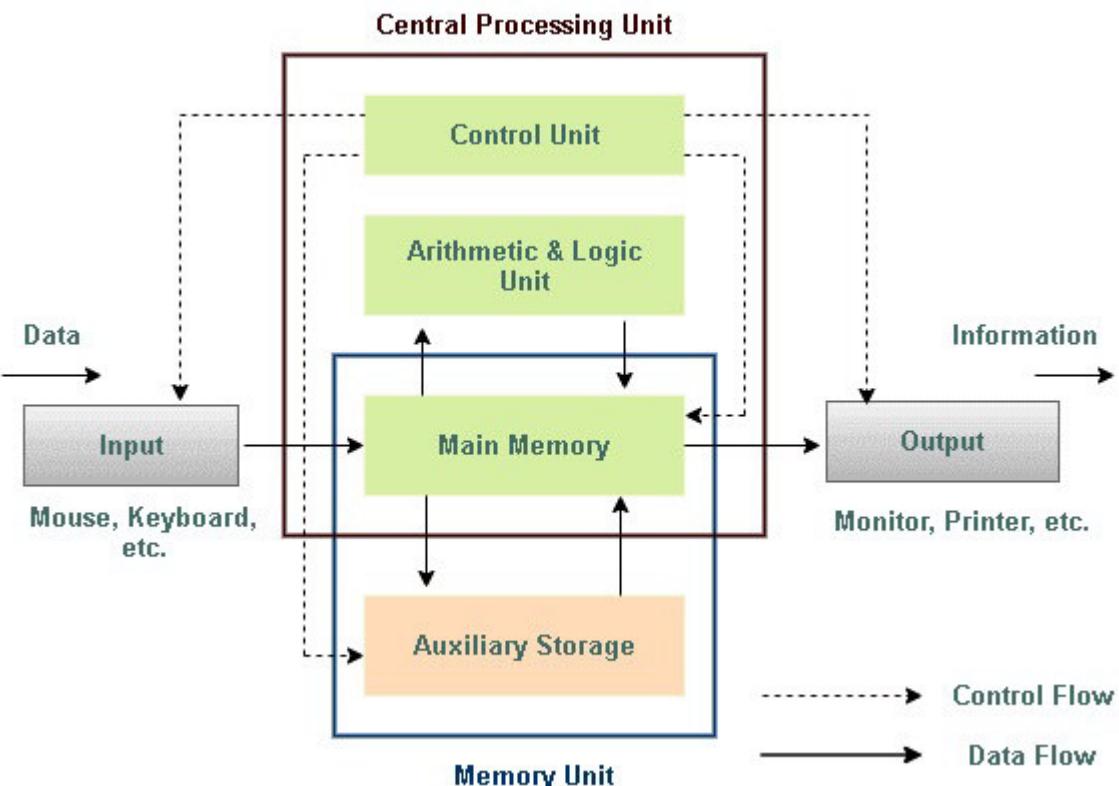
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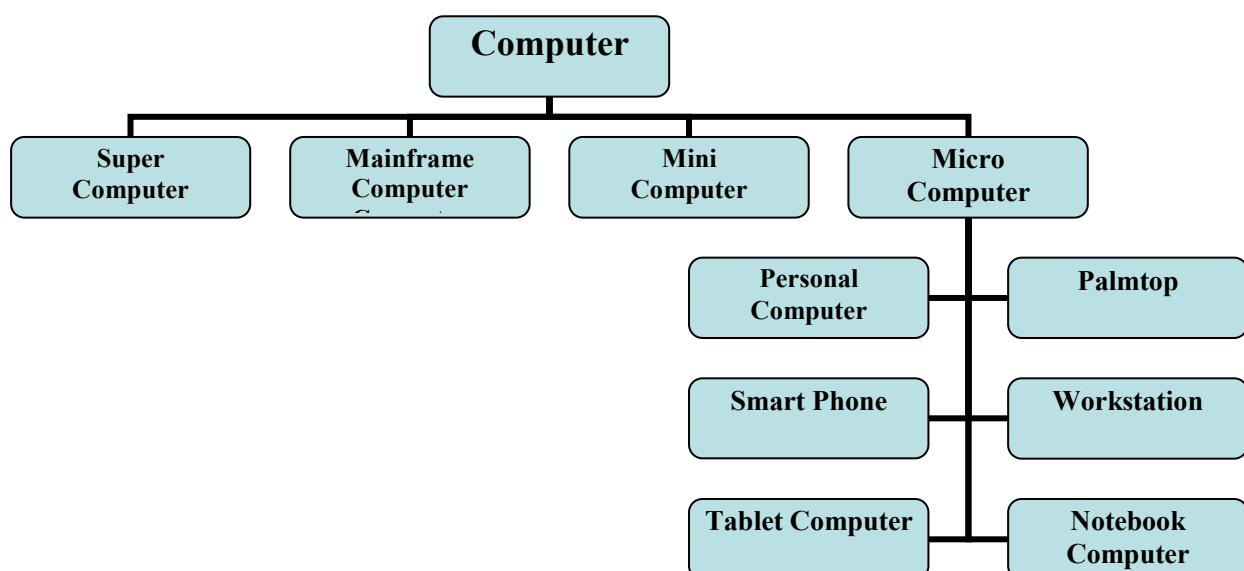
Introduction of Computer

Computer system- A computer is an electronic device that can be programmed to accept data (input), process it and generate result (output). A computer along with additional hardware and software together is called a computer system.



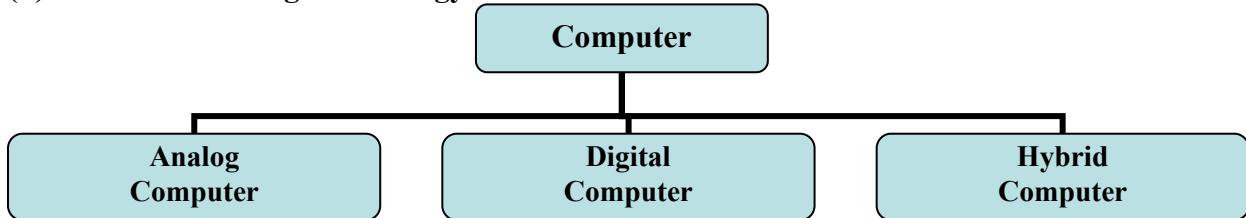
Classification of Development of Computer

(i) Based on size and work.



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(ii) Based on working Technology



Comparison of computer types

Computer Types	Size and Capacity	Cost	Processing Speed	Usage
Super Computer	Huge amounts of data, largest size	Most expensive	Fastest computer in the world	It is used in scientific research areas for analyzing data obtained from exploring the solar system, satellites, weather forecasting etc.
Mainframe Computer	Large amounts of data, very large size	Expensive	Very fast	It is used in large organizations with multiple simultaneous users e.g. banks
Mini Computer	Its low weight and small capacity	Less expensive	Fast	It is used in universities and departments of large companies.
Micro Computer	smallest, can fit on a desktop	Cheapest	Fast	It is used in home, personal use by one user at a time.

Analog computer and Digital Computer

Analog Computer	Digital Computer
1. Analog computers works with continuous values or these types of systems process continuous data.	1. Digital computers works with discrete values or these types of systems process discrete data.
2. Speed of analog computers is less than the digital computers.	2. Speed of digital computers is more than the analog computers.
3. Analog computer has very low or limited memory and it can store less amount of data.	3. Digital computer has very big memory it can store large amount of data.
4. Analog computers are less reliable than digital computers.	4. Digital computers are more reliable than analog computers.
5. Its speed of processing is not so high.	5. Its speed of processing is very high.
6. It provides results with less accuracy as compared to digital computers.	6. It provides results with higher accuracy as compared to analog computers.
7. Analog computers have complex architecture.	7. Digital computers do not have so complex architecture like analog computers.
8. Analog computers show the result in terms of voltage signals.	8. Digital computers show the result in computer display screen.
9. Readability of analog computers is low.	9. Readability of digital computer is high.
10. Examples includes analog clock and thermometer etc.	10. Examples includes digital laptop, digital camera, digital watches etc.

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Characteristics of Computer

Speed- A computer works with much higher speed and accuracy compared to humans while performing mathematical calculations.

Reliability- A computer is reliable as it gives consistent result for similar set of data. If we give same set of input any number of times, we will get the same result.

Accuracy- Computers perform calculations with 100% accuracy errors may occur due to data inconsistency or inaccuracy.

Consistency- The computer is so consistent that it can perform trillions of processes without errors for several hours

Diligence- A computer can perform millions of tasks or calculations with the same consistency and accuracy.

Memory- A computer has built-in memory called primary memory where it stores data, where it can store instant data immediately

Versatility- Versatility refers to the capability of a computer to perform different kinds of works with same accuracy and efficiency.

Remembrance Power- The computer has the power to store any data or information for as long as we like. Data can also be recalled easily if needed.

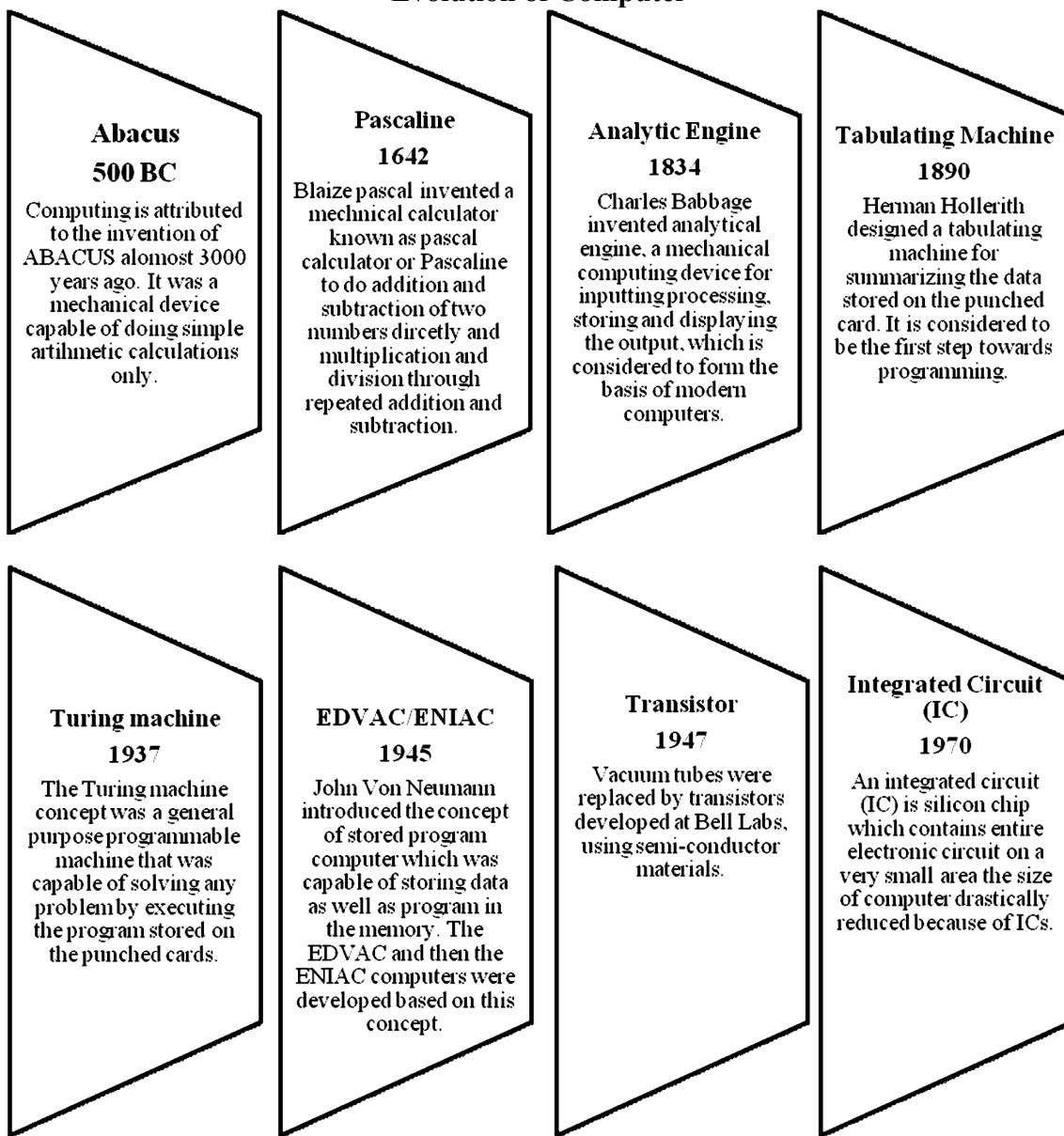
Storage Capacity- Computer can store huge amounts of data.

Automation- Computers can also be used to automate routine tasks with the help of a task scheduler.

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Evolution of Computer



Generations of Computers- At a Glance

Generations	Hardware	Software	Memory	Input/Output Devices	Language	Examples of Generations	Advantages/ disadvantages
First Generation (1940-1956)	Vacuum Tube	Machine language binary (0, 1)	Magnetic tapes and magnetic drums	Paper tape and punched cards	Low level language, Machine language (0,1)	ENIAC, EDVAC, UNIVAC, IBM 650, IBM 701	Consume lot of electricity, expensive, large size, higher energy, Consumption Greater chance of error

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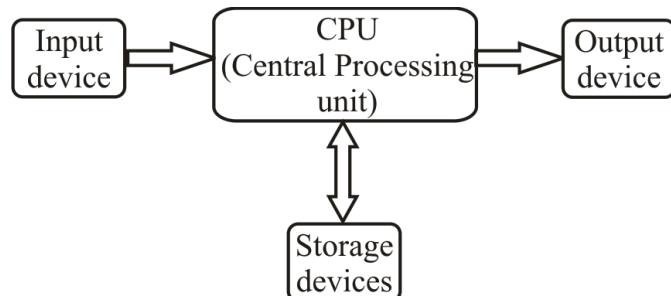
Second Generation (1956-1963)	Transistor	Batch operating system	Magnetic core, magnetic disk	Magnetic tape and punched cards	Assembly and high level language (FORTRAN, ALGOL, COBAL)	PDP - 8, IBM 1400 Series IBM 7090 & 7094 UNIVAC 1107 CDC 3600	Smaller in size low power consumption and generated less heat.
Third Generation (1964-1975)	Integrated Circuit (ICs) SSI, MSI	Time sharing/ multi program ming operating system	Large magnetic core, magnetic tape/disk	Magnetic tape, monitor, keyboard, printer etc.	High-level language (PASCAL, BASIC)	IBM 360, IBM 370, PDP-11, NCR 395	Relatively fast, small and cheap easy to use
Fourth Generation (1975-1989)	Micro-processor and very large scale integration (VLSI)	Graphical user interface (GUI), UNIX, Real Time, Distributed operating system.	Semiconductor memory	Pointing devices keyboard, monitor etc.	High level language C, C++, Database etc.	IBM PC, STAR 1000, APPLE II, APPLE Macintosh Alter 8800 etc.	Highly reliable and very less maintenance storages capacity very large and faster.
Fifth Generation (1990-present)	Based on Artificial intelligence, uses the Ultra large-scale Integration (ULSI) technology and parallel processing method.	Internet and multimedia software parallel/ multi processing operating system.	Optical disk, virtual memory (huge storage capacity)	Touch screen, pen, speech input, light scanner printer etc.	Understand natural language (human language)	Desktops, laptops, tablets, smart phone	Portable and small in size fastest.

Computer Hardware & Software

Hardware	Software
1. Hardware is a physical parts of computer that cause processing of data	1. Software is a set of instruction that tells a computer exactly what to do.
2. It is manufactured	2. It is developed and engineered.
3. Hardware cannot perform any task without software	3. Software cannot be executed without hardware
4. As hardware are physical electronic devices, we can see and touch hardware	4. We can see and also use the software but cannot actually touch them.
5. Hardware is not affected by computer viruses.	5. Software is affected by computer viruses.
6. If Hardware is damaged it is replaced with new one.	6. If Software is damaged, its backup copy can be reinstalled
7. Example- Keyboard, Mouse, Monitor, Printer, CPU, Hard disk, RAM, ROM etc.	7. Example- MS word, Excel, PowerPoint, Photoshop, MySQL, etc.

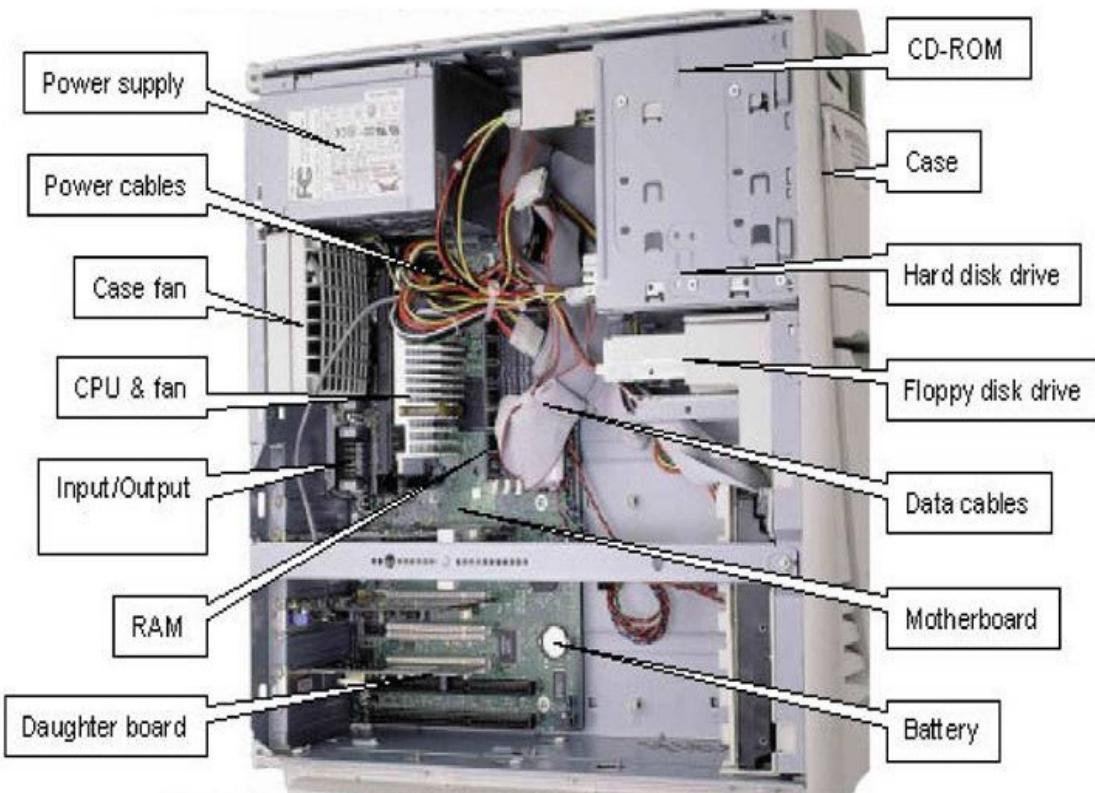
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Components of Personal Computer

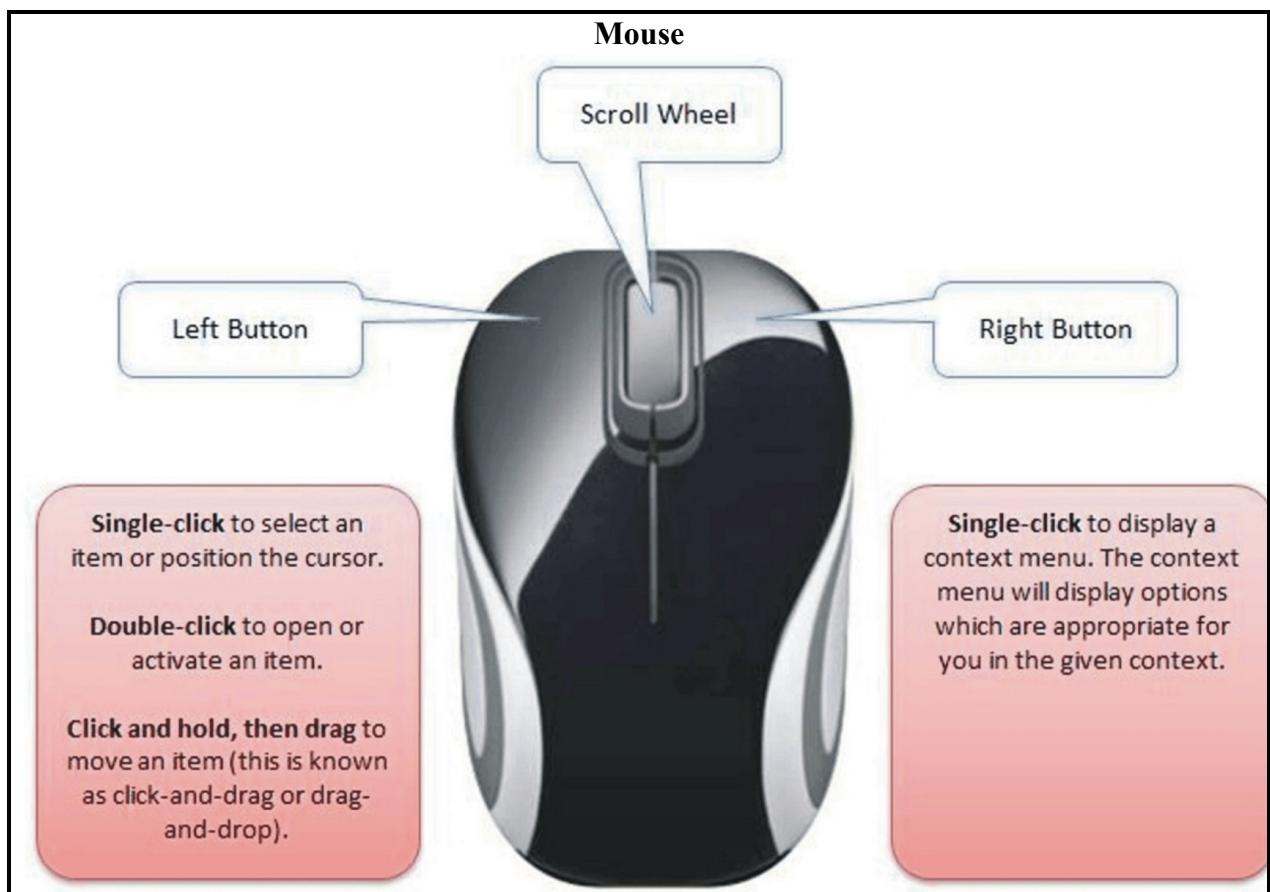
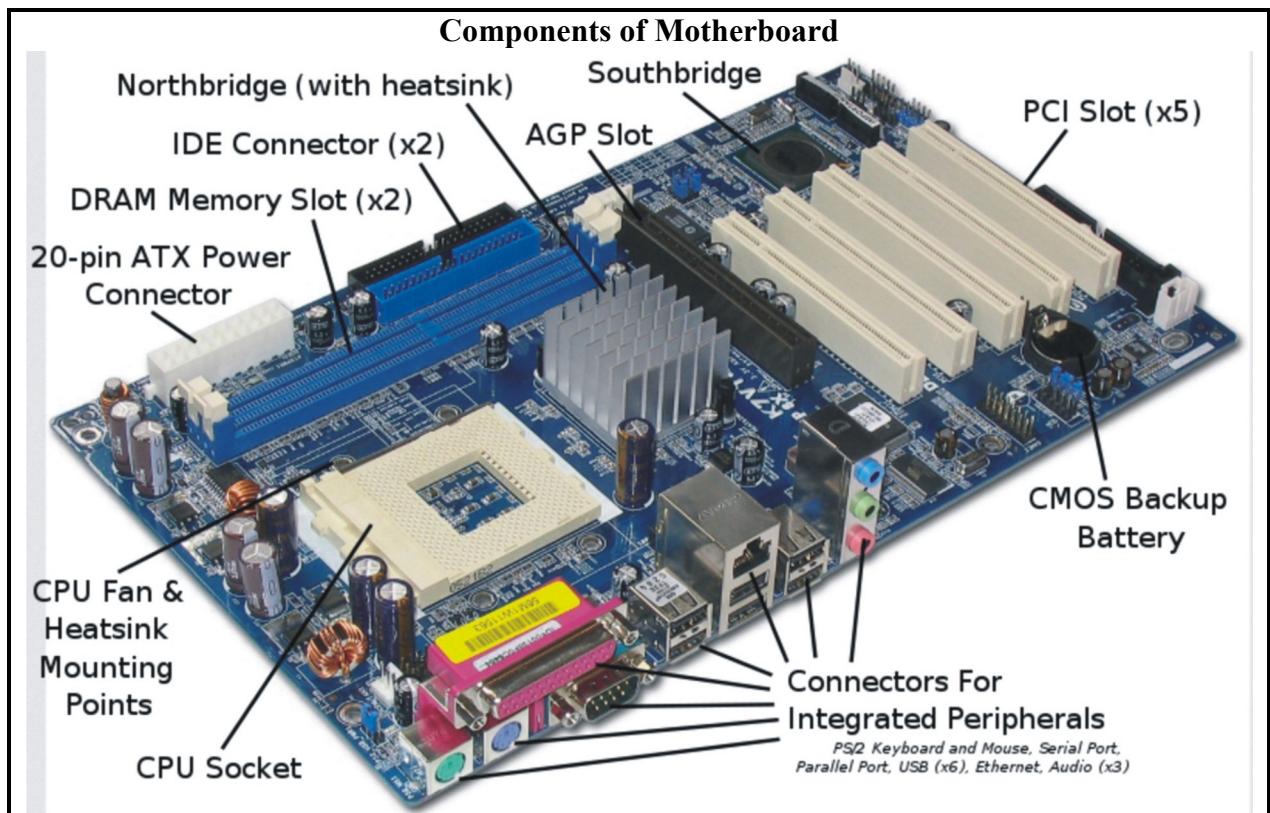


Operation	Description
1. Take Input	The process of entering data and instructions into the computer system
2. Store Data	Saving data and instructions so that they are available for processing as and when required.
3. Processing Data	Performing arithmetic and logical operations on data in order to convert them into useful information
4. Output information	The process of producing useful information or results for the user, such as a printed report or visual display.
5. Control the work flow	Directs the manner and sequence in which all of the above operations are performed.

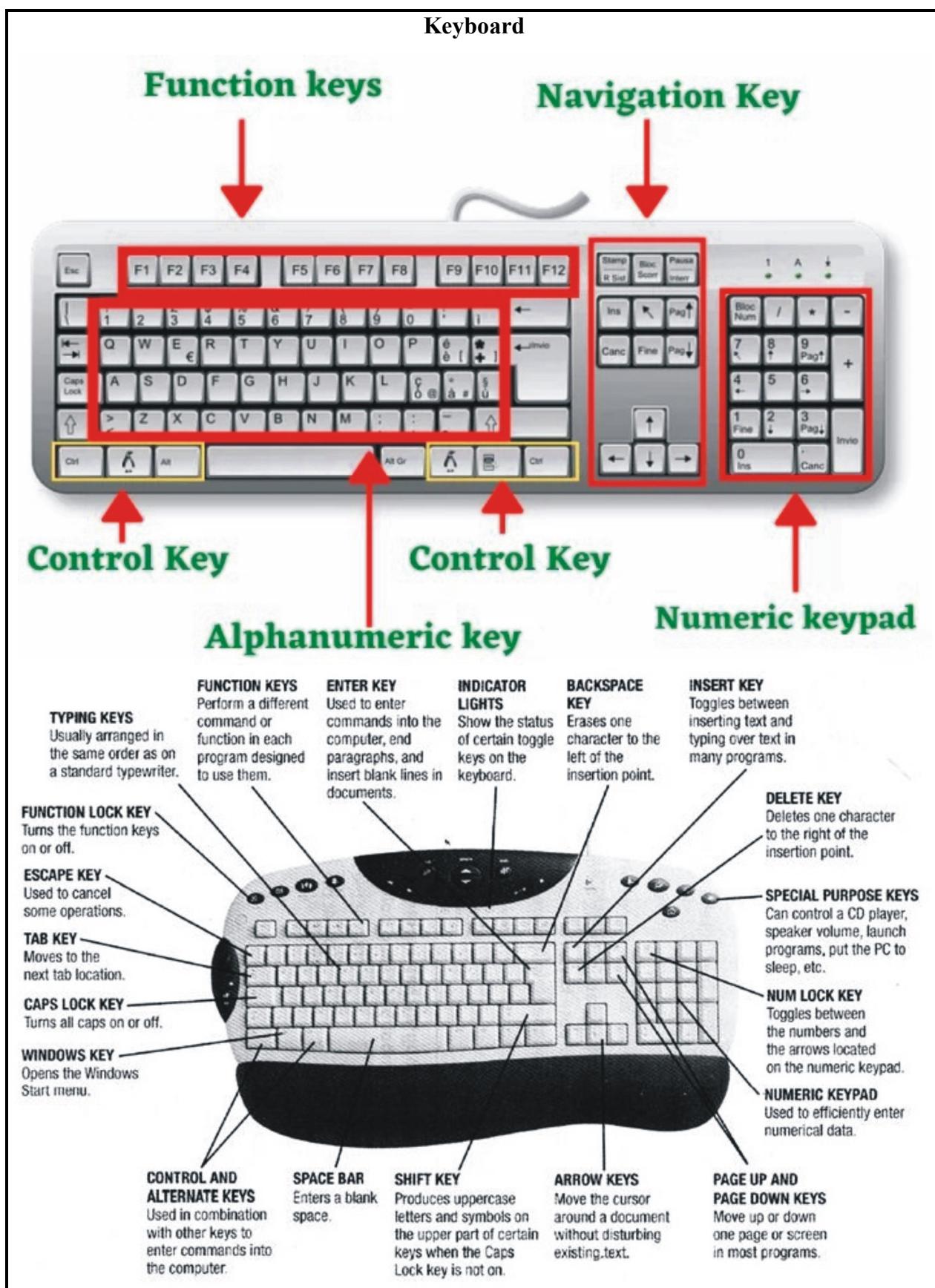
Inside view of System Unit



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Input Devices



Keyboard



Mouse



Joystick



Scanner



Web cam



Game Pad



Stylus Pen



BCR (Bar Code Reader)



**OCR
(Optical Character Reader)**



Digital camera



Microphone



Light pen



Graphic tablet



Track ball



Pointing stick



MICR (Magnetic Ink character Recognition)



Digitizer



OMR (Optical Mark Reader)



Video Capture Hardware

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Output Devices



Monitor (LED, LCD, CRT etc)



Printer



Plotter



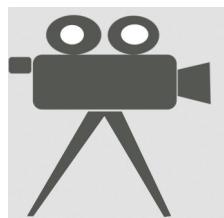
Projector



Loudspeaker



Speech synthesizer



Film Recorder



Head phones



Sound card



Video card



Computer Output Microfilm (COM)

Both Input-Output Devices



Touch Screen



Modems



Headsets
(Headset consists of speakers & microphone)

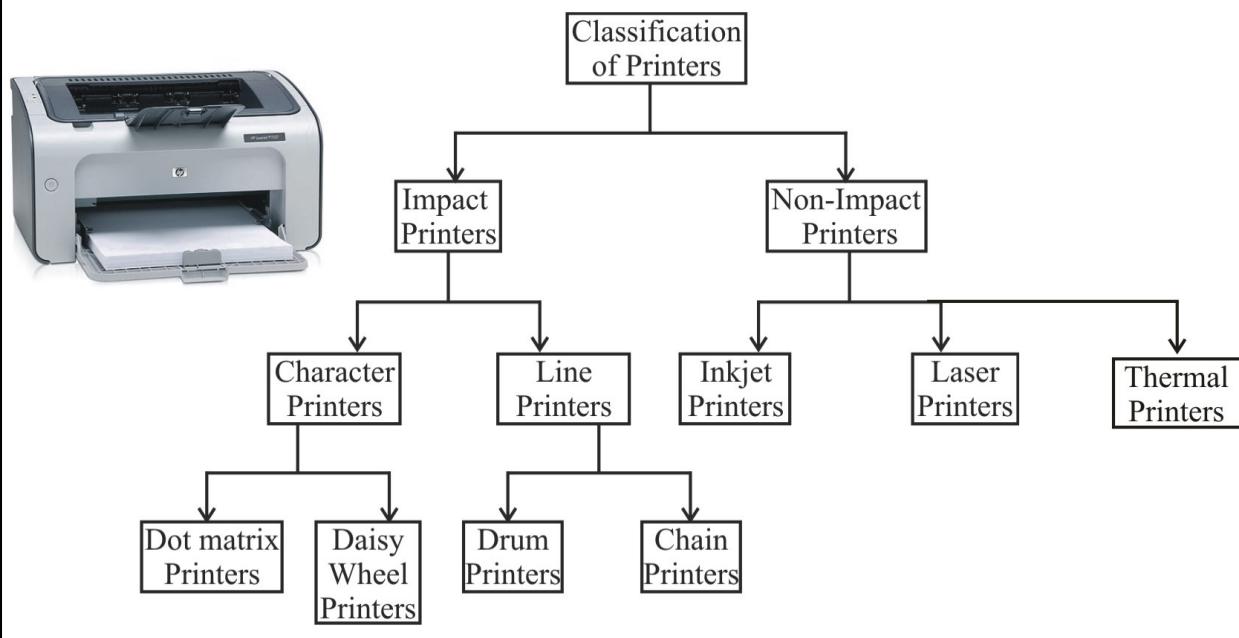


Facsimile (FAX)
(It has scanner to scan the document and also have printer to print the document)

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Printer



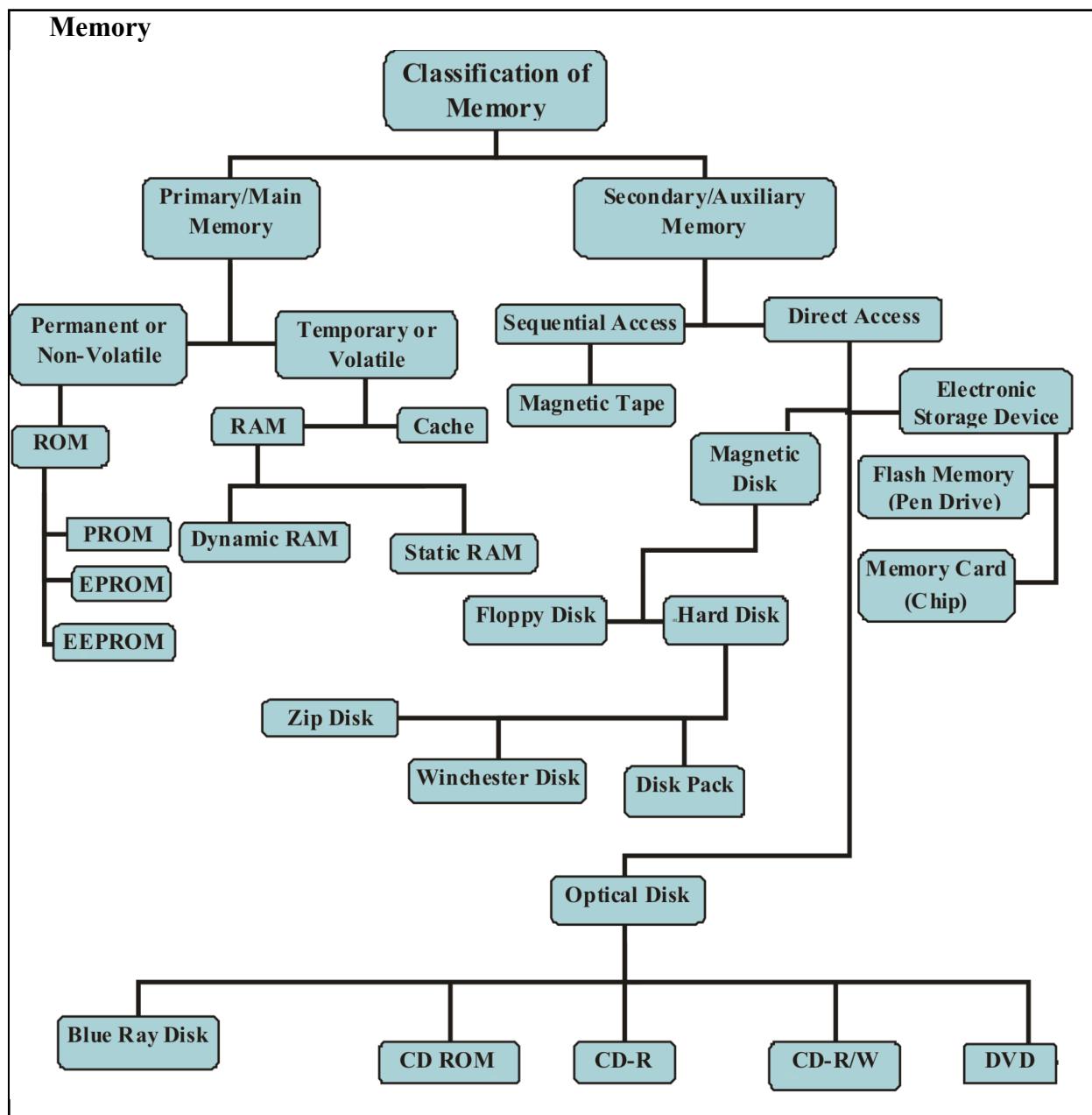
Impact and Non-Impact printer

Impact Printer	Non-Impact Printer
1. A type of printer that produces characters and graphics on a piece of paper by striking.	1. A type of printer that produces characters and graphics on a piece of paper without striking
2. It prints by hammering a set of metal pin or character set.	2. Printing is done by depositing ink in any form.
3. Electromechanical devices are used	3. No electromechanical device is used.
4. Faster speeds around 250 words per second.	4. Slower speeds around 1 page per 30 seconds.
5. Have banging noise of needle on paper.	5. Works silently
6. They are not suited for printing photograph or any high quality media.	6. They are best suited for printing photograph or any high quality media.
7. Examples of the impact printer are Dot printer, Daisy printer, Line printer, Drum printer etc.	7. Examples of the Non-impact printers are laser printers, inkjet printers, thermal printer etc.

Inkjet Printer and Laser Printer

Inkjet Printer	Laser Printer
1. They have nozzle from which ink is sprayed on to paper and it gets printed.	1. They do not have nozzle.
2. Ink in the cartridges is in liquid form, which dries if not used for a long time	2. Ink is in the form of toner (powder). It does not dry up even if you don't use it for a long time.
3. It is cheap in price	3. It is expensive than inkjet printers.
4. Inkjet reaches maximum speed at only 16 pages per minute	4. A laser printer can pump out up to 100 pages per minute.
5. If you print assignments, projects or print colourful pictures, then one can prefer inkjet printers.	5. If you want to print only text like documents or PDFs or want to print normal pages, then one can prefer Laser printers.

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Primary Memory and Secondary Memory

Primary Memory	Secondary Memory
1. Primary memory is temporary	1. Secondary memory is permanent.
2. Primary memory is directly accessible by processor/CPU	2. Secondary memory is not directly accessible by the CPU.
3. Nature of parts of primary memory varies, RAM - volatile in nature, ROM - Non-volatile in nature	3. It is always Non-volatile in nature.
4. The memory devices used for primary memory are semi-conductor memories.	4. The secondary memory devices are magnetic and optical memories.
5. Primary memory is also known as main memory or internal memory.	5. Secondary memory is also known as external memory or Auxiliary memory.
6. Examples - RAM, ROM, Cache memory, PROM, EPROM, Registers etc.	6. Examples - Hard Disk, Floppy Disk, magnetic, Tapes etc.

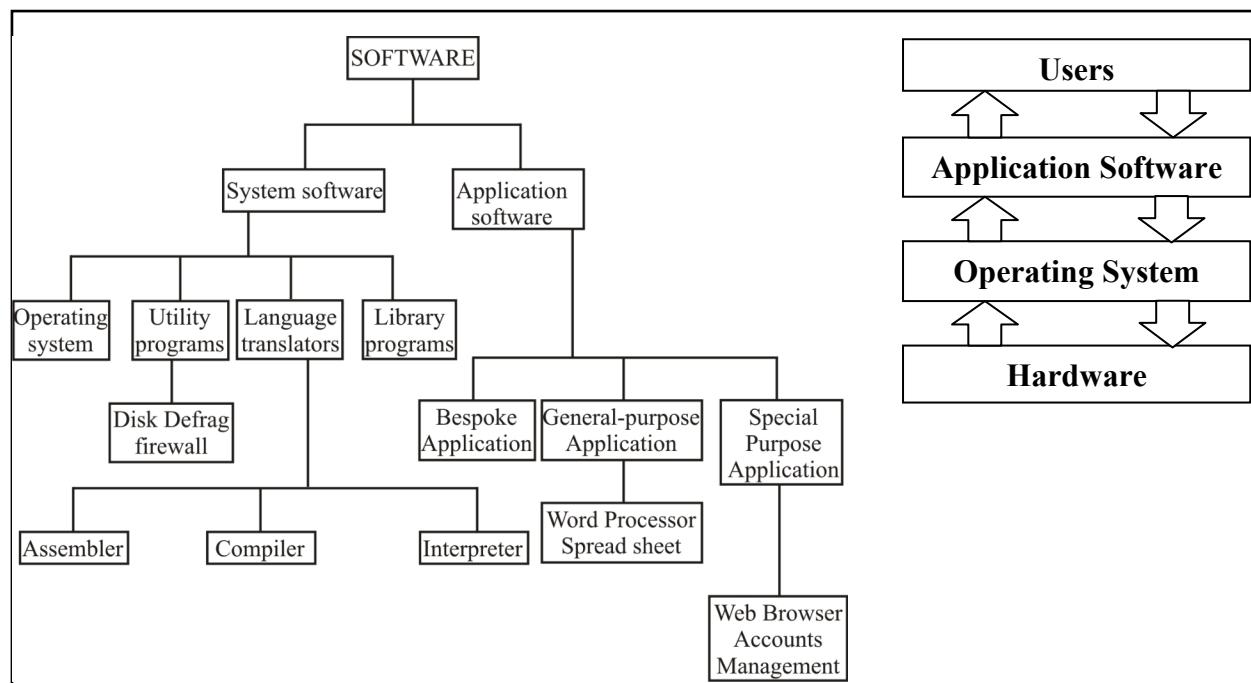
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Memory Hierarchy

Memory	Access Time	Storage Capacity	
ROM	1 μ Sec	4 to 8 MB	
Register	1-2 ns	200 Byte	
Cache Memory	3-10 ns	32 KB to 4 MB	
RAM	11-60ns	16 MB to 4 GB	
Magnetic Disk	10-50ms	160 GB to 1600 GB	
Optical Disk	100-200 ms	700 MB to 60 GB	

A pyramid diagram illustrating the hierarchy of memory components. At the top is 'Registers' (Bytes), followed by 'Cache memory' (KB/MB), 'Main memory' (GB), 'USB/Flash memory' (GB), 'Magnetic disk/Hard disk' (TB), and at the bottom is 'Magnetic tapes/Tape drives' (PB/EB). Arrows on the left point upwards from 'Registers' to 'Cache memory' to 'Main memory' to 'USB/Flash memory' to 'Magnetic disk/Hard disk'. Arrows on the right point downwards from 'Registers' to 'Cache memory' to 'Main memory' to 'USB/Flash memory' to 'Magnetic disk/Hard disk'. Labels on the left read 'Cost, Speed, Smaller, frequently used' and 'Size, Access Time, increase, more storage' on the right.

Software

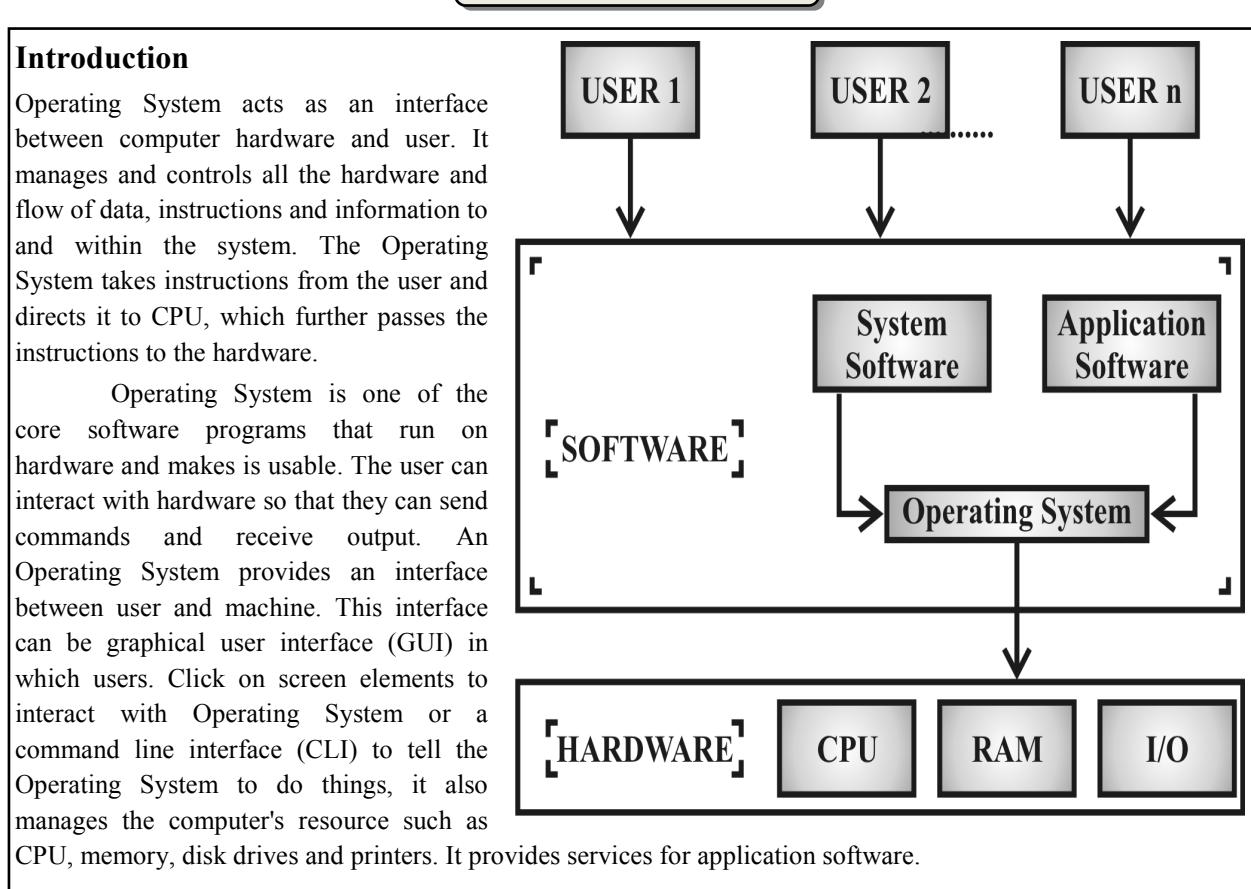


System Software and Application Software

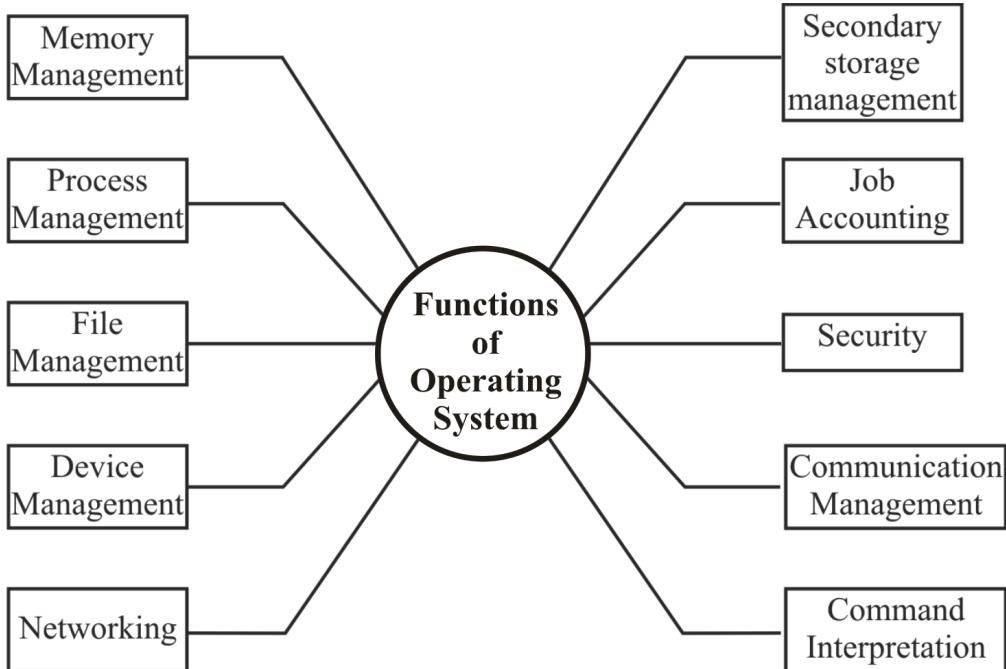
System software	Application software
1. System software maintains the system resources and give the path for application software to run.	1. Application software is built for specific tasks.
2. Low level languages are used to write the system software	2. While high level languages and used to write the application software.
3. Without system software, system can't run.	3. while without application software system always runs.
4. System software programming is complex than application software	4. Application software programming is simpler as comparison to system software.
5. Example of system software are operating system, compiler, etc.	5. Example of application software are, Photoshop, MS office, VLC player etc.

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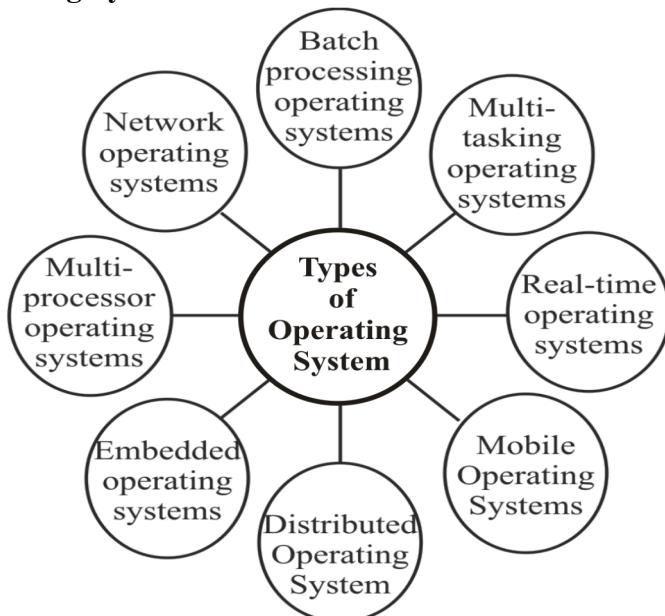


Functions of an Operating System-



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Types of Operating System



Types of operating systems	Characteristics	Advantages	Disadvantages	Examples
Batch processing operating system	This type of OS does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and group them into batches. It's also known at the 'First come, First serve.'	<ul style="list-style-type: none"> It is very difficult to guess or know the time required for any job to complete. Multiple users can share the batch system is very less. 	<ul style="list-style-type: none"> Lack of interaction between the user and the job. Batch systems are hard to debug. 	Payroll systems bank statements etc.
Multi-tasking operating system	The user directly gives instructions to an OS, and the OS executes multiple tasks at a time. These system are also known as time sharing systems.	<ul style="list-style-type: none"> Each task receives equal time to use the CPU Reduces CPU idle time Fewer chances of duplication of software. 	<ul style="list-style-type: none"> Due to multiple sharing, it is unreliable Data communication is difficult 	Multics, Unix, Linux, Windows 2000 server, windows NT servers, etc.
Real-time operating system	It is defined as a data processing system in which the time interval required to process and respond to inputs is so small that it controls the environment. the time taken by the system to respond to an input and	<ul style="list-style-type: none"> These operating systems focus more on running applications than those in the queue. It provides the best management of memory allocation. 	<ul style="list-style-type: none"> Very few tasks run at the sometime in order to avoid errors It needs specific interrupts 	MTOS, Lynx, RTx, Robots, Medical imaging system, scientific experiments, weapon systems etc.

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	display of required updated information is termed as the response time.		signals and devices drivers to respond earliest to interrupts.	
Multiprocessor operating system	It is allows the use of multiple CPUs in a computer system for executing multiple processes at the same time.	It helps in increasing the reliability and improving the overall performance and through put of computer system.	A large amount of memory is required for running and executing several user programs.	Linux, Unix, windows 2000.
Network operating system	These types of operating system allow shared access of files, printers, security, applications and other networking functions over a small private network.	<ul style="list-style-type: none"> • It has stable and centralized servers that can handle security concerns well. 	In this type of OS, the failure of any node in a system affects the whole system.	Microsoft windows server 2003, Microsoft windows server 2008, UNIX, Linux, Mac OSx, Novell Netware and BSD etc.
Distributed operating system	In this types of OS, multiple CPUs are used to serve multiple processes and users. All the computers have their own memory unit and CPU are interconnected and communicate with each other over a shared communication network.	<ul style="list-style-type: none"> • Failure of one will not affect the other network communication as all systems are independent from each other. • Increased data exchange speed and reduced load on the host computer. 	A single system failure might not affect the entire communication but the failure of the main network can crash it.	LOCUS, micros, IRIX, DYNIX, ALX, SOLARIS, mach, OSF/1 etc.
Embedded operating system	It is installed on an embedded computer system, which is primarily used for performing computational tasks in electronic devices.	<ul style="list-style-type: none"> • These operating system allow the implementation of embedded systems in an efficient manner. • The computer system with embed led operating system is easy to use and maintain. 	<ul style="list-style-type: none"> • It is only possible to perform some specific operations with these OS. • These OS cannot be used in frequently changing environments. 	GPS systems, Palm OS, windows EC, medical devices ATMs, etc.
Mobile operating system	It is helps to run other application software on mobile device. It is the same kind of software as the famous computer operating systems like Linux and windows, but now they are light and simple to some extent.	<ul style="list-style-type: none"> • It provides on ease to users. 	<ul style="list-style-type: none"> • Some of the mobile operating systems are not user friendly. 	Android, iOS, Blackberry symbian, palm OS, windows phone web OS, etc.

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MS-DOS

- MS- DOS was developed and introduced by Microsoft in 1981.
- MS-DOC is a single user and single tasking operating system developed for personal computers.
- This operating system provides a command line user interface, which means that a user needs type a command at the command line for performing s specific task.

MS-DOS Command List-

COMMAND	DESCRIPTION
Append	The append command can be used by programs to open files in another directory as if they were located in the current directory.
Assign	The assign command is used to redirect drive requests to a different drive.
Attrib	The attrib command is used to change the attributes of a single file or a directory
Break	The break command sets or clear extended Ctrl + C single file or a directory.
Call	The call command is used run a script or batch program from within another script or batch program. The call command has no effect outside of a script or batch files.
Chdir	The chdir command is used to display the drive latter and folder that you are currently in.
Chkdsk	The Chkdsk command, often referred to as check disk is used to identify and correct certain hard drive errors.
Choice	The choice command is used within a script or batch program to provide a list of choices.
Cls	The Cls command clears the screen of all previously entered commands and other text.
Copy	The copy command copies one or more files from one location to another.
Country	The country command is used in the CONFIG. Sys files to tell MS-DOS to use country specific text conventions during processing.
Ctty	The Ctty command is used to change the default input and output devices for the system.
Date	The date command is used to show or change the current date.
Dblspace	The dblspace command is used to create or configure DoubleSpace compressed drives.
De bug	The debug command starts debug, a command live application used to test and edit programs.
De frag	The defrag command is use to defragment a drive you specify. The defrag command is the command live version of Microsoft Disk defragmenter.
Del	The del command is use to delete on or more files. The del commands is same as the erase command.
Deltree	The deltree command is used to delete a directory and all the files and subdirectories with in it.
Devicehigh	The devicehigh command is used in the CONFIG.SYS file to load device drivers into upper memory.
Dir	The dir command is used to display a list of files and folders contained inside the folder that you are currently working in. The dir command also display other important information like hard drive serial number, the total number of file listed, the total amount of free space left on the drive.

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Drvspace	The drvspace command is used to create or configure drive space compressed drives. Drvspace, executed using the drvspace command, is an updated version of double space.
Echo	The echo command is used to show messages, most commonly from within script and batch file. The echo command can also be used to turn the echoing feature on or off.
Edit	The edit command starts the MS-DOS editor tool, which is used to create and modify text files.
Edlin	The edlin command starts the edlin tool, which is used to create and modify text files.
Emm 386	The emm 386 command is used to give MS-DOS access to more than 640 KV of memory.
Exe2bin	The exe2bin command is used to convert EXE files binary Format.
Exit	The exit command is used to end the command.com session that you are currently working in.
Expand	The expand command is used to extract the files and folders contained in Microsoft cabinet (CAB) files.
Fast help	The fast help command provides more details information on any of the other MS-DOS command.
Fe	The Fe command is used to compare individual or sets of files and then show the differences between them.
F disk	The F disk command is used to create manage and delete hard drive partitions.
Find	The find command is used to run a specified text string in one or more files.
For	The for command is used to run a specified command for each file in a set of files. The for command is most often used within a batch or script.
Format	The format command is used to format a drive in the file system that you specify.
Intersvr	The Intersvr command is used to start the Interlink server and to copy Interlink files from one computer to another.
Join command	The Join command is used to attach a drive letter to a directory located on another drive. It's similar to the subst command which associates a drive letter with a local directory.
Key b	The Key b command is used to configure a keyboard for a specific language.
Go to	The go to command is used in a batch or script file to direct the command process to a label defined in the script.
Graphics	The graphics command is used to load a program that can print graphics.

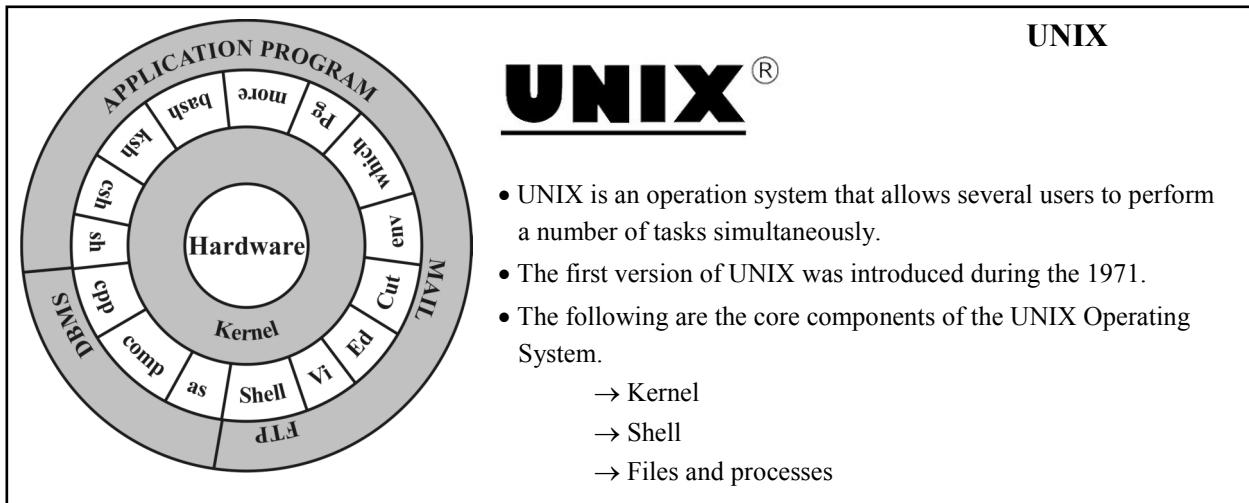
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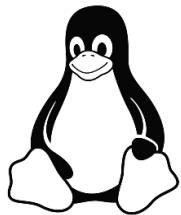
Help	The help command provides more detailed information of any other command prompt or ms-dos command.
If	The command used to perform conditional function in a batch.
Interink	The interink command is used to connect two computers via a parallel and serial connection to share files and printers.
LH	The LH command is the shorthand version of Loadhigh command.
Load fix	The Load fix command is used to load the specified program in the first specified 64 k of memory and then runs program.
Load high	The Load high command is used to load a program onto high memory and is usually used from within the auto exec. bat file.
Md	The command is the shorthand version of the Mkdir command.
Mem	The Mem command shows Information about used and free memory areas and programs that are currently loaded into memory in the ms-Dos subsystem.
Mkdir	The Mkdir command is used to create a new folder.
Mode	The Mode command is used to configure system device.
More	The More command is used to display the information contained in text file the More command case also be used paginate the result of result of any others prompt or Ms-Dos command.
Msav	The Msav command starts Microsoft Antivirus.
Mscdex	The Mscdex command is used to provide CO-RAM access to ms-Dos.
Msd	The Msd command starts Microsoft Diagnostics, a tool used to display information about your computers.
Ms Func	The Ms func command is use Load information specific to a particular country or region.
Prompt	The prompt command is used to customized the appearance to the prompt text in command Prompt or Ms-Dos.
Rem	The rem command is used to Record comments or Remarks in a batch or script file.
Romdir	The Ramdir command is used to delete an existing or completely empty folder.
Shift	The Shift command is used to change the position of replaceable parameters in a batch or script file.
Sys	The sys command is used to copy the Ms-Dos system files and command interpreter to a disk. The sys command is used most often to create a simple bootable disk or hard drive.
Tree	The tree command is used to graphically display the folder structure of a specified drive of path.
Ver	The Ver command is used to display the current Ms-Dos version number.
Vsafe	The Vsafe command is used to start Vsafe is basic virus protection system for Ms-Dos.

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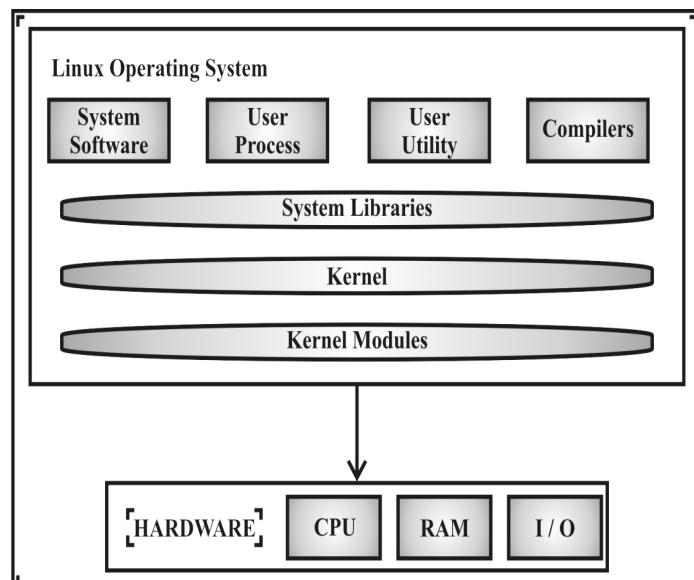
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LINUX



- Linux is an open-source operating system like other operating systems such as Microsoft Windows.
- The Linux operating system was developed by Linux Torvalds in 1991, which sprouted as an idea to improve the UNIX Operating System.
- Examples of Linux operating system is: Ubuntu, Debian, Cent OS, Fedora, Red Hat. Arch Linux, SUSE, Mint etc.



LINUX COMMANDS LIST

COMMAND	Description
Pwd	The ‘Pwd’ command is used to display the location of current working directory.
Mkdir	The ‘mkdir’ command is used to create a new directory under any directory.
Rmdir	The ‘rmdir’ command is used to delete a directory.
Is	The ‘ls’ command is used to display a list of content of directory.
CD	The ‘cd’ command is used to change the current directory.
Touch	The ‘touch’ command is used to create empty files. We can create multiple empty files by executing it once.
Cat	The ‘Cat’ command is a multi-purpose utility in the Linux system. It can be used to create a file, display context of the file, copy the context of one file to another file, and more.
RM	The ‘rm’ command is used to remove a file.
CP	The ‘cp’ command is used to copy a file or directory.
MV	The ‘mv’ command is used to move a file or a directory from one location to another location.
Rename	The ‘rename’ command is used to rename files. It is useful for renaming a large group of files.

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Head	The ‘head’ command is used to display the context of a file. It displays the first 10 lines of a file.
Tail	The ‘tail’ command is similar to the ‘head’ command. It displays the last to 10 lines of the file context and also useful for reading the error message
Tac	The ‘tac’ command is the reverse of ‘cat’ command. It displays the file context in reverse order.
SU	The ‘Su’ command provides administrative access to another user.
ID	The ‘id’ command is used to display the user ID (UID) and group ID (GID).
Useradd	The ‘useradd’ command is used to add or remove a user on a Linux server.
Passwd	The ‘passwd’ command is used to create and change the password for a user.
CUT	The ‘Cut’ command is used to select a specific column of a file.
Grep	The ‘grep’ command is useful for searching the context from a file. Generally, it is used with the pipe.
Comm	The ‘comm’ command is used to compare two files or streams. By default, it displays three columns
Sed	The ‘sed’ command is also known as stream editor. It is used to edit files using a regular expression.
tee	The ‘tee’ command is quite similar to the ‘cat’ command. The only difference between both filters is that is put standard input on standard output and also write them into a file.
tr	The ‘tr’ command is used to translate the file context like from lower case to upper case.
Uniq	The ‘uniq’ command is used to from a sorted list in which every word will occur only once.
Wc	The ‘wc’ command is used to count the lines, words and characters in a file.
Od	The ‘Od’ command is used to display the context of a file in different, such as hexadecimal, octal and ASCII characters.
Sort	The ‘Sort’ command is used to sort files in alphabetical order.
gzep	The ‘gzip’ command is used to truncate the file size. It is a compressing tool
gunzip	The ‘gunzip’ command is used to decompress of file. It is a reverse operation of ‘gzip’ command.
Find	The ‘find’ command is used to find a particular file within a directory.
Locate	The ‘locate’ command is used to search a file by file name.
Date	The ‘date’ command is used to display date, time, time zone, and more.
Cal	The ‘cal’ command is used to display the current month’s calendar with the current date highlighted.
Sleep	The ‘sleep’ command is used to hold the terminal by the specified amount of time. By default, it takes time in seconds.
Time	The ‘time’ command is used to display the time to execute a command.
Zcat	The ‘zcat’ command is used to display the compressed files.
df	The ‘df’ command is used to display disk space used in the file system.
mount	The ‘mount’ command is used to connect an external device file system to the system’s file system.
Exit	Linux ‘exit’ command is used to exit from the current shell.
Clear	Linux ‘clear’ command is used to clear the terminal screen.
IP	The ‘IP’ command is an updated version of the ipconfig command. It is used to assign an IP address, initialize an interface, disable an interface.
SSh	Linux ‘ssh’ command is used to create a remote connection through the ‘ssh’ protocol.
mail	The ‘mail’ command is used to sent mails from the command line.
Ping	The ‘ping’ command is used to check the connectivity between two nodes that is whether the server is connected. It is a short form of ‘Packet Internet Groper.’
host	The ‘host’ command is used to display the IP address for a given domain name and vice versa.
man	The ‘man’ command is used to display the user manual of any command that we can run on the terminal.
Echo	The ‘echo’ command is used to display line of text/string that are passed as an argument.
Chmod	The ‘Chmod’ command is used to change the access permissions of file system objects (files and directories) sometimes known as modes.
tar	The ‘tar’ stands for tape archive, is used to create archive and extract the archive files.

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Windows-



- Microsoft windows, commonly referred to as windows, is a group of several proprietary graphical operating system families, all of which are developed and marketed by Microsoft
- Microsoft introduced an operating environment named windows on November 20, 1985, as a graphical operating system shell for MS-DOS in response to the growing interest in graphical user interfaces (GUI).

Name of Operating System	Date of Release	Significant Features
• Windows 95	• August, 1995	<ul style="list-style-type: none"> • ✓ 32 Bit File System. • ✓ Multitasking. • ✓ Object Linking and Embedding (OLE). • ✓ Plug and Play. • ✓ Optimized memory management.
• Windows 98	• June, 1998	<ul style="list-style-type: none"> • ✓ 32 Bit data link control (DLC) protocol. • ✓ Improved GUI. • ✓ Improved online communication through various tools. Such as outlook express, personal web server and web publishing wizard. • ✓ Multiple display support. • ✓ Windows update.
• Windows 2000	• February, 2000	<ul style="list-style-type: none"> • ✓ More reliable against application failure. • ✓ Improved Windows explorer. • ✓ Secure file system using encryption. • ✓ Microsoft management console (MMC). • ✓ Improved maintenance operations.
• Windows ME	• September, 2000	<ul style="list-style-type: none"> • ✓ System restoration against failure. • ✓ Universal plug and play. • ✓ Automatic updates. • ✓ Image preview.
• Windows XP	• October, 2001	<ul style="list-style-type: none"> • ✓ Attractive desktop and user interface. • ✓ System restore. • ✓ Windows firewall. • ✓ Files and settings transfer wizard.
• Windows Server 2003	• April, 2003	<ul style="list-style-type: none"> • ✓ Enhanced Internet Information Service (ITS). • ✓ Enhanced Microsoft Message Queuing (MSMQ). • ✓ Enhanced active directory support. • ✓ Watchdog timer.
• Windows Vista	• November, 2006	<ul style="list-style-type: none"> • ✓ Multilingual User interface. • ✓ Enhanced search engine. • ✓ Enhanced internet explorer. • ✓ Enhanced Windows media player. • ✓ Enhanced Windows update. • ✓ Windows system assessment tool.
• Windows 7	• October, 2009	<ul style="list-style-type: none"> • ✓ Libraries to improve file access and organization. • ✓ Action center for system maintenance backups, and troubleshooting. • ✓ Improved networking via home group. • ✓ Device stage for recognizing USB devices faster. • ✓ Quick Desktop view button.

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• Windows 8	• October, 2012	<ul style="list-style-type: none"> • ✓ Simplified Desktop for increased speed. • ✓ Start menu has been replaced. • ✓ Improved security. • ✓ Enhanced search bar. • ✓ Ribbon and Quick access toolbar in office 2007. • ✓ Windows Reader is a native PDF reader.
• Windows 8.1	• October, 2013	<ul style="list-style-type: none"> • ✓ Add start Button to the desktop. • ✓ Boot directly to the Desktop. • ✓ Allows Snap start screen apps. • ✓ Enhanced automatically Windows update.
• Windows 10	• July, 2015	<ul style="list-style-type: none"> • ✓ Enhanced New start menu. • ✓ Voice-controlled digital assistant Cortana integration. • ✓ Microsoft edge web browser. • ✓ Multiple desktops and task view. • ✓ Tablet mode. • ✓ Enhanced Action Center. • ✓ Universal Apps.
• Windows 11	• October, 2021	<ul style="list-style-type: none"> • ✓ 5G supported. • ✓ Enhanced Cortana. • ✓ Microsoft edge with IE mode replaces the internet explorer 11. • ✓ S mode available. • ✓ Wallet is removed. • ✓ Android Apps supported. • ✓ Improved Touch keyboard.

Some Operating systems for Mobile Phone and Tablets

Mobile OS	Developer	Release Date
 Android	Google	23 September, 2008
 iOS (iPhone OS)	Apple	29 June, 2007
 Bada	Samsung electronics	February, 2010
 Black Berry OS	Black Berry Ltd.	19 January, 1999
 MeeGo OS	Nokia and Intel	26 May, 2010
 Symbian OS	Symbian Ltd. and Nokia	5 June, 1997
 Web OS	LG electronics	January, 2009
 Palm OS	Palm Ltd.	1996
 Windows Mobile	Microsoft Corporation	21 October, 2010
 Harmony OS	Huawei	9 August, 2019

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Data Communications and Computer Network

Data communications- The process of electronic transfer of information between two locations is known as data communication. The five basic elements of Data communication are-

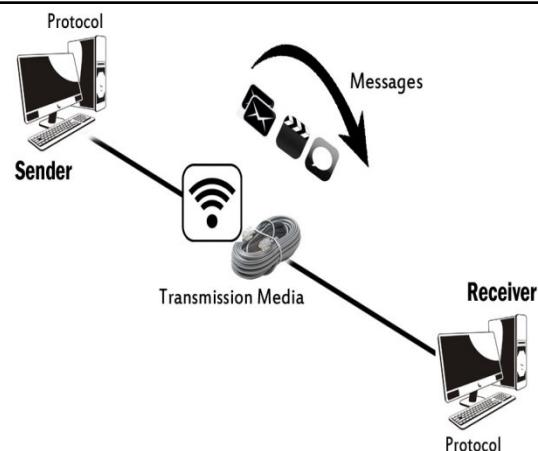
→ **Message-** it is the information to be communicated. It may be in the form of text, pictures, audio, video or any combination of these.

→ **Sender-** It is the device that creates and transmits the information.

→ **Receiver-** It is the device that receives the information.

→ **Medium-** It is the communication channel through which the information travels from sender to receiver. It could be a physical wire or radio waves.

→ **Protocol-** It represents a set of rules that governs the communication process between the senders to the receiver.



Measuring capacity of communication media

In data communication, the transmission medium is also known as channel. The capacity of a channel is the maximum amount of signals or traffic that a channel can carry. It is measured in terms of bandwidth and data transfer rate as described below.

Bandwidth- Bandwidth of a channel is the range of frequencies available for transmission of data through that channel. Bandwidth is measured in Hertz (Hz).

$$1 \text{ KHz} = 1000 \text{ Hz}$$

$$1 \text{ MHz} = 1000 \text{ KHz} = 1000000 \text{ Hz}$$

Data transfer Rate- Data transfer rate is the number of bits transmitted between source and destination in one second. It is also known as bit rate. It is measured in terms of bits per second (bps). The higher units for data transfer rates are-

$$1 \text{ Kbps} = 2^{10} \text{ bps} = 1024 \text{ bps}$$

$$1 \text{ Mbps} = 2^{20} \text{ bps} = 1024 \text{ Kbps}$$

$$1 \text{ Gbps} = 2^{30} \text{ bps} = 1024 \text{ Mbps}$$

$$1 \text{ Tbps} = 2^{40} \text{ bps} = 1024 \text{ Gbps}$$

Types of Data Communication



Data travels only in one direction

(i) **Simplex communication-** It is a one way or unidirectional communication between two devices in which one device is sender and other one is receiver. For example, data entered through a Keyboard, Radio broadcasting, television broadcasting, etc.

(ii) **Half-duplex communication-** It is two way or bidirectional

communications between two devices in which both the devices can send and receive data or control signals in both directions, but not at the same time. For example, Walkie-Talkie, Two-way radio that has a push-to-talk button.



$$\text{Channel capacity} = \text{Bandwidth} \times \text{propagation Delay}$$



Data travels in both direction at the same time

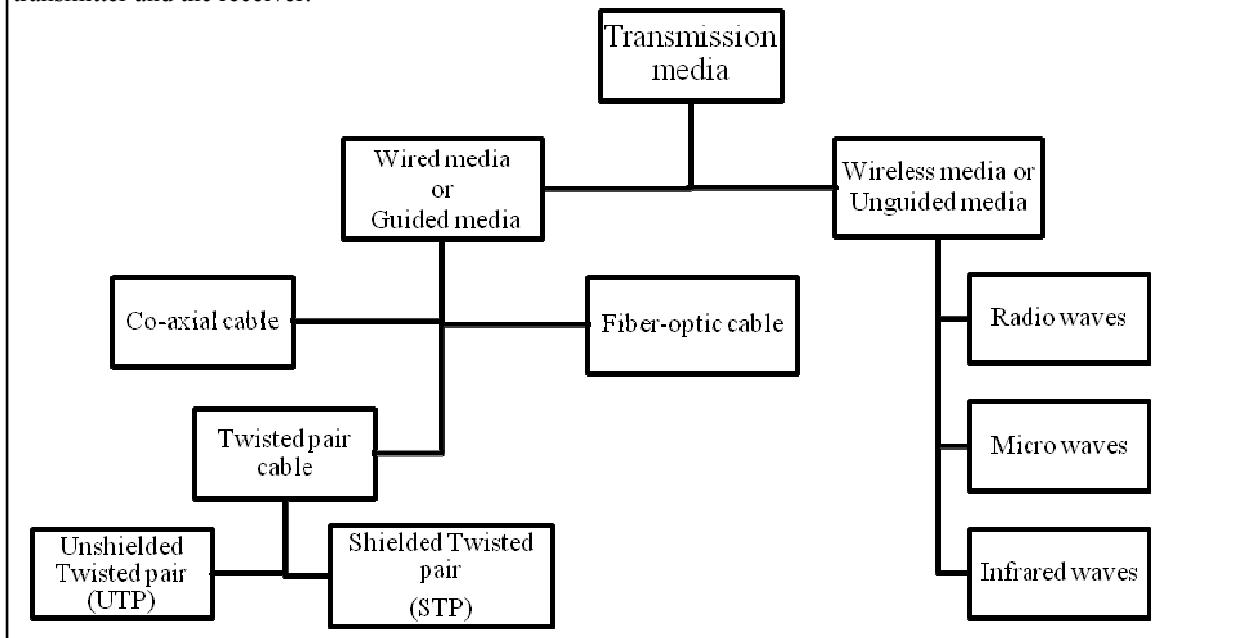
(iii) **Full-duplex communication-** It is two way or bidirectional communication in which both devices can send and receive data simultaneously. For example, mobile phones and landline telephones.

$$\text{Channel capacity} = 2 \times \text{Band width} \times \text{propagation delay}$$

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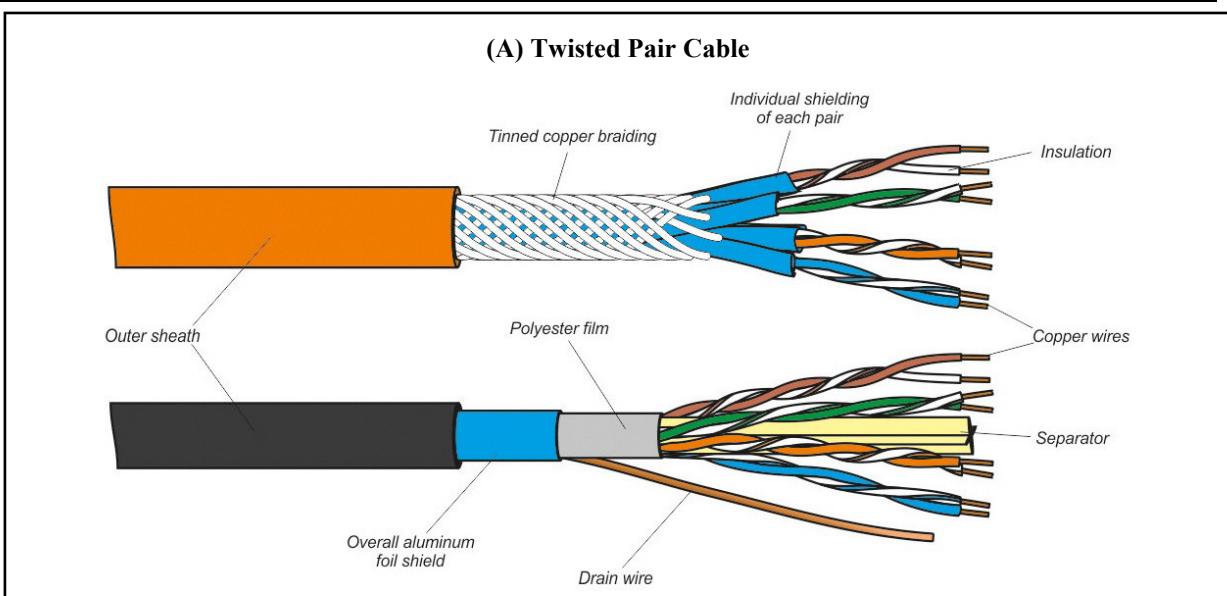
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Transmission Media— In data communication terminology, a transmission medium is a physical path between the transmitter and the receiver.

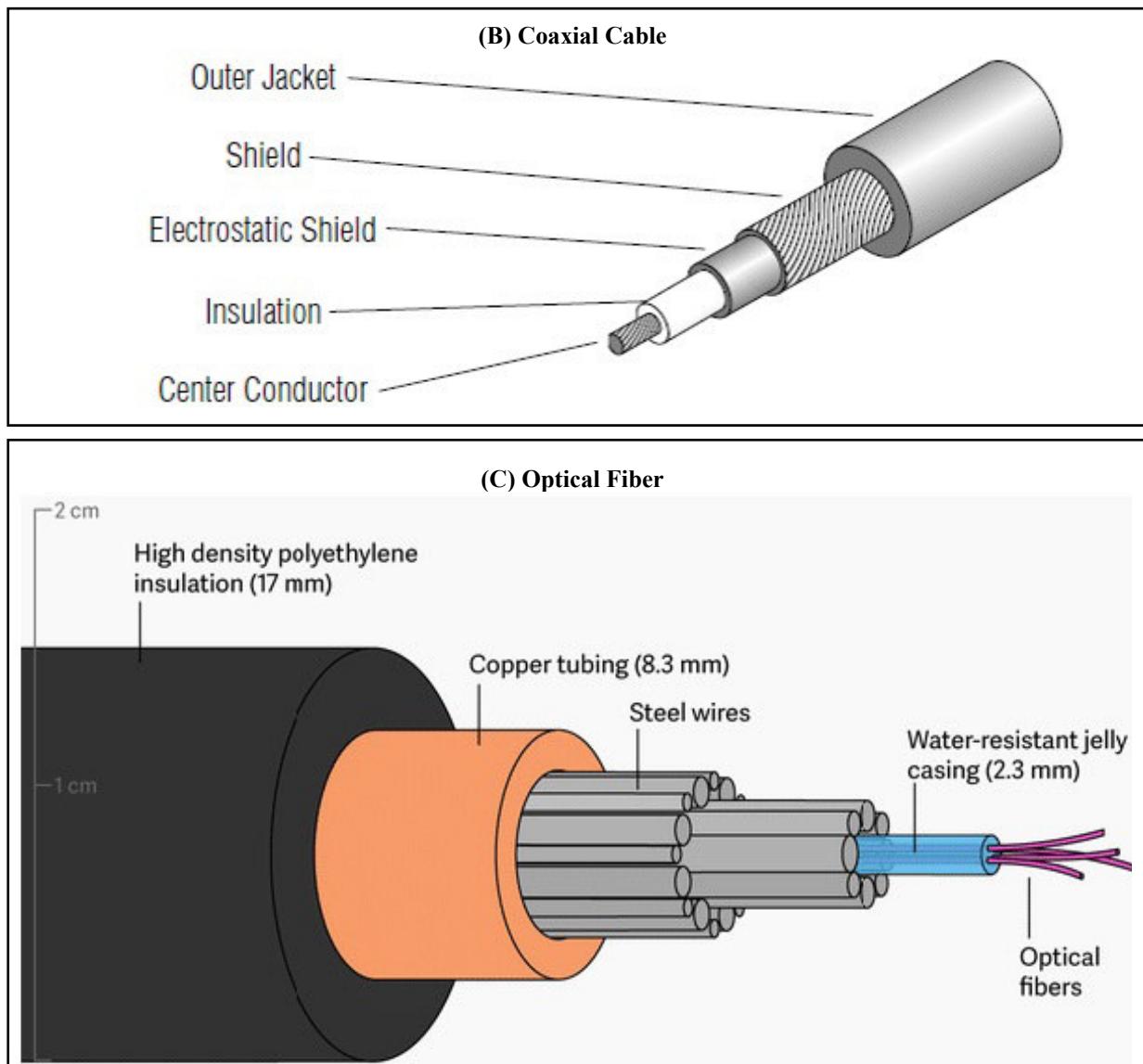


Guided Media and Unguided Media

Guided Media	Unguided Media
The signal energy propagates through wire in guided media.	The signal energy propagates through air in unguided media.
Guided media is used for point-to-point communication.	Unguided media is generally suited for radio broadcasting in all directions.
Discrete network topologies are formed by the guided media.	Continuous network topologies are formed by the unguided media.
Signals are in the form of voltage, current or photons in the guided media	Signals are in the form of electromagnetic waves in unguided media.
By adding more wires, the transmission capacity can be increased in guided media.	It is not possible to obtain additional capacity in unguided media.
Example of guided media are twisted pair wires, co-axial cables, optical fiber cables.	Example of unguided media are microwave or radio links and infrared light.



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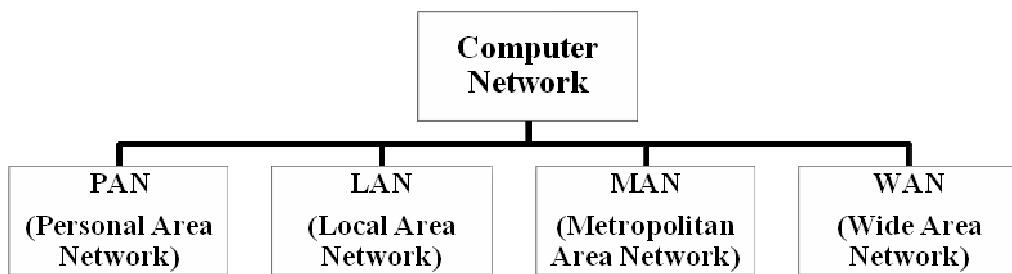
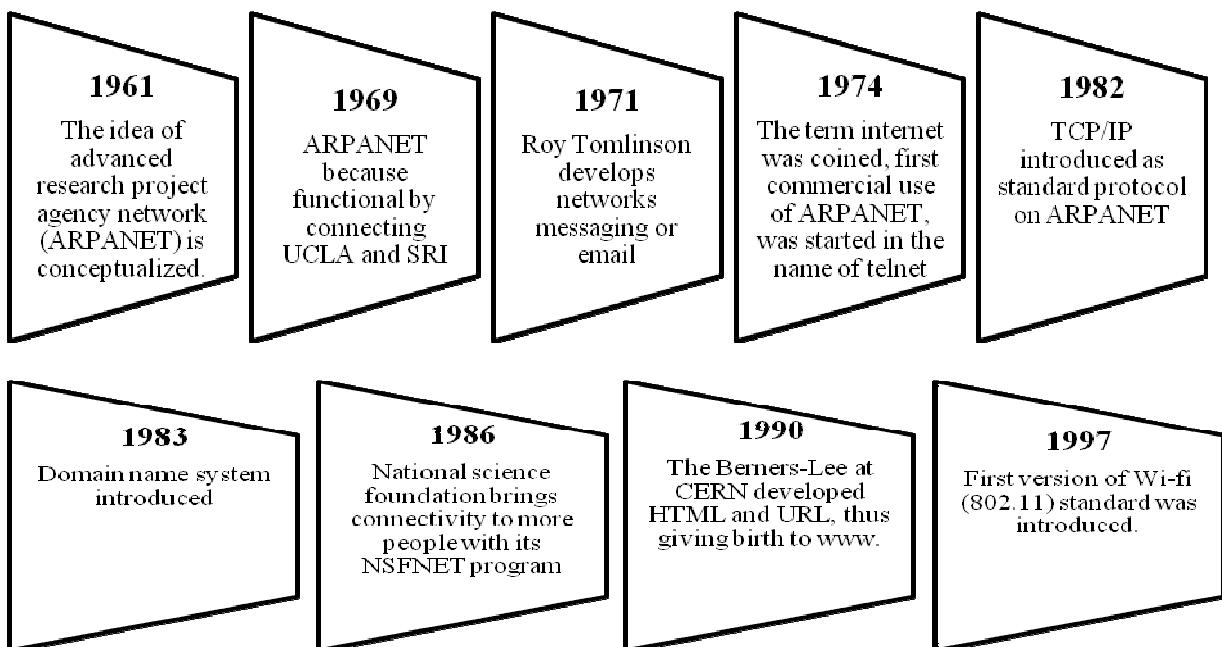
Radio wave, Microwave and infrared waves

Basis	Radio wave	Microwave	Infrared wave
1. Direction	These are omni-directional in nature.	These are unidirectional in nature.	These are unidirectional in nature
2. Penetration	At low frequency they can penetrate through solid objects and walls but high frequency they bounce off the obstacle.	At low frequency, they can penetrate through solid objects and walls at high frequency, they cannot penetrate.	They cannot penetrate through any solid object and walls.
3. Frequency Range	Frequency range: 3 KHz to 1 GHz	Frequency range: 1 GHz to 300 GHz	Frequency range: 300 GHz to 400 GHz
4. Security	These offers poor security	These offers medium security	These offers high security.
5. Attenuation	Attenuation is high	Attenuation is variable	Attenuation is low
6. Usage Cost	Setup and usage cost is moderate	setup and usage cost is high	Usage cost is very less.

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Evolution of Networking



LAN, MAN and WAN

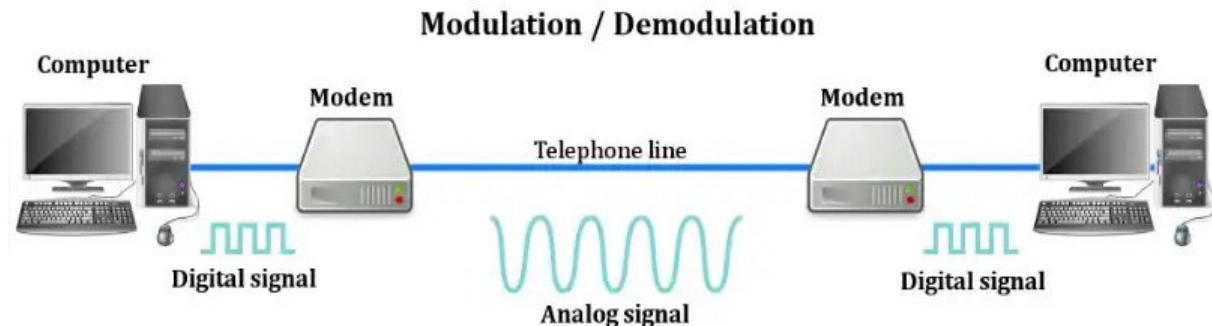
Basis	LAN	MAN	WAN
Full-Form	LAN stands for Local Area Network	MAN stands for Metropolitan Area Network.	WAN stands for Wide Area Network.
Geographic span	Operates in small areas such as the same building or campus	Operates in large areas such as a city	Operates in larger areas such as country or continent
Ownership	LAN's ownership is private	MAN's ownership can be private or public.	While WAN also might not be owned by one organization
Transmission speed	The transmission speed of a LAN is high	While the transmission speed of a MAN is average	Whereas the transmission speed of a WAN is low.
Propagation delay	The propagation delay is short in a LAN.	There is a moderate propagation delay in a MAN	Whereas, there is a long propagation delay in a WAN
Congestion	There is less congestion in LAN	While there is more congestion in MAN	Whereas there is more congestion than MAN in WAN
Design & Maintenance	LAN's design and maintenance are easy	While MAN's design and maintenance are difficult than LAN	Whereas WAN's design and maintenance are also difficult than LAN as well MAN
Fault tolerance	There is more fault tolerance in LAN	While there is less fault tolerance	In WAN, there is also less fault tolerance

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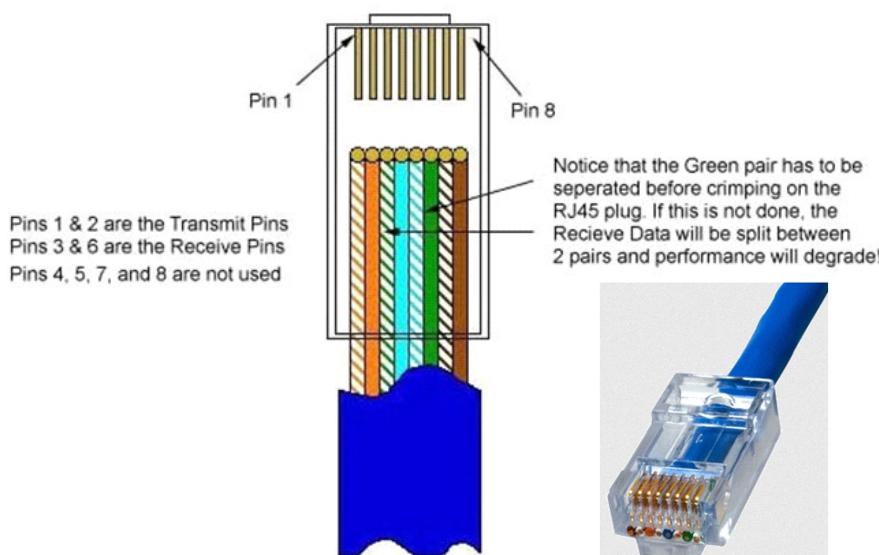
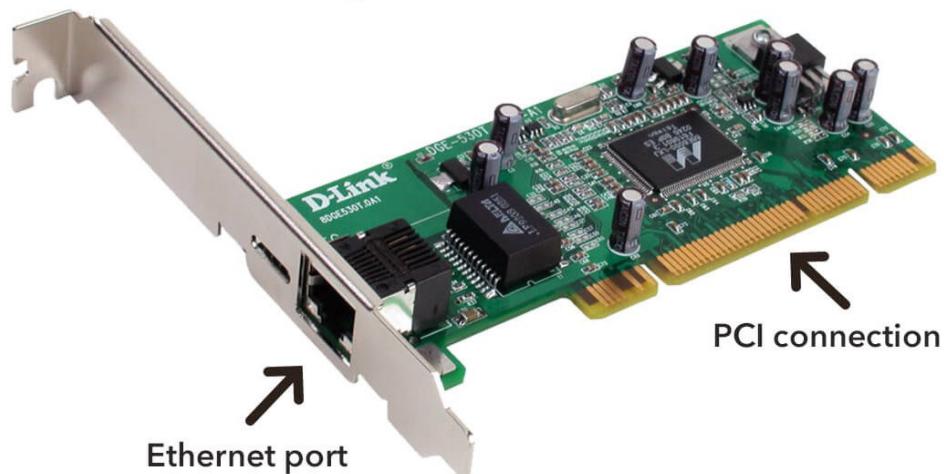
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Network Devices

Modem— Modem stands for 'MOdulator DEModulator'. It refers to a device used for conversion between analog signals and digital bits.



Ethernet Card— Ethernet card, also known as Network Interface Card (NIC Card) is a network adapter used to setup a wired network. It acts as an interface between computer and the network. It is installed in computer to establish a LAN.



RJ 45— RJ 45 or Registered Jack-45 is an eight-pin connector that is used exclusively with Ethernet cables for networking. It is a standard networking interface that can be seen at the end of all network cables.

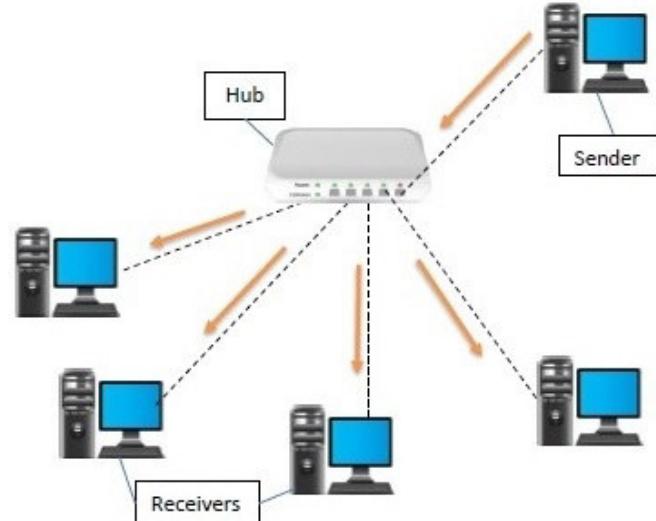
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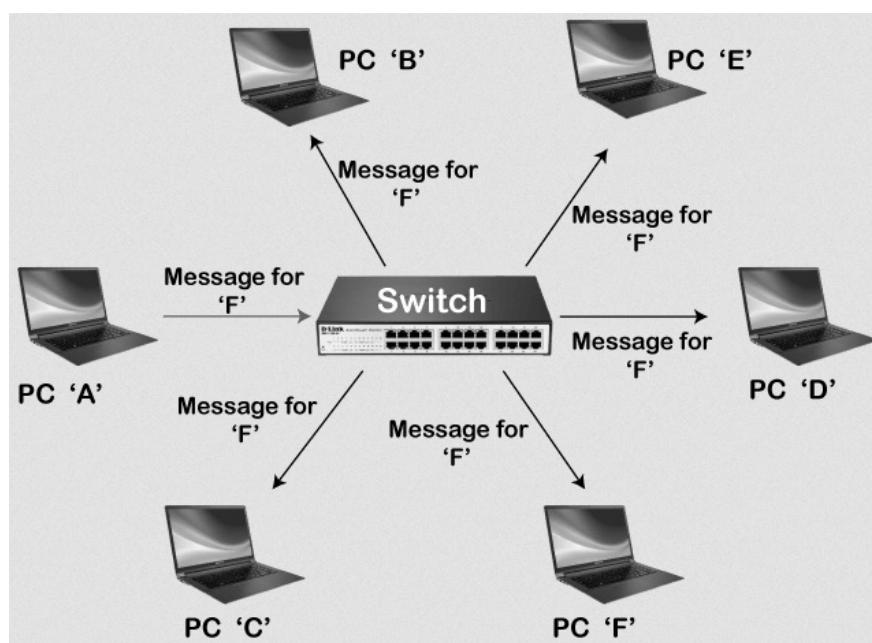
Repeater– A repeater is an analog device that works with signals on the cables to which it is connected. The weakened signal appearing on the cable is regenerated and put back on the cable by a repeater.



Hub– An Ethernet hub is a network device used to connect different devices through wires. Data arriving on any of the lines are sent out on all the others. The limitation of Hub is that if date from two devices come at the same time, they will collide



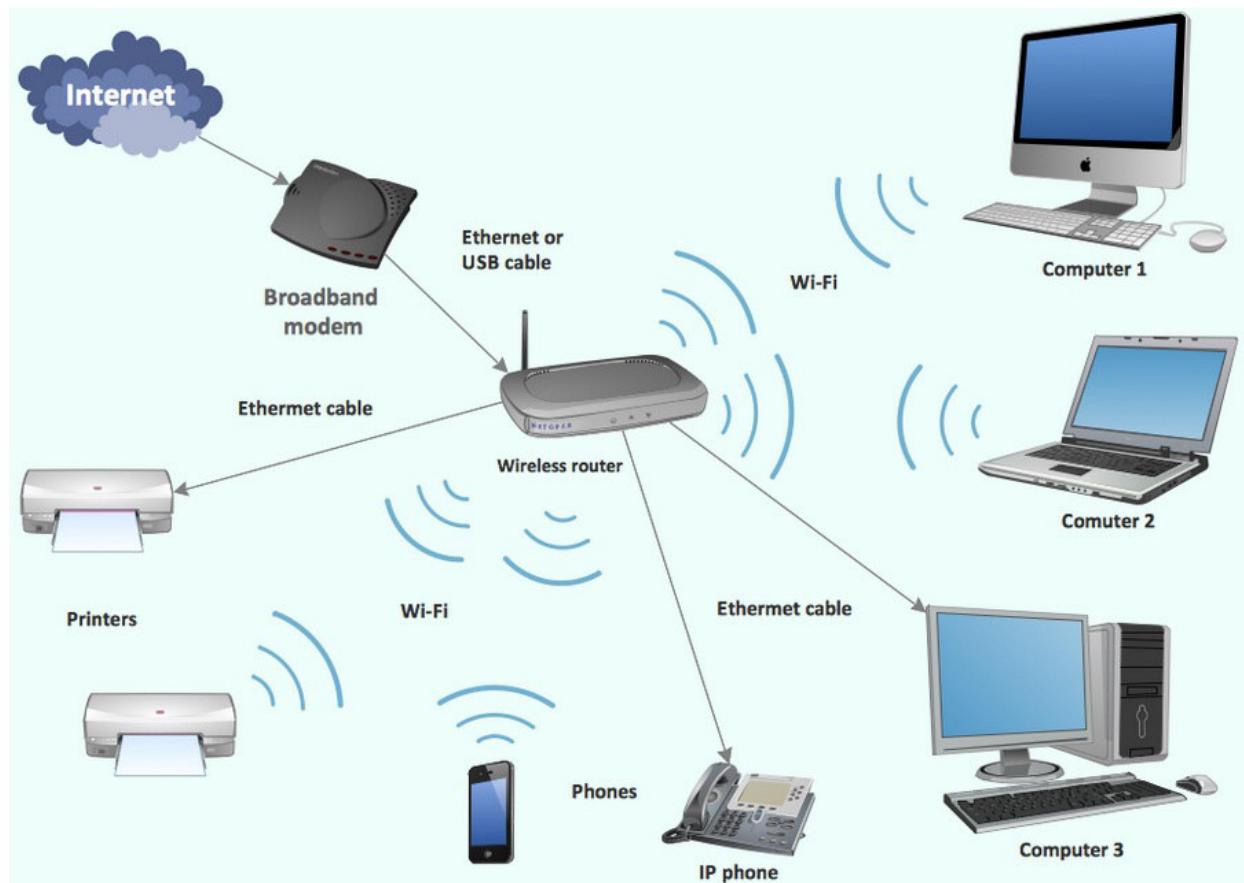
Switch– A switch is a networking device that plays a central role in a Local Area Network (LAN). Like a hub, a network switch is used to connect multiple computers or communicating devices.



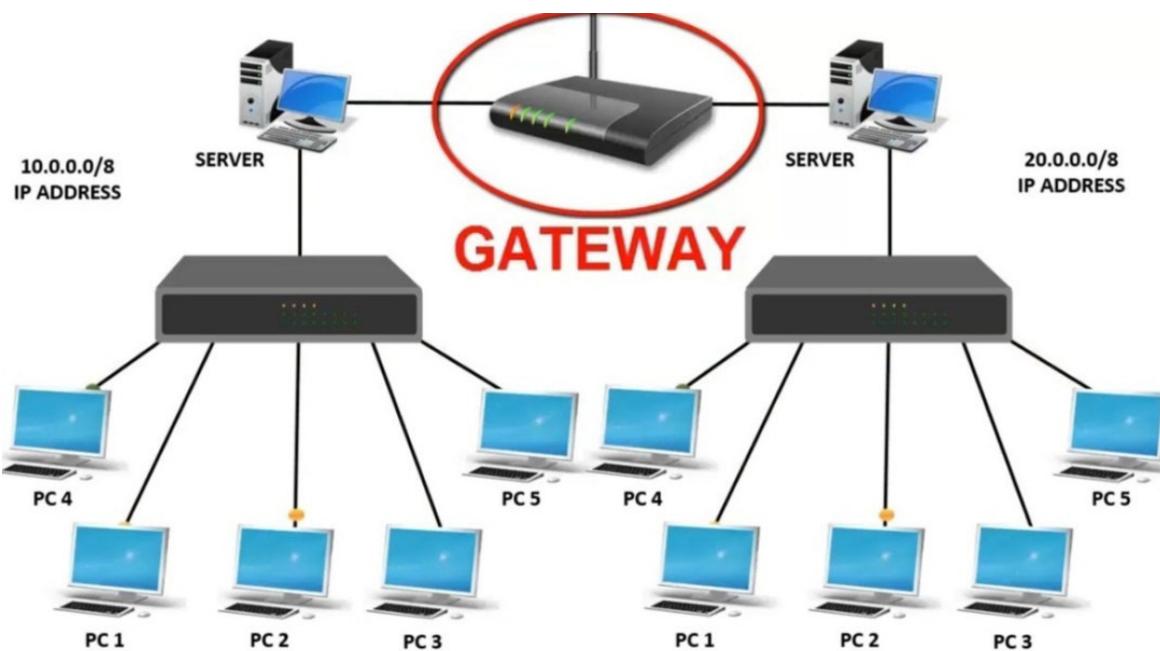
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Router– A router is a network device that can receive the data, analyze it and transmit it to other networks. A router connects a local area network to the internet.

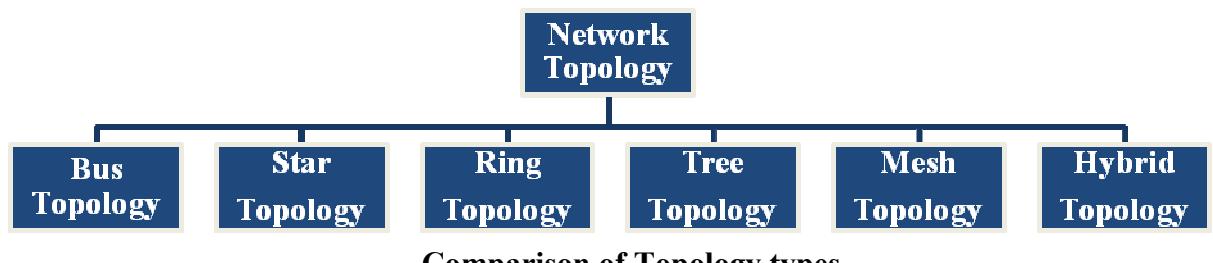


Gateway– A gateway, as the name suggests is a passage to connect two networks together that may work upon different networking models, gateways are generally more complex than switches or routers. Gateway is also called a protocol converter.



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Comparison of Topology types

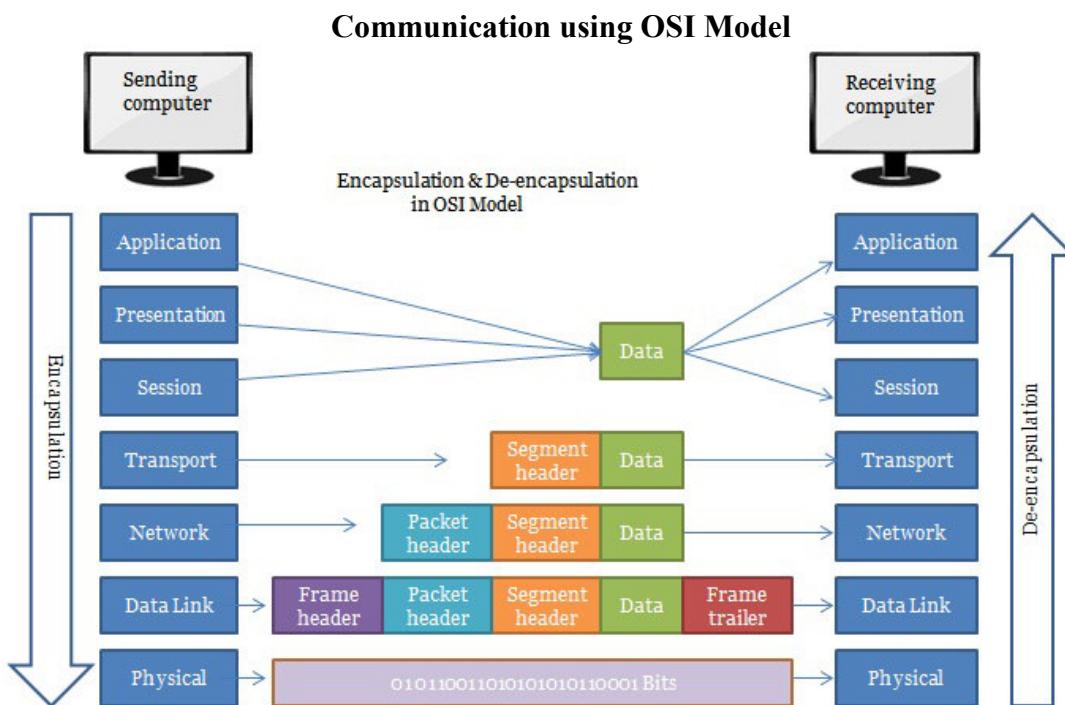
Basis	Bus	Star	Ring	Tree	Mesh	Hybrid
Topology						
Architecture	A network topology in which there is a single line (the bus) to which all nodes are connected and the node connect only to this bus.	A network topology in which peripheral node are connected to central node (such as a hub, switch or router)	In ring topology each node is connected to two other devices, one each on either side, the nodes connected with each other thus forms a ring the link in a ring topology is unidirectional.	Tree topology is the variation of star topology. This topology has a hierarchical flow of data. In tree topology all the computers are connected like the branches of tree.	In this networking topology, each communicating device is connected with every other device in the network. In order to connect n nodes. Mesh topology require $n(n-1)/2$ communication links	The hybrid topology is the combination of multiple topologies, used for constructing a single large topology.
Advantages	<ul style="list-style-type: none"> Usually requires less cabling The failure of one computer does not effect the other computers in the network 	<ul style="list-style-type: none"> Allows easy error detection and correction Star topology is easy to install. 	<ul style="list-style-type: none"> Each node has an equal access to other nodes in the network Addition of new node does not degrade the performance of the network 	<ul style="list-style-type: none"> Supported by most hardware and software Date is receive a by all the nodes efficiently because of point-to-point link. 	<ul style="list-style-type: none"> Message delivery is more reliable. Network congestion is minimum due to large number of links. 	<ul style="list-style-type: none"> It is more effective as it uses multiple topologies It contains the best and efficient feature of the combined topology form which it is constructed.
Disadvantages	<ul style="list-style-type: none"> The failure of the backbone cable results in the breakdown of entire network It is difficult to reconstruct in case of faults 	<ul style="list-style-type: none"> The hub failure leads to the overall network crash. Requires more amount of cable for connecting the nodes. 	<ul style="list-style-type: none"> It is relatively expensive to construct the ring topology. The failure of one node in the ring topology affects the other nodes in the ring. 	<ul style="list-style-type: none"> When the root node fails, the whole network crashes. It is difficult to configure. 	<ul style="list-style-type: none"> It is very expensive to implement. It is very difficult to configure and install. 	<ul style="list-style-type: none"> It is relatively more complex than the other topology It is difficult to install and configure.

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Delay/ Response time	Slow response time because of one computer transmit at a time	Good response time, depends on lot of stops	Data has to make a lot of stops	Slowly because of more traffic.	Manages high amounts of traffic because multiple devices can transmit data simultaneously	Worst response time.
Common Cable	Coaxial cable, twisted pair, fiber	<ul style="list-style-type: none"> • Coaxial cable twisted pair fiber • No more than 100 meters from the computer to the connection device 	Twisted pair requires more cables than other topologies	Overall length of each segment is limited by the of cabling used (Coaxial, Twisted pair-Fiber)	All king of cable that can be used with LAN and WAN.	Cabling depends on the types of networks, twisted pair, coaxial fiber.
Congestion control	One computer at a time sends information. Information goes along the cable and the computer accesses the information off the cable	Compared bus topology it gives for much better performance signals don't necessarily get transmitted to all the work stations	Information goes in one direction around the ring and passes along the ring until it reaches the correct computer, no buffering at repeater.	A transmission from any station propagates throughout the medium and can be received by all other stations.	A few of congestion direct from source to destination except the station with less connection	Often used across long distances, information on transfer can happen in different ways, depending on the other topologies.
Reliability	If the common cable fails, then the whole system will crash down.	In hub fails then the whole system will crash down.	If the cable fails or any computer shuts down, then the whole system will crash down.	In case of any node failure, other hierarchical network are not affected	A failure of one device does not cause a break in the network or transmission of data.	Extremely rare reliability
Complexity	Easy to connect or remove nodes in a network without affecting any other node.	Average complexity each device connects to central device with only one link only.	Complexity because of simple to data to devices.	Move complex because of tree is combination a star network topology and a bus topology.	Installation is complex in mesh topology, as each node is connected to more than one node.	the most complicated one
Security	Any computer that is connected to bus topology network will be able to see all the data transmissions on all the other computers	Security depends on central device security.	data travels from one device to the next until they reach their destination.	The data pass over more than one node	The data pass over more than one node	The worst security

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OSI (Open Source Interconnection) Model

Layer	Application	Functions	Protocols	Central Devices
Application Layer (Layer 7)	These application produce the data which has to be transferred over the network. This layer also serves as a window for the application services to access the network and for displaying the received information to the user. Example- browsers, Skype, Messenger etc.	<ul style="list-style-type: none"> • Networks virtual terminal • Mail services • Directory services 	SMTP, HTTP, FTP, POP3, SNMP, Telnet.	-
Presentation Layer (Layer 6)	It is also called the Translation Layer. the data from the application layer is extracted here and manipulated as per the required format to transmit over the network.	<ul style="list-style-type: none"> • Translation ASCII to EBCDIC • Encryption/Decryption • Compression 	MPEG, XDR, SSL, TLS, MIME	-

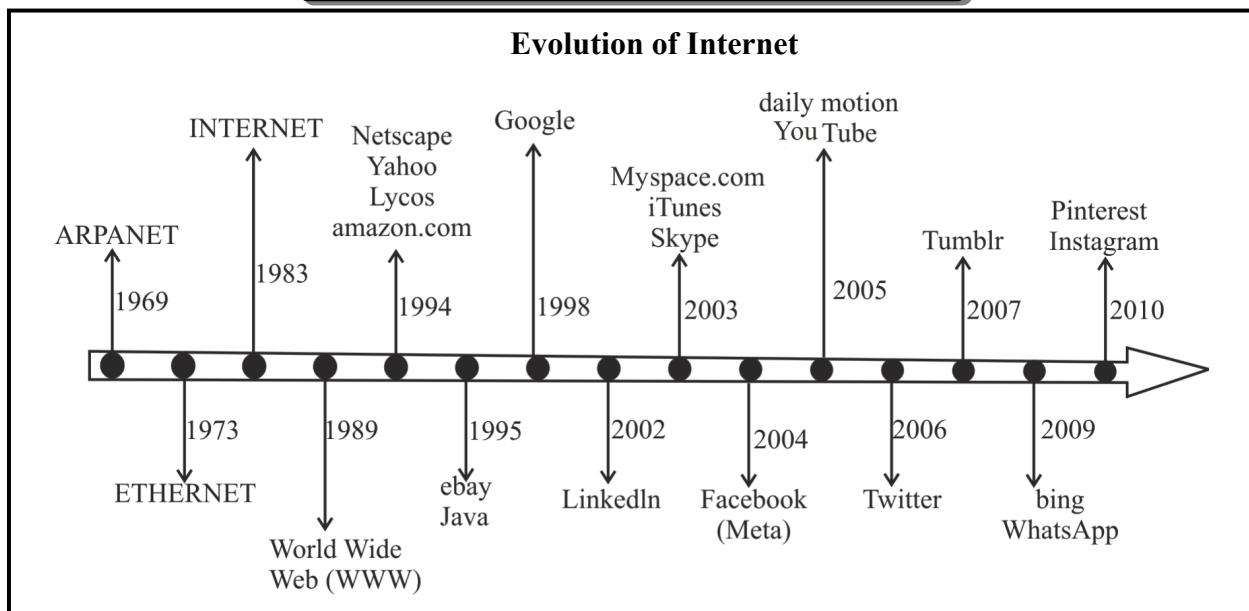
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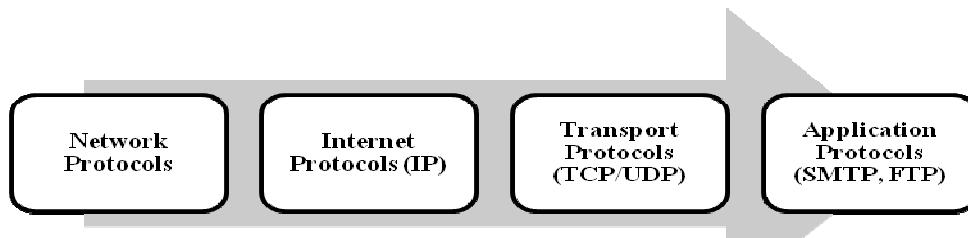
Session layer (Layer 5)	This layer is responsible for the establishment of connection maintenance of sessions, authentication and also ensures security.	<ul style="list-style-type: none"> • Session establishment, maintenance and termination • synchronization • Dialog controller 	NetBIOS, SAP PPTP, ADSP, RTCP, PAP, RCP	Gateway phone, Servers
Transport Layer (Layer 4)	The data in the transport layer is referred to as segments. It is responsible for the end to end delivery of the complete message. The transport layer also provides the acknowledgement of the successful data transmission and re-transmits the data if an error is found.	<ul style="list-style-type: none"> • Segmentation and reassembly • Services point addressing • Message acknowledgement 	TCP, UDP, SPX	Firewall, Gateway
Network Layer (Layer 3)	It works for the transmission of data from one host to the other located in different networks. It also takes care of packet routing. the sender and receiver's IP addresses are placed in the header by the network layer	<ul style="list-style-type: none"> • Routing • Logical Addressing • Subnet traffic control. 	IPv4, IPv6, ICMP, IPSEC, MPLS	Router Brouters
Data Link Layer (Layer 2)	It is responsible for the node-to-node delivery of the message. The main function of this layer is to make sure data transfer is error free from one node to another, over the physical layer, it collects the packets to form frames, which are then transmitted over the network.	<ul style="list-style-type: none"> • Framing • Physical addressing • Error control • Flow control • Access control 	PPP, ARP Frame, Relay, ATM, Fiber Cable etc.	Switch Bridge Access point
Physical Layer (Layer 1)	It is responsible for transmitting individual bits from one node to the next. When receiving data, this layer will get the signal received and convert it into 0s and 1s and send them to the data link layer. Which will put the frame back together	<ul style="list-style-type: none"> • Bit synchronization • bit rate control • Physical topologies • Transmission mode 	RJ-45 100 Base Tx, ISDN.	Hub, NIC, Cable, Modem, wireless Repeaters

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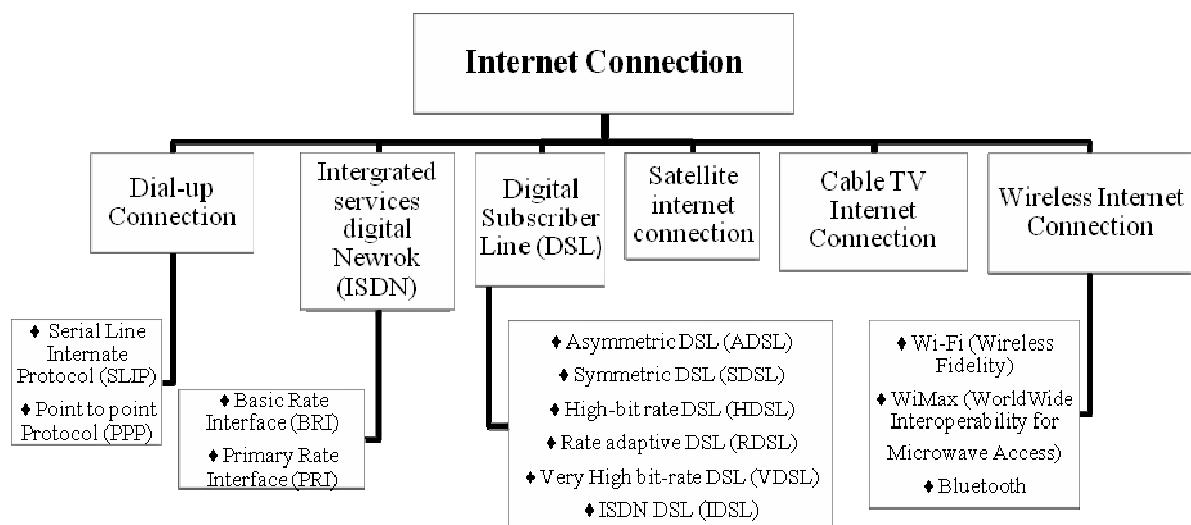
The Internet and World Wide Web



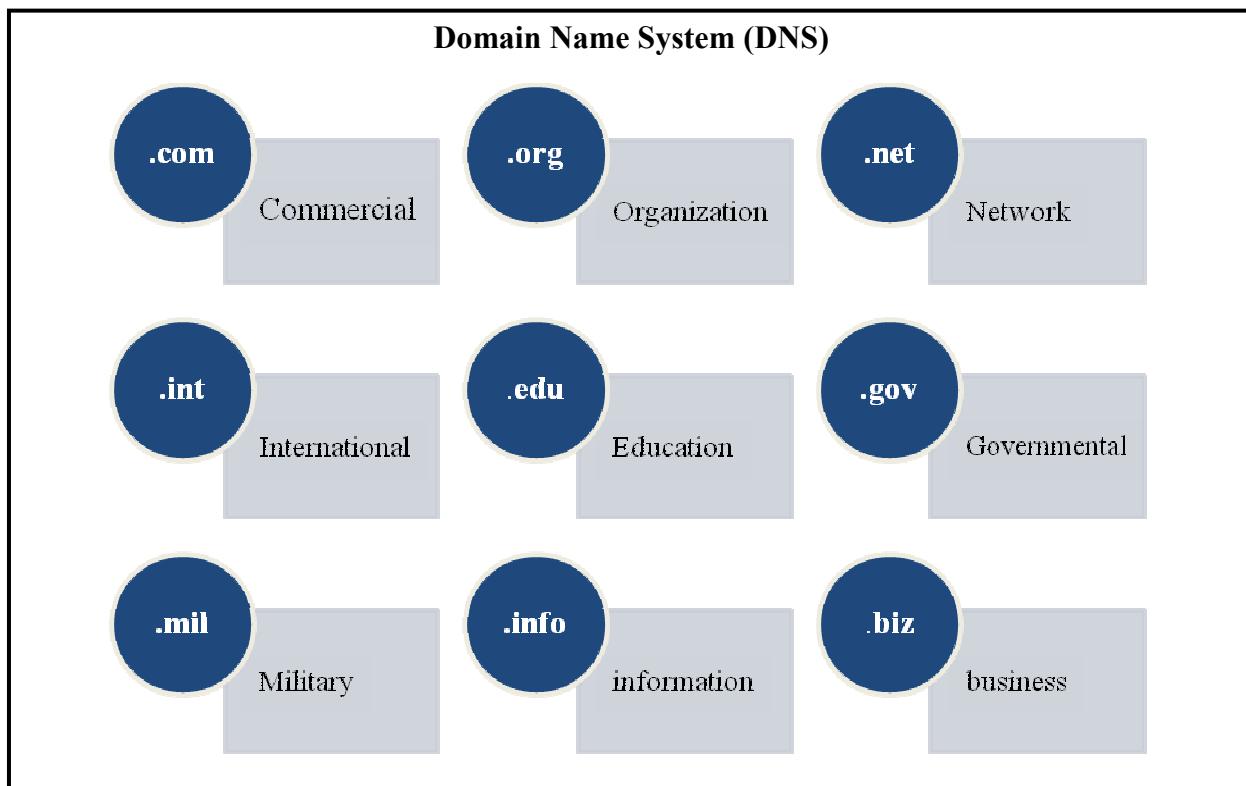
Internet Architecture Model



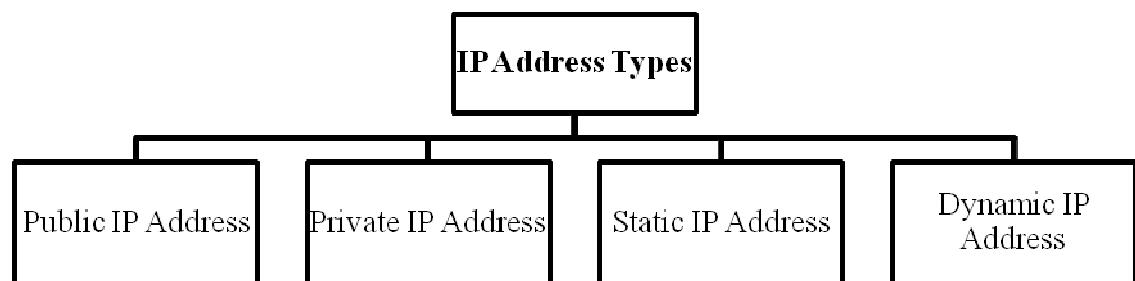
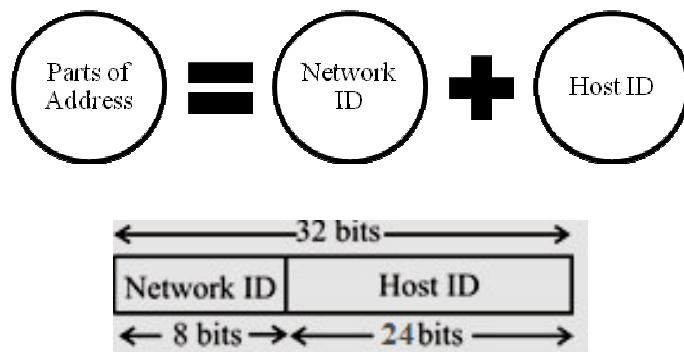
Internet Connection



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Internet Protocol (IP) Address



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IPv4 and IPv6

IPv4	IPv6
1. IPv4 has a 32-bit address length.	1. IPv6 has a 128-bit address length.
2. It supports manual and DHCP address configuration.	2. It supports Auto and renumbering address configuration.
3. It can generate 4.29×10^9 address space.	3. Address space of IPv6 is quite large it can produce 3.4×10^{38} address space.
4. Address representation of IPv4 is in decimal.	4. Address representation of IPv6 is in hexadecimal
5. In IPv4 checksum field is available.	5. In IPv6 checksum field is not available.
6. It has broadcast message transmission scheme.	6. In IPv6 multicast and any cast message transmission scheme is available.
7. IPv4 has a header of 20-60 bytes.	7. IPv6 has header of 40 bytes fixed.
8. Example - 192.0.2.1.	8. Example – 2001 : 0db8 : 85a3 : 0000 : 0000 : 8a2e : 0370 : 7334

Class of IP addresses

Address Class	Address Range	Default subnet Mask	Bit Assignment
Class A	1.0.0.0 to 126.255.255.255.	255.0.0.0	7 Bit 24 Bit 0 Network Host
Class B	128.0.0.0 to 191.255.255.255	255.255.0.0	14 Bit 16 Bit 1 0 Network Host
Class C	192.0.0.0 to 223.255.255.255	255.255.255.0	21 Bit 8 Bit 1 1 0 Network Host
Class D (Multicast)	224.0.0.0 to 239.255.255.255	Reserved for Multicasting	28 Bit 1 1 1 0 Host
Class E (Reserved)	240.0.0.0 to 254.255.255.255	Experimental	28 Bit 1 1 1 1 Host

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Internet and World Wide Web

Internet

World Wide Web (WWW)

1. Internet is a means of connecting a computer to any other computer anywhere in the world.

1. World Wide Web (WWW) which is a collection of information which is accessed via the internet.

2. It originated sometimes in late 1960s.

2. Tim Berners-Lee invented the World Wide Web (WWW) in 1989.

3. The first version of the internet was known as ARPANET.

3. In the beginning WWW was known as 'NSFNET'.

4. Internet uses IP Address.

4. WWW uses HTTP.

5. Internet is primarily hardware based.

5. WWW is more software oriented as compared to the internet.

Website

Website

Static Website

Dynamic Website

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Static and Dynamic web Pages

Static Web page

Dynamic Web page

1. In Static Web Pages, Pages will remain same until someone change it manually.

2. In static web pages, information are change rarely.

3. In static web pages, data base is not used.

4. Static web pages are written in languages such as : HTML, Java Script, CSS, etc.

5. Static web pages does not contain any application program

1. In dynamic web pages, content of pages are different for different visitors.

2. In dynamic web page, information are change frequently.

3. In dynamic web pages, database is used.

4. Dynamic web pages are written in languages such as: CGI, AJAX, ASP, ASP.NET etc.

5. Dynamic web pages contains application program for different services.

8. Uniform Resource Locator (URL)-

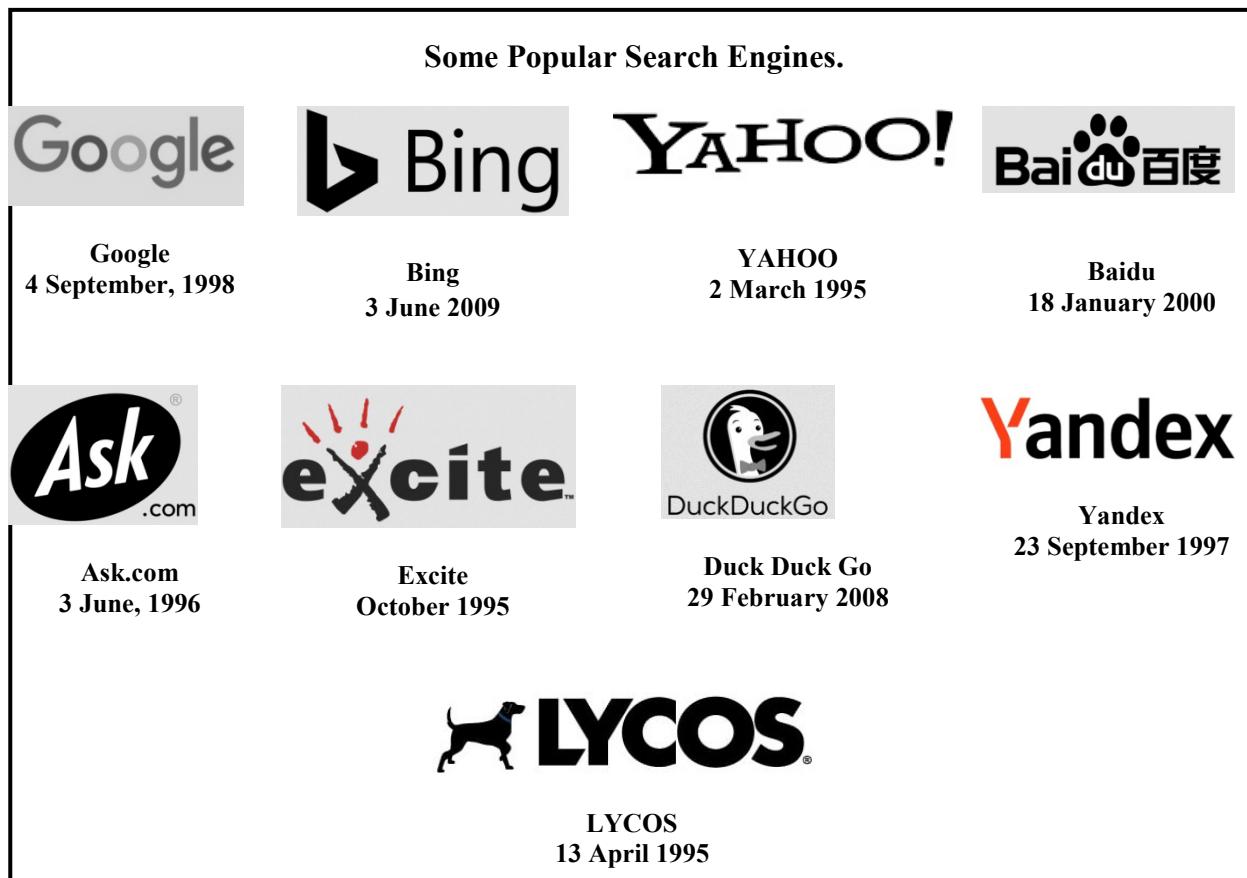


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Web Browsers

Web Browser	Release Date	Developers	
	World Wide Web	1990	Tim Berners Lee
	Mosaic	1993	Marc Andreessen (NCSA)
	Netscape Navigator	1994	Netscape Communications AOL
	Internet Explorer	1995	Microsoft
	Mozilla Firefox	2002	Mozilla Foundation
	Safari	2003	Apple
	Google Chrome	2008	Google
	Opera	1995	Opera

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Most Commonly used tags in HTML

HTML tags	Description	Syntax
HTML	It is the root of the html document which is used to specify that the document is html.	<html> statements </html>
Head	Head tag is used to contain all the head element in the html file.	<head> statements </head>
Body	It is used to define the body of html document. It contains image, tables, lists etc.	<body> statements </body>
Title	It is used to define the title of html document.	< title > statements </title>
Heading	It is used to define the heading of html document.	< h1 > Statements < /h1 > < h2 > Statements < /h2 > < h3 > Statements < /h3 >

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Paragraph	It is used to define paragraph content in html document.	< P > Statements < /P >
Emphasis	It is used to renders as emphasized text.	< em > Statements < /em >
Bold	It is used to specify bold content in html document.	< b > Statements < /b >
Italic	It is used to write the content in italic format.	< i > Statements < /i >
Small	It is used to set the small font size of the content.	< Small > Statements < /Small >
Underline	It is used to set the content underline.	< u > Statements < /u >
Deleted text	It is used to represent as deleted text. It cross the text content.	< Strike > Statements < /Strike >
Anchor	It is used to line one page to another page.	< a href = “.....”> Statements < /a >
List	It is used to list the content.	< li > Statements < /li >
Ordered List	It is used to list the content in a particular order.	< ol > Statements < /ol >
Unordered List	It is used to list the content without order.	< ul > Statements < /ul >
Comment	It is used to set the comment in html document in html document. It is not visible on the browser.	< ! - - Statements >
Scrolling Test	It is used to scroll the text or image content.	<marquee> Statements </marquee >
Center	It is used to set the content into the center.	< center > Statements < /center >
Font	It is used to specify the font size, font color and font – family in html document.	< font > Statements < /font >
Line break	It is used to break the like.	< br >
Image	It is used to add image element in html document.	< img >

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Link	It is used to link the content from external source.	< link >
Tables	Table tag is used to create a table in html document.	<table> Statements < /table >
Tr	It is used to define row of html table.	< tr > Statements < /tr >
Th	It defines the header cell in a table. By default it set the content with bold and center property.	< th > Statements < /th >
Td	It defines the standard cell in html document.	< td > Statements < /td >
Form	It is used to create html form for user.	<form> Statements < /form >
Submit Input	It is used to take the input from the user.	< input >
Dropdown option	It is used to select an option from a drop down list.	<option> statements </option>

E-mail (Electronic Mail)

To demo@yourname.com ► **Recipient E-mail Address**

Cc demo2@example.com name@yourcompany.com ► **Carbon Copy Receiver E-mail Address**

Bcc info@yourcompany.com ► **Blind Carbon Copy Receiver E-mail Address**

Example ► **(Subject) A Short Title About Your E-mail**

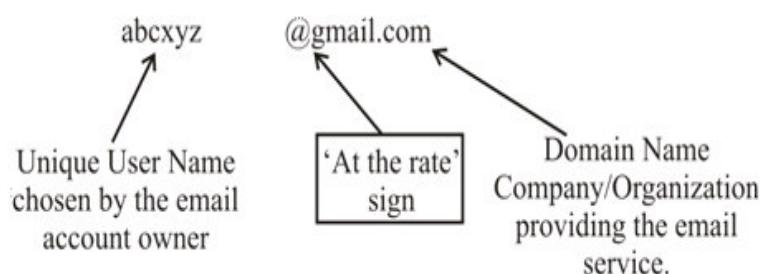
Dear sir, ► **Greetings**

I would like to take this opportunity ► **Message Body**

--
Thanks & Regards ► **Closing**

Mr. Y ► **Signature**

An email address consists of 3 parts



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Some Popular Social Media Site

Sites	Launched	Founders
 Facebook	2004	Mark Zuckerberg
 YouTube	2005	Jawed Karim, Steve Chen, Chad Hurley
 WhatsApp	2009	Brian Acton, Jan Koum
 Instagram	2010	Kevin Systrom, Mike Krieger
 Tik Tok	2016	Byte Dance Ltd, Zhang Yiming
 Snapchat	2011	Evan Spiegel, Bobby Murphy, Reggie Brown
 Reddit	2005	Steve Huffman, Alexis Ohanian, Aaron Swartz.
 Pinterest	2010	Ben Silberman, I Paul Sciarra, Evan Sharp
 Twitter	2006	Jack Dorsey, Evan Williams, Biz Stone.
 LinkedIn	2003	Reid Hoffman
 Telegram	2013	Nikolai Durov Pavel Durov

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Microsoft Office

1. MS Word System

Accessing MS Word-

→ We can start MS Word by using the start menu.

Start → All program → Microsoft Office → Microsoft word.

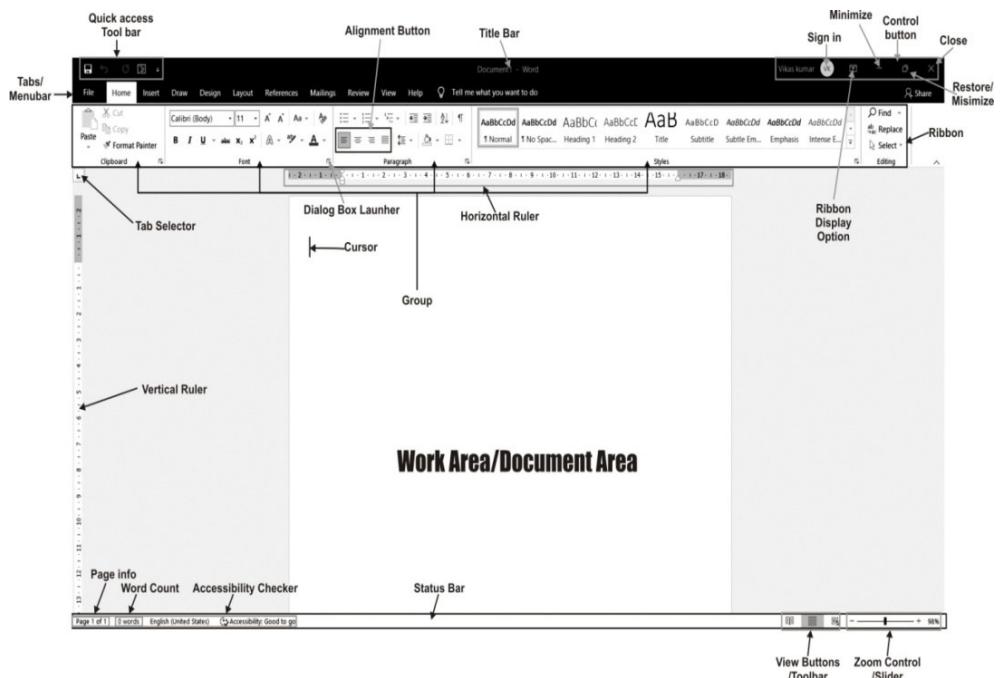
→ We can start MS Word by using Run Command.

- Select start → Run to display the Run dialog box.

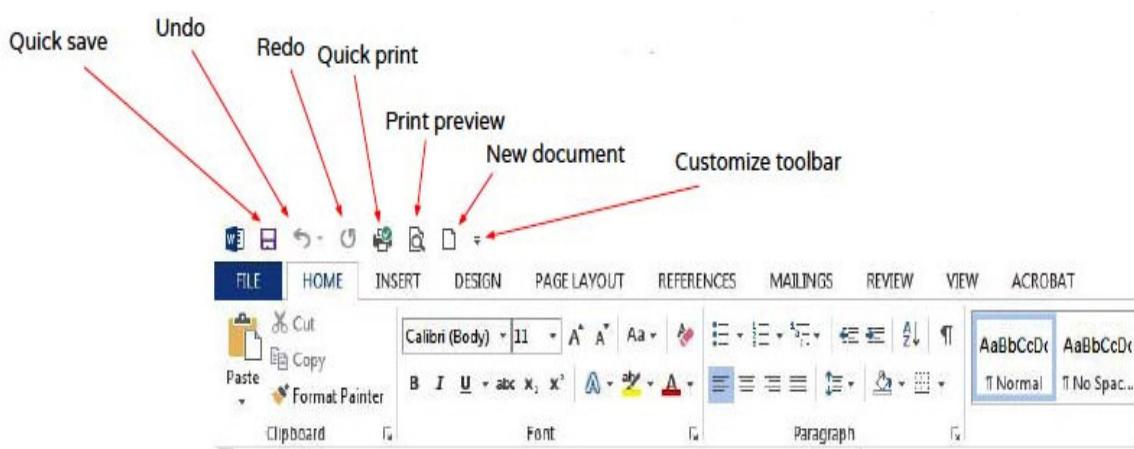
OR

Press ‘Window’Key + R

- Type ‘winword’ in the open text box and click ok or press the Enter Key.

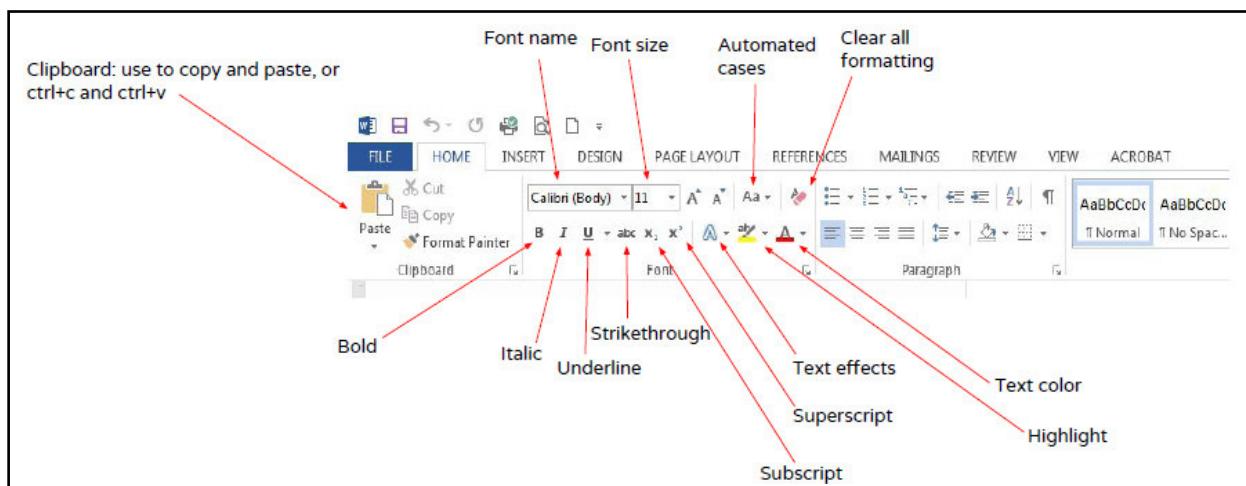


Quick Access toolbar

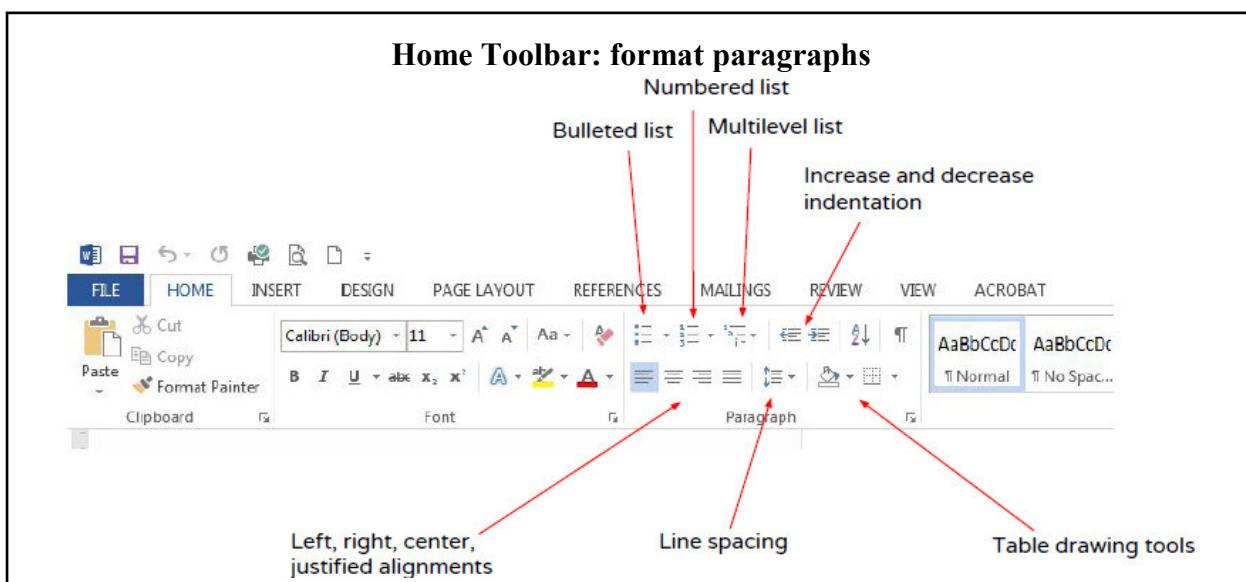


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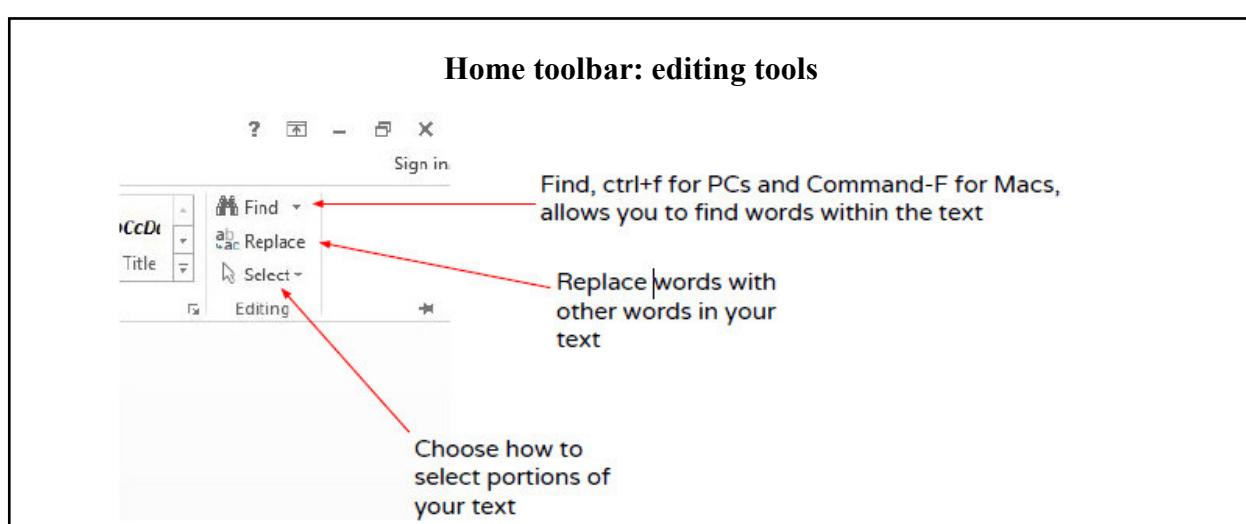
Home Toolbar: font style & clipboard



Home Toolbar: format paragraphs

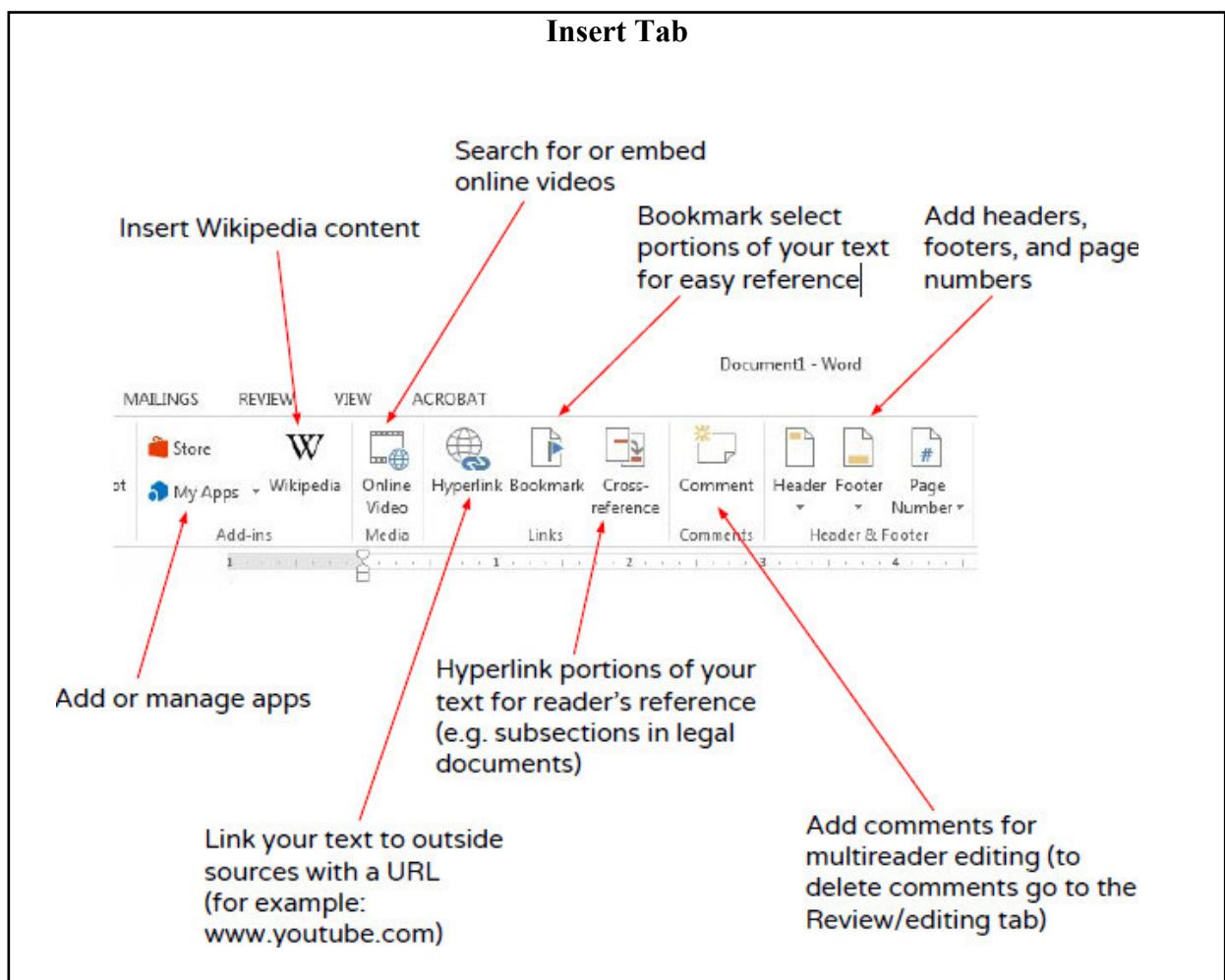
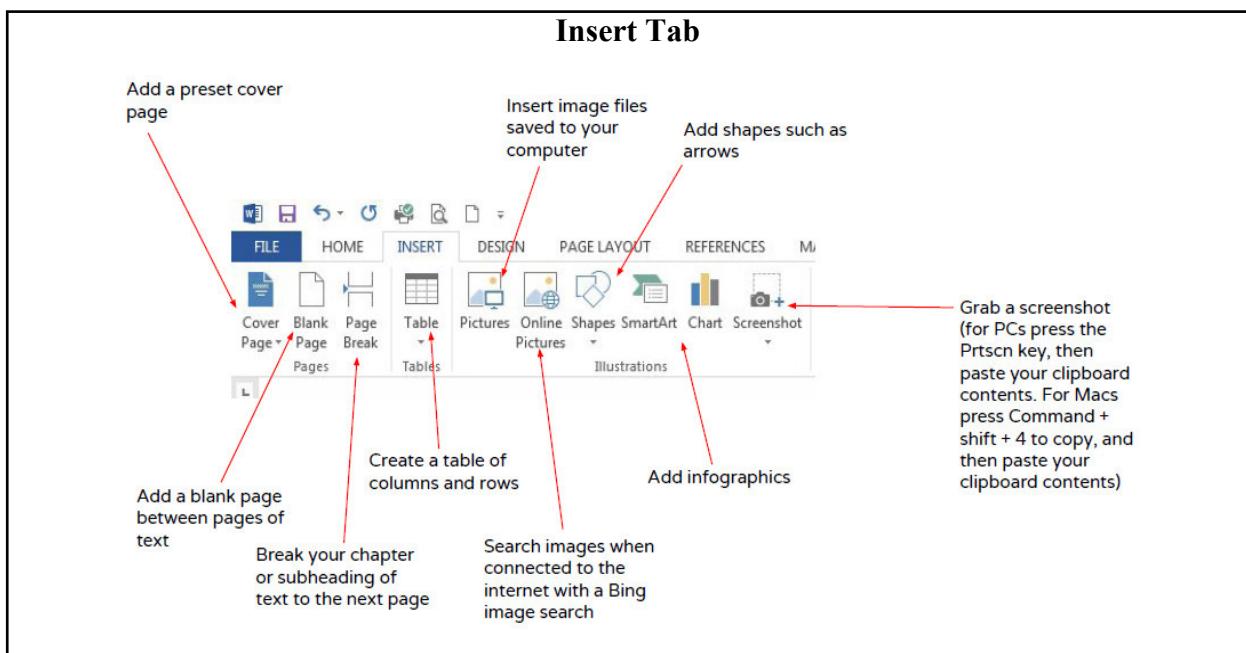


Home toolbar: editing tools



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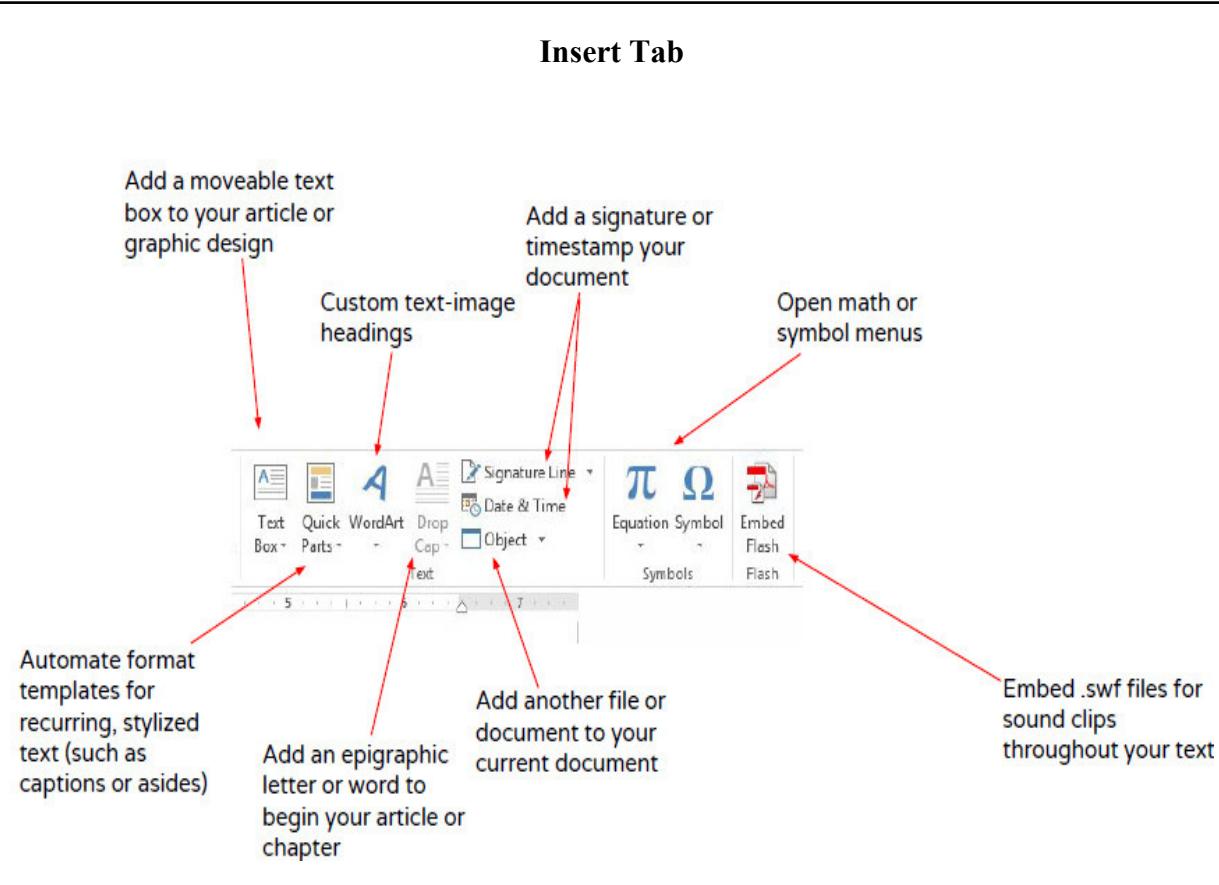
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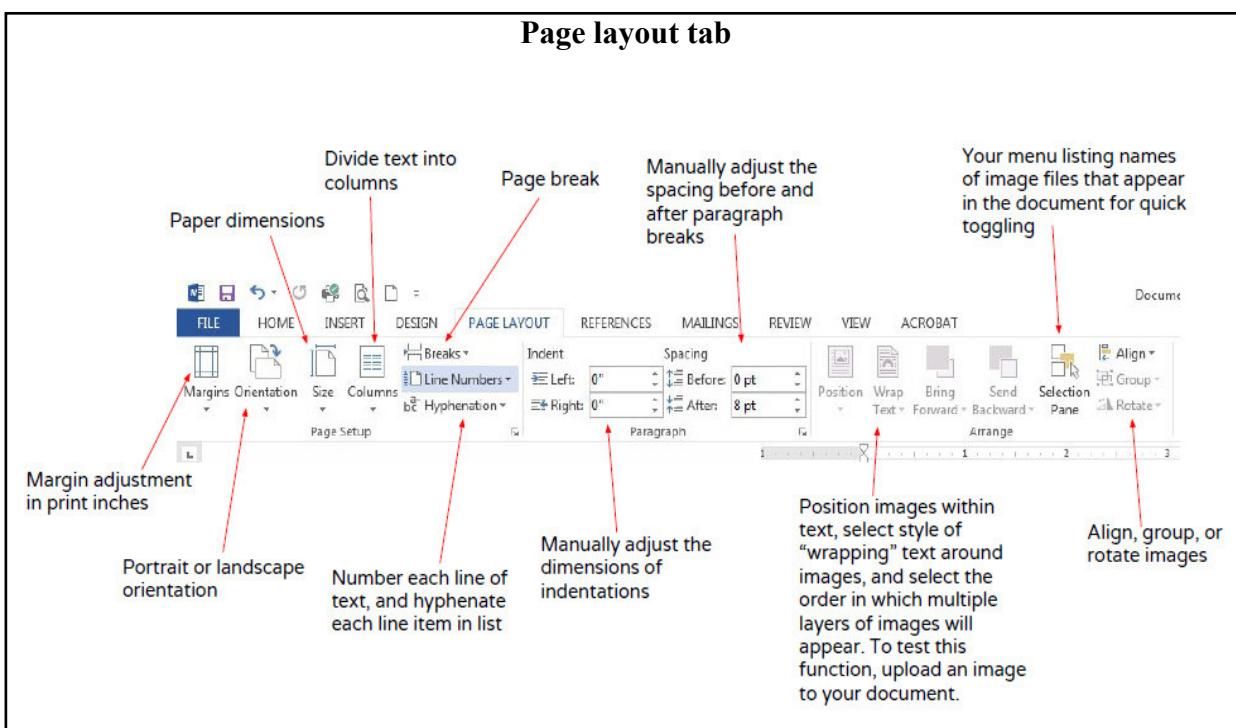
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Insert Tab

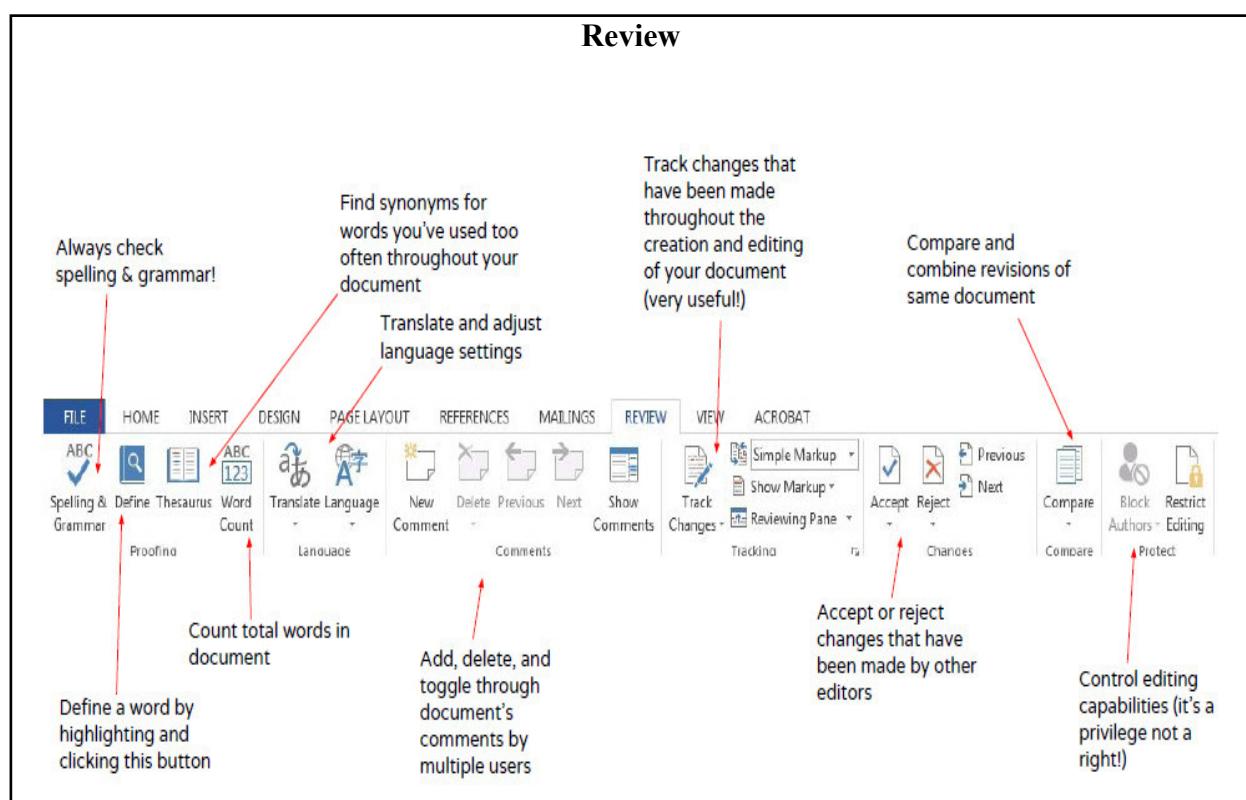
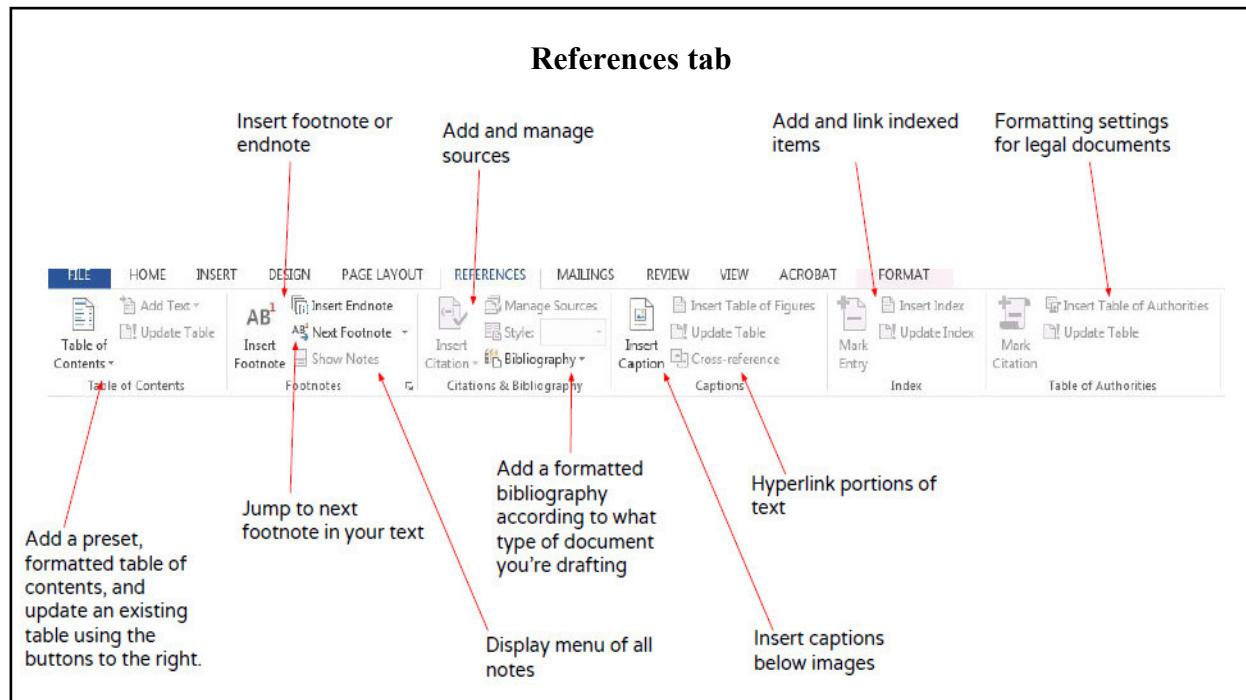


Page layout tab



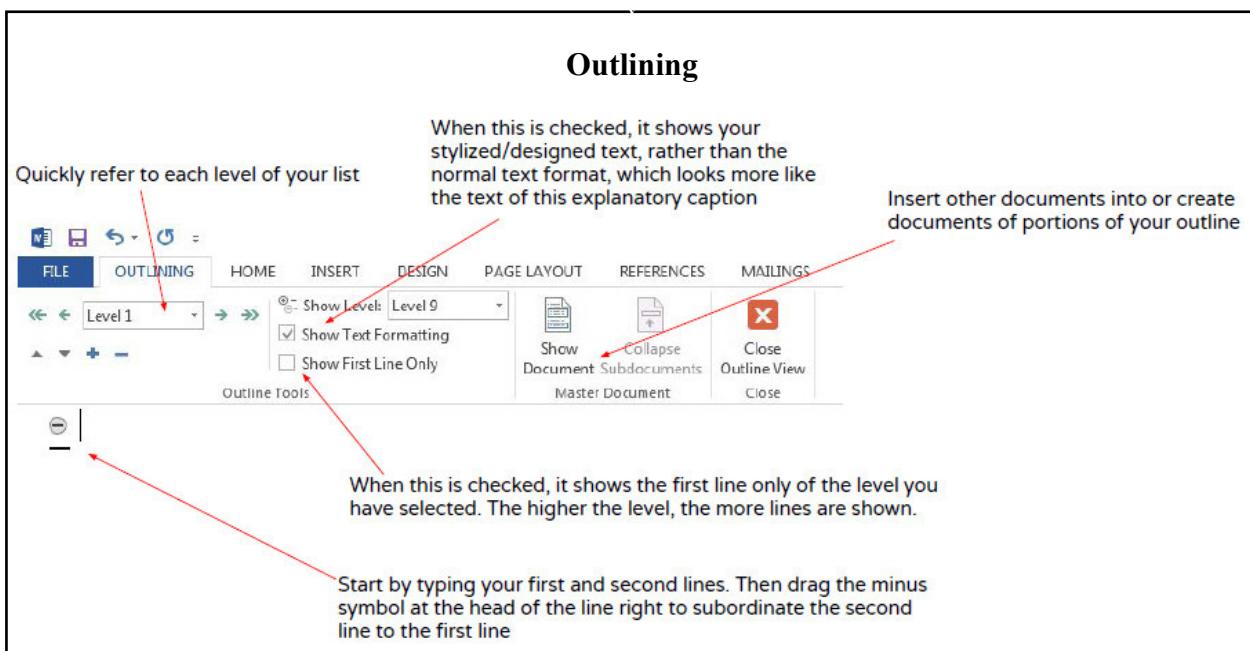
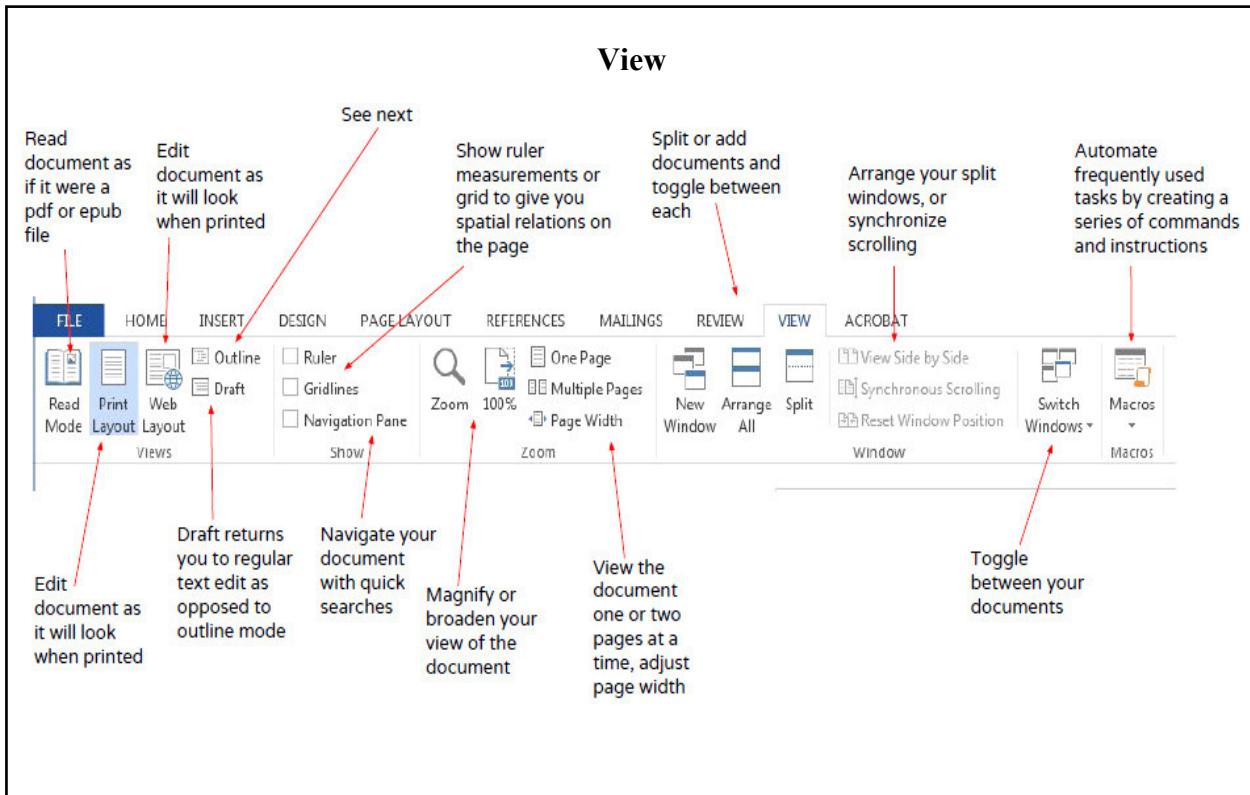
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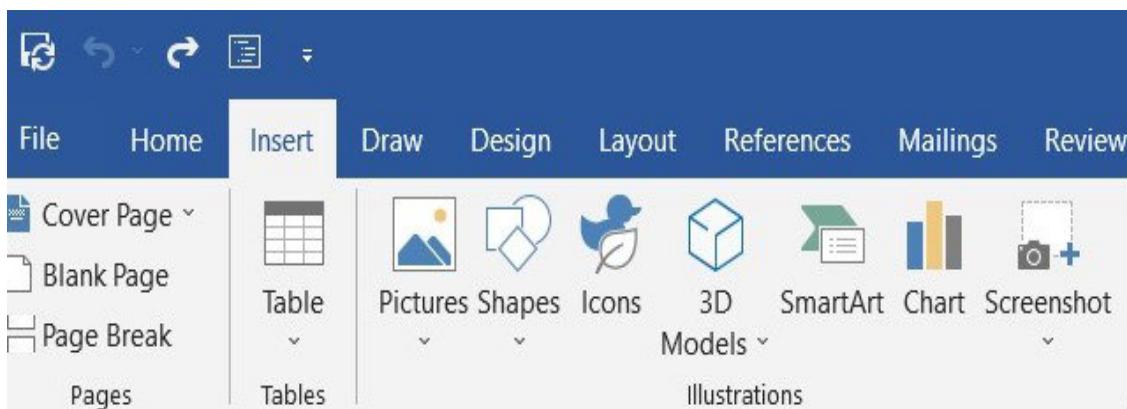
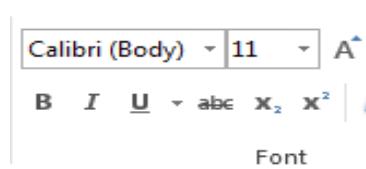
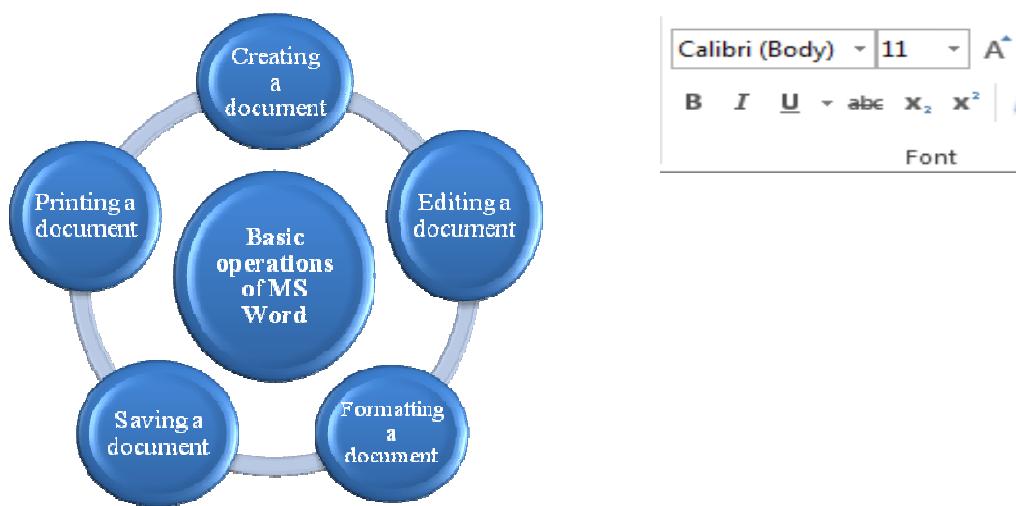
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Basic Operations Performed in MS Word.



Creating a document

1. Open word
2. go to file tab → New → Blank document

OR

Press ctrl + N keys

Add and Format Text-

1. Place the cursor and type some text
2. To format, select the text and then

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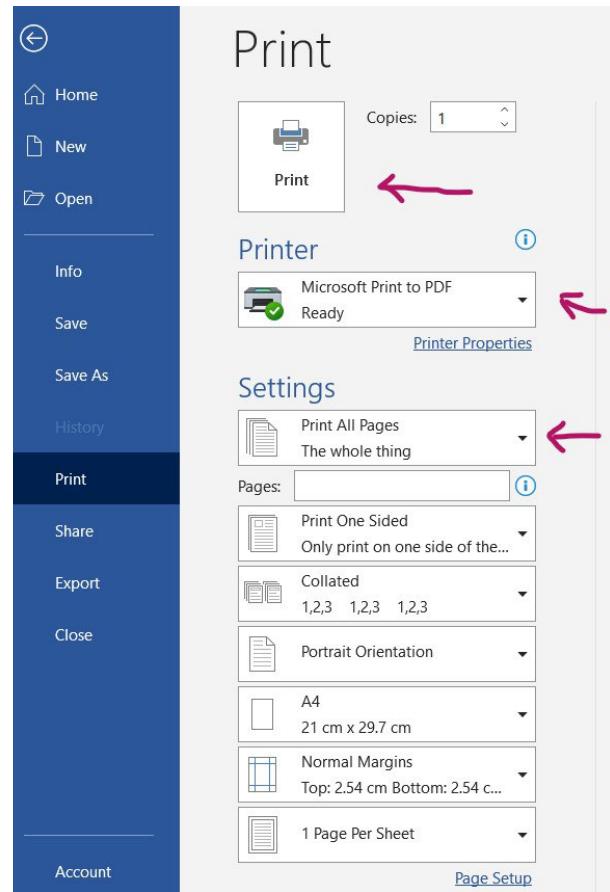
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Add Pictures, Shapes, SmartArt and more

Step-1: Select the **Insert** tab.

Step-2: Select what you want to add:

- **Tables** - select **Table**, hover over the size you want, and select it.
- **Pictures** - select **Pictures**, browse for pictures from your computer, select a stock image, or even search Bing.
- Note:** Older versions of Word may have **Online Pictures** on the ribbon next to **Pictures**.
- **Shapes** - select **Shapes**, and choose a shape from the drop-down.
- **Icons** - select **Icons**, pick the one you want, and select **Insert**.
- **3D Models** - select **3D Models**, choose from a file or online source, go to the image you want, and select **Insert**.
- **SmartArt** - select **SmartArt**, choose a **SmartArt Graphic**, and select **OK**.
- **Chart** - select **Chart**, select the chart you want, and select **OK**.
- **Screenshot** - select **Screenshot** and select one from the drop-down



Open an existing word document:

Goto **File** tab → **Open** → **Browse** → select your document → Click open.

Step 1: Click on **file tab**

Step 2: Click on **open** and browse or navigate to where the document is store and double click it or select it.

Short Cut key- Press Ctrl + O keys.

Save The document:

Save→ To save the changes in the original document. It just update current file.

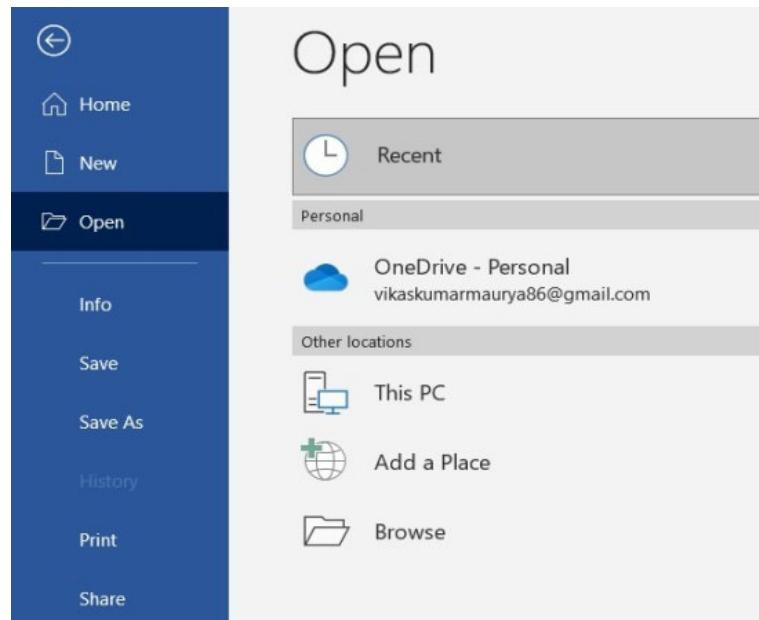
Save As→ To save a different copy of the document along with the changes made
Save As mean don't update current file and create new file with different name.

Shortcut Keys→

Ctrl + S → Save

F12 → Save As

Note→ When you save for the first time "save" and "Save As" command are same.



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Print a document:

Before you print, you can preview your document and specify which pages you want to print.

Step-1: Click File > Print.

or

Press **Ctrl + P** shortcut keys from keyboard .

Step-2: To preview each page, select the forward and backward arrows at the bottom of the page.



If the text is too small to read, use the zoom slider at the bottom of the page to enlarge it.



Step-3: Choose the number of copies and any other option you want such as print all pages, print current page orientation and choose printer etc.

MS Word Shortcut Keys	
Press keys	To do this one
Ctrl + A	Select all contents of the page.
Ctrl + B	Bold selected text.
Ctrl + C	Copy selected text.
Ctrl + D	Open Font dialog box
Ctrl + X	Cut selected text.
Ctrl + P	Open the print window.
Ctrl + E	Aligns the line or selected text to the center of the screen
Ctrl + F	Open find box.
Ctrl + G	Go to
Ctrl + H	Replace
Ctrl + I	Italic selected text.
Ctrl + J	Justify the text
Ctrl + K	Open insert hyperlink window
Ctrl + U	Underline selected text
Ctrl + V	Paste

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Ctrl + Y	Redo the last action performed
Ctrl + Z	Undo last action
Ctrl + L	Aligns the line or selected text to the left of the screen.
Ctrl + R	Align Selected text to the right of the screen.
Ctrl + M	Indents the paragraph
Ctrl + N	Create a new document.
Ctrl + Shift + F	Change the font.
Ctrl + Shift + >	Increase selected font with 1pts up to 12pt and then increase font +with 2pts.
Ctrl + O	Open a file
Ctrl + F12	launch the open dialog box
End key	Move the cursor to the end of line
Home key	Move the cursor to the start of line
Ctrl +]	Increase selected font with 1pts.
Ctrl + Shift + <	Decrease selected font with 1pts, if above 12pts then decreases font by 2pt.
Ctrl + [Decrease selected font with 1pts.
Ctrl + Shift + *	View or hide non printing characters.
Ctrl + left arrow key	Moves cursor one word to the left.
Ctrl + right arrow key	Moves cursor one word to the right.
Ctrl + up arrow key	Moves cursor to the beginning of the paragraph.
Ctrl + down arrow	Moves cursor to the end of the paragraph.
Ctrl + Del	Deletes word to right of cursor
Ctrl + Backspace	Deletes word to left of cursor
Ctrl + End	Moves the cursor to the end of the document
Ctrl + Home	Moves the cursor to the home of the document
Ctrl + Spacebar	Reset selected text to the default font.
Ctrl + 1	Single space lines

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Ctrl + 2	Double space lines
Ctrl + 5	1.5-line spacing
Ctrl + Alt + 1	Changes text to heading 1.
Ctrl + Alt + 2	Changes text to heading 2.
Ctrl + Alt + 3	Changes text to heading 3.
Ctrl + F1	Toggles the display of the Ribbon.
F1	Open help
Alt + Ctrl + F2	Open new document
Ctrl + F2	Display the print preview.
Alt + P, SP	To open page setup dialog box
Shift + F3	change case
Shift + insert	Paste the copying text
F4	Repeat the last action performed (Word 2000+)
F5	Go To
Ctrl + Shift + F6	Opens to another open Microsoft Word document.
F7	Spell and grammar
Shift + F7	Runs a Thesaurus check on the word highlighted.
F12	Save As.
Shift + F12	Save
Ctrl + Shift + F12	Prints the document
Alt + Shift + D	Insert the current date
Alt + Shift + T	Insert the current time
Mouse Action	To do this one
Click, hold and drag	Selects text from where you want.
Double-click	To select a word.
Triple-click	To Select the paragraph.
Ctrl + Mouse wheel	Zooms in and out

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2. MS EXCEL SYSTEM

Accessing MS Excel-

→ We can start MS Excel by using the start menu-
Start → All program → Microsoft Office → Microsoft Excel.

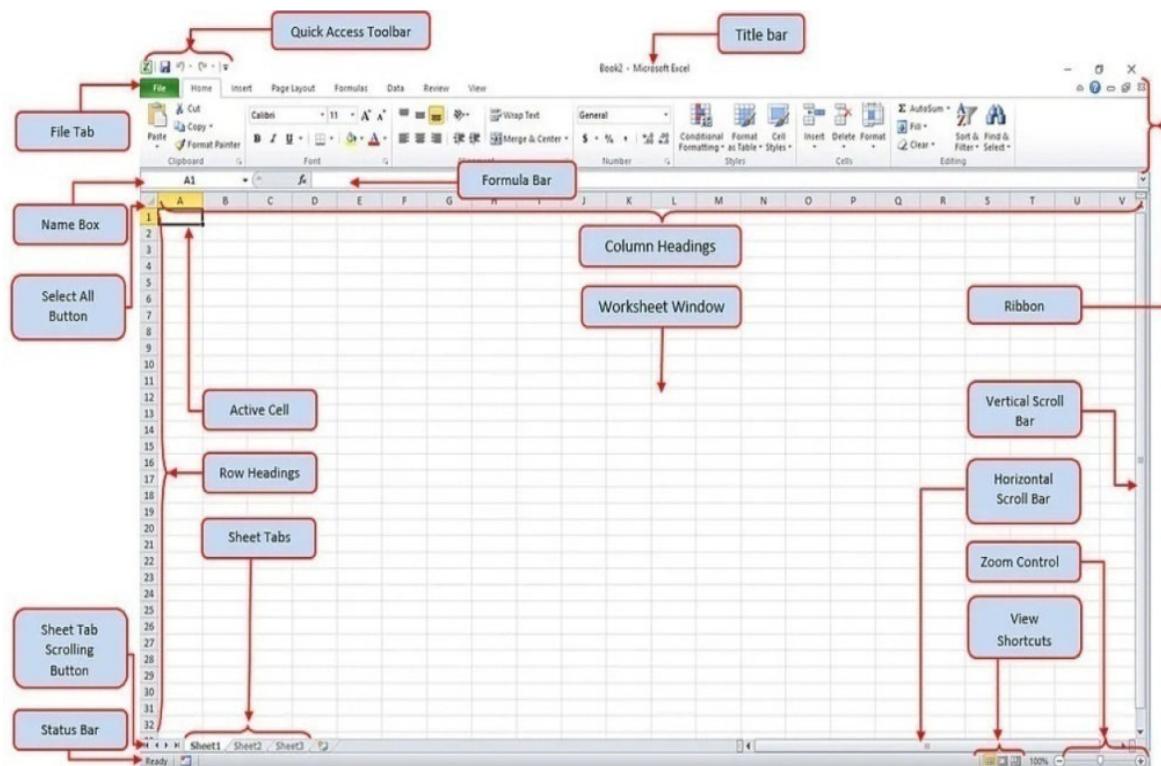
→ We can start MS Excel by using Run Command.

(i) Select start→Run to display the run dialog box.

OR

Press ‘windows’ key + R

(ii) Type ‘excel’ in the open text box and click OK or press the Enter key.



Basic Operations performed in MS Excel-



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Some important terminology for MS Excel.

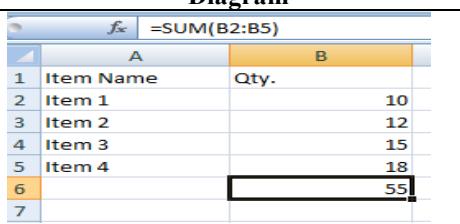
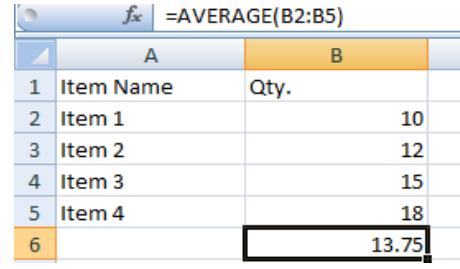
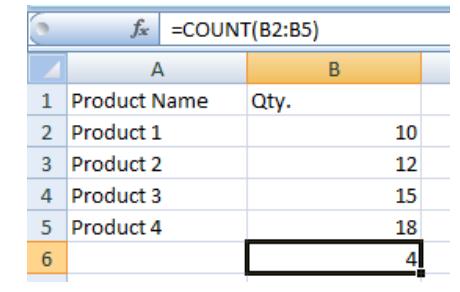
Term	Explanation
Work book	The workbook refers to an excel spreadsheet file. It is collection of one or more spreadsheet. Opening a workbook with three work sheets by default and we can add maximum 255 worksheet within workbook.
Worksheet	Within the workbook is where you'll find document called worksheet. Also known as spreadsheets, you can have multiple worksheets nested in a workbook.
Cells	A cell is a rectangle or block housed in a worksheet. Any data that you want to enter into your worksheet must be placed in a cell. It is the intersection of a row and a column, each cell has its-own name or cell address. The maximum number of cells in excel 2D19 is 17,179,869,184.
Column	Columns are a vertical block of cell that runs from top to bottom along the length of worksheet. In this, the alphabet is displayed from left to right A worksheet has a maximum 16344 columns. Column start with A, B, C and end with XFD.
Row	Rows are aligned horizontally. The maximum number of rows in excel 2019 is 1048576
Ribbon	Above the workbook is a section of command tabs called the Ribbon. A multitude of options are found behind each tab of the ribbon.
Cell Reference	A cell reference is a set of coordinates that identifies a specific cell. It is a combination of letters and numbers. For example, A5 would point to the cell located where column A and row 5 intersect.
Cell Range	A cell range is a collection of cells that have been identified as a group based on a variety of criteria. By using a colon (:) between cell references, excel can determine the range, also known as an array. e.g. A1:C1.
Merged cell	When two or more cells are combined, it is become what is known as a merged cell.
Operator	Operators are symbols or signs that indicate which calculation must be made in an expression.
Formula	A sequence inside a cell that is used to produce a value. It must begin with an equal (=) sign. This could be a mathematical equation, cell references, function or operator. A formula is also known as an expression.
Formula Bar	Nestled between the ribbon and workbook the formula bar will display the contents of an active cell. In the case of formulas. The formula bar will display all components of the formula.
Function	Functions are formulas that are pre-built into excel. They are designed to help simplify potentially complex formulas in a worksheet.

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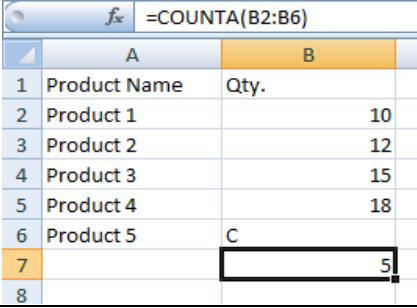
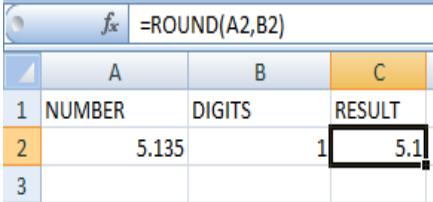
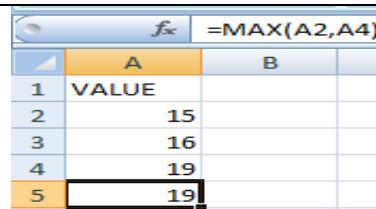
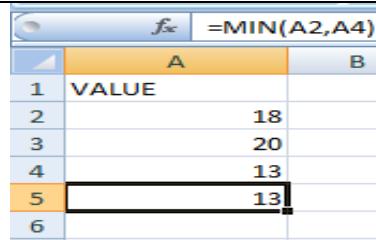
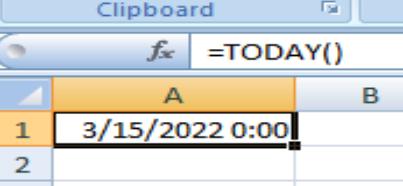
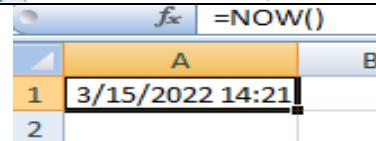
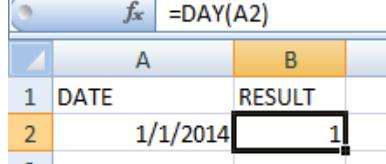
Filter	Filters are rules that you can employ to decide which rows in a worksheet to display. These filters can use data such as conditions or values.
Auto sum	This feature will add up the numbers you have entered in your sheet and display the total in a cell of your choosing.
Auto format	This is an automated format application to cells that match pre-determined criteria. This could be as simple as font alignment and size.
Pivot Table	This is a data summarization tool most commonly used to sort, average to sum up automatically. The information is pulled from one table while the results are displayed in another. Pivot tables makes it easy to retrieve specific information from a large source of data.
Pivot Chart	This type of chart provides aid for pivot tables. By providing graphical representations of the pivot table data, the user can provide a level of interactivity with the data.
Item	These are sub-categories of fields in your pivot table. If you have a field that is marked state, the items could be Alabama, Alaska and so on.

Some important functions used in MS Excel-

Functions	Description	Syntax	Diagram
SUM()	The sum function adds values you can add individual values, cell references or ranges or a mix all three.	sum (num1, [num2],) num1 – The first value to sum [required] num2 – [optional] the second value to sum For example- =sum (A2:A5)	
AVERAGE 0	AVERAGE function calculate the average value in the range of cells	= AVERAGE (num1, [num2],) num1 – A number or cell reference that refers to numeric value [required] num2 – A number or cell reference that refers to numeric values. Example- AVERAGE (A1: A5)	
COUNT()	The count function, counts the numbers of cells in a range of cells. Empty cells and text values are ignored.	= COUNT (value1, [value2],) value1 – An item, cell reference, or range. value2 – An item, cell reference, or range [optional] Example- =COUNT(1, 2, 3, 4)//Returns 4 =COUNT(1, "a")// Returns 1	

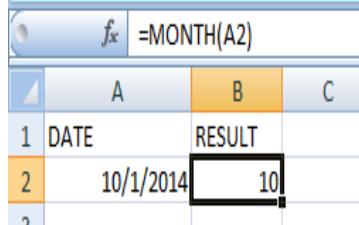
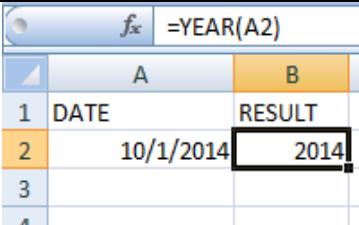
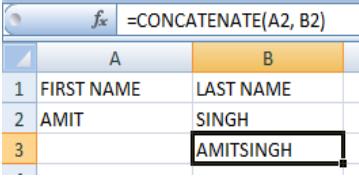
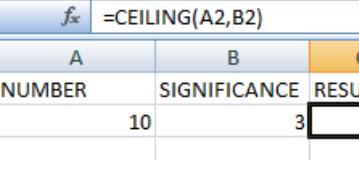
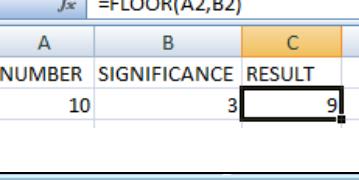
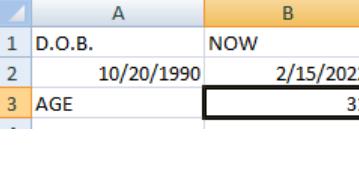
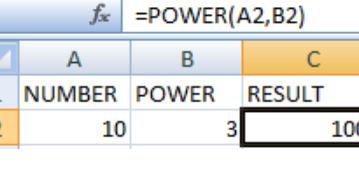
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COUNTA()	<p>COUNTA function returns the count of cells that contain numbers, text, logical value, error values and empty text (""). COUNTA does not count empty cells.</p> <p>= COUNTA (value1, [value2],) Example— = COUNTA (1, 3, 8)//returns 3 = COUNTA (2, 5, "b", 1%)//returns 4</p>	
ROUND()	<p>The ROUND function rounds a number to a specific number of digits.</p> <p>= ROUND (number, num_digits) number-(required) The number that you want to round. num-digits (Required) The number of digits to which you want to round the number argument. Example— = ROUND (B, B1, 1)// ROUND to 1 decimal place</p>	
MAX()	<p>The Excel MAX function returns the largest numeric value in the data provided.</p> <p>= MAX (number1, [number2],) Example— = MAX (15, 16, 19)// returns 19</p>	
MIN()	<p>This function returns the smallest value out of a set of values.</p> <p>= MIN (num1, [num2],) Example— MIN (18, 20, 13)//returns 13</p>	
TODAY()	<p>In MS Excel TODAY() functions returns current date.</p> <p>=TODAY() Example— TODAY()// Current date TODAY() + 90// 90 days from today</p>	
NOW()	<p>In MS Excel NOW() functions returns current date and time.</p> <p>NOW()</p>	
DAY()	<p>The DAY() function returns the day value in a given date as a number between 1 to 31 from a given date.</p> <p>= DAY(date)</p>	

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MONTH()	This function returns the month of date represented by a serial number. The month is given as an integer from 1(January) to 12 (December).	MONTH (Serial_Number) Example— MONTH ("01_OCT")//Returns11	
YEAR()	This function returns the year corresponding to the date, given as an argument.	YEAR (Serial_Number) Serial_Number is the date of the year you want to find it. Example— Year ("10/01/2014") = 2014	
CONCATENATE()	CONCATENATE() use to join two or more text string into one string.	CONCATENATE (text1, [text2],) Example— CONCATENATE("TOTAL", " VALUE") = TOTAL VALUE	
CEILING()	CEILING() — The CEILING function rounds a number up to its nearest multiple of significance.	=CEILING (Number, significance)	
FLOOR()	In MS Excel the FLOOR rounds a number down to the nearest multiple of significance.	=FLOOR(number, significance)	
DATEDIF()	In MS Excel the DATEDIF function returns the difference between two date values in years, month or days.	=DATEDIF(start_dat, end_date,unit)	
POWER()	The POWER() returns the result of a number raised to a given number. This function is alternative of exponent operator.	=POWER(number, power)	

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Microsoft Excel Shortcuts Keys	
Press Keys	To do this one
F2	Edit the selected cell.
F5	Go to a specific cell. For example A5.
F11	Create chart.
Ctrl + Shift + ;	Enter the current time.
Ctrl + :	Enter the current date.
Alt + Shift + F1	Insert New Worksheet.
Shift + F3	Open the Excel formula window.
Shift + F5	Bring up search box.
Ctrl + A	Select all contents of the worksheet.
Ctrl + B	Bold selected text.
Ctrl + I	Italic selected text.
Ctrl + K	Insert link.
Ctrl + U	Underline selected text.
Ctrl + 5	Strikethrough selected text.
Ctrl + P	Printing dialog box open.
Ctrl + Z	Undo last action.
Ctrl + F9	Minimize current window.
Ctrl + F10	Maximize currently selected window.
Ctrl + F6	Switch between open workbooks/ windows.
Ctrl + Page up	Move between Excel worksheets in the same Excel document.
Ctrl + Page down	Move between Excel worksheets in the same Excel document.
Ctrl + Tab	Move between two or more open Excel files.
Alt + =	Create a formula to sum all of the above cells.
Ctrl + '	Insert the value of the above cell into cell currently selected.
Ctrl + Shift + !	Format number in comma format.
Ctrl + Shift + \$	Format number in currency format.
Ctrl + Shift + #	Format number in date format
Ctrl + Shift + %	Format number in percentage format
Ctrl + shift + ^	Format number in scientific format.
Ctrl + Shift + @	Format number in time format.
Ctrl + Arrow Key	Move cursor to next section to text.
Ctrl + Space	Select entire column.
Shift + Space	Select entire row.

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3. MS POWER POINT SYSTEM

Accessing MS Power Point

→ We can start MS Power point by using the start menu-

Start → All program → Microsoft Office → Microsoft Power Point

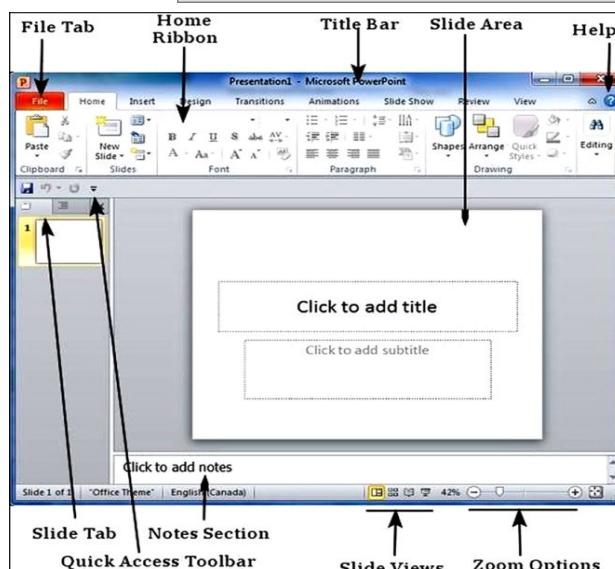
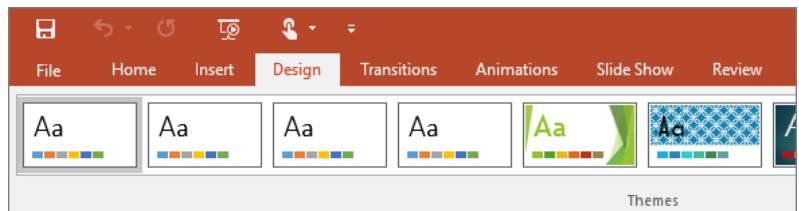
→ we can start MS Power Point by using Run Command-

- Select start → Run to display the Run dialog box.

OR

Press ‘window’ key +R.

- Type ‘powerpt’ in the open text box and click OK or press the Enter key.



Basic Operations Performed on a Presentation-

Creating a new presentation

Adding slides to the presentation

Designing the presentation

Saving a new presentation

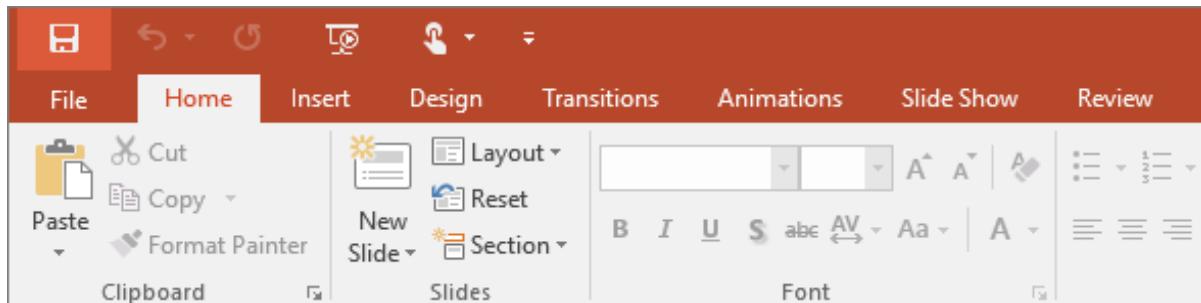
Printing the presentation

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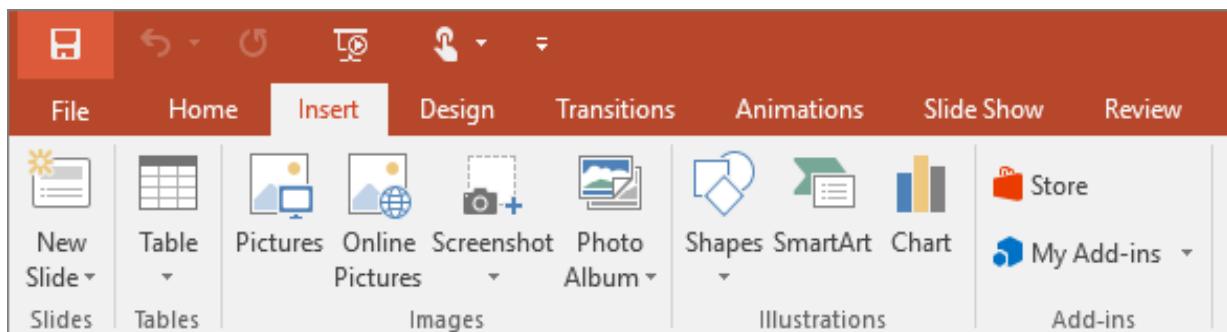
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Tabs-

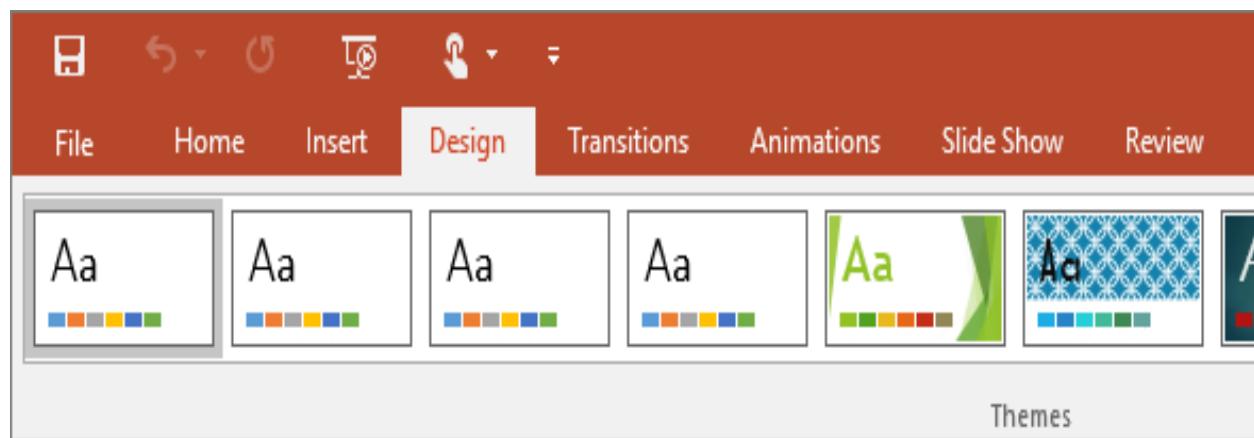
→ **Home Tab**-The home tab holds the cut and paste features, Font and Paragraph option and what you need to add organize slides.



→ **Insert Tab- Insert**- Click Insert tab to add something to a slide. This includes Pictures, Shapes, Charts, Links, Text boxes, Video and more.



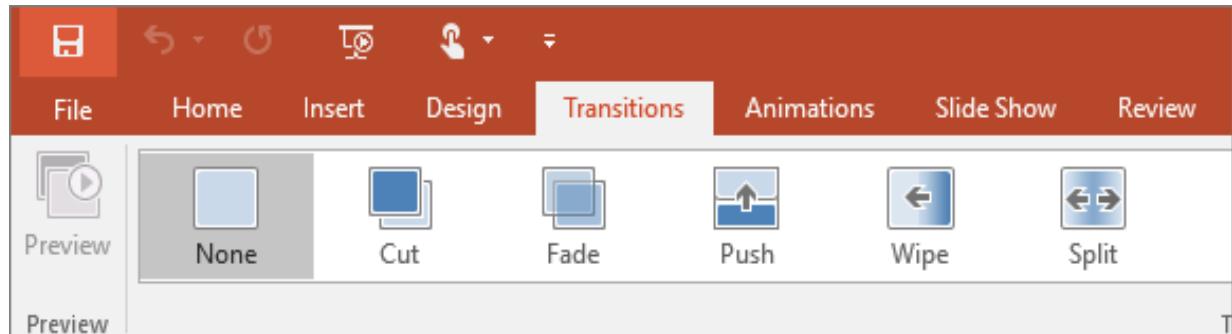
→ **Design Tab**-On the design tab, you can add a theme or color scheme or format the slide background.



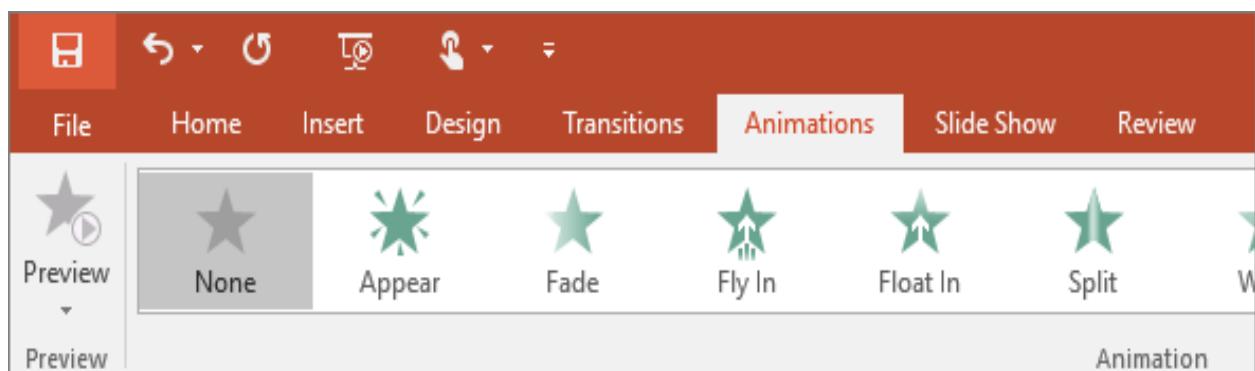
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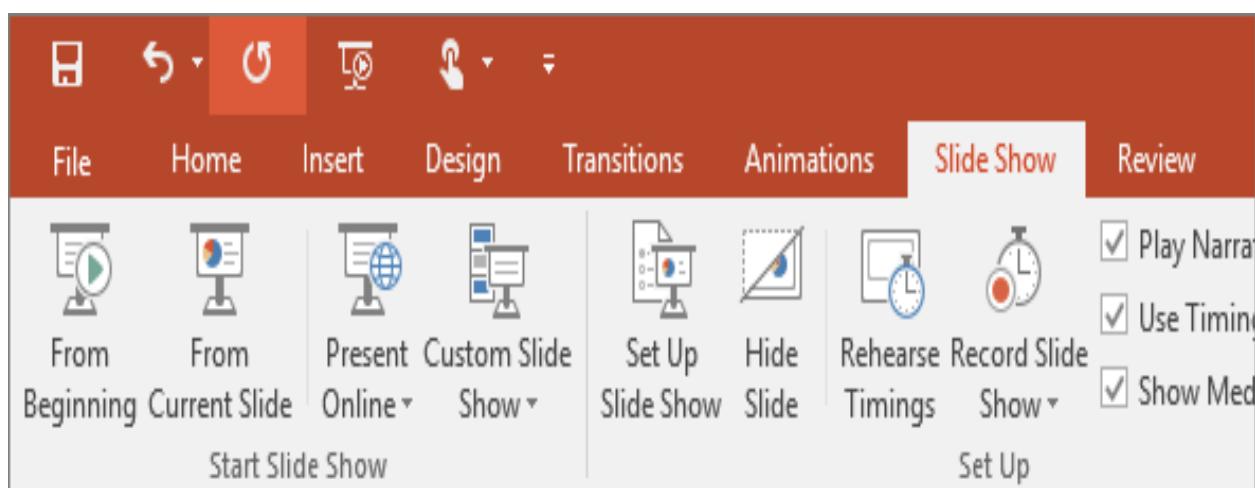
→ **Transitions Tab**— A slide transition is the visual effect that occurs when you move from one slide to the next during a presentation. You can control the speed, add sound, and customize the look of the transition effect.



→ **Animation Tab**— Use the animations tab to apply animation to a slide and the effect based on animation type.



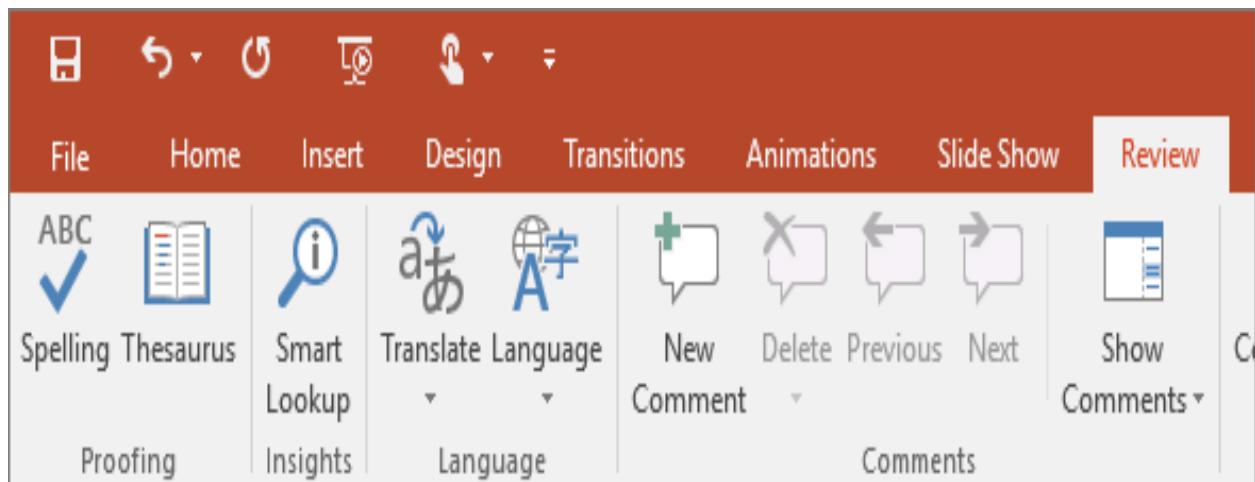
→ **Slides Show**— On the slide show tab, set up the way that you want to show your presentation to others.



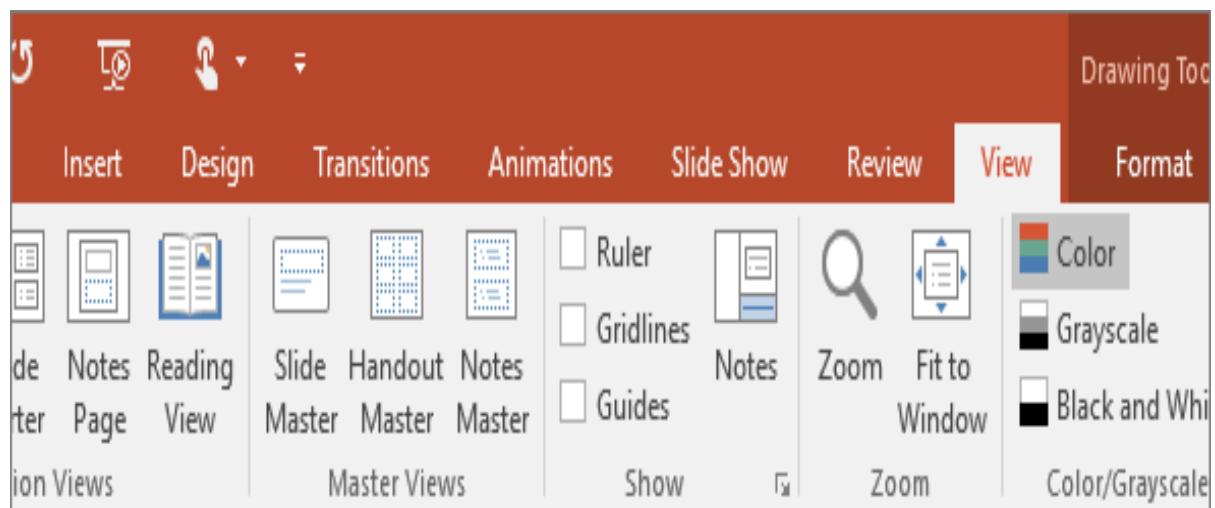
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→ **Review**- The review tab lets you add comments, run spell check.



→ **View**-Views allow you to look at your presentation in different ways depending on where you are in the creation or delivery process.

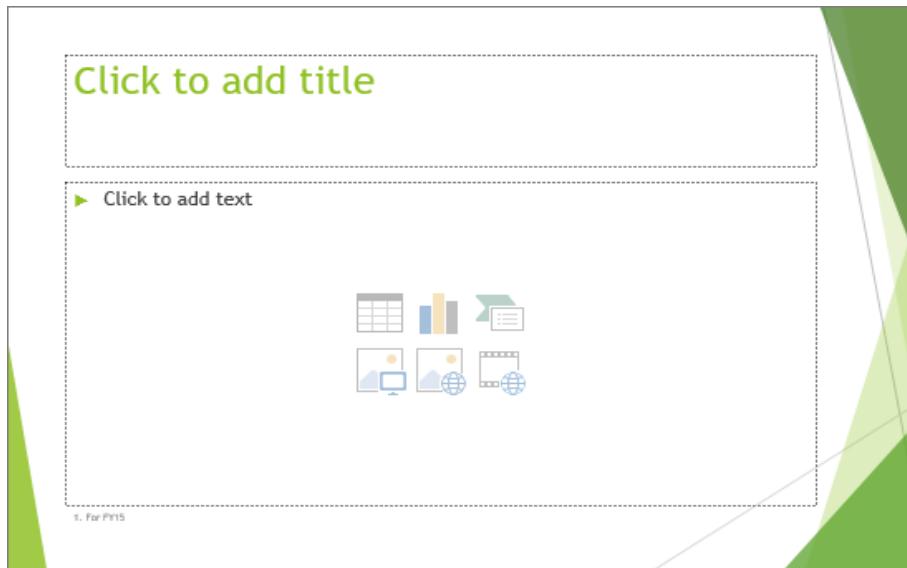


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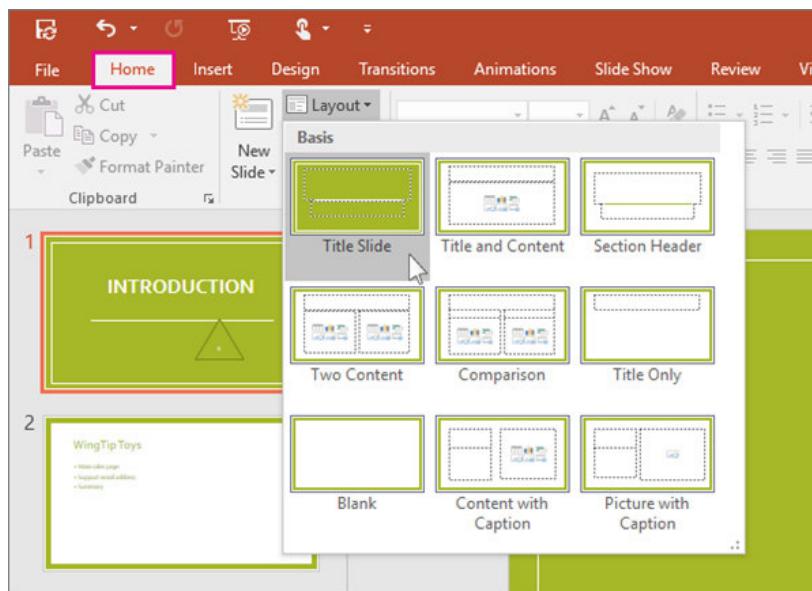
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Create a Presentation

1. Open the Microsoft PowerPoint.
2. In the left pane, select new.
3. To create a presentation from scratch, select blank presentation.
4. To use a prepared design, select one of the templates.



- Add a Slide**-1. In the thumbnails on the left pane, select the slide you want new slide to follow.
2. In the Home tab, in the slides section, select new slide.
3. In the slides section, select layout and then select the layout you want from the menu.



- **Place holder**- In PowerPoint, the dotted areas in an empty slides are called placeholder. A placeholder is a pre-formatted container on a slide for content (text, graphics or video). The pre-set formatting makes it easier to format slides consistently. To resize a placeholder, drag one of its corner borders.

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MS PowerPoint Short Cut Keys	
Ctrl + N	Create new presentation
Ctrl + M	Add a new slide
Ctrl + B	Make selected text bold
Ctrl + X	Cut selected text, object or slide
Ctrl + C	Copy selected text, object or slide
Ctrl + V	Paste cut or copied text, object or slide
Ctrl + Z	Undo the last action
Ctrl + S	Save the presentation
Alt + H	Go to the Home tab
Alt + I	Go to the Insert tab
F5	Start the slide show
Esc	End the slide show
Ctrl + Shift + Tab	Switch between the thumbnail pane and the outline view pane.
Ctrl + A	Select all object on a slide
Ctrl + Shift + C	Copy Formatting only
Ctrl + K	Insert a hyperlink
Ctrl + Shift + V	Paste formatting
Ctrl + Spacebar	Remove formatting
Ctrl + O	Open a presentation
Ctrl + P	Print a presentation
Ctrl + Q	Exit PowerPoint
Ctrl + W	Close a presentation
Shift + F5	Resume slide show
Backspace	Delete one character to the left
Ctrl + Backspace	Delete one word to the left
Delete	Delete one character to the right.
Ctrl + Delete	Delete one word to the right.
Ctrl + F	Open find dialog box.
F10	Active the menu bar end.
Ctrl + H	Open the replace dialog box
Shift + F4	Repeat the last find action.
Shift + F3	Switch between sentence case.

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4. M.S. Access System

Accessing MS Access-

→ We can start MS Access by using the start menu-
Start → all program → Microsoft Office → Microsoft Access.

→ we can start MS Access by using run command
(i) Select start → Run to display the run dialog box.

OR

Press ‘window’ key + R

(ii) Type ‘msaccess’ in the open text box and click ok or press the enter key.



Basic Operations performed in MS Access.

Creating a database

Creating a database table

Defining relationship

Creating a database query

Microsoft Access : Shortcuts Keys	
1. Shortcuts keys for database files.	
Ctrl + N	Open a new database.
Ctrl + O	Open an existing database.
Shift + F10	Display a shortcut menu for a selected item.
Alt + I	Open the look in list.
Ctrl + S	Save a database object.
F12	Open the save as dialog box.
Ctrl + P	Print the current or selected object.
Esc	Cancel print preview.
2. Shortcuts keys for the ribbon	
Alt + F	Open the file Menu.
Alt + H	Open the Home tab.
Alt + C	Open the create tab.
Alt + T	Open the table tab.
Alt + X	Open the external data tab.
Alt + Y	Open the database tools tab.
Alt + J	Open the fields tab.
F10	Select the active tab of the ribbon.
Shift + Tab	Move the focus to commands on the ribbon.

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Ctrl + F1	Expand or collapse the ribbon.
F6	Move the focus to a different pane of the window.
F11	Show or hide the Navigation Pane.
Ctrl + F	Go to search box in the Navigation Pane.
Ctrl + F6	Switch to the next or previous database window.
Ctrl + W	Close the active database window.
Alt + F11	Switch between the visual basic editor and the previous active window.
Ctrl + F10	Maximize or restore a selected window

3. Shortcuts keys for menus, dialog boxes, wizards, property sheets, text boxes, combo boxes and list boxes.

Home	Select the first or last command on the menu.
Spacebar	Open the selected menu.
Shift + F10	Open a shortcut menu.
Ctrl + Home	Move to the top or bottom of the selected gallery list.
Alt	Close the visible menu and submenu at the same time.
Esc	Close the visible menu.
Ctrl + Tab	Switch to the next or previous tab in a dialog box.
Shift + Tab	Move to the next or previous option or option group.
Alt + Down Arrow	Open the selected drop-down list box
Esc	Cancel the command and close the dialog box.
Alt + N	Move to the next page of the wizard.
Alt + B	Move to the previous page of the wizard.
Alt + F	Complete the wizard.
F4	Show or hide the property sheet.
Alt + Enter	Display a property sheet in design view.
Ctrl + Tab	Toggle forward between tabs when a property is selected.
Ctrl + Shift + Tab	Toggle backward between tabs when a property is selected.
Shift + Home	Select from the insertion point to the beginning of the text entry.
Ctrl + Shift + Left Arrow	Change the selection by one word to the left.
Ctrl + Shift + Right Arrow	Change the selection by one word to the right.
F4	Open a combo box.
F2	Rename a selected object.
Ctrl + G	Display the immediate window in the Visual Basic Editor.

4. Shortcuts keys for Design, Layout, Datasheet view.

F2	Switch between edit mode and Navigation mode in a datasheet.
Esc	Exit Navigation mode.
F5	Switch to the form view from the form design view.
F6	Switch between the upper and lower portions of a window.
F7	Open the Visual Basic Editor from a selected property in the property sheet for a form.
Alt + F11	Switch from the visual basic editor back to the form or report design view.
Alt + F8	Show or hide the field list pane.
Ctrl + C	Copy the selected control to the Clipboard.
Ctrl + X	Cut the selected control to the clipboard.
Ctrl + V	Paste the contents of the clipboard in the upper-left corner of the selected section.
Ctrl + A	Select all records.
F9	Recalculated the fields in the window.
F1	Open the help window.
F7	Check spelling.

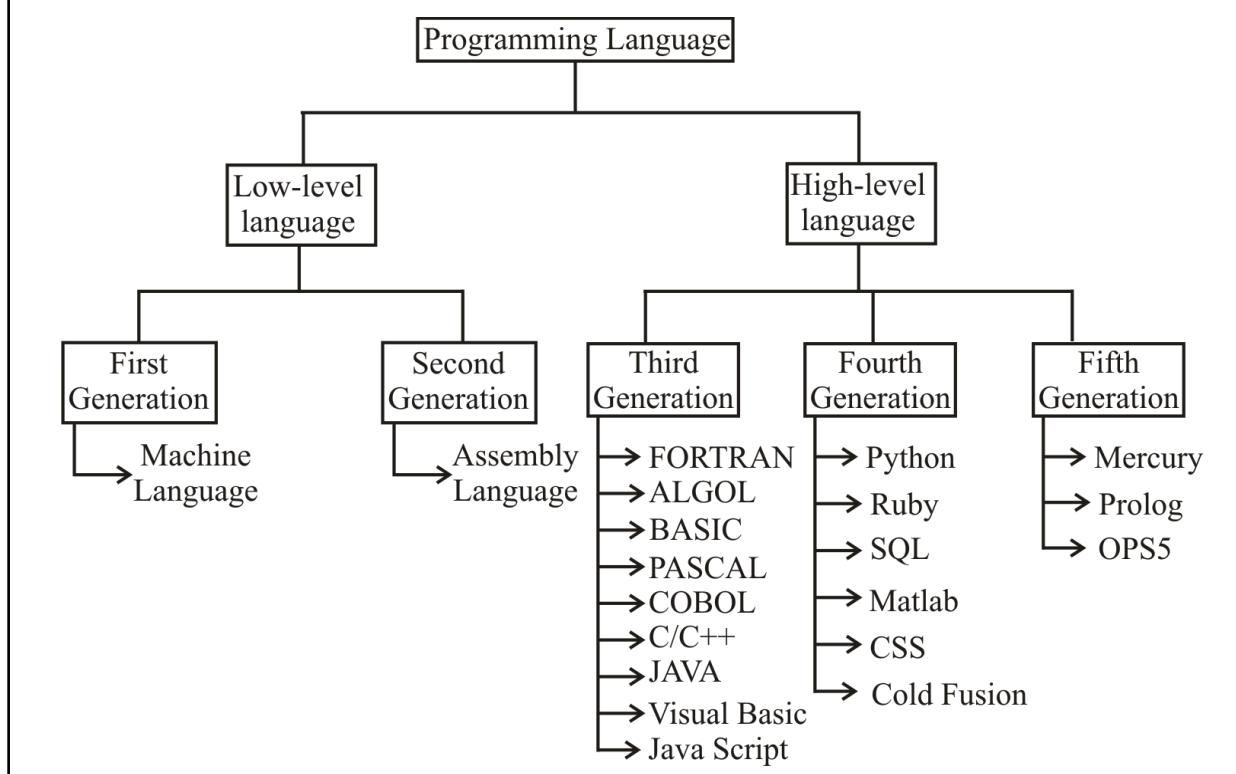
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Programming language

Evolution of programming languages

Period of employment	Programming language	Characteristics
1940s	Machine language	<ul style="list-style-type: none"> • Machine dependent • Faster execution • Difficult to use and understand • More prone to errors
1950s	Assembly language	<ul style="list-style-type: none"> • Machine dependent • Faster execution • More prone to errors • Relatively simple to use
1950-1970	FORTRAN, LISP, COBOL, ALGOL 60, BASIC, APL	<ul style="list-style-type: none"> • High-Level languages • Easy to develop and understand programs • Less prone to errors
1970-1990	C, C++, Forth, Prolog, Smalltalk, Ada, Perl, SQL	<ul style="list-style-type: none"> • Very high-level language • Easier to learn • Highly portable
1990s	Java, HTML, VB, PHP, XML, C#	<ul style="list-style-type: none"> • Internet-based languages • Object-oriented languages • More efficient • Reliable and robust

Generations of Programming languages



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Language processors: Assembler, Compiler and Interpreter

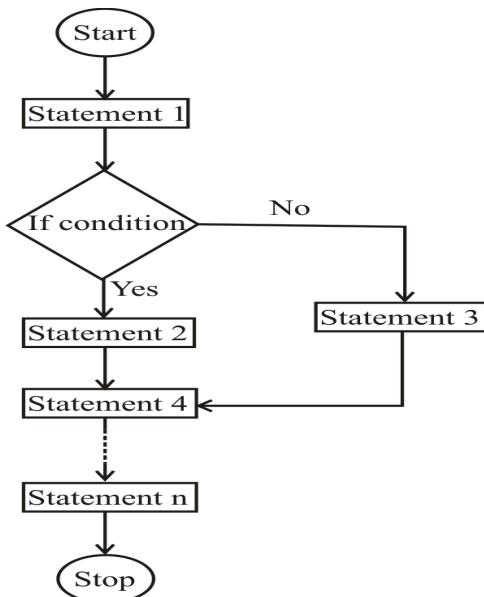
Parameters	Compiler	Interpreter	Assembler
Conversion	It converts the high defined programming language into machine language or binary code.	It also converts program developed code into machine language or binary code.	It converts programs written in the assembly language to the machine language or binary code.
Scanning	It scans the entire program before converting it into binary code.	It translates the program line by line to the equivalent machine code.	It converts the source code into the object code then converts it into the machine code.
Error Detection	Given the full error report after the whole scan.	Detects error line by line and stops scanning until the error in the previous line is solved.	It detects errors in the first phase, after fixation the second phase starts.
Code Generation	Intermediate code generation is done in the case of compiler.	There is no intermediate code generation.	There is an intermediate object code generation.
Execution Time	It takes less execution time comparing to an interpreter.	An interpreter takes more execution time than the compiler.	It takes more time than the compiler.
Examples	C, C#, Java, C++	Python, Perl, VB, Post script, LISP, etc.	GAS, GNU.

Algorithm, Pseudo code and Program

Algorithm	Pseudo code	Program
<p>1. It is systematic logical approach, which is a well-defined, step-by-step procedure that allows a computer to solve a problem.</p> <p>2. Algorithms are generally written in a natural language or plain English language.</p> <p>3. Algorithm of linear search-</p> <p>Step 1 - Start from the left most element of arr[] and one by one compare X with each element of arr[].</p> <p>Step 2 - If X matches with an element, return the index.</p> <p>Step 3 - If X doesn't match with any of elements, return -1.</p>	<p>1. It is a simpler version of a programming code in plain English which uses short phrases to write code for a program before it is implemented in a specific programming language.</p> <p>2. Pseudocode is written in a format that is similar to the structure of a high-level programming language.</p> <p>3. Pseudocode for linear search-</p> <pre>FUNCTION linear search (list, search Term): For index FROM 0 → length (list): IF list [index] = search Term THEN RETURN index END IF ENDLOOP RETURN -1 END FUNCTION</pre>	<p>1. It is exact code written for problem following all the rules of the programming language. A program is a set of instructions for the computer to follow.</p> <p>2. Program on the other hand allows us to write a code in particular programming language</p> <p>3. Program for Linear search.</p> <pre>int search (int arr [], int n, int x) { int i; for (i = 0; i < n; i++) if (arr [i] == x) return i; return -1; }</pre>

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Flowchart



– **Flowchart** (Pictorial representation of a process) of statements in the If-Then-Else selection structure-

Symbols of Flowchart

Symbols	Name	Function
→ (Arrow)	Flow line	Shows the process direction. Each flowline connects two blocks.
○ (Oval)	Terminal (Start/Stop)	It indicates the beginning or end of a flowchart.
◇ (Diamond)	Decision	Shows a step that decides the next step in a process. This is commonly a Yes/No or True/False question.
□ (Parallelogram)	Input / Output	It indicates the process of inputting or outputting external data.
— (Comments)	Comments	It indicates additional information regarding a step in process.
□ (Rectangle)	Process	Process symbol represents a step in a process
○ (Circle)	On-page Connector	Pairs of on-page connector are used to replace long lines on a flowchart page.
▽ (Trapezoid)	Off-page Connector	An off-page connector is used when the target is on another page.

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Popular High-Level Language-

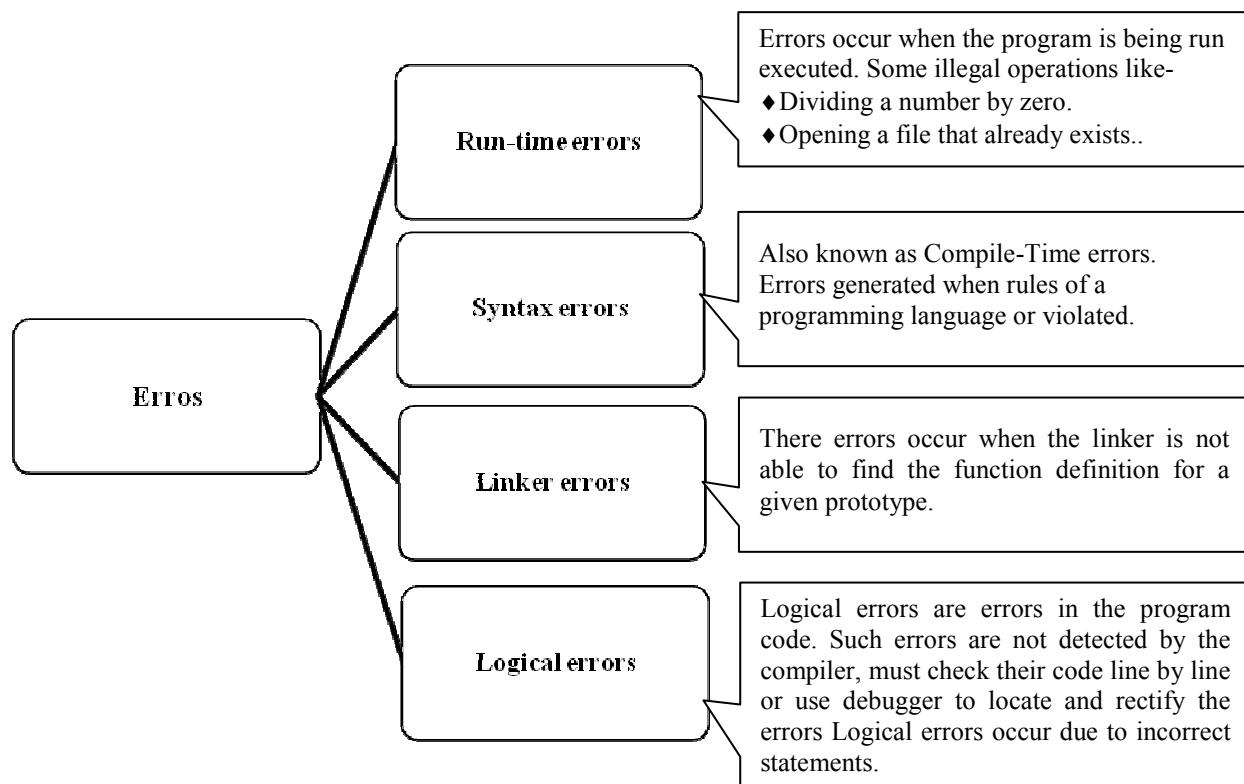
Languages	Release Date	Developer	Significant Characteristics
FORTAN (FORmula TRANslation)	1957	John Backus	<ul style="list-style-type: none"> • It is easier to learn as compared to the other scientific high-level language. • It has a powerful built-in library containing some useful functions, which are helpful in performing complex mathematical computations. • It enables the programmers to create well-structured and well-documented programs.
LISP (LISt Processing)	1958	John McCarthy	<ul style="list-style-type: none"> • LISP (List Processing) is easy to write and use. • It is most suitable for artificial intelligence (AI) applications • It supports garbage collection and interactive computing.
COBOL (COmmon Business Oriented Language)	1959	COnference on DAta SYstem Languages (CODASYL) committee.	<ul style="list-style-type: none"> • It has several built-in functions to automate the various tasks in business domain. • It can handle and process a large amount of data at a time and in a very efficient manner. • It does not implement the concept of pointers, user-defined data types, and user-defined functions and hence is simple to use.
BASIC (Beginner's All-purpose Symbolic Instruction Code)	1964	John Kemeny and Thomas Kurty	<ul style="list-style-type: none"> • It is first interpreted language • It is easy to learn as it uses common English words • It is a general-purpose language.
PASCAL	1970	Niklaus Wirth	<ul style="list-style-type: none"> • It enables the programmers to develop well-structured and modular programs that are easy to maintain and modify. • The data in this language is stored and processed with the help of strong data structures. • The PASCAL compiler has strong type checking capability that prevents the occurrence of data type mismatch errors in a program.
C	1972	Dennis Ritchie and Brian Kernighan	<ul style="list-style-type: none"> • C is machine and operating system independent language. • It can be used to develop a variety of applications, hence, it is considered to be quite flexible. • It allows the programmer to define and use their own data types.
C++	1979	Bjarne Strous Trup	<ul style="list-style-type: none"> • It uses the concept of objects and classes for developing program • The code developed in this language can be reused in a very efficient and productive manner. • The number of instructions required to accomplish a particular task in C++ is relatively lesser as compared to some of the other high-level programming languages.
JAVA	1995	James Gosling	<ul style="list-style-type: none"> • It is a highly object-oriented and platform independent language. • The programs written in this language are compiled and interpreted in two different phases. • It assists the programmers in managing the memory

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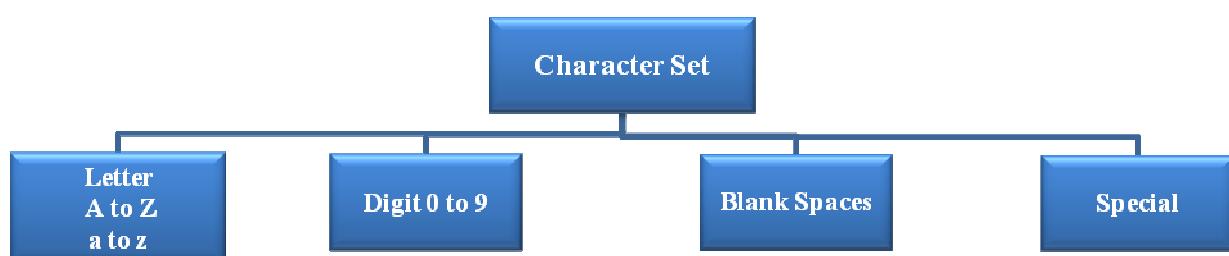
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			automatically with a feature called garbage collection. <ul style="list-style-type: none"> It also implements the concept of dynamic binding and threading in a better and efficient manner as compared to other object-oriented languages.
Python	1991	Guido Van Rossum	<ul style="list-style-type: none"> It is an interpreted and object-oriented programming language. The syntax and the semantics of this language are quite clear and concise. It is a platform independent language.
C# (C-Sharp)	2000	Anders Hejlsberg (Microsoft)	<ul style="list-style-type: none"> It is object-oriented visual programming and component-oriented language. It is multimedia (audio, animation and video) supported. It is suitable for web-based applications and language interoperability.

Errors occur in programming languages



Character set, keywords and Data types used in programming language.



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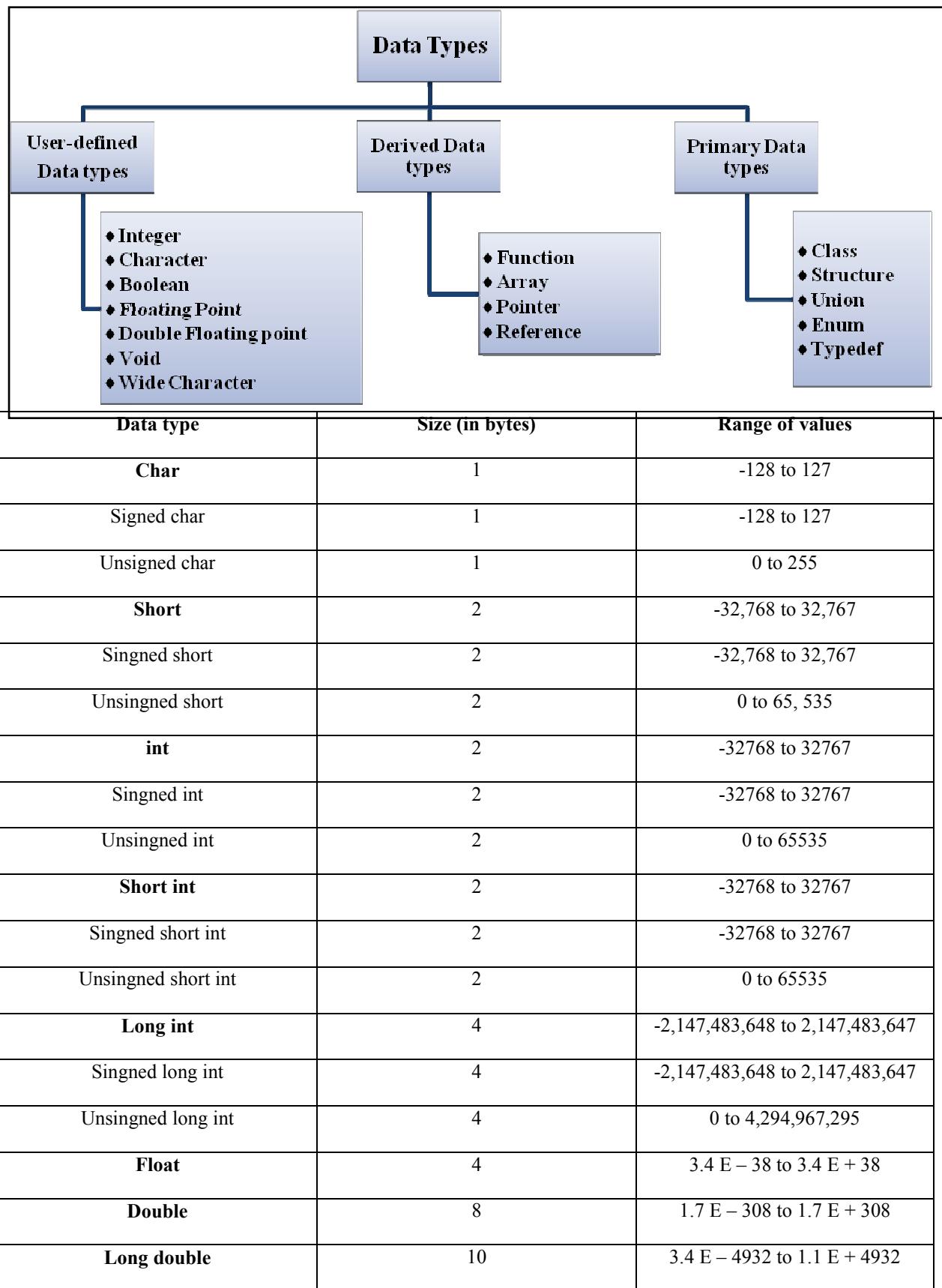
Special symbols

Special Symbol	Name	Special Symbol	Name
!	Exclamation sign	{	Left braces
#	Pound sign	}	Right braces
\$	Dollar sign	[Left bracket
%	Percentage sign]	Right bracket
^	Caret	\	Backward slash
&	Ampersand	/	Forward slash
*	Asterisk	,	Comma Sigh
(Left Parenthesis	.	Period
)	Right parenthesis	;	Semicolon
_	Underscore	:	Colon
-	Minus sign	'	Apostrophe
+	Plus sign	"	Quotation marks
?	Question mark	~	Tilde

Keywords used in C

auto	else	long	Switch
break	Else if	Register	Then
Char	Extern	Return	Typedef
Const	Float	Short	Union
Continue	For	Signed	Unsigned
Default	Go to	Size of	Void
Do	If	Static	Volatile
Double	int	Struct	While

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Operators

Category	Operator Symbol	Description
Arithmetic Operators	Unary Operators	
	++	Increments a given number
	--	Decrements a given number
	Size of	Determines the size of a variable in bytes
	(type)	Converts the data type of a variable
	Binary Operators	
	+	Performs addition operation
	-	Performs subtraction operation
	*	Performs multiplication operation
	/	Performs division operation
Relational Operators	%	Calculates the remainder after division
	<	Less than
	>	Greater than
	<=	Less than equal to
	>=	Greater than equal to
	==	Is equal to
Logical Operators	!=	Not equal to
	&&	Performs logical AND operation
		Performs logical OR operation
Assignment Operators	!	Performs logical NOT operation
	=	Assigns the right hand side value of the expression to the left hand side value of the expression
	+=	Adds the variables present on either side of the expression. $a + b \Rightarrow a = a + b$
	-=	Subtracts the variables present on either side of the expression. $a - b \Rightarrow a = a - b$

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Bit-manipulation Operators	$* =$	Multiples the variables present on either side of the expression. $a * = b \Rightarrow a = a * b$
	$/ =$	Divides the variables present on either side of the expression. $a / = b \Rightarrow a = a / b$
	$\% =$	Performs the modulus operation on the variables present on either side of the expression. $a \% = b \Rightarrow a = a \% b$
	$\&$	Performs AND operation on the bits of the operands.
	$\ $	Performs OR operation on the bits of the operands
	\sim	Performs NOT operation on the bits of the operands.
	\wedge	Performs XOR operation on the bits of the operands.
		$>>$ Shifts data bits to the right.
		$<<$ Shifts data bits to the left.

Precedence of Operators

Types of operator	Operators	Associativity
Unary Operators	$+, -, !, \sim, ++, --, \text{type}, \text{size of}$	Right to left
Arithmetic operators	$*, /, \%, +, -$	Left to right
Bit-manipulation operators	$<<, >>$	Left to right
Relational operators	$>, <, >=, <=, ==, !=, =$	Left to right
Logical operators	$\&\&, \ $	Left to right
Conditional operators	$?, :$	Left to right
Assignment operators	$=, +=, -=, *=, /=, \% =$	Right to left

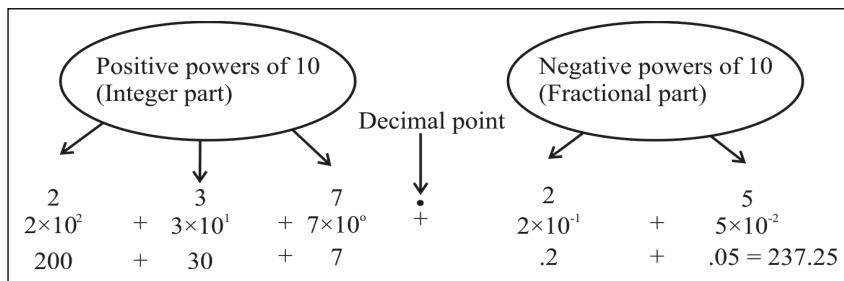
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Number system

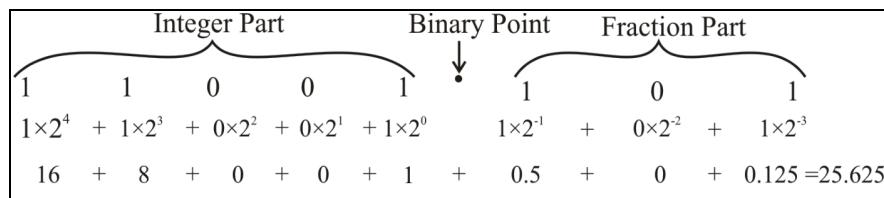
Decimal System—It is a positional number system that uses 10 as a base to represent different values. Therefore, this number system is also known as base 10 number system. In this system, 10 symbols are available for representing the value. These symbols include the digits from 0 to 9.

Example, the value 237 which comes before the decimal point, is called integer value and the value 25, which comes after the decimal point, is called fraction value.



Binary System— The binary system uses base 2 to represent different value. Therefore, the binary system is also known as base-2 system. As this system used base2, only two symbols. are available for representing the different values in this system. These symbols are 0 and 1, Which are also known as bits in computer terminology. Using binary system, the computer systems can store and process each type of data in terms of 0s and 1s only.

Example, the binary number 11000.101 represents the decimal value 25.625.



Technical terms	Used in Binary System.
Bit	<ul style="list-style-type: none"> ◆ It is the smallest unit of information used in a computer system. ◆ It can either have the value 0 or 1. ◆ Derived from the words 'Binary digIT'.
Nibble	It is a combination of 4 bits.
Byte	<ul style="list-style-type: none"> ◆ It is combination of 8 bits. ◆ Derived from words 'by eight'.
Word	It is a combination of 16 bits.
Double word.	It is a combination of 32 bits.
Kilobyte (KB)	It is used to represent the 1024 bytes of information.
Megabyte (MB)	1024 KB _s
Gigabyte (GB)	1024 MB _s
Terrabyte (TB)	1024 GB _s
Petabyte (PB)	1024 TB _s
Exabyte (EB)	1024 PB _s
Zettabyte (ZB)	1024 EB _s
Yottabyte (YB)	1024 ZB _s

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Octal system— The octal system is the positional number system that used base 8 to represent different values. Therefore, this number system is also known as base-8 system. As this system uses base 8, eight symbols are available for representing the value in this system. These symbols are the digits 0 to 7.

Example, The octal number 215.43 represents the decimal value 141.5469.

Integer Part			Octal point	Fraction Part	
2	1	5	↓	4	3
2×8^2	$+ 1 \times 8^1$	$+ 5 \times 8^0$		4×8^{-1}	$+ 3 \times 8^{-2}$
128	+ 8	+ 5	+	0.5	+ 0.0469 = 141.5469

Hexadecimal system— The hexadecimal system is a positional number system that uses base 16 to represent different values. Therefore, this number system is known as base-16 system. As this system uses base 16, 16 symbols are available for representing the value in this system. These symbols are the digits 0-9 and the letters A, B, C, D, E and F. The digits 0-9 are used to represent the decimal value 0 through 9 and The letters A, B, C, D, E and F are used to represent the decimal value 10 through 15.

Example, the hexadecimal number 4A9.2B represents the decimal value 1193.1679.

Integer Part			Hexadecimal point	Fraction Part	
4	A	9	↓	2	B
4×16^2	$+ 10 \times 16^1$	$+ 9 \times 16^0$		2×16^{-1}	$+ 11 \times 16^{-2}$
1024	+ 160	+ 9	+	0.125	+ 0.0429 = 1193.1679

Decimal Number	Octal representation	Hexadecimal Symbol	4-bit Binary Number
0	0	0	0000
1	1	1	0001
2	2	2	0010
3	3	3	0011
4	4	4	0100
5	5	5	0101
6	6	6	0110
7	7	7	0111
8	10	8	1000
9	11	9	1001
10	12	A	1010
11	13	B	1011
12	14	C	1100
13	15	D	1101
14	16	E	1110
15	17	F	1111

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Decimal to non-decimal conversions

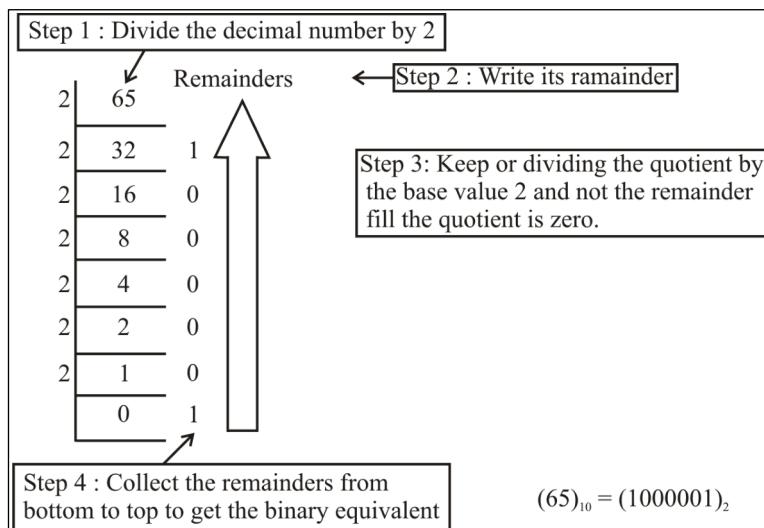
The decimal to non-decimal (binary, octal or hexadecimal), conversions use the step given below.

Step 1: Divide the given number by the base value of the number system in which it is to be converted.

Step 2 : Note the remainder.

Step 3: Keep on dividing the quotient by the base value and note the remainder till the quotient is zero.

Step 4 : Write the noted remainders in the reverse order (from bottom to top).

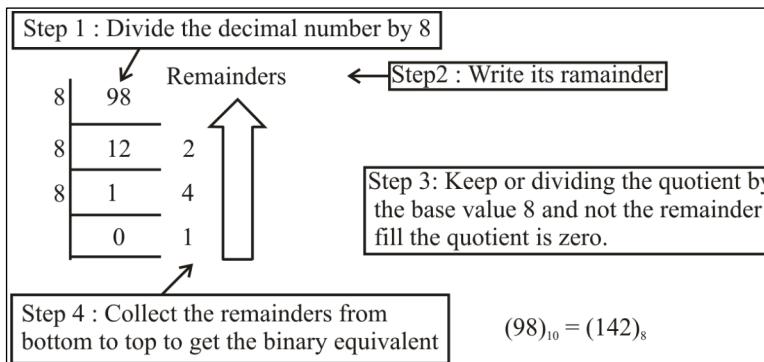


(i) Decimal to Binary conversion-

Let us now convert a decimal value to its binary representation and verify that the binary equivalent of $(65)_{10}$ is $(1000001)_2$.

(ii).Decimal to Octal conversion-

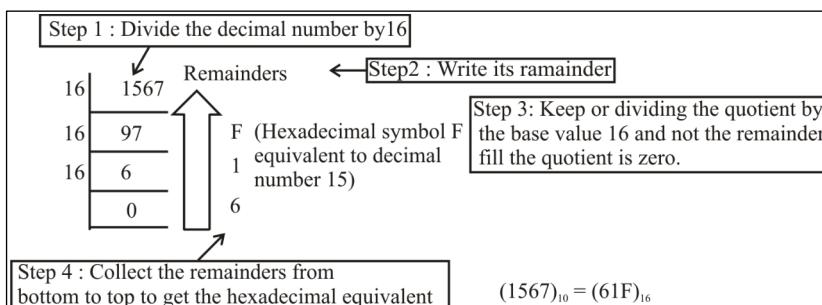
The following example illustrate the method of converting decimal number 98 into its equivalent octal number.



(iii).Decimal to Hexadecimal conversion-

The following example illustrate the method of converting decimal number to its hexadecimal equivalent.

Non-decimal to decimal conversions



- The non-decimal to decimal conversions can be implemented by taking the concept of place values not consideration we can use the following steps to convert the given number with base value to its decimal equivalent, where base value can be 2, 8 and 16 for binary, octal and hexadecimal number system, respectively.
- Step 1 :** Write the position number for each alphanumeric symbol in the given number.
- Step 2 :** Get positional value for each symbol by raising its position number to the base value symbol in the given number.
- Step 3 :** Multiply each digit with the respective positional value to get a decimal value.
- Step 4 :** Add all these decimal values to get the equivalent decimal number.

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(i). Binary Number to Decimal Number conversion- The following example illustrate the method of converting binary number $(1101)_2$ to decimal number.

$$\begin{aligned}
 \text{Digit} &\rightarrow & 1 & 1 & 0 & 1 \\
 \text{Positional value} &\rightarrow & 2^3 & 2^2 & 2^1 & 2^0 \\
 \text{Decimal Number} &\rightarrow & 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\
 && 8 & + & 4 & + & 0 & + & 1 & = (13)_{10} \\
 \text{Therefore, } & (1101)_2 & = (13)_{10}
 \end{aligned}$$

(ii). Octal number to Decimal number conversion- The following example shows how to compute the decimal equivalent of an octal number $(257)_8$.

$$\begin{aligned}
 \text{Digit} &\rightarrow & 2 & 5 & 7 \\
 \text{Positional value} &\rightarrow & 8^3 & 8^2 & 8^1 \\
 \text{Decimal Number} &\rightarrow & 2 \times 8^2 & + & 5 \times 8^1 & + & 7 \times 8^0 \\
 && 128 & + & 40 & + & 7 & = (175)_{10} \\
 \text{Therefore, } & (257)_8 & = (175)_{10}
 \end{aligned}$$

(iii). Hexadecimal Number to Decimal number conversion- The following example Shows how to compute the decimal equivalent of an Hexadecimal $(3A5)_{16}$.

$$\begin{aligned}
 \text{Digit} &\rightarrow & 3 & A & 5 \\
 \text{Positional value} &\rightarrow & 16^2 & 16^1 & 16^0 \\
 \text{Decimal Number} &\rightarrow & 3 \times 16^2 & + & 10 \times 16^1 & + & 5 \times 16^0 \\
 && 768 & + & 160 & + & 5 & = (933)_{10} \\
 \text{Therefore, } & (3A5)_{16} & = (933)_{10}
 \end{aligned}$$

Conversion from Binary number to Octal number and Vice-versa

(i) Binary number to Octal Number- Given a binary number, an equivalent octal number representation by 3 bits is computed by grouping 3 bits from right to left and replacing each 3-bit group by the corresponding octal digit. In case number of bits in a binary number is not multiple of 3, then add required, number of 0s on most significant position of the binary number

Example – Convert $(10101100)_2$ to octal number.

$$\begin{aligned}
 &\text{Make group of 3-bits of the} \\
 &\text{given binary number (Right to left)} & \underline{010} & \underline{101} & \underline{100} \\
 &\text{Write octal number for each 3- bit group.} & 2 & 5 & 4 \\
 &\text{Therefore, } (10101100)_2 & = (254)_8
 \end{aligned}$$

(ii) Octal number to Binary number- Each octal digit is an encoding for a 3-digit binary number. Octal number is converted to binary by replacing each octal digit by a group of three binary digits.

Example– Convert $(705)_8$ to binary number.

$$\begin{aligned}
 \text{Octal digit} &\rightarrow & 7 & 0 & 5 \\
 \text{Write 3-bits binary} \\
 \text{value for each digit} &\rightarrow & 111 & 000 & 101 \\
 \text{Therefore, } & (705)_8 & = (111000101)_2
 \end{aligned}$$

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Conversion from Binary number to Hexadecimal number and vice-versa

(i) Binary Number to Hexadecimal Number- Given a binary number, its equivalent hexadecimal number is computed by making a group of 4 binary digits from right to left and substituting each 4-bit group by its corresponding computed by making a group of 4 binary digits from right to left and substituting each 4-bit group by its corresponding hexadecimal alphanumeric symbol. If required, add 0 bit on to have number of bit in a binary number as multiple of 4.

Example- Convert $(0110101100)_2$ to hexadecimal number.

Make group of 4-bits of

the given binary number (Right to left) 0001 1010 1100

Writ hexadecimal symbol for each group→1 A C

Therefore, $(0110101100)_2 = (1AC)_{16}$

(ii). Hexadecimal number to Binary number- Each hexadecimal symbol is an encoding for a 4-digit binary number. Hence, the binary equivalent of a hexadecimal number is obtained by substituting 4-bit binary equivalent of each hexadecimal digit and combining them together.

Example. Convert $(23D)_{16}$ to binary number.

Hexadecimal digits→ 2 3 D

Write 4-bit binary for each digit→ 0010 0011

1101

Therefore, $(23D)_{16} = (001000111101)_2$

Conversion form octal number to hexadecimal number

The given octal number can be converted' into its equivalent hexadecimal number in two different steps. Firstly, We need to convert the given octal number into its binary equivalent. After obtaining the binary equivalent, we need to making a group of 4 binary digits form Right to left and substituting each 4-bit group by its corresponding hexadecimal alphanumeric symbol. In this type of conversion, we need to represent each digit in the octal number to its equivalent 3-bit binary number.

Example- Convert the octal number $(365)_8$ into its hexadecimal number.

Octal digits→ 3 6 5

Write 3-bits binary value

for each digit→ 011 110 101

Regrouping into 4-bits of

the binary number (Right to left)→ 0000 1111 0101

Write hexadecimal symbol

for each group→ 0 F 5

Therefore, $(365)_8 = (F5)_{16}$

Conversion of a number with fractional part.

(i) fractional part of Decimal number to Binary number.

Example. Convert decimal number $(0.25)_{10}$ to binary.

Integer part

$$\begin{array}{r} 0.25 \times 2 = 0.50 \quad 0 \\ 0.50 \times 2 = 1.00 \quad 1 \end{array}$$


Since the fractional part is 0, the multiplication is stopped. Write the integer part from top to bottom to get binary number for the fractional part.

Therefore, $(0.25)_{10} = (0.01)_2$

Example- Convert $(0.675)_{10}$ to binary.

Since the fractional part (.400) is the repeating value in the calculation, the multiplication is stepped, write the integer part from top to bottom to get binary number for the fractional part.

Therefore, $(0.675)_{10} = (0.1010110)_2$

$$\begin{array}{r} 0.675 \times 2 = 1.350 \quad 1 \\ 0.350 \times 2 = 0.700 \quad 0 \\ 0.700 \times 2 = 1.400 \quad 1 \\ 0.400 \times 2 = 0.800 \quad 0 \\ 0.800 \times 2 = 1.600 \quad 1 \\ 0.600 \times 2 = 1.200 \quad 1 \\ 0.200 \times 2 = 0.400 \quad 0 \end{array}$$


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(ii). fractional part of Decimal number to Octal Number.

Example— Convert $(0.625)_{10}$ to Octal Number.

$$\begin{array}{r}
 & \text{Integer part} \\
 0.625 \times 8 = 5.000 & 5 \\
 0.000 \times 8 = 0.000 & 0
 \end{array}$$

Since the fractional part is 0, the multiplication is stopped, write the integer part from top to bottom to get octal number for the fractional part .

$$\text{Therefore, } (0.625)_{10} = (0.50)_8$$

(iii) Fractional part of Decimal number to hexadecimal number.

Example— Convert $(0.675)_{10}$ to hexadecimal.

$$\begin{array}{r}
 & \text{Integer Part} \\
 0.675 \times 16 = 10.800 & A \quad (\text{Hexadecimal symbol for 10}) \\
 0.800 \times 16 = 12.800 & C \quad (\text{Hexadecimal symbol for 12})
 \end{array}$$

Since the fractional part (.800) is repeating, the multiplication is stopped, Write the integer part from top to bottom to get hexadecimal equivalent for the fractional part.

$$\text{Therefore, } (0.675)_{10} = (0.AC)_{16}$$

Non-decimal number with fractional part to Decimal number system

(i) Fractional part of Binary number to Decimal number.

Convert $(0.111)_2$ into decimal number.

$$\begin{array}{r}
 \text{Digit} \rightarrow 0. \quad 1 \quad 1 \quad 1 \\
 \text{Fractional value} \rightarrow \quad 2^{-1} \quad 2^{-2} \quad 2^{-3} \\
 \text{Decimal value} \rightarrow \quad 1 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3} \\
 \qquad \qquad \qquad 0.5 + 0.25 + 0.125 = 0.875 \\
 \text{Therefore,} \qquad \qquad \qquad (0.111)_2 = (0.875)_{10}
 \end{array}$$

(ii) Fractional part of octal number to Decimal number.

⇒ Convert $(0.12)_8$ into decimal number.

$$\begin{array}{r}
 \text{Digit} \rightarrow 0. \quad 1 \quad 2 \\
 \text{Fractional value} \rightarrow \quad 8^{-1} \quad 8^{-2} \\
 \text{Decimal value} \rightarrow \quad 1 \times 8^{-1} + 2 \times 8^{-2} \\
 \qquad \qquad \qquad 0.125 + 0.03125 = 0.15625 \\
 \text{Therefore} \qquad \qquad \qquad (0.12)_8 = (0.15625)_{10}
 \end{array}$$

(iii) Fractional part of Hexadecimal number to Decimal number

⇒ Convert $(0.58)_{16}$ into decimal number.

$$\begin{array}{r}
 \text{Digit} \rightarrow 0. \quad 5 \quad 8 \\
 \text{Fractional value} \rightarrow \quad 16^{-1} \quad 16^{-2} \\
 \text{Decimal value} \rightarrow \quad 5 \times 16^{-1} + 8 \times 16^{-2} \\
 \qquad \qquad \qquad 0.3125 + 0.03125 = 0.34375 \\
 \text{Therefore,} \qquad \qquad \qquad (0.58)_{16} = (0.34375)_{10}
 \end{array}$$

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Fractional Binary number to octal or Hexadecimal number

Example— Convert $(10101100.01011)_2$ to octal number.

Make perfect group of 3-bits → $\frac{010}{2}$ $\frac{101}{5}$ $\frac{100}{4}$. $\frac{010}{2}$ $\frac{110}{6}$
Write octal symbol for each group → 2 5 4 . 2 6
Therefore, $(10101100.01011)_2 = (254.26)_8$

Note— Make 3-bit groups from right to left for the integer part and left to right for the fractional part.

Example— Convert $(10101100.010111)_2$ to hexadecimal number.

make perfect group of 4-bits → $\frac{1010}{A}$ $\frac{1100}{C}$. $\frac{0101}{5}$ $\frac{1100}{C}$
Write hexadecimal symbol for each group → A C . 5 C
Therefore, $(10101100.010111)_2 = (AC.5C)_{16}$

Binary coded Decimal (BCD) systems

Weighted 4-bit BCD Code

BCD System

Excess-3 (XS-3) BCD Code

Weighted 4-bit BCD code-

Example— Represent the decimal number 5327 in weighted BCD code.

⇒ The given decimal number is 5327

The corresponding 4-bit 8421 BCD representation of decimal digit.

8	4	2	1		
5	→	0	1	0	1
3	→	0	0	1	1
2	→	0	0	1	0
7	→	0	1	1	1

Therefore, The 8421 BCD representation of decimal number $(5327)_{10}$ is $(0101001100100111)_2$

Example— Convert the decimal number $(87.34)_{10}$ to weighted BCD code.

⇒ The given decimal number is 87.34

The corresponding 4-bit 8421 BCD representation of decimal digit

8	4	2	1		
8	→	1	0	0	0
7	→	0	1	1	1
3	→	0	0	1	1
4	→	0	1	0	0

Therefore, The 8421 BCD representation of decimal number $(87.34)_{10}$ is $(1000\ 0111.0011\ 0100)_2$.

Excess-3 BCD Code-

Example— Convert the decimal number 85 to XS-3 BCD code.

⇒ The given decimal number is 85. now, add 3 to each digit of the given decimal number as—

$$\begin{aligned} 8 + 3 &= 11 \\ 5 + 3 &= 8 \end{aligned}$$

The corresponding 4-bit 8421 BCD representation of the decimal digit—

8	4	2	1		
11	→	1	0	1	1
8	→	1	0	0	0

Therefore, the XS-3 BCD representation of the decimal number 85 is 1011 1000.

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ASCII Code

Characters	Decimal representation	Hexadecimal representation
NUL	0	0
SOH	1	1
STX	2	2
ETX	3	3
EOT	4	4
ENQ	5	5
ACK	6	6
BEL	7	7
BS	8	8
HT	9	9
CAN	24	18
SUB	26	1A
ESC	27	1B
RS	30	1E
US	31	1F
!	33	21
#	35	23
\$	36	24
%	37	25
&	38	26
*	42	2A
+	43	2B
/	47	2F
0 - 9	48 - 57	30 - 39
<	60	3C
=	61	3D
>	62	3E
?	63	3F
A - I	65 - 73	41 - 49
J - O	74 - 79	4A - 4F
P - Z	80 - 90	50 - 5A
a - i	97 - 105	61 - 69
j - o	106 - 111	6A - 6F
p - z	112 - 122	70 - 7A

Gray Code

The Gray code or reflected binary code is an ordering of the binary number system such that two successive values differ in only one bit. Gray codes are very useful in the normal sequence of binary number generated by the hardware that may cause an error or ambiguity during the transition from one number to the next. The Gray code is not weighted that means it does not depends on positional value of digit. This cyclic variable code that means every transition from one value to the next value involves only one bit change.

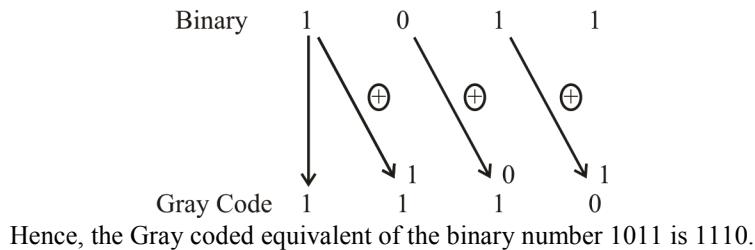
Binary to Gray code conversion– We can convert a number represented in the binary form the Gary we need to remember the following two rules:-

- (i) The most significant Bit (MSB) of the Gray code is always equal to the MSB of the given binary code.
- (ii) Other Bits of the output gray code can be obtained by XORing binary code but at that index and previous index.

Example- Convert the Binary number 1011 to its equivalent Gray coded number.

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Gray to binary conversion- We can convert the gray coded number to its binary equivalent by remembering the following two major rules.

- (i) The most significant bit (MSB) of the binary code is always equal to the MSB of the given gray code.
- (ii) Other bits of the output binary code can be obtained by checking gray code bit at that index. If current gray code bit is 0, then copy previous binary code bit, else copy invert of previous binary code bit.

Example- Convert the Gray coded number 11010011 to its binary equivalent.

Gray code digit	Binary digit
1	→ 1
1	invert of previous binary code bit → 0
0	copy previous binary code bit → 0
1	invert of previous binary code bit → 1
0	copy previous binary code bit → 1
0	copy previous binary code bit → 1
1	invert of previous binary code bit → 0
1	invert of previous binary code bit → 1

Hence, the binary equivalent of gray coded number 11010011 is 10011101.

One's complement system

1's complement of a binary number is another binary number obtained by toggling all bits in it, i.e. transforming the 0 bit to 1 and the 1 bit to 0.

Example- 1's complement of '1100' is '0011'

Two's complement system

2's complement of a binary number is 1, added to the 1's complement of the binary number.

Exmaple- 2's complement of 1100 is ?

1's complement of 1100 is 0011 added 1, to the is complement.

$$\begin{array}{r}
 0011 \\
 +1 \\
 \hline
 0100
 \end{array}$$

2's complement of '1100' is '0100'

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Boolean Algebra

The basic rules of Boolean Algebra

$A + 0 = A$	$A \cdot 1 = A$	$A \cdot A = A$	$A + AB = A$
$A + 1 = 1$	$A + A = A$	$A \cdot \bar{A} = 0$	$A + \bar{A}B = A + B$
$A \cdot 0 = 0$	$A + \bar{A} = 1$	$\bar{\bar{A}} = A$	$(A + B)(A + C) = A + BC$

Basic laws of Boolean Algebra-

Laws of Boolean Algebra	Expression
Laws of Multiplication	$A \cdot A = A$
Laws of Addition	$A + A = A$
Commutative Laws	$A \cdot B = B \cdot A$
Associative Laws	$A \cdot B \cdot C = (A \cdot B) \cdot C = A \cdot (B \cdot C)$ $A + B + C = (A + B) + C = A + (B + C)$
Distributive Laws	$A \cdot (B + C) = (A \cdot B) + (A \cdot C)$ $A + (B \cdot C) = (A + B) \cdot (A + C)$
Absorption Laws	$A \cdot (A + B) = A$ $A + A \cdot B = A$
Involution Law	$\bar{\bar{A}} = A$
Uniqueness to Complement Law	$A + \bar{A} = 1$ $A \cdot \bar{A} = 0$
Demorgan's Theorem	$\bar{A + B} = \bar{A} \cdot \bar{B}$ $\bar{A \cdot B} = \bar{A} + \bar{B}$

Logic Gates

Basic Logic Gates

1. AND Gate-



The circuit symbol of AND Gate

The truth table of AND gate

Input A	Input B	Input Y
0	0	0
0	1	0
1	0	0
1	1	1

Logical Expression - $[Y = A \cdot B]$

2. OR Gate-



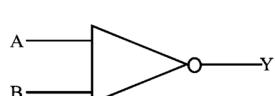
The circuit symbol of OR Gate

The truth table of OR gate

Input A	Input B	Input Y
0	0	0
0	1	1
1	0	1
1	1	1

Logical Expression - $[Y = A + B]$

3. NOT Gate-



The circuit symbol of NOT Gate

The truth table of NOT gate

Input A	Output Y
0	1
1	0

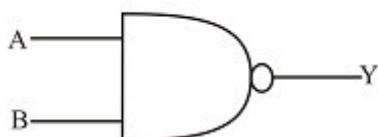
Logical Expression - $[Y = \bar{A}]$

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Derived Logic Gates

1. NAND Gate-



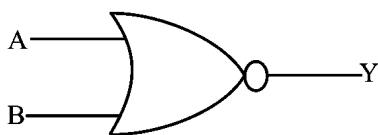
The circuit symbol of NAND gate

The truth table of NAND gate

Input A	Input B	Input Y
0	0	1
0	1	1
1	0	1
1	1	0

$$\text{Logical Expression} - \boxed{Y = \overline{A \cdot B}}$$

2. NOR Gate-



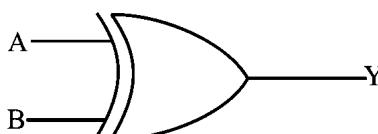
The circuit symbol of NOR Gate

The truth table of NOR gate

Input A	Input B	Input Y
0	0	1
0	1	0
1	0	0
1	1	0

$$\text{Logical Expression} - \boxed{Y = \overline{A + B}}$$

3. XOR Gate-



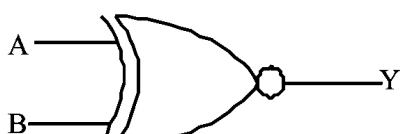
The circuit symbol of XOR Gate

The truth table of XOR gate

Input A	Input B	Input Y
0	0	0
0	1	1
1	0	1
1	1	0

$$\text{Logical Expression} - \boxed{Y = A \oplus B = \overline{AB} + AB}$$

4. XNOR Gate-



The circuit symbol of XNOR Gate

The truth table of XNOR gate

Input A	Input B	Input Y
0	0	1
0	1	0
1	0	0
1	1	1

$$\text{Logical Expression} - \boxed{Y = A \oplus B}$$

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ABBREVIATION RELATED TO COMPUTER

A

ABC	: Atanasoff Berry Computer
ABI	: Application Binary Interface
ABR	: Available Bit Rate
ANSI	: American National Standard Institute
API	: Application Programming Interface
ADC	: Analog-To-Digital Converter
ADB	: Apple Desktop Bus
ADE	: Automatic Design Engineering
ADO	: Active X Data Objects
ADSI	: Active Directory Service Interfaces
AGP	: Accelerated Graphics Port
AIF	: Application Integration Feature
AJAX	: Asynchronous Java Script And XML
ALGOL	: Algorithmic Language
ARC	: Advanced Risk Computing
ASF	: Active Streaming Format
ASP	: Active Server Page
ATA	: At Attachment
ARPA	: Advanced Research Agency Addressing
AVI	: Audio Visual Interleaving
ASG	: Abstract Semantic Graph
ASIC	: Application Specific Integration Circuit
ASP	: Application Service Provider
ALU	: Arithmetic And Logical Unit
AI	: Artificial Intelligence
ASCII	: American Standard Code for Information Interchange
ATM	: Automatic Teller Machine
ATA	: Advanced Technology Attachment

B

BSNL	: Bharat Sanchar Nigam Limited
BD	: Blue-Ray disk
BINAC	: Binary Automatic Computer
Bit	: Binary Digit
BPL	: Broadband Over Power Line
BBS	: Bulletin Board System
BCD	: Binary Coded Decimal
BCR	: Bar Code Reader
BMP	: Basic Multilingual Plane
BRAN	: Broadband Radio Access Networks
BFD	: Binary File Descriptor
BGP	: Border Gateway Protocol
BIN	: Binary

BMP	: Bit Map
BIOS	: Basic Input Output System
BOF	: Beginning OF File
BOOTP	: Bootstrap Protocol
BPI	: Bytes Per Inch
BPS	: Bits Per Second
BAR	: Base Address register
BASIC	: Beginner's All purpose Symbolic Instruction Code
BCC	: Blind Carbon Copy
BHIM	: Bharat Interface for Money

C

CPU	: Central Processing Unit
CRT	: Cathode Ray Tube
CDAC	: Centre for Development of Advanced Computing
CLI	: Computer Line Interface
COBOL	: Common Business Oriented Language
CPS	: Character Per Second
CU	: Control Unit
CAL	: Common Application Language
CAE	: Common Application Environment
CAD	: Computer Aided Design
CAL	: Computer Aided learning
CAM	: Computer Aided Manufacturing
CAT	: Computer Aided Translation
CC	: C Compiler
CAQ	: Computer Aided Quality Assurance
CPN	: Central Processing Node
CDMA	: Code Division Multiple Access
CDOT	: Centre For D
CDR	: Compact Disc Recordable
CDRom	: Compact Disc Read Only Memory
CDRW	: Compact Disc Rewritable
CDR/W	: Compact Disc Read/Write
COBOL	: Common Business Oriented Language
CGA	: Colour Graphic Array
CGI	: Common Gateway Interface
CAI	: Computer Assisted (Aided) Instruction
CLR	: Common Language Runtime
CMOS	: Complementary Metal Oxide Semiconductor
CNC	: Computer Numerical Control
COM	: Component Object Module
COMAL	: Common Algorithmic Language
CRT	: Cathode Ray Tube

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CSI	: Common System Interface
CSS	: Cascading Style Sheets
CT	: Computerized Tomography
CTCP	: Client-To-Client Protocol
CD	: Compact Disk
CTS	: Clear To Send
CU	: Central Unit
CUA	: Control User Access
CVV	: Card Verifiacation Value

D

DAC	: Digital Analog Converter
DCL	: Digital Command Language
DFD	: Data Flow Diagram
DPI	: Dots Per Inch
DB	: Database
DAA	: Data Access Arrangement
DBA	: Database Management System
DCE	: Data Communications Equipment
DDS	: Digital Data Storage
DDS	: Distributed Data Server
DIM	: Device Interface Module
DHTML	: Dynamic HTML
DLC	: Data Link Control
DTR	: Data Terminal Ready
DVD	: Digital Versatile Disc
DIVX	: Digital Video Express
DNS	: Domain Name System
DOS	: Disk Operating System
DoS	: Denial of Service
DPMI	: Dos Protected Mode Interface
DRAM	: Dynamic Ram
DVD RW	: DVD Re Writable
DTP	: Desktop Publishing
DVR	: Digital Video Recorder
DSL	: Digital Subscriber Line or, Domain Specific Language
DBMS	: Database Management System
DFS	: Distributed File System
DMA	: Direct Memory Access

E

E-Mail	: Electronic Mail
E-Comm.	: Electronic Commerce
EBCDIC	: Extended Binary Coded Decimal Interchange Code
EBCDIC	: Extended Binary Coded Decimal Interchange Code
EDP	: Electronic Data Processing
EDSAC	: Electronic Delay Storage Automatic Calculator

EE-PROM	: Electrically Erasable Programmable Read Only Memory
ENIAC	: Electronic Numerical Integrated and Computer
EDVAC	: Electronic Discrete Variable Automatic Computer
EOF	: End Of File
EXE	: Executable
EDD	: Enhanced Disk Drive
EFF	: Electronic Frontier Foundation
EFI	: Extensible Firmware Interface
EGA	: Enhaced Graphics Array
EIO	: Electronic Id Card
EASI	: Embedded All-In-One System Interface
ERP	: Error Recovery Procedure
EPROM	: Erasable Programmable Read Only Memory
EUC	: End-User Computing
ETTS	: Electronic Information Transfer System
EPFO	: Employees Provident Fund Organaization

F

FAT	: File Allocation Table
FAQ	: Frequently Asked Questions
FTP	: File Transfer Protocol
FIFO	: First In First Out
FCS	: Frame Check Sequence
FDC	: Floppy Disk Drive Controller
FDD	: Floppy Disk Drive
FDM	: Frequency Division Multiplexing
FORTRAN	: Formula Translation
FS	: File System
FXP	: File Exchange Protocol
FSB	: Front Side Bus
FSF	: Free Software Foundation

G

GUI	: Graphical User Interface
Gb	: Gigabit
GIGO	: Garbage In, Garbage Out
GB	: Gigabyte
GDA	: Globla Document Annotation
GDI	: Graphical Device Interrace
GIF	: Graphics Interchange Format
GPU	: Graphics Processing Unit

H

HDD	: Hard Disk Drive
HD-DVD	: High Definition-DVD

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HDA	: Head Disk Assembly
HDD	: Hard Disk Drive
HDLC	: High Level Data Link Control Procedures
HHD	: Hybrid Hard Drive
HTML	: Hypertext Markup Language
HTTP	: Hypertext Transfer Protocol
HSTP	: High Speed Transport Protocol
HID	: Human Interface Device
HTWL	: Hyper Text Web Language

I

IBM	: International Business Machine
IT	: Information Technology
IGMP	: Internet Group Management Protocol
IIS	: Internet Information Services
IMAP	: Internet Message Access Protocol
IPC	: Inter-Process Communication
IPTV	: Internet Protocol Television
IRC	: Internet Relay Chat
IMAC	: Internet Macintosh
IHV	: Independent Hardware Vender
IFSMGR	: Instable File System Manager
IS	: Infromation System
ISDN	: Intergrated Services Digital Network
ICM	: Image Color Management
ICM	: Image Compression Manager
ICMP	: Internet Control Message Protocol
IDT	: Internet Development Toolbox
IGRP	: Interior Gateway Routing Protocol
ISO	: International Organization For Standardization
IVV	: Independent Verification & Validation
IM	: Instant Messaging
I/O	: Input/Output
I/P	: Internet Protocol
ISP	: Internet Service Provider
ITU	: International Telecommunication Union
IP SEC	: Internet Protocol Security
IIOT	: Industrial Internet of Things
IAM	: Identity and Access Management
IFR	: International Federation of Robotics
IDL	: Interface Definition Language
IMF	: International Monetary Fund

J

JSP	: Java Server Pages
JAM	: Java Administration Server

J2CE	: Jave 2 Cryptographic Edition
JDS	: Java Desktop System
JMX	: Java Management Extensions
JCP	: Java Community Process
JPEG	: Joint Photographic Experts Group
JS	: Java Script
JFC	: Java Foundation Classes

K

KHz	: Kilohertz
KB	: Kilobyte
KBPS	: Kilobit Per Second
KPA	: Key Process Area

L

LSI	: Large Scale Intergration
LASER	: Light Amplification by Stimulated Emission of Radition
LED	: Liquid/Light Emiting Diode
LPM	: Line Per Minute
LSB	: Least Significant Bit
LSI	: Large Scale Integration
LA	: Laboratory Automation
LAN	: Local Area Network
LBP	: Laser Beam Printer
LPT	: Line Printer
LBA	: Logical Block Address
LCD	: Liquid Crystal Display
LIFO	: Last In First Out
LU	: Logical Unit

M

MS-DOS	: Microsoft-Disc Operating System
MTNL	: Mahanagar Telephone Nigam Limited
MANET	: Mobile Ad-Hoc Network
MDI	: Multiple Document Interface
MOS	: Metal Oxide Semiconductor
MSB	: Most Significant Bit
MU	: Memory Unit
MAC	: Media Access Control
MAN	: Metropolitan Area Network
MAOS	: Multi Application Operating System
MB	: Megabit/Megabyte
MBR	: Master Boot Record
MIDP	: Mobile Information Device Profiles
MICR	: Magnetic Ink Character Recognition
MIDI	: Music Instrument Digital Interface
MIMO	: Multiple-Input Multiple-Output
MIPS	: Million Instructions per Second
MMX	: Multi-Media Extensions

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MNG	: Multiple-Image Network Graphics
MPEG	: Motion Pictures (Coding) Experts Group
MMU	: Memory Management Unit
MMX	: Multimedia Extension
MPM	: Multi-Programming Monitor
MPU	: Micro Processor Unit
MODEM	: Modulator-Demodulator
MUI	: Multimedia User Interface
MVS	: Multiple Virtual Storage
MIME	: Multipurpose Internet Mail Extensions
MIS	: Management Information System

N

NAL	: National Aerospace Laboratories
NASSCOM	: National Association of Software and Service Computer
NPCI	: National Payment Corporation of India
NIC	: Network Interface Card
NOS	: Network Operating System
NT	: New Technology (Windows)
NCS	: Network Computing System
NET PC	: Network Personal Computer
NFS	: Network File System
NIO	: New I/O
NNTP	: Network News Transfer Protocol
NPI	: Network Provider Interface

O

OS	: Operating System
OOP	: Object Oriented Programming
OOS	: Open Source Software
OAM	: Operation And Maintenance
OCR	: Optical Character Reader
OMR	: Optical Mark Reader
OLAP	: On-Line Analytical Processing
OSPF	: Open Shortest Path First

P

PDL	: Program Design Language
PL 1	: Programming Language 1
POS	: Point of Sales
PROM	: Programmable Read Only Memory
PCI	: Peripheral Component Interconnect
PDA	: Personal Digital Assistant
PDF	: Portable Document Format
PLA	: Programmable Logic Array
PPI	: Pixels Per Inch
PPP	: Point-to Point Protocol
PPTP	: Point-To-Point Tunneling Protocol
P2P	: Peer-To-Peer

PAN	: Personal Area Network
PAP	: Password Authentication Protocol
PC	: Personal computer
PIC	: Peripheral Interface Controller
PIN	: Personal Identification Number
PNG	: Portable Network Graphics
PAIH	: Public-Access Internet Host
PCP	: Printer Control Protocol
PCT	: Private Communication Technology
PDC	: Primary Domain controller
POP	: Point Of Presence
PSM	: Printing Systems Manager
PSTN	: Public Switched Telephone Network
PSN	: Packet Switching Network
PSP	: Passport Seva Project

Q

QAM	: Quadrature Amplitude Modulation
QFA	: Quick File Access
QFP	: Quoted For Permanence
QDR	: Quad Data Rate
QOS	: Quality of Service
QSAM	: Query Service on Aadhaar Mapper
QR Code	: Quick Response Code

R

RPG	: Report Program Generator
RAID	: Redundant Array of Independent Disks
RDBMS	: Relational Database Management System
RDRAM	: Rambus Dynamic RAM
RTOS	: Real Time Operating System
RAM	: Random Access Memory
RARP	: Reverse Address Resolution Protocol
RLN	: Remote Lan Node
RWM	: Read Write Memory
ROM	: Read Only Memory
REFAL	: Recursive Functions Algorithmic Language
REG	: Register
RTL	: Register Transfer Language
RPA	: Robotics Process Automation

S

S RAM	: Static Ram
SCSI Port	: Small Computer System Interface Port
SEO	: Search Engine Optimization
SET	: Secure Electronic Transactions
SAN	: Storage Area Network
SATA	: Serial Ata
SBIN	: Super user Binary
SBP-2	: Serial Bus Protocol-2

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SDK	: Software Development Kit
SLIP	: Serial Line Internet Protocol
SMTP	: Simple Mail Transfer Protocol
SMBIOS	: System Management Bios
SNTP	: Simple Network Time Protocol
SQL	: Structured Query Language
SDRAM	: Synchronous Dynamic Random Access Memory

T

TFT	: Thin-Film Transistor
TFTP	: Trivial File Transfer Protocol
TLD	: Top Level Domain
TTL	: Transistor-Transistor Logic
TB	: Terabyte
TCP/IP	: Transmission Control Protocol/Internet Protocol
TTF	: True Type Font
TTS	: Text-To-Speech
TDMA	: Time Division Multiple Access
TTY	: Teletype

U

ULSI	: Ultra Large Scale Intergration
UNIVAC	: 1-Universal Automatic Computer
UPS	: Uninterruptible Power Supply
URI	: Uniform Resource Identifier
UI	: User Interface
URL	: Uniform Resource Locator
USB	: Uniform Serial Bus
UTR	: Unique Transaction Reference
UTS	: Unreserved Ticket System
UTP	: Unshielded Twisted Pair
UPI	: Unified Payment Interface
USSD	: Unstructured Supplementary Service Data

V

VDU	: Visual Display Unit
VLSI	: Very Large Scale Intergration
VSNL	: Videsh Sanchar Nigam Limited
Var	: Variable
VOIP	: Voice Over IP
VB	: Visual Basic
VBS	: Visual Basic For Application
VLAN	: Virtual Loacal Area Network
VGA	: Video Graphics Character Table
VM	: Virtual Memory
VMS	: Video Memory System
VPN	: Virtual Private Network
VSAM	: Virtual Storage Access Method

VT	: Video Terminal
-----------	------------------

W

WIMAX	: Worldwide Interoperability for Microwave Access
WLL	: Wireless Local Loop
WORM	: Write Once Read Many
WAIS	: Wide Area Information Servers
Wi-Fi	: Wireless Fidelity
WWAN	: Wireless Wide Area Network
WAN	: Wide Area Network
WAP	: Wireless Application Protocol
WINFS	: Windows Future Storage
WMP	: Windows Media Player
WWW	: World Wide Web
WOL	: Wake-On-Line
WSDL	: Web Services Description Language
WGS	: Work Group System
WAIS	: Wide Area Information Servers

X

XHTML	: eXtensible HyperText Markup
XML	: eXtensible Markup Language
XUL	: Xml User Interface Language
XSL-FO	: eXtensible Stylesheet Language Formatting Objects
XSLT	: eXtensible Stylesheet Language Transformations.
XAML	: eXtensible Application Markup Language
XMMS	: X Multimedia System
XNS	: X erox Network Services
XSL	: eXtensible Stylesheet Language

Y

YTD	: It Is Used For Year To Date.
Y2K	: Year Two thousand.

Z

ZIP	: Compressed File
ZIP	: Zone Information Protocol
ZSL	: Zero Slot Lan
ZISC	: Zone Instruction Set Computer
ZIFS	: Zero Insertion Force Socket
ZMA	: Zone Multicast Address