

COMPUTER

CAPSULE

Quick Revision

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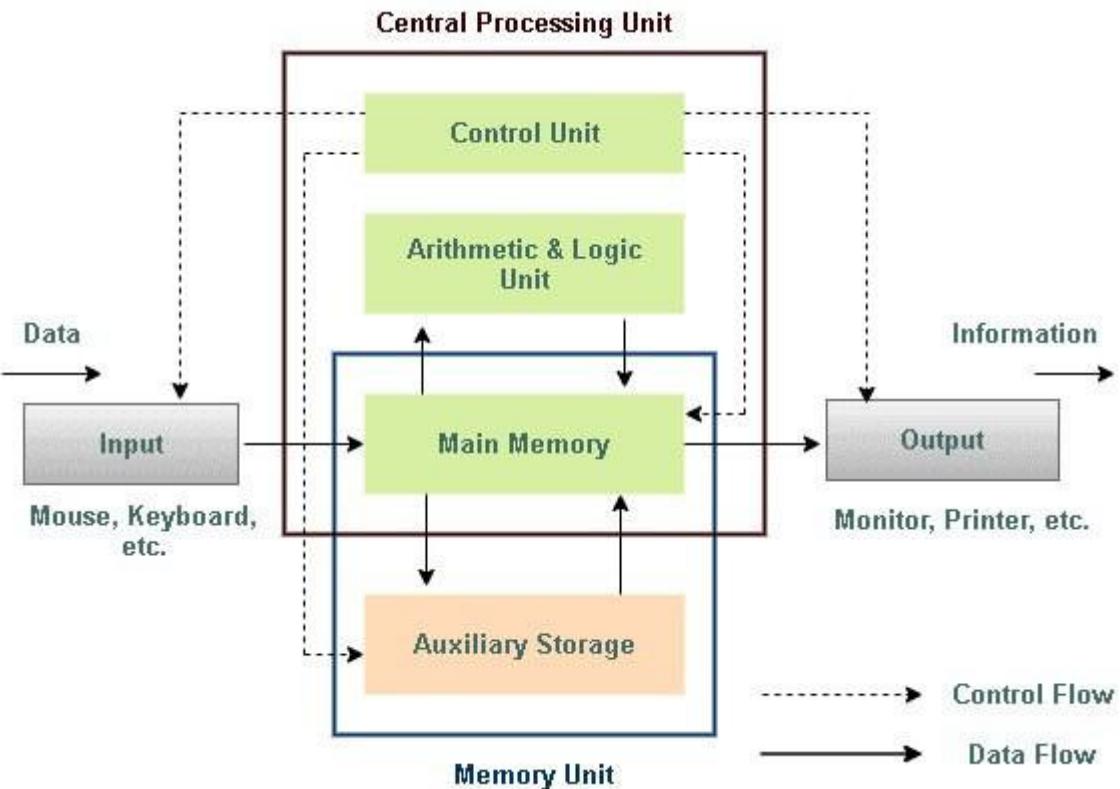
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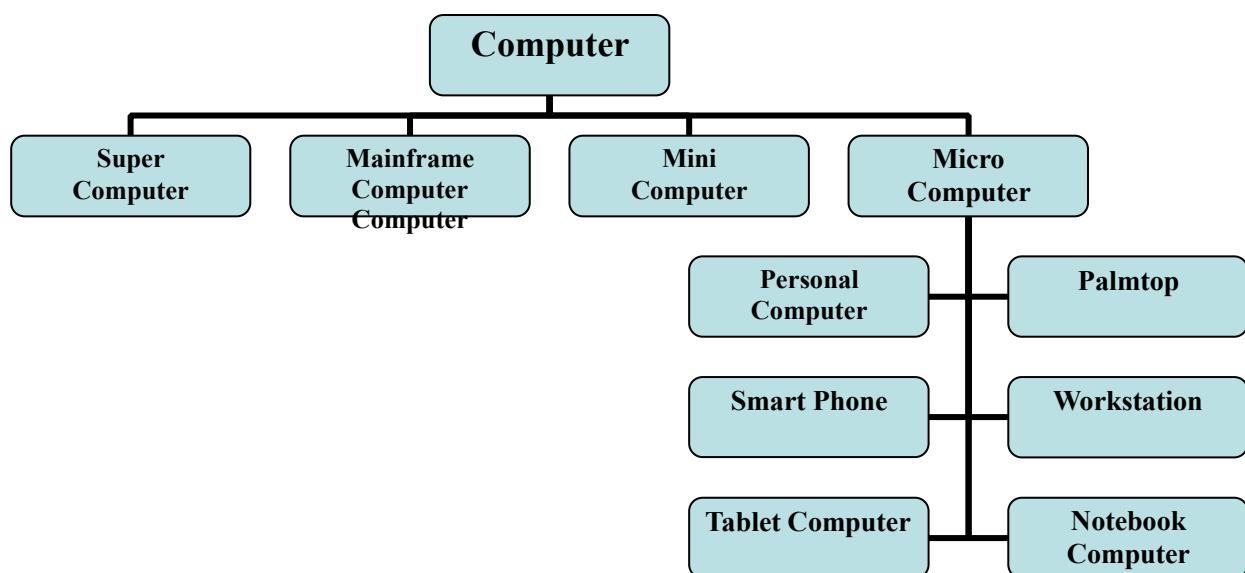
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Introduction of Computer

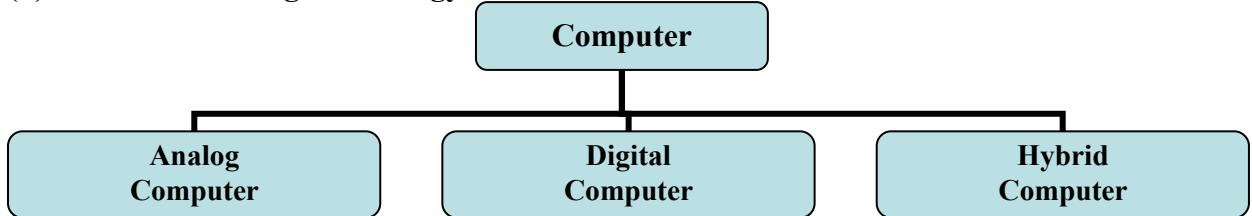
Computer system- A computer is an electronic device that can be programmed to accept data (input), process it and generate result (output). A computer along with additional hardware and software together is called a computer system.



Classification of Development of Computer (i) Based on size and work.



(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. |

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.

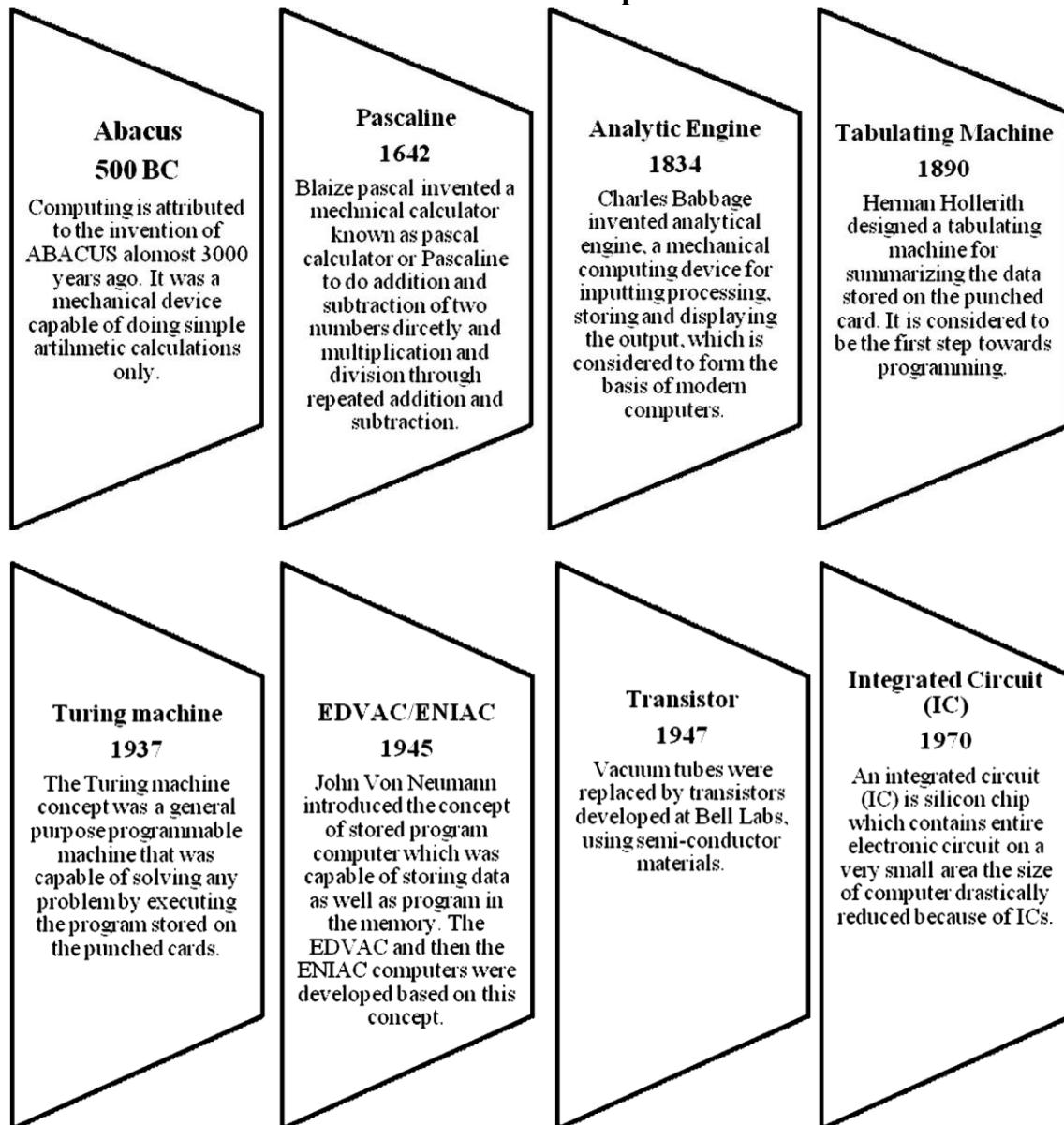
Storage Capacity- Computer can store huge amounts of data.

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

| 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 |
|-------------------------------------|-------------|--------------------------------|-----------------------------------|------------------------------|--|--|---|

Evolution of Computer



Generations of Computers- At a Glance

| | | | | | | | |
|--|--|--|--|---|--|---|--|
| 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) | Microprocessor 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. |

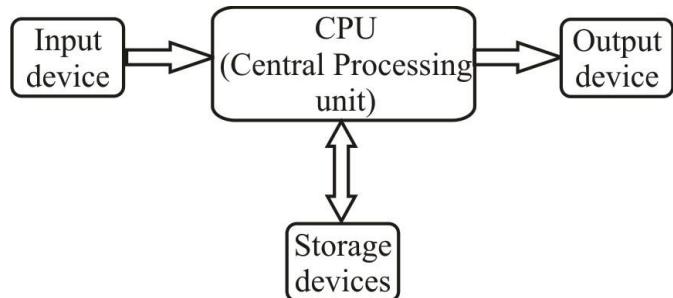
Computer Hardware & Software

| 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.

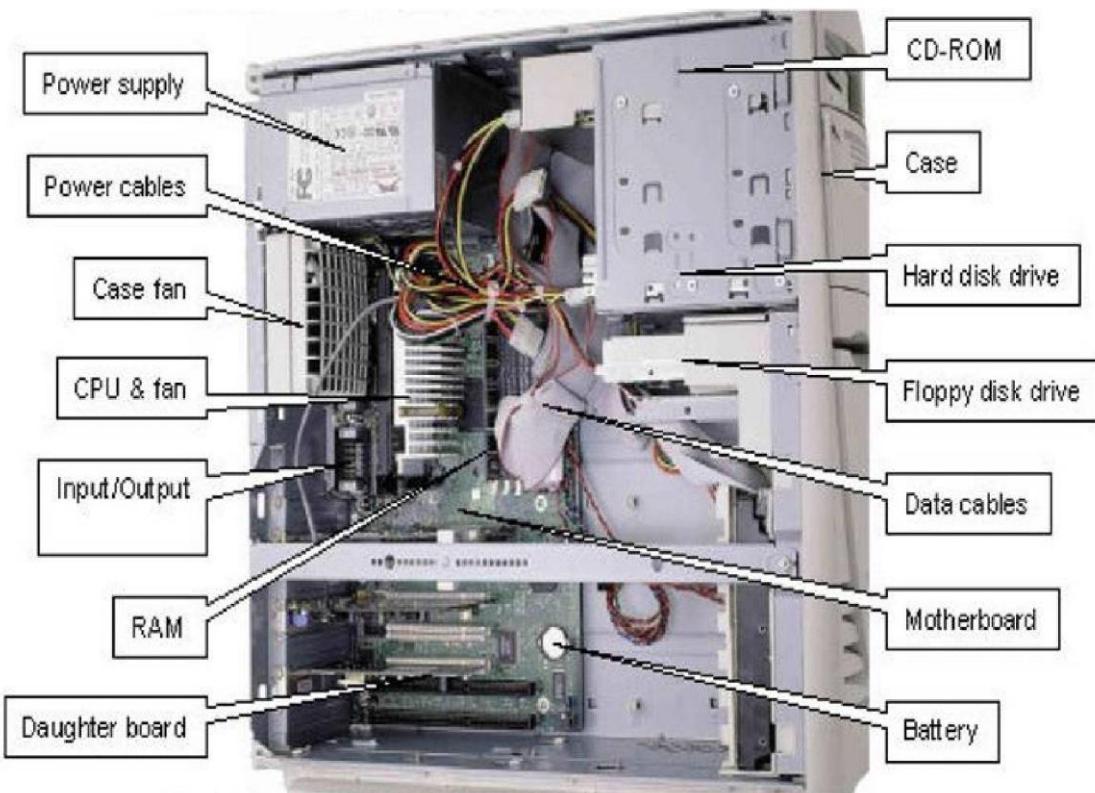
7. Example- MS word, Excel, PowerPoint,
Photoshop, MySQL, etc.

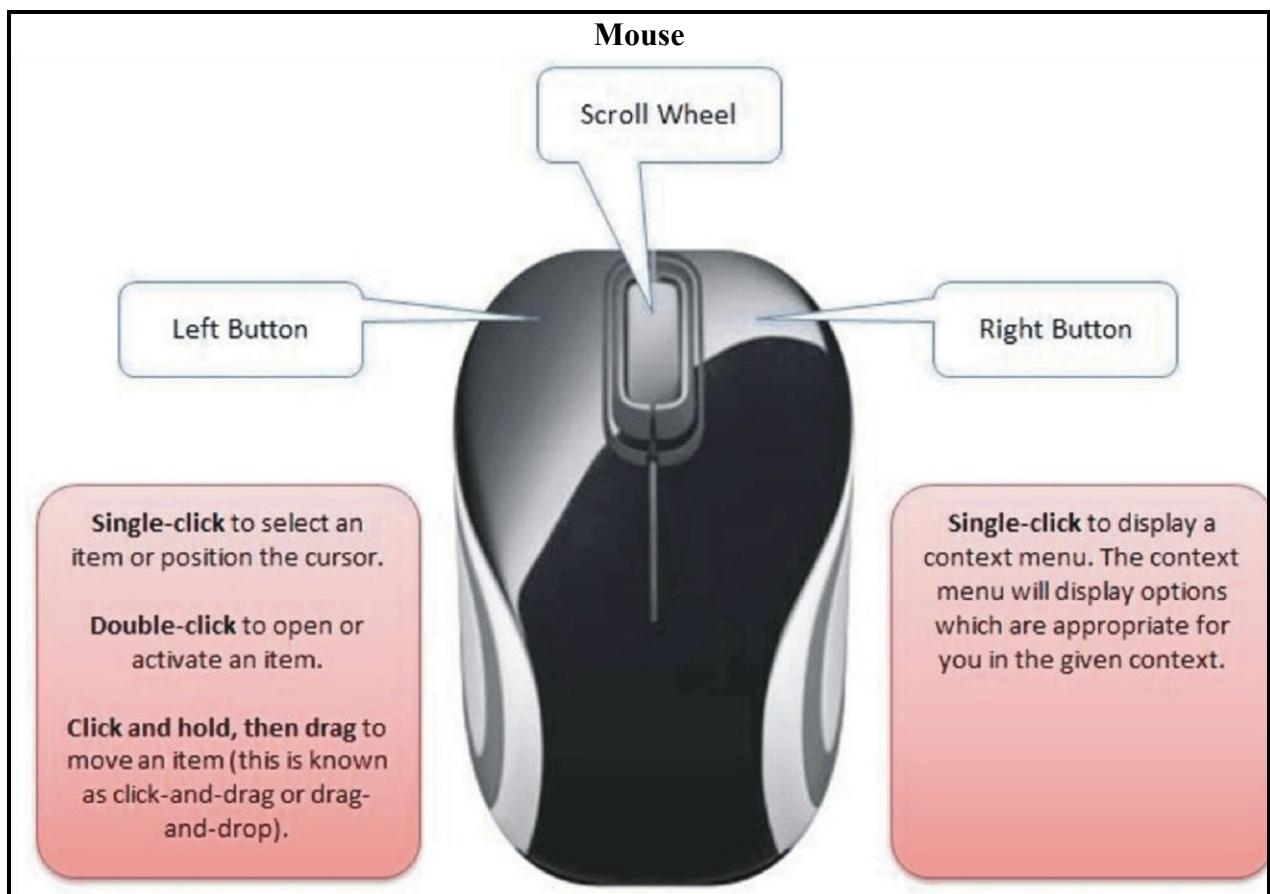
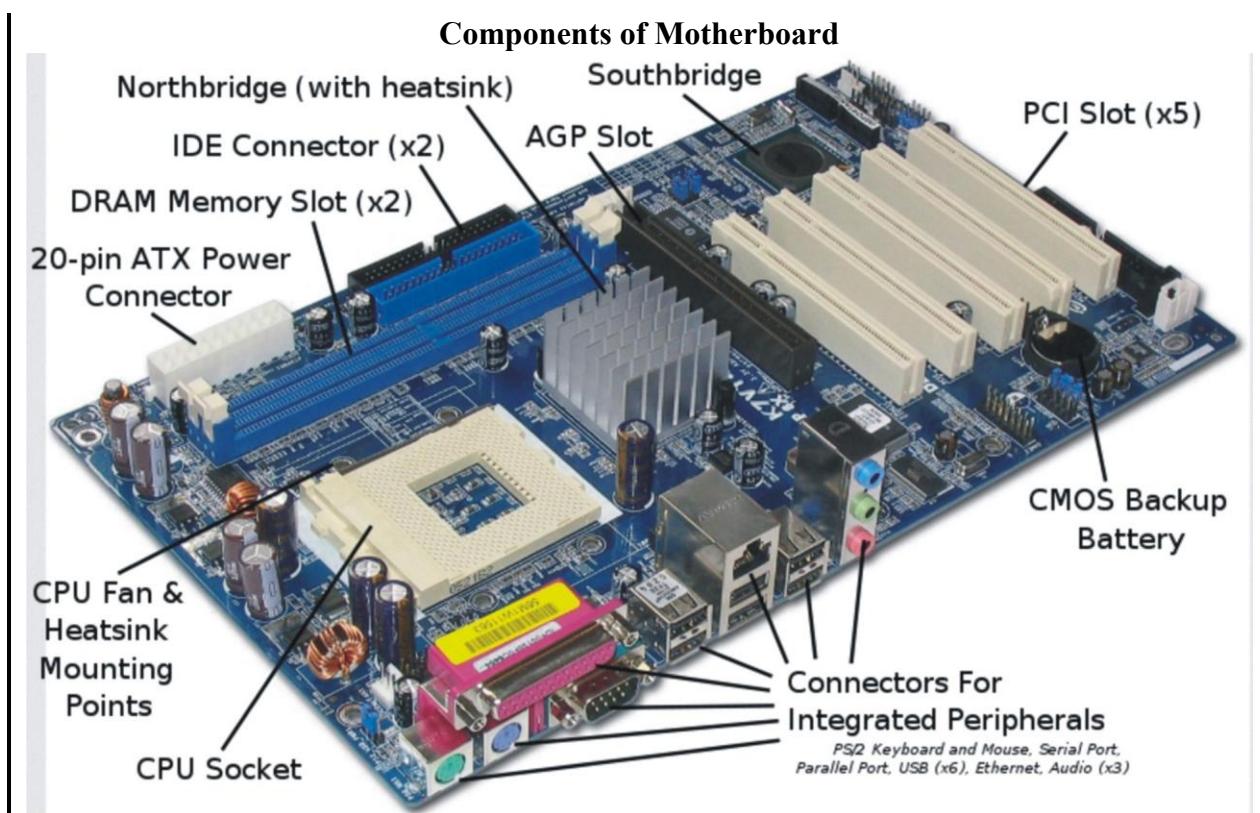
Components of Personal Computer



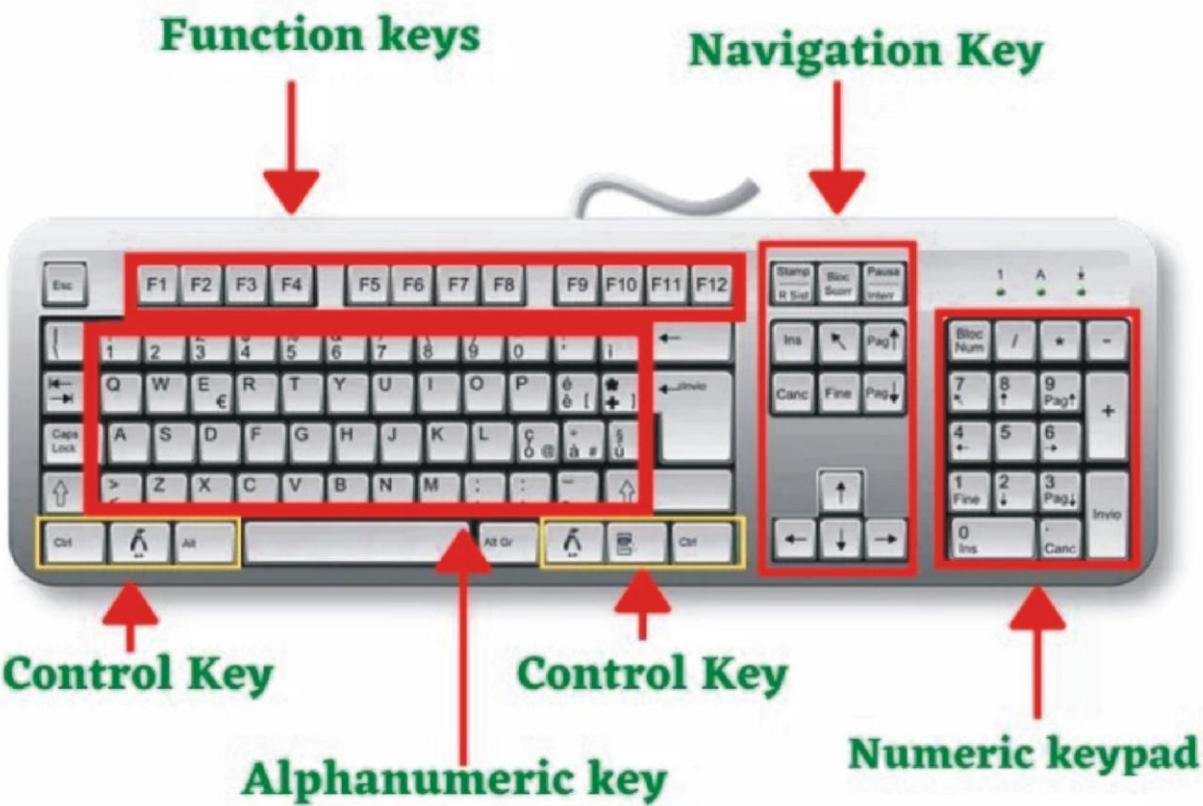
| Operation | Description |
|---------------------------------|--|
| 1. Take Input | The process of entering data and instructions into the computer system |
| 2. Store Data | Saving data and instructions so that they are available for processing as and when required. |
| 3. Processing Data | Performing 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





Keyboard



TYPING KEYS

Usually arranged in the same order as on a standard typewriter.

FUNCTION KEYS

Perform a different command or function in each program designed to use them.

ENTER KEY

Used to enter commands into the computer, end paragraphs, and insert blank lines in documents.

INDICATOR LIGHTS

Show the status of certain toggle keys on the keyboard.

BACKSPACE KEY

Erases one character to the left of the insertion point.

INSERT KEY

Toggles between inserting text and typing over text in many programs.

DELETE KEY

Deletes one character to the right of the insertion point.

SPECIAL PURPOSE KEYS

Can control a CD player, speaker volume, launch programs, put the PC to sleep, etc.

NUM LOCK KEY

Toggles between the numbers and the arrows located on the numeric keypad.

NUMERIC KEYPAD

Used to efficiently enter numerical data.

FUNCTION LOCK KEY

Turns the function keys on or off.

ESCAPE KEY

Used to cancel some operations.

TAB KEY

Moves to the next tab location.

CAPS LOCK KEY

Turns all caps on or off.

WINDOWS KEY

Opens the Windows Start menu.

CONTROL AND ALTERNATE KEYS

Used in combination with other keys to enter commands into the computer.

SPACE BAR

Enters a blank space.

SHIFT KEY

Produces uppercase letters and symbols on the upper part of certain keys when the Caps Lock key is not on.

ARROW KEYS

Move the cursor around a document without disturbing existing text.

PAGE UP AND

MOVE up or down one page or screen in most programs.

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

Output Devices



Monitor (LED,
LCD, CRT etc)



Printer



Plotter



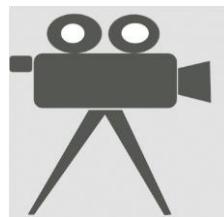
Projector



Loudspeaker



Speech synthesizer



Film Recorder



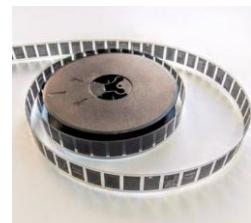
Head phones



Sound card



Video card



Computer Output Microfilm
(COM)

Both Input-Output Devices



(FAX)

Touch Screen

Modems

Headsets

(It has scanner to scan the
(Headset consists of document and also have
speakers & printer to print the microphone)
document)

Facsimile

Printer



**Classification
of Printers**

**Impact
Printers**

**Character
Printers**

**Line
Printers**

**Non-Impact
Printers**

**Inkjet
Printers**

**Laser
Printers**

**Thermal
Printers**

**Dot matrix
Printers**

**Daisy
Wheel
Printers**

**Drum
Printers**

**Chain
Printers**

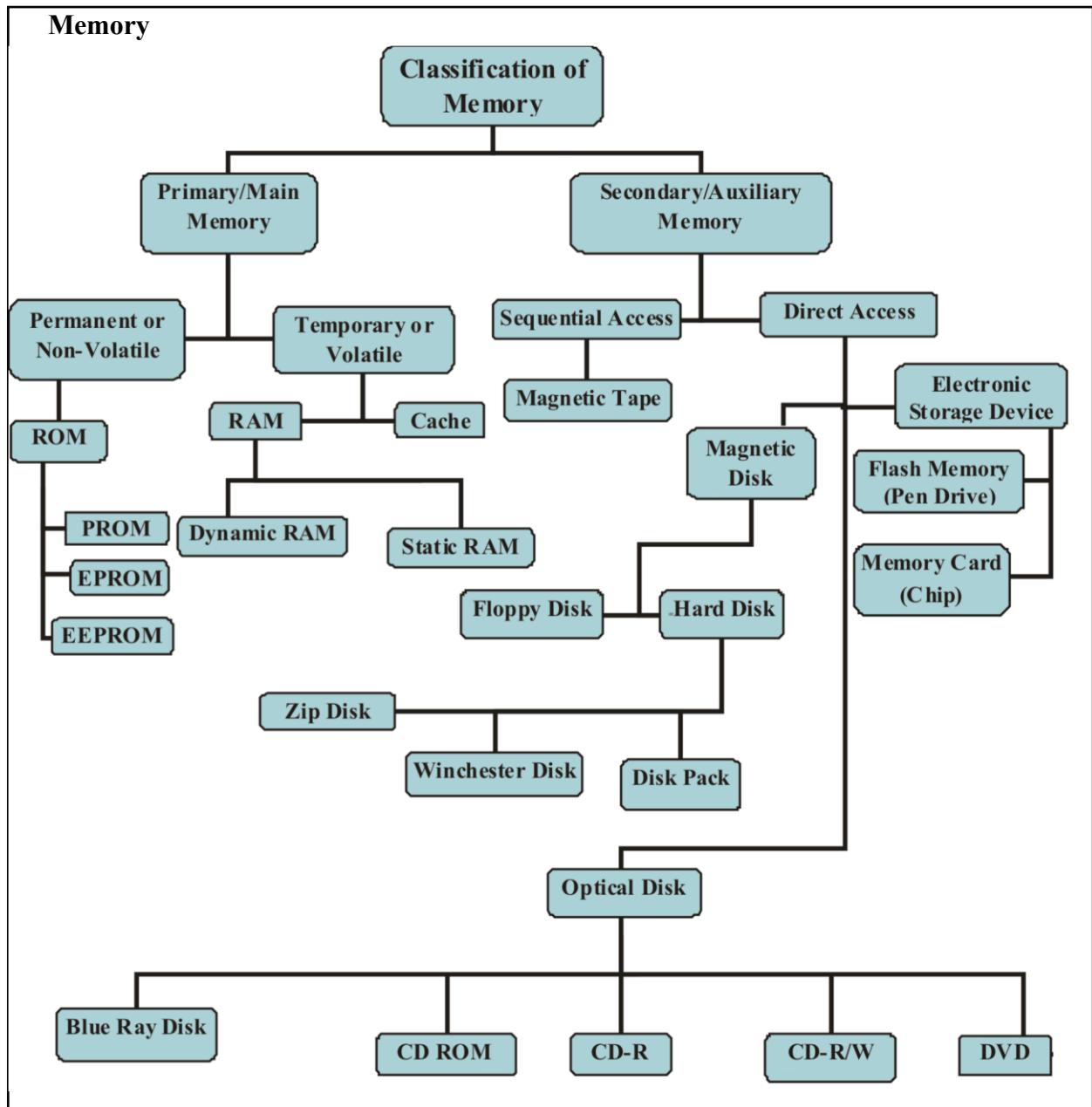
Impact and Non-Impact printer

| 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. Example 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. |



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. |

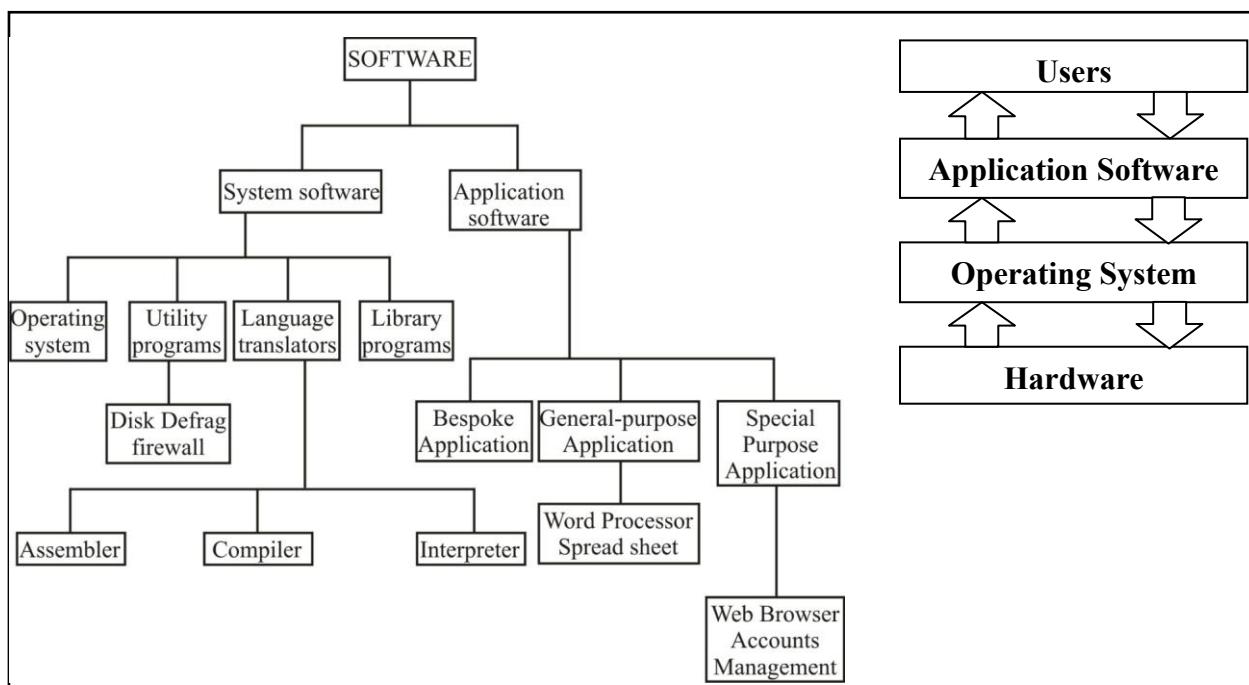
6. Examples - RAM, ROM, Cache memory, PROM, EPROM, Registers etc.

6. Examples - Hard Disk, Floppy Disk, magnetic, Tapes etc.

Memory Hierarchy

| Memory | Access Time | Storage Capacity | |
|---------------|-------------|-------------------|--|
| ROM | 1µ 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 | |

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 are 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. |

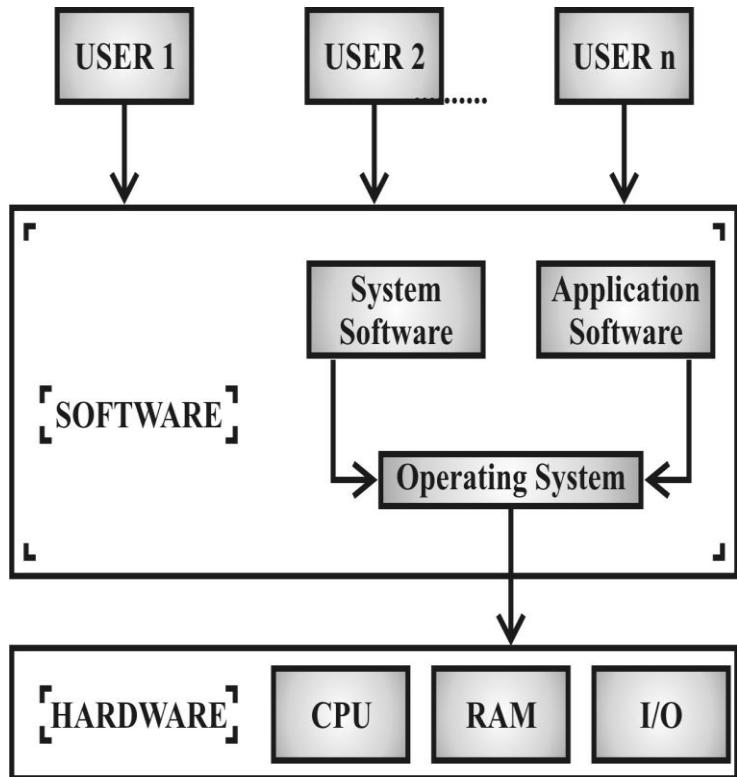
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| 5. Example of system software are operating system, compiler, etc. | 5. Example of application software are, Photoshop, MS office, VLC player etc. |
|---|--|

Operating System

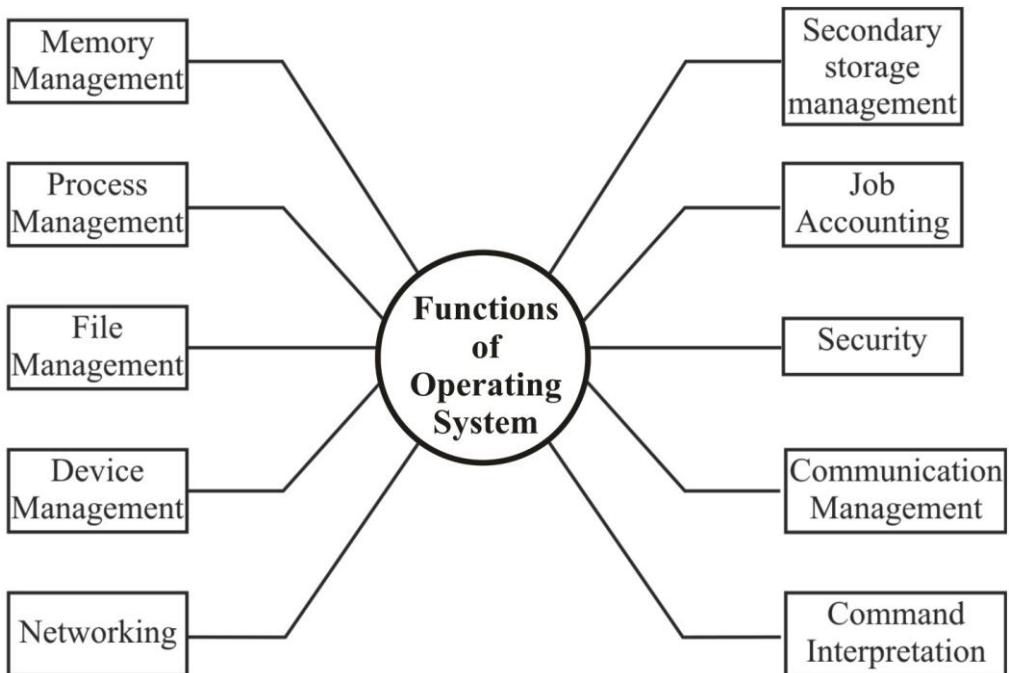
Introduction

Operating System acts as an interface between computer hardware and user. It manages and controls all the hardware and flow of data, instructions and information to and within the system. The Operating System takes instructions from the user and directs it to CPU, which further passes the instructions to the hardware.

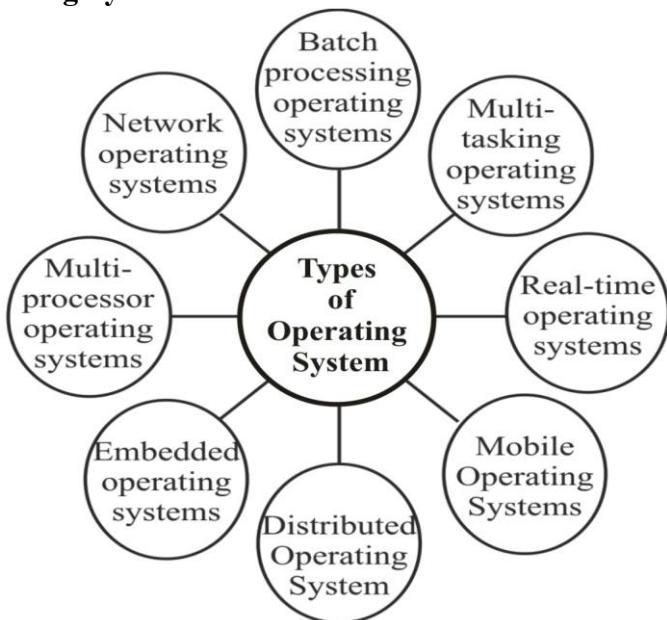
Operating System is one of the core software programs that run on hardware and makes it usable. The user can interact with hardware so that they can send commands and receive output. An Operating System provides an interface between user and machine. This interface can be graphical user interface (GUI) in which users click on screen elements to interact with Operating System or a command line interface (CLI) to tell the Operating System to do things, it also manages the computer's resource such as CPU, memory, disk drives and printers. It provides services for application software.



Functions of an Operating System-



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 | <p>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</p> | <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. |
|-----------------------------------|---|--|---|--|

| | | | | |
|--|---|--|---|---|
| | 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 | <p>It is installed on an embedded computer system, which is primarily used for performing computational tasks in electronic devices.</p> <ul style="list-style-type: none"> These operating systems allow the implementation of embedded systems in an efficient manner. The computer system with embedded 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 | <p>It 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.</p> | <ul style="list-style-type: none"> It provides 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. |

MS-DOS



- MS-DOS was developed and introduced by Microsoft in 1981.
- MS-DOS 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 to type a command at the command line for performing a 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 clears extended Ctrl + C single file or a directory. |
| Call | The call command is used to 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 letter 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. |

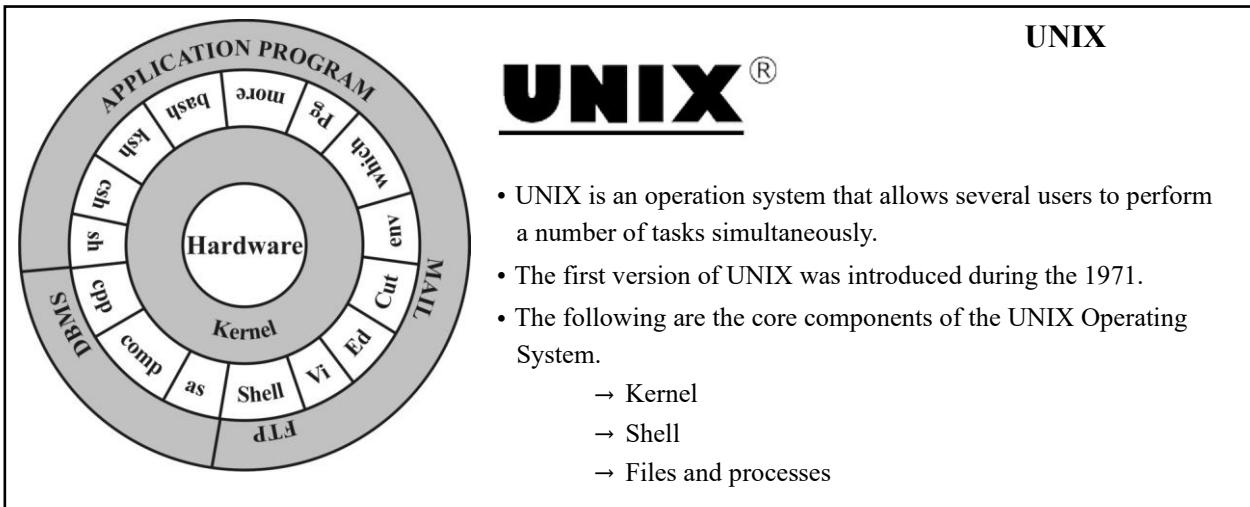
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|-------------------|--|
| Copy | The copy command copies one or more files from one location to another. |
| Country | The country command is used in the CONFIG.SYS files to tell MS-DOS to use country specific text conventions during processing. |
| 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 one 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 within 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. |

| | |
|------------------|---|
| Drvspace | The drvspace command is used to create or configure drive space compressed drives. Drivspace, 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 KB 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. |

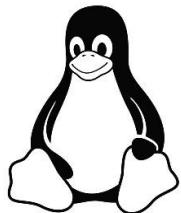
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|---------------------|--|
| Fe | The Fe command is used to compare two individual or sets of files and then show the differences between them. |
| F disk | The F disk command is used to create, manage, and delete hard drive partitions. |
| Find | 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 labeled line in the script. |
| Graphics | The graphics command is used to load a program that can print graphics. |

| | |
|------------------|--|
| Help | The help command provides more detailed information of any other command prompt or msdos command. |
| If | The command used to perform conditional function in a batch. |
| Interlink | The interlink 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 the 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. |

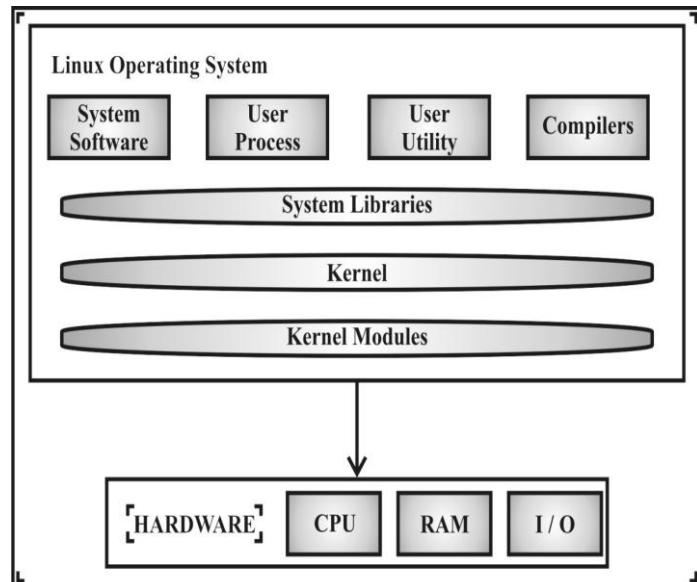
| | |
|----------------|---|
| Mode | The Mode command is used to configure system device. |
| More | The More command is used to display the information contained in text file the More command case also be used paginate the result of result of any others prompt or Ms-Dos command. |
| Msav | The Msav 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 hand 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 top display the current Ms-Dos version number. |
| Vsafe | The Vsafe command is used to start Vsafe is basic virus protection system for Ms-Dos. |



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. |

| | |
|----------------|---|
| 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 it puts standard input on standard output and also writes 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 form 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 a 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 send emails 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 lines of text/string that are passed as arguments. |

| | |
|--------------|---|
| 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. |

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. |
| • 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 1.1. 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 |
| | Nokia and Intel | 26 May, 2010 |

| | | | |
|---|-----------------------|------------------------|------------------|
|  | MeeGo OS | | |
|  | 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 |

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-

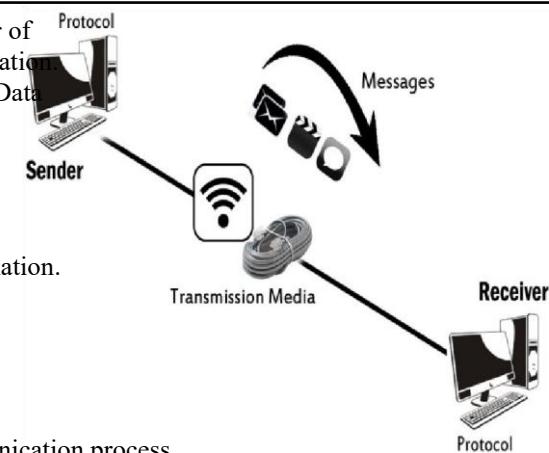
→ **Message**- it is the information to be communicated. It may be in the form of text, pictures, audio, video or any combination of these.

→ **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-

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

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

$$1 \text{ Gbps} = 2^{30} \text{ bps} = 1024 \text{ Mbps} \quad 1 \text{ Tbps} = 2^{40} \text{ bps} = 1024 \text{ Gbps}$$

Types of Data Communication



(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

Data travels only in one direction
communications between devices in which both the device 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 but only one at a time

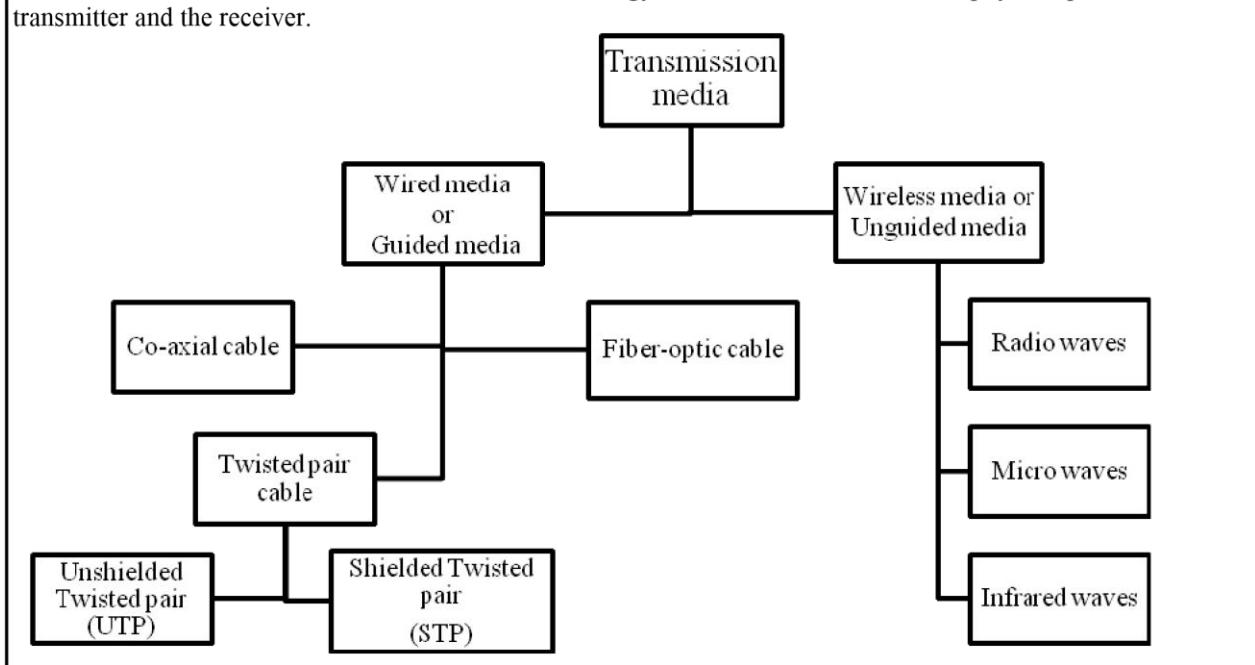


(iii) **Full-duplex communication**- It is two way or bidirectional communication in which both devices can send and receive data simultaneously. For example, mobile phones and landline telephones.

Data travels in both direction at the same time

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

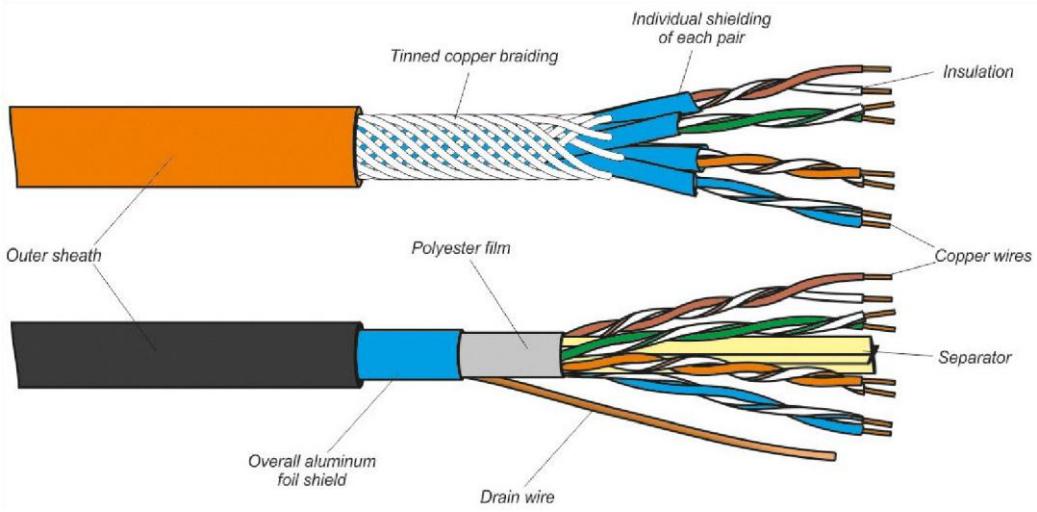
Transmission Media– In data communication terminology, a transmission medium is a physical path between the transmitter and the receiver.

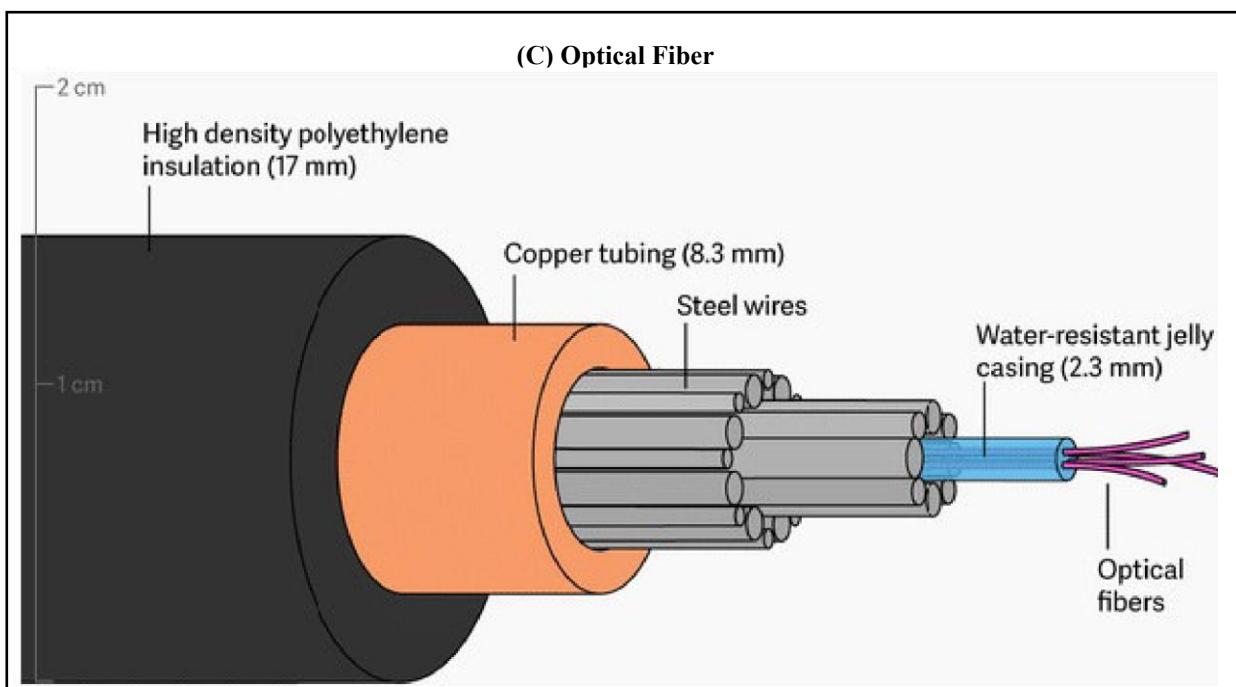
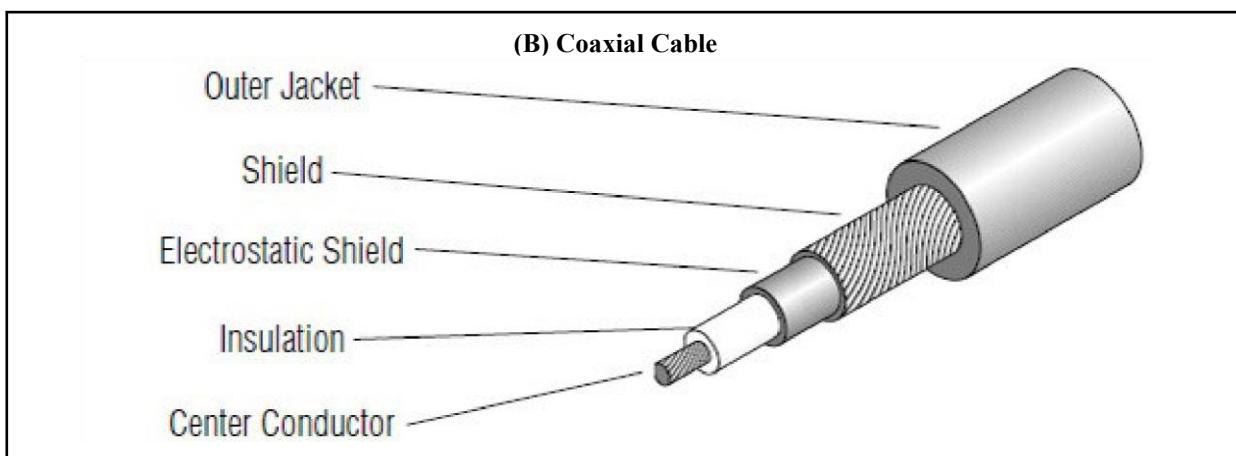


Guided Media and Unguided Media

| 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. |

(A) Twisted Pair Cable



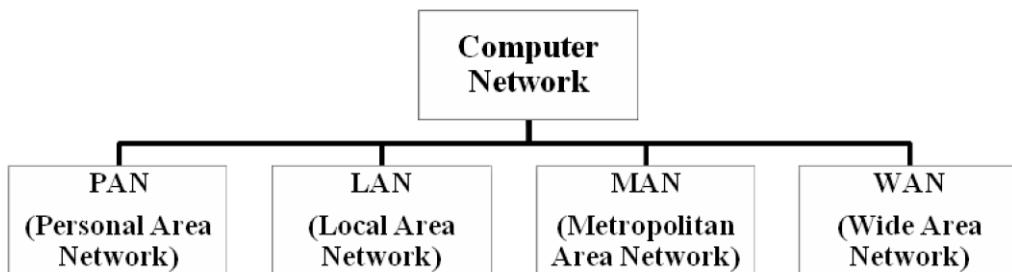
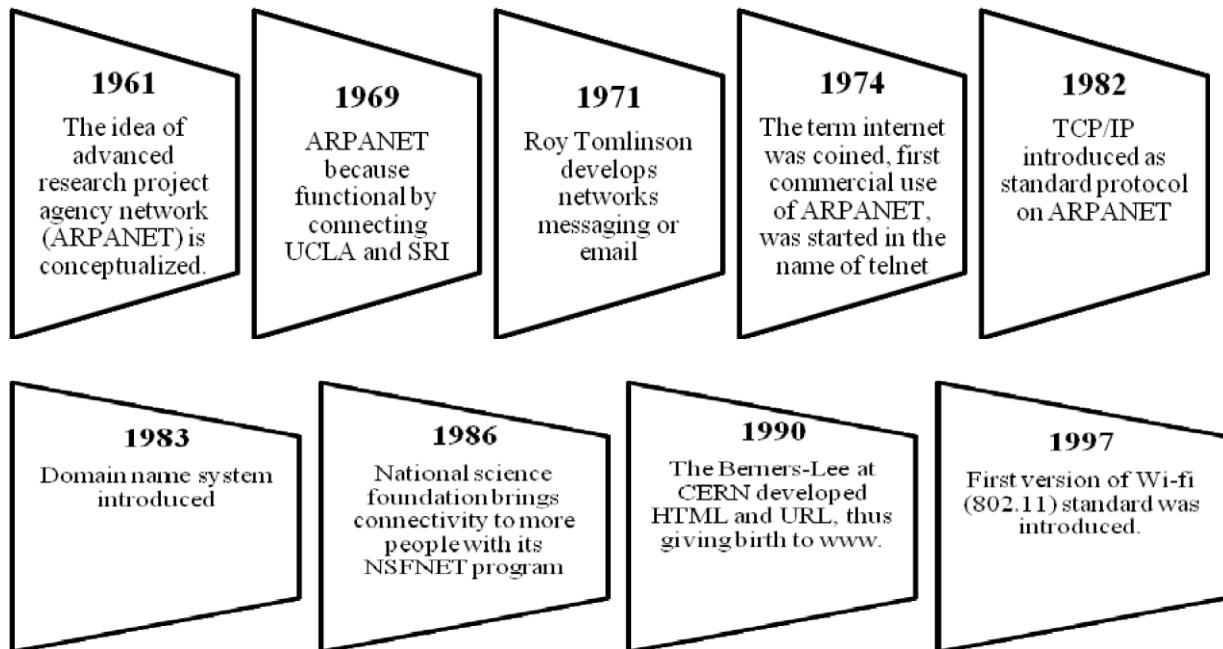


Radio wave, Microwave and infrared waves

| 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. |
|----------------------|----------------------------------|------------------------------|--------------------------|

Evolution of Networking



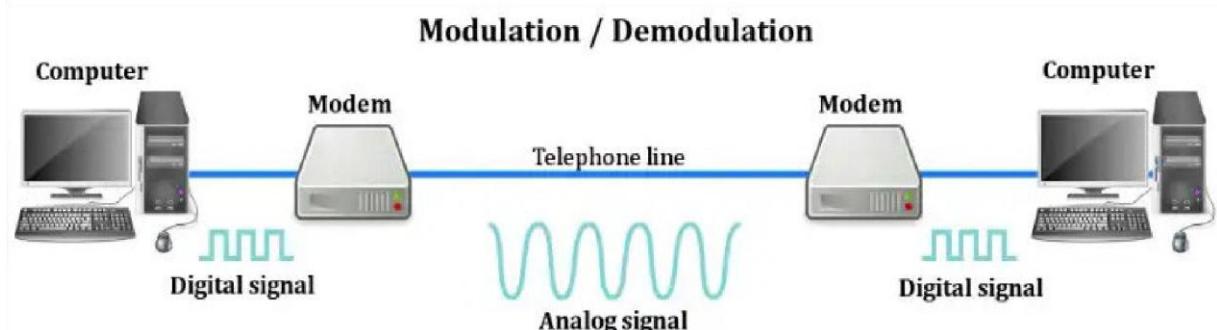
LAN, MAN and WAN

| 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 |

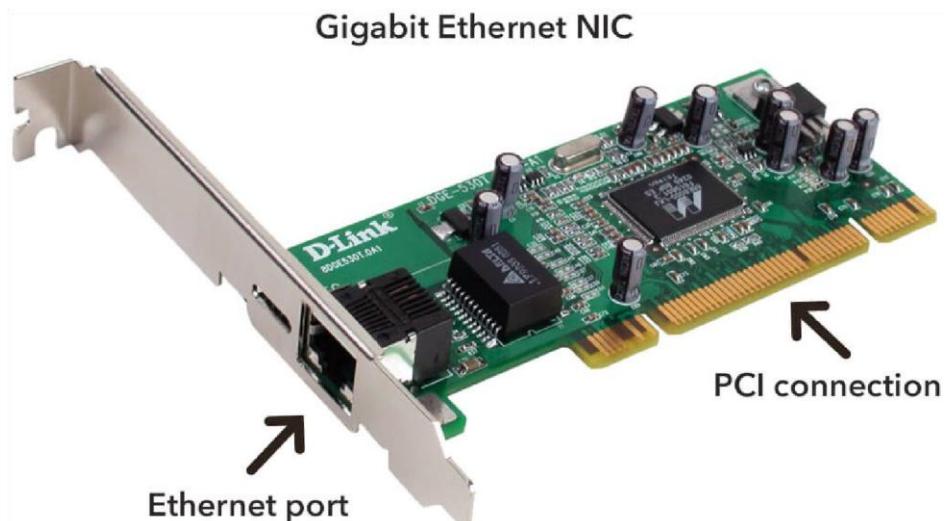
| | | | |
|---------------------------------|---------------------------------------|---|--|
| Design & Maintenance | LAN's design and maintenance are easy | While MAN's design and maintenance are difficult than LAN | Whereas WAN's design and maintenance are also difficult than LAN as well MAN |
| Fault tolerance | There is more fault tolerance in LAN | While there is less fault tolerance | In WAN, there is also less fault tolerance |

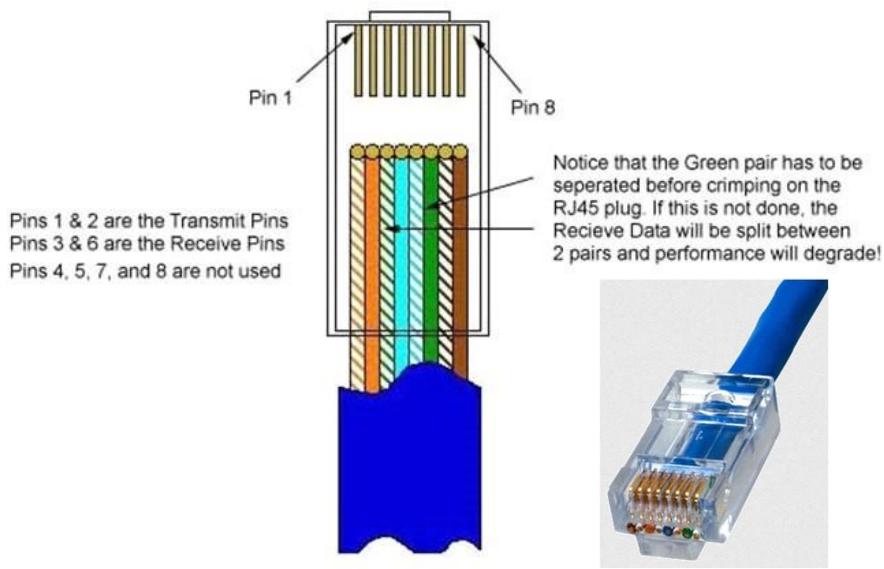
Network Devices

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.



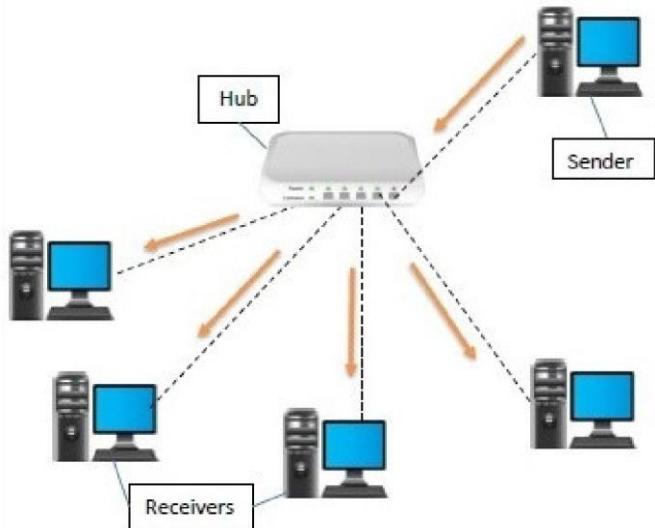


RJ 45– RJ 45 or Registered Jack-45 is an eight-pin connector that is used exclusively with Ethernet cables for networking. It is a standard networking interface that can be seen at the end of all network cables.

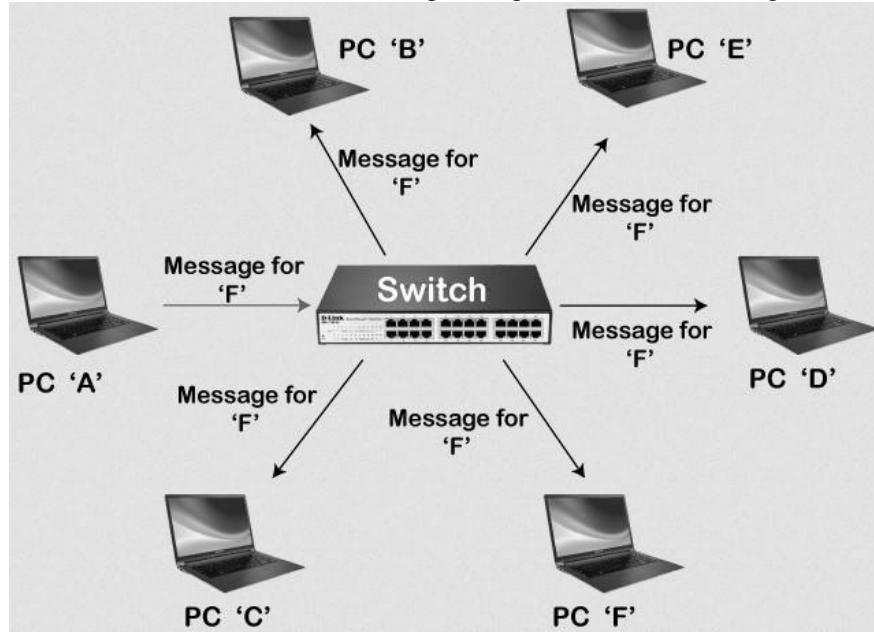
Repeater– A repeater is an analog device that works with signals on the cables to which it is connected. The weakened signal appearing on the cable is regenerated and put back on the cable by a repeater.



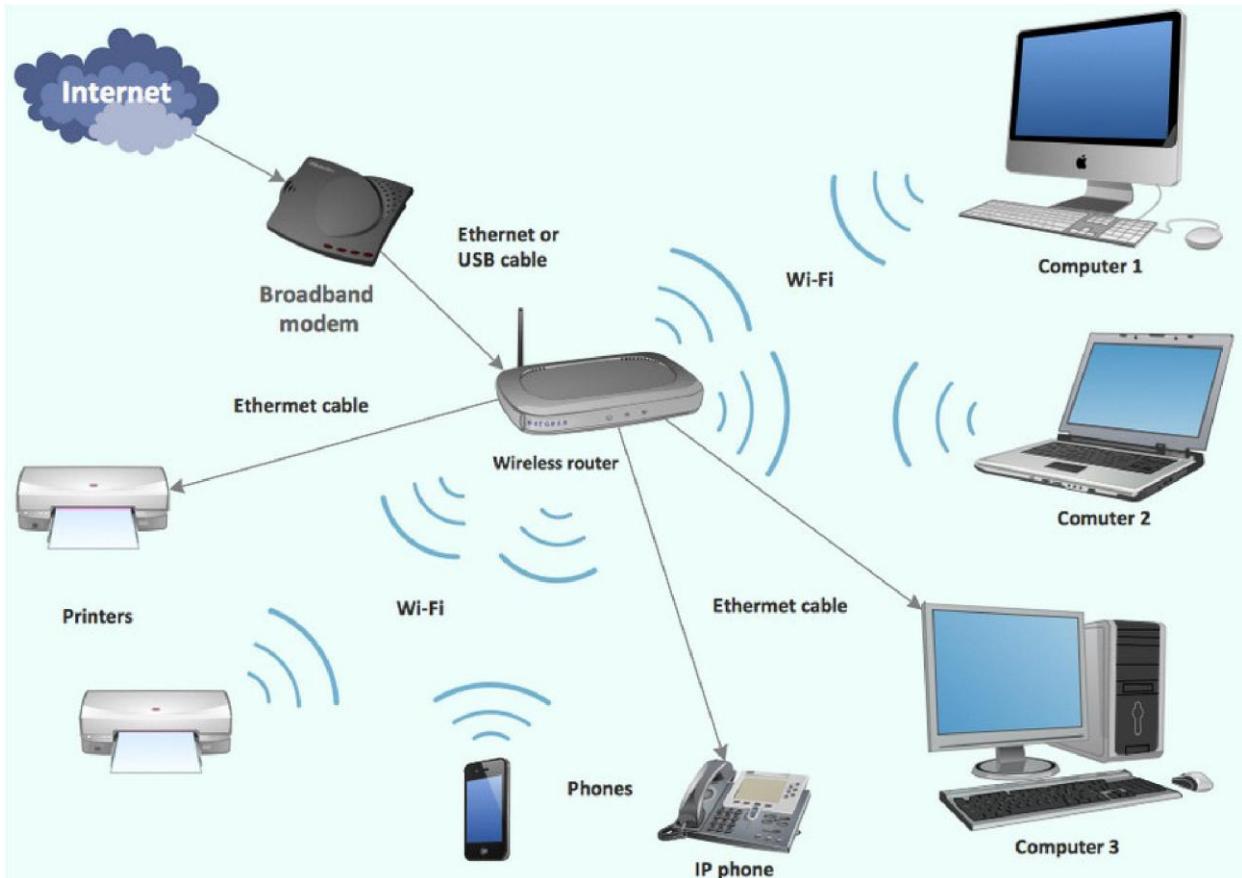
Hub– An Ethernet hub is a network device used to connect different devices through wires. Data arriving on any of the lines are sent out on all the others. The limitation of Hub is that if date from two devices come at the same time, they will collide



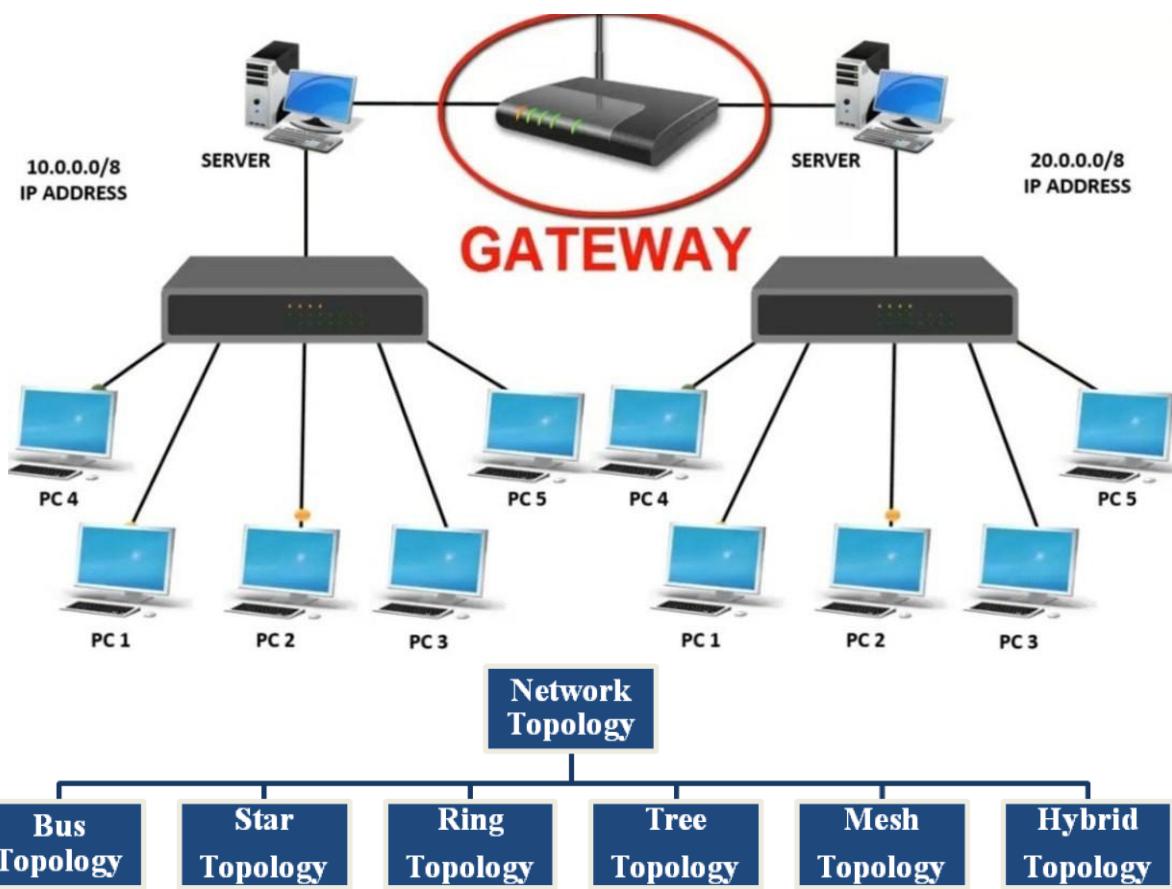
Switch– A switch is a networking device that plays a central role in a Local Area Network (LAN). Like a hub, a network switch is used to connect multiple computers or communicating devices.



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.



Comparison of Topology types

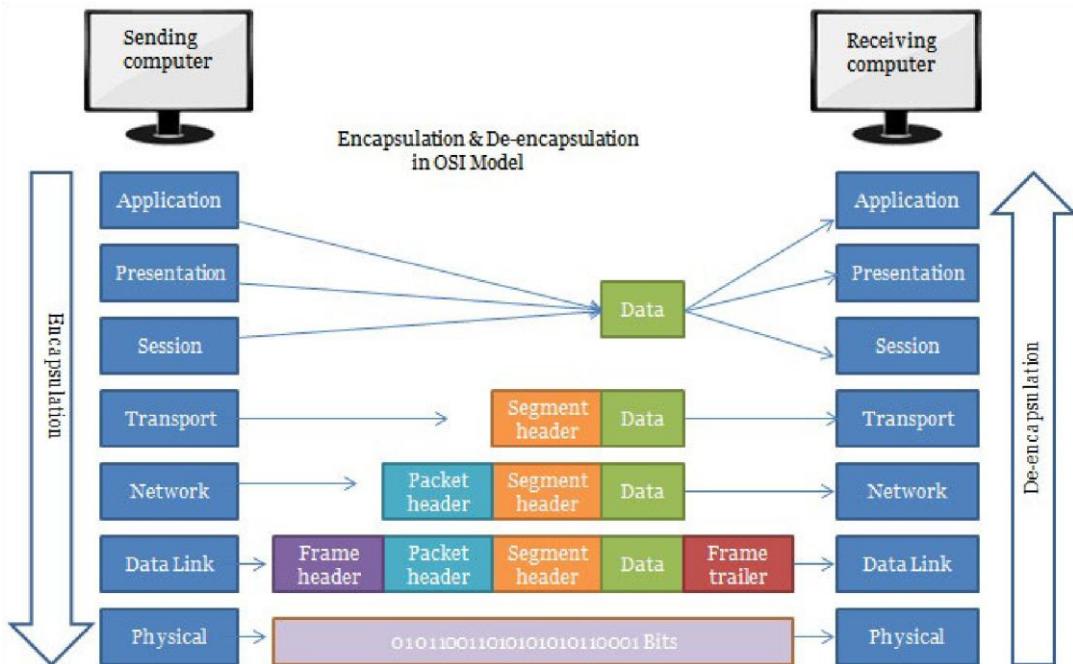
| Basis | Bus | Star | Ring | Tree | Mesh | Hybrid |
|--------------|--|---|---|---|--|---|
| Topology | | | | | | |
| Architecture | A network topology in which there is a single line (the bus) to which all nodes are connected and the node connect only to this bus. | A network topology in which peripheral 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 <ul style="list-style-type: none"> 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 Data is received 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 from 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. |

| | | | | | | |
|-----------------------------|---|--|---|---|---|--|
| 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 | <ul style="list-style-type: none"> Twisted pair requires more cables than other topologies | Overall length of each segment is limited by the of cabling used (Coaxial, Twisted pairFiber) | 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 tree to devices. | More complex because of combination of 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 |

Communication using OSI Model



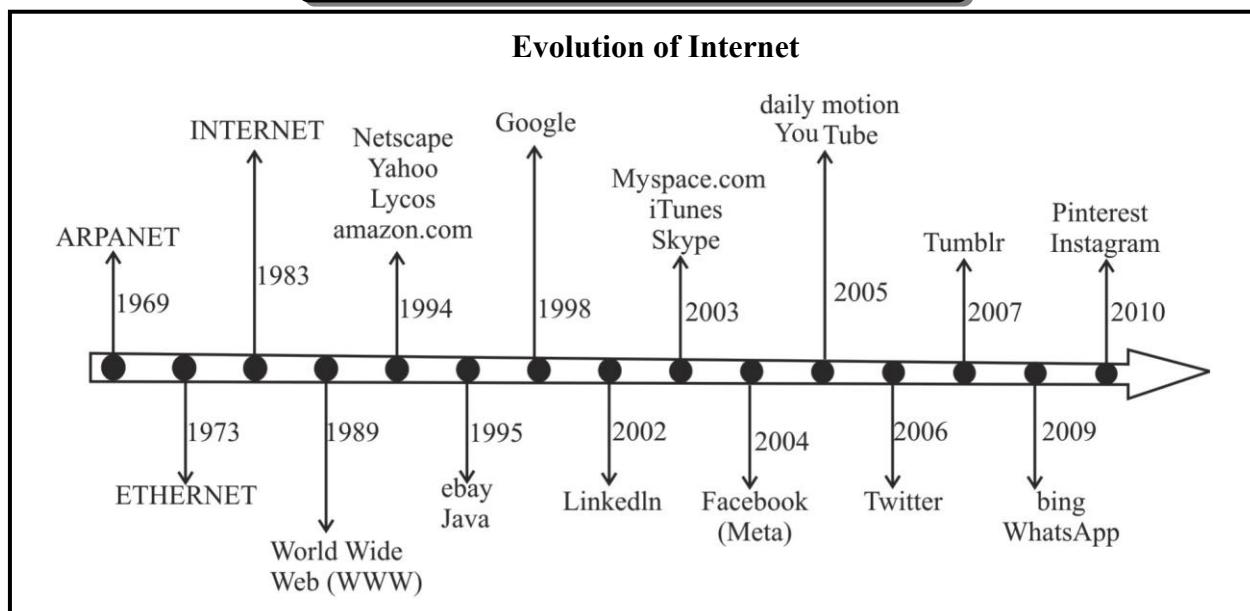
OSI (Open Source Interconnection) Model

| Layer | Application | Functions | Protocols | Central Devices |
|-------------------------------------|--|--|---|-----------------|
| Application Layer (Layer 7) | <p>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.</p> <p>Example- browsers, Skype, Messenger etc.</p> | <ul style="list-style-type: none"> • Networks virtual terminal • Mail services • Directory services | <p>SMTP, HTTP, FTP, POP3, SNMP, Telnet.</p> | - |
| Presentation Layer (Layer 6) | <p>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.</p> | <ul style="list-style-type: none"> • Translation ASCII to EBCDIC • Encryption/Decryption • Compression | <p>MPEG, XDR, SSL, TLS, MIME</p> | - |

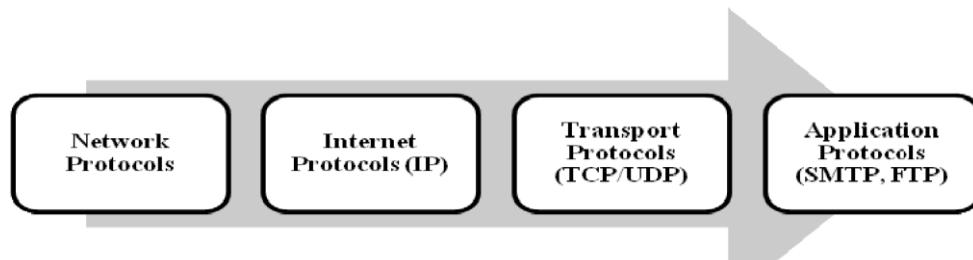
| | | | | |
|--------------------------------------|---|---|--|----------------------------|
| Session layer (Layer 5) | This layer is responsible for the establishment of connection maintenance of sessions, authentication and also ensures security. | <ul style="list-style-type: none"> • Session establishment, maintenance and termination • synchronization • Dialog controller | Net BIOS, SAP PPTP, ADSP, RTCP, PAP, RPCP | 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 from 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) | <p>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</p> | <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 |
|---------------------------------|--|---|--------------------------|--|

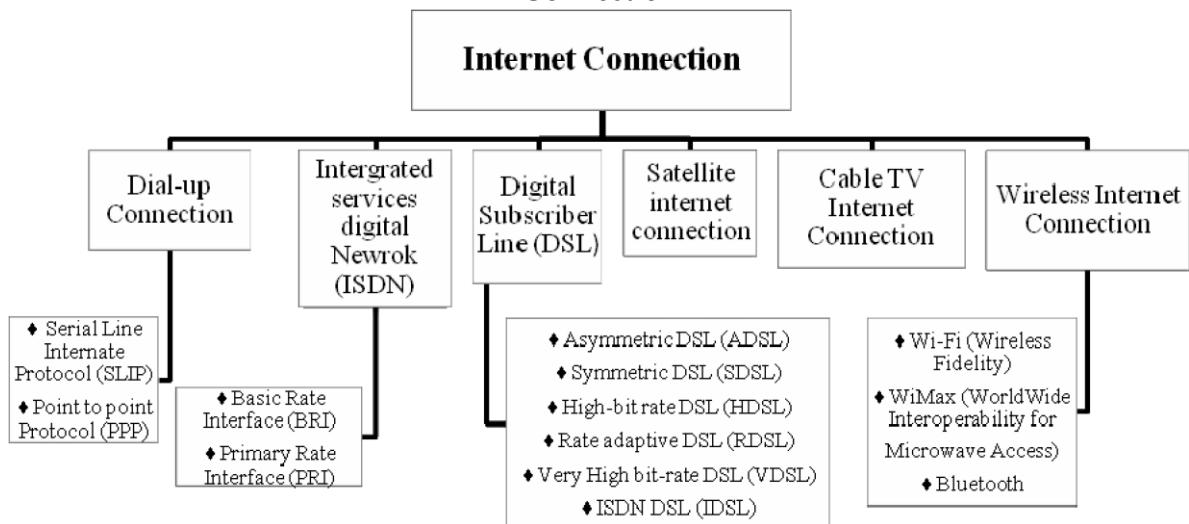
The Internet and World Wide Web

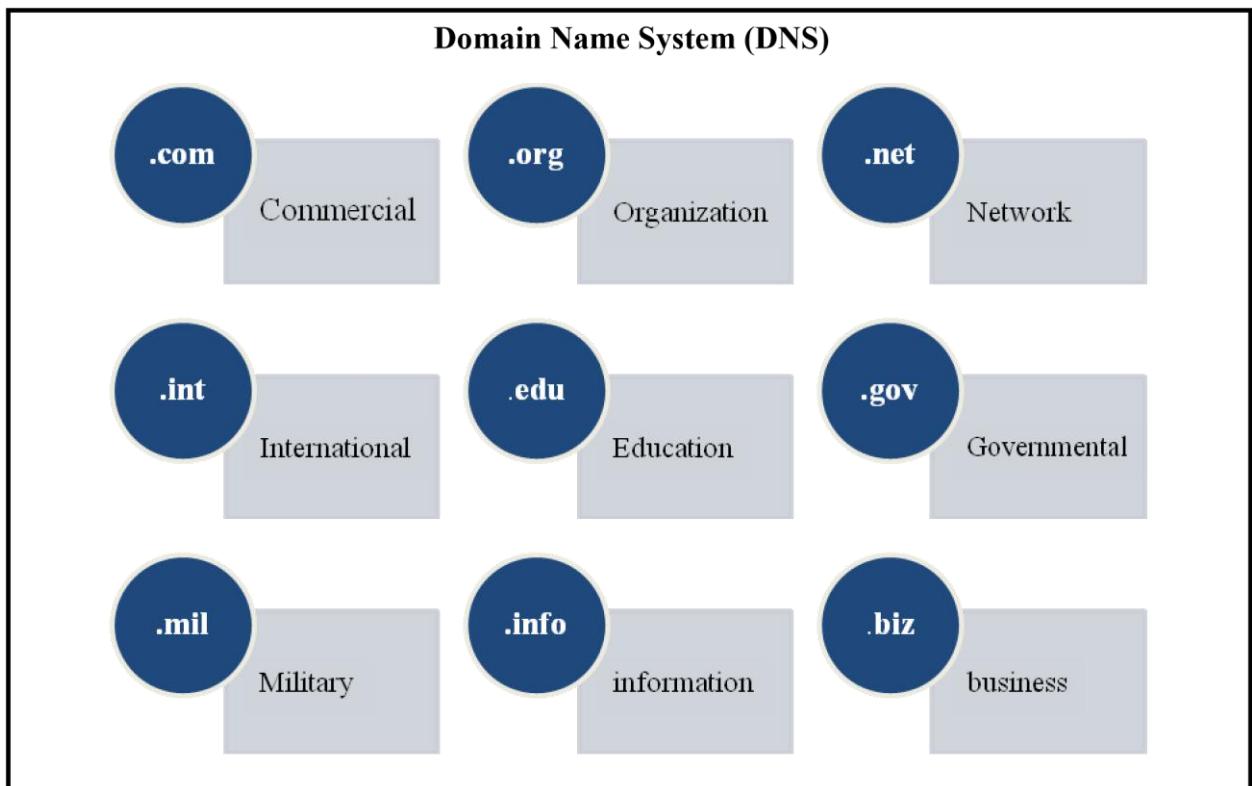


Internet Architecture Model

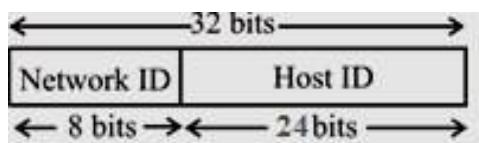


Internet Connection

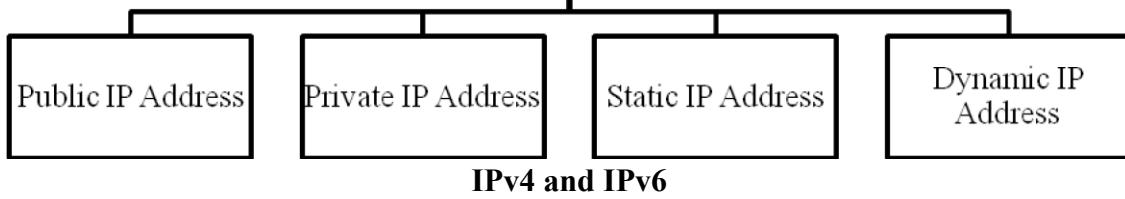




Internet Protocol (IP) Address



IP Address Types



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 : 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 | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">7 Bit</td> <td style="text-align: center;">24 Bit</td> <td></td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">Network</td> <td style="text-align: center;">Host</td> <td></td> </tr> </table> | | 7 Bit | 24 Bit | | 0 | Network | Host | | |
| | 7 Bit | 24 Bit | | | | | | | | | | |
| 0 | Network | Host | | | | | | | | | | |
| Class B | 128 . 0 . 0 . 0 to 191 . 255 . 255 . 255 | 255.255.0.0 | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">14 Bit</td> <td style="text-align: center;">16 Bit</td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Network</td> <td style="text-align: center;">Host</td> </tr> </table> | | 14 Bit | 16 Bit | | 1 | 0 | Network | Host | |
| | 14 Bit | 16 Bit | | | | | | | | | | |
| 1 | 0 | Network | Host | | | | | | | | | |
| Class C | 192 . 0 . 0 . 0 to 223 . 255 . 255 . 255 | 255.255.255.0 | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">21 Bit</td> <td style="text-align: center;">8 Bit</td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Network</td> <td style="text-align: center;">Host</td> </tr> </table> | | 21 Bit | 8 Bit | | 1 | 1 | 0 | Network | Host |
| | 21 Bit | 8 Bit | | | | | | | | | | |
| 1 | 1 | 0 | Network | Host | | | | | | | | |
| Class D (Multicast) | 224 . 0 . 0 . 0 to 239 . 255 . 255 . 255 | Reserved for Multicasting | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">28 Bit</td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Host</td> </tr> </table> | | 28 Bit | | 1 | 1 | 1 | 0 | Host | |
| | 28 Bit | | | | | | | | | | | |
| 1 | 1 | 1 | 0 | Host | | | | | | | | |

| | | | | | | | | |
|-------------------------------|---|--------------|---|------|---|---|---|------|
| Class E (Reserved) | 240 . 0 . 0 . 0 to 254 . 255 . 255 . 255 | Experimental | 28 Bit <table border="1"><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>Host</td></tr></table> | 1 | 1 | 1 | 1 | Host |
| 1 | 1 | 1 | 1 | Host | | | | |

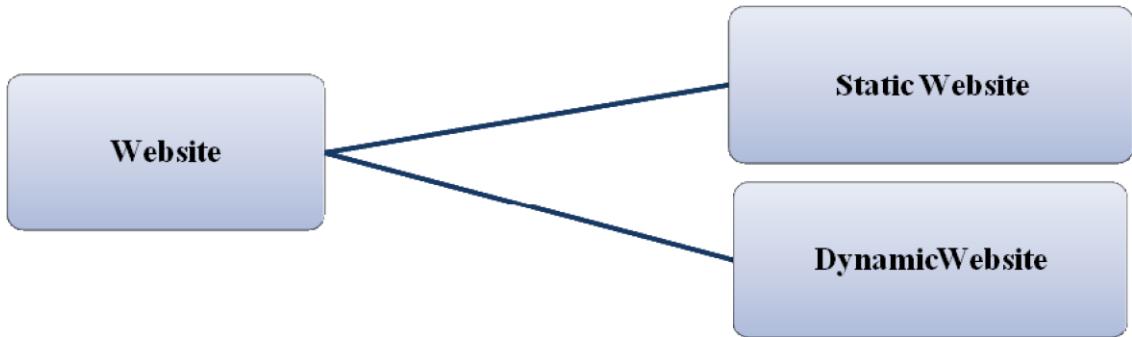
Internet and World Wide Web

Internet

World Wide Web (WWW)

- | | |
|--|---|
| <p>1. Internet is a means of connecting a computer to any other computer anywhere in the world.</p> <p>2. It is originated sometimes in late 1960s.</p> <p>3. The first version of the internet was known as ARPANET.</p> <p>4. Internet uses IP Address.</p> <p>5. Internet is primarily hardware based.</p> | <p>1. World Wide Web (WWW) which is a collection of information which is accessed via the internet.</p> <p>2. Tim Berners-Lee invented the World Wide Web (WWW) in 1989.</p> <p>3. In the beginning WWW was known as 'NSFNET'.</p> <p>4. WWW uses HTTP.</p> <p>5. WWW is more software oriented as compared to the internet.</p> |
|--|---|

Website



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.

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

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

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

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

3. In dynamic web pages, database is used.

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

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

5. Static web pages does not contain any application program.

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

8. Uniform Resource Locator (URL)-

URL

Uniform Resource Locator



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 |

Some Popular Search Engines.

| | | | |
|---|---|--|---|
|  |  |  |  |
| Google 4 September, 1998 | Bing 3 June 2009 | YAHOO! 2 March 1995 | Baidu 18 January 2000 |
|  |  |  |  |
| Ask.com 3 June, 1996 | Excite October 1995 | Duck Duck Go 29 February 2008 | Yandex 23 September 1997 |
|  | | | |
| LYCOS 13 April 1995 | | | |

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 > |

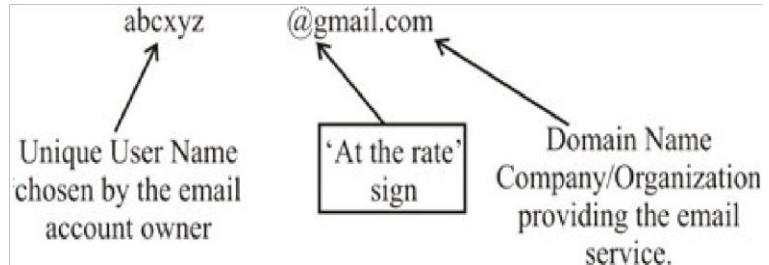
| | | |
|-----------------------|---|---|
| Paragraph | It is used to define paragraph content in html document. | < P > Statements < /P > |
| Emphasis | It is used to renders as emphasized text. | < em > Statements < /em > |
| Bold | It is used to specify bold content in html document. | < b > Statements < /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. | 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. | Statements |
| Line break | It is used to break the like. | < br > |
| Image | It is used to add image element in html document. | < img > |
| 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 X name@yourcompany.com X ► **Carbon Copy Receiver E-mail Address**
Bcc info@yourcompany.com X ► **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



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 |

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.

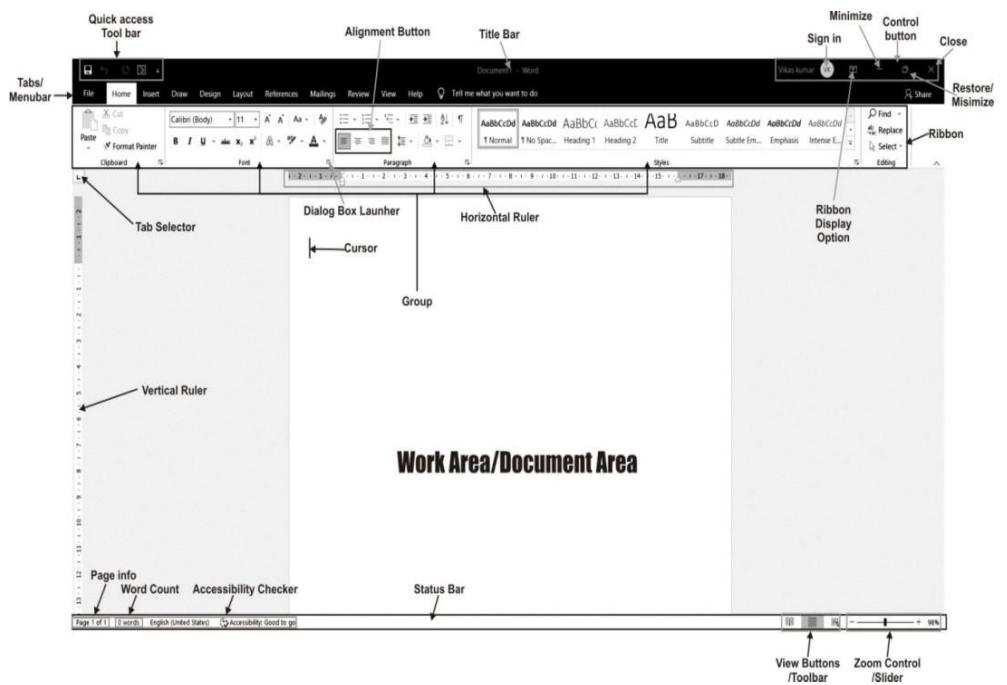
→ We can start MS Word by using Run Command.

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

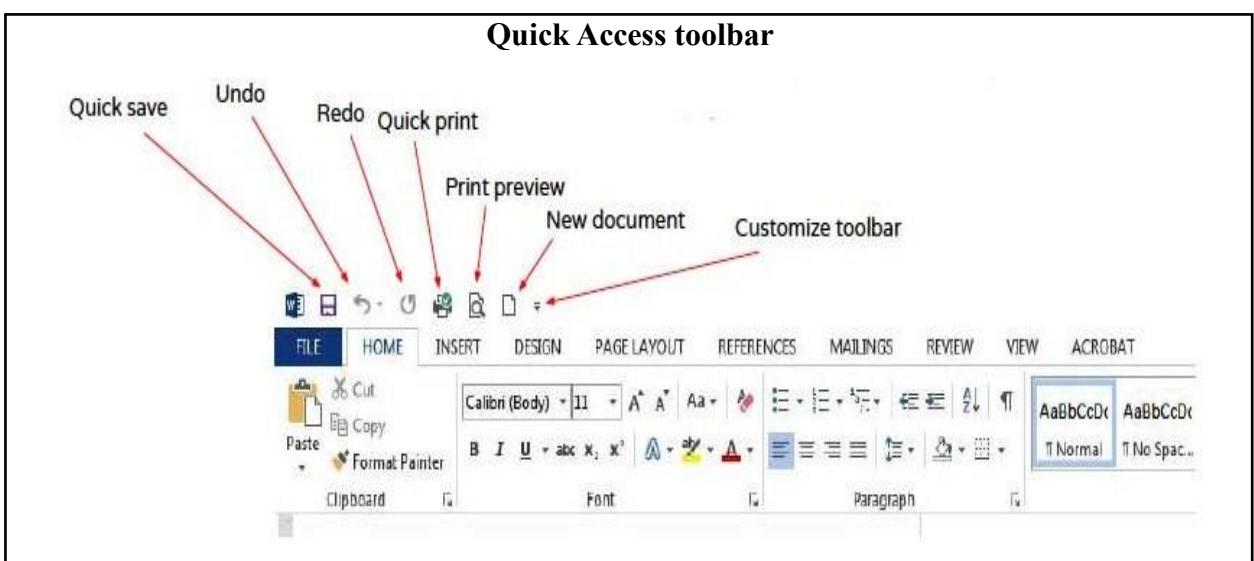
OR

Press ‘Window’Key + R

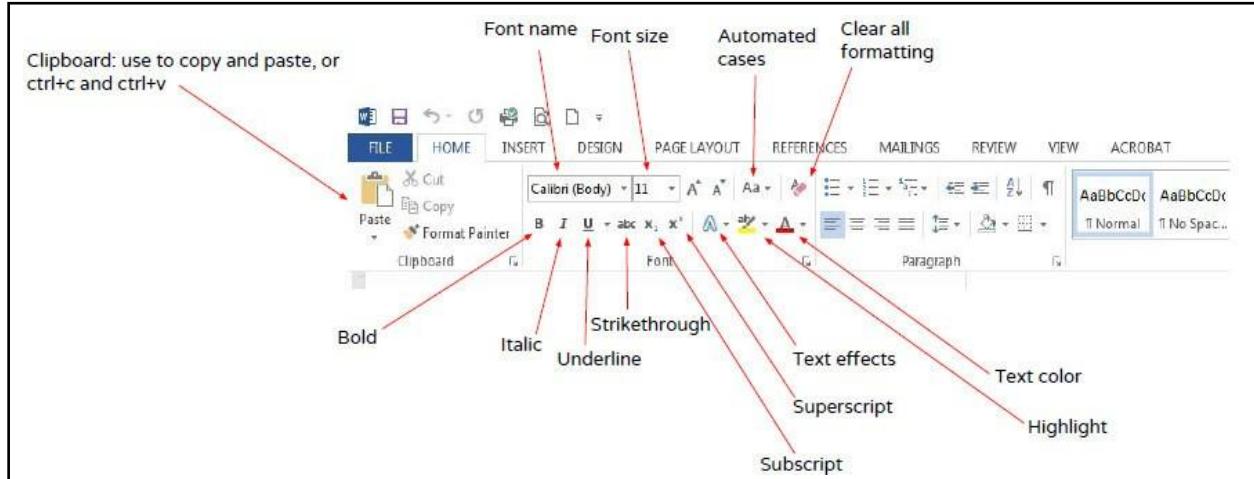
(ii) Type ‘winword’ in the open text box and click ok or press the Enter Key.



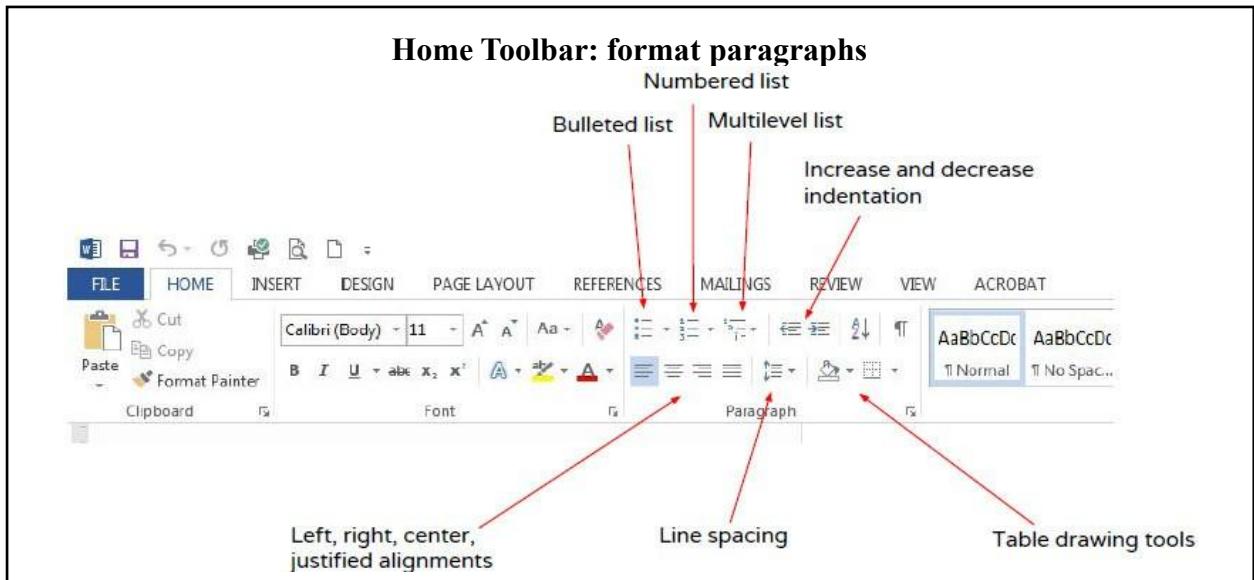
Quick Access toolbar



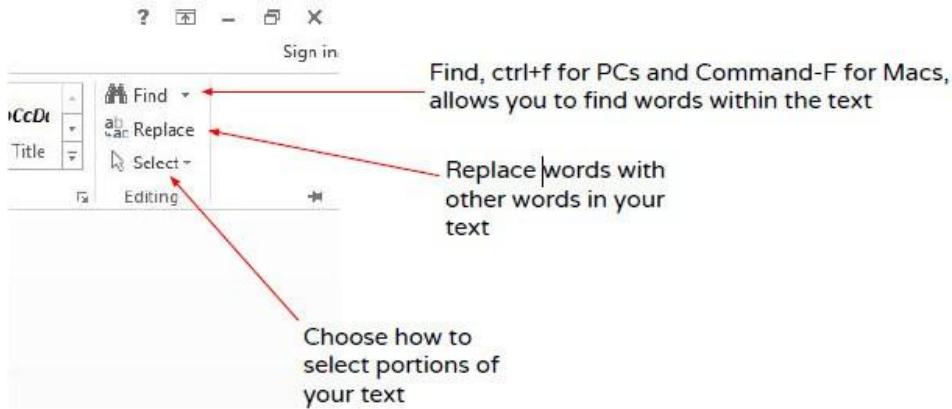
Home Toolbar: font style & clipboard



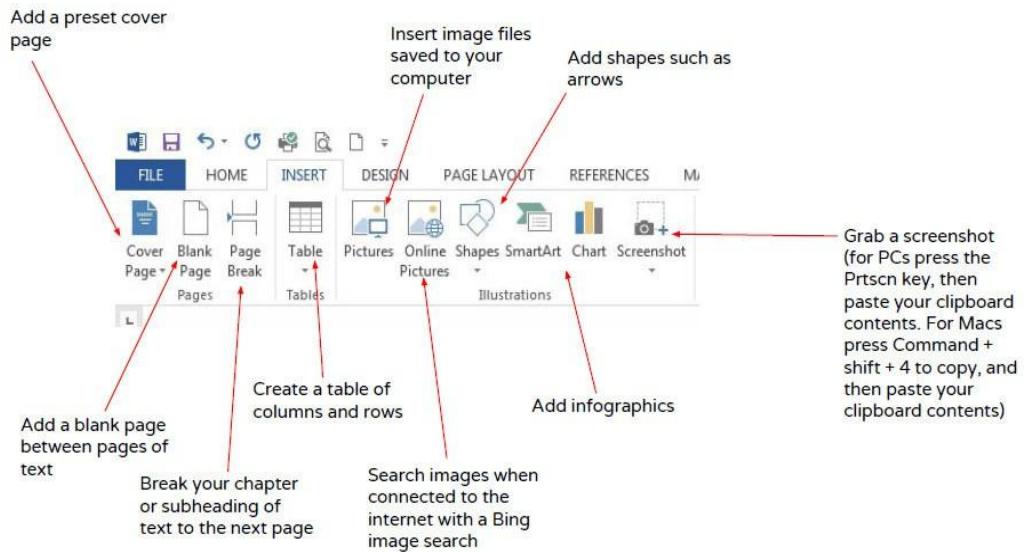
Home Toolbar: format paragraphs



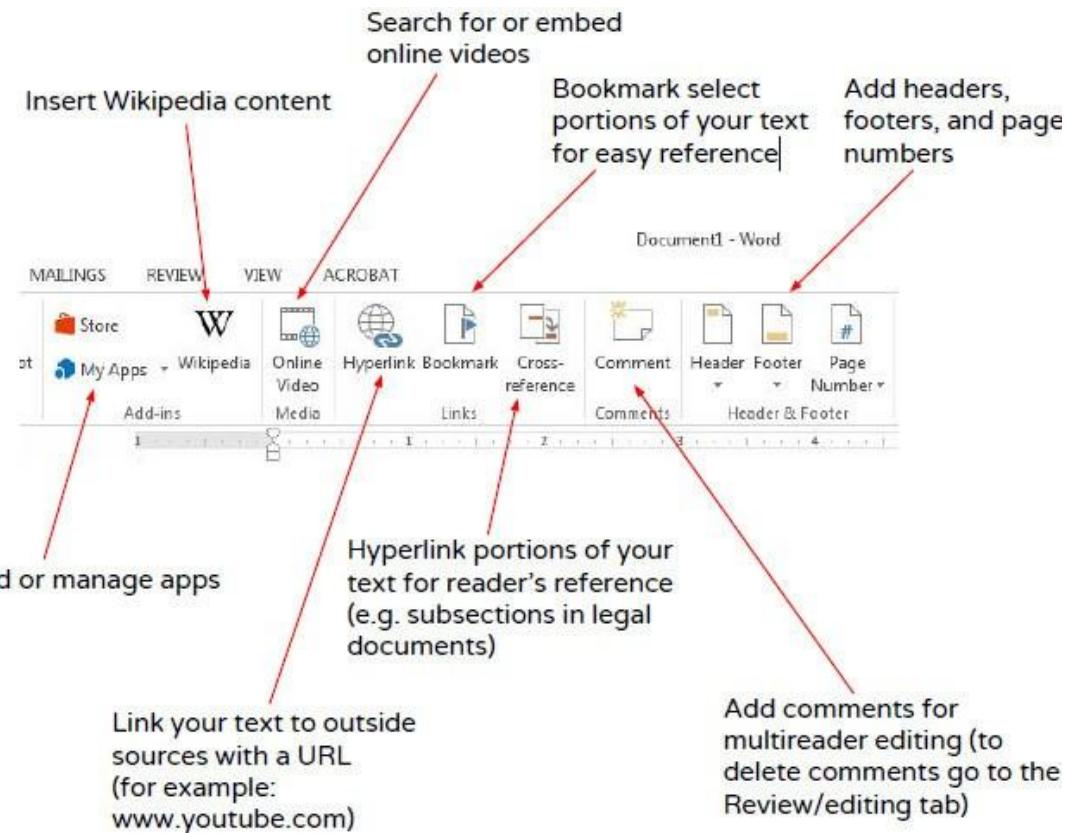
Home toolbar: editing tools



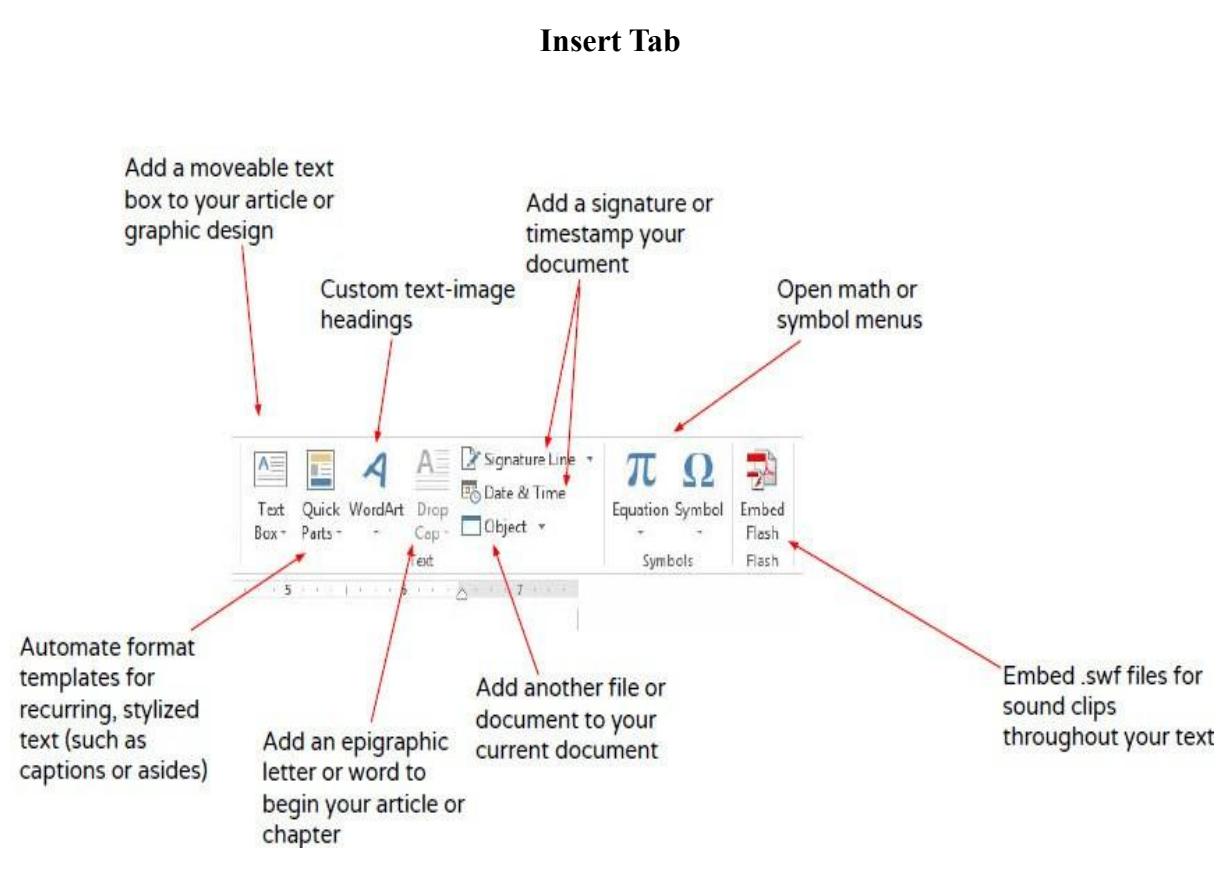
Insert Tab



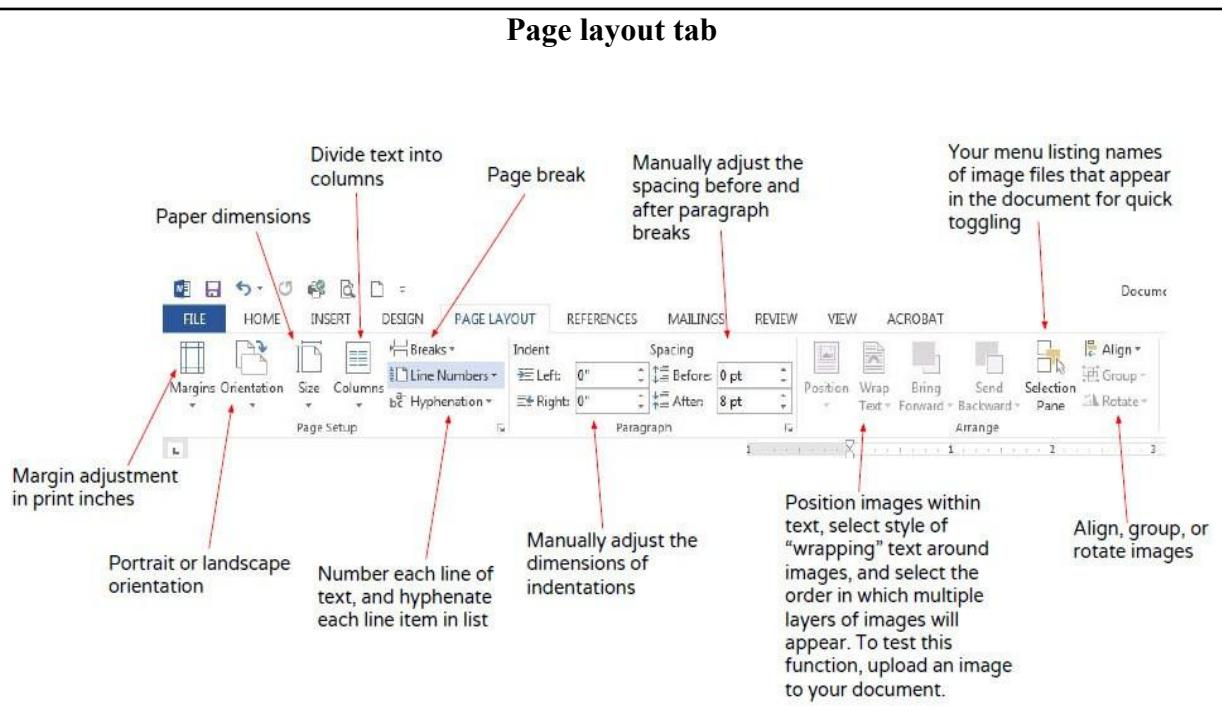
Insert Tab



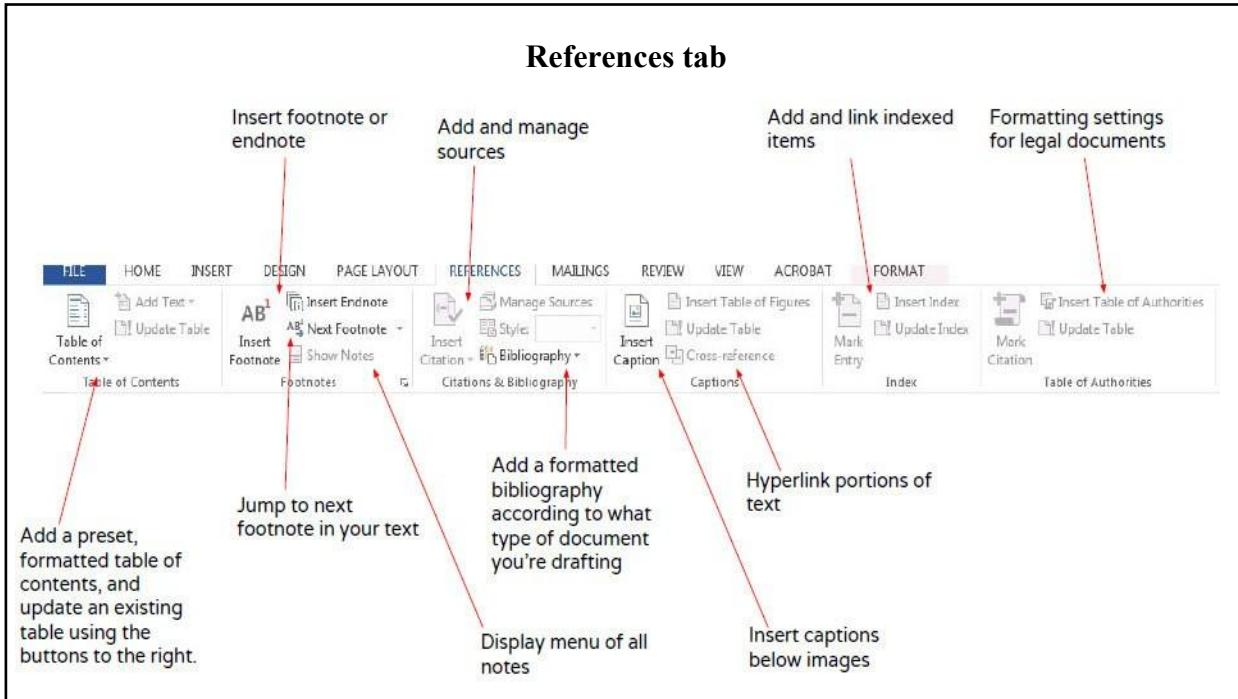
Insert Tab



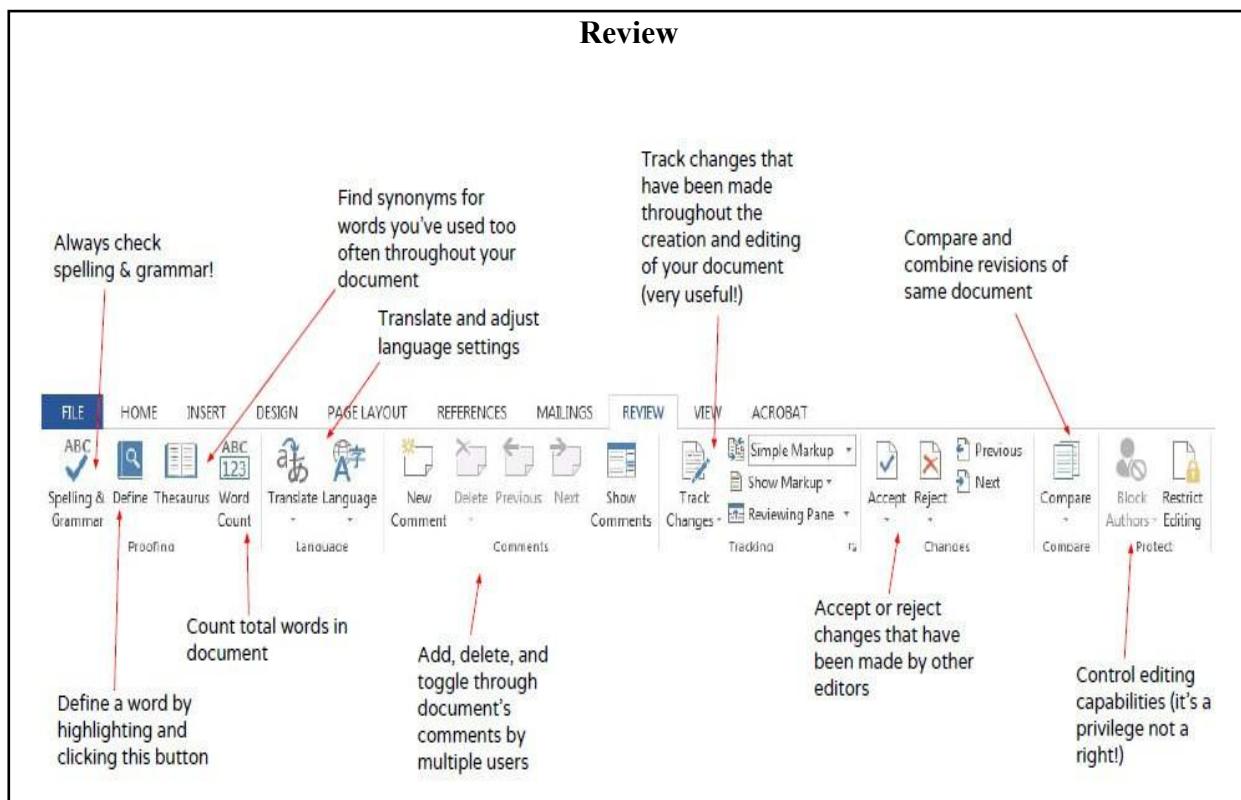
Page layout tab

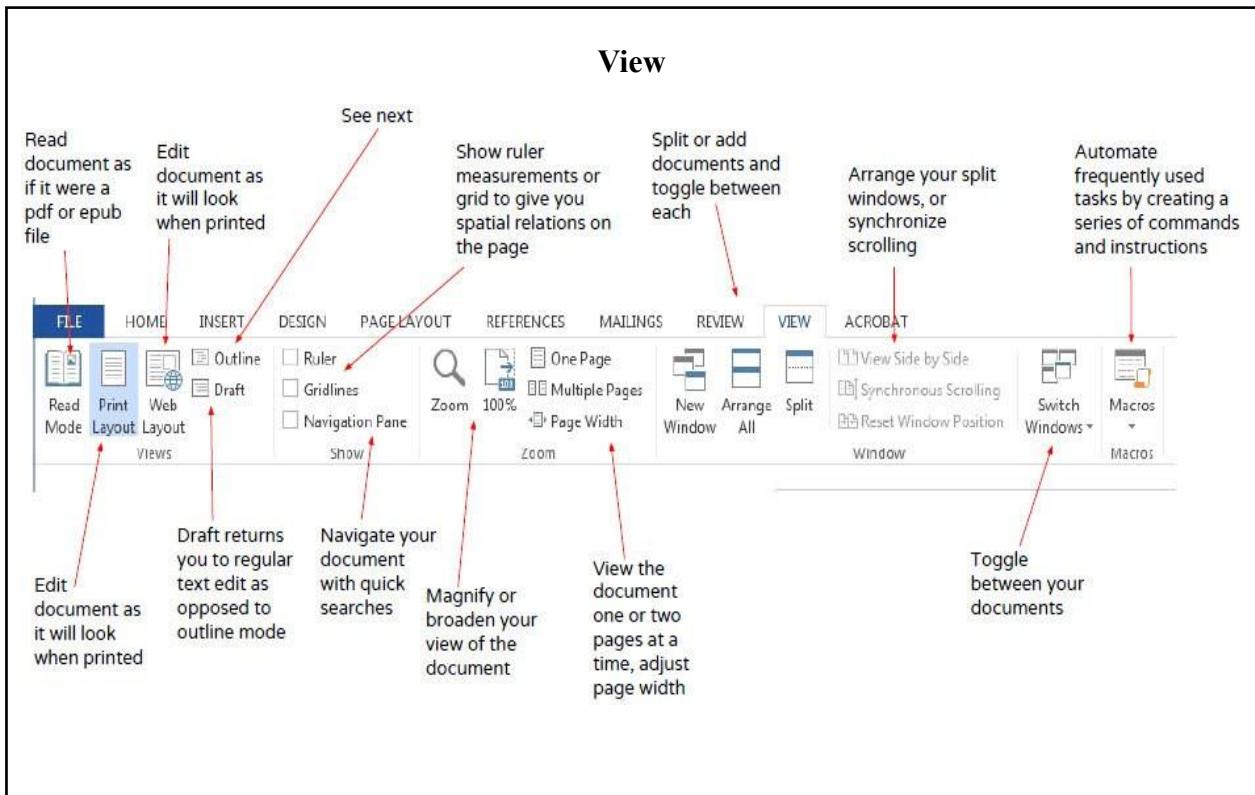


References tab



Review



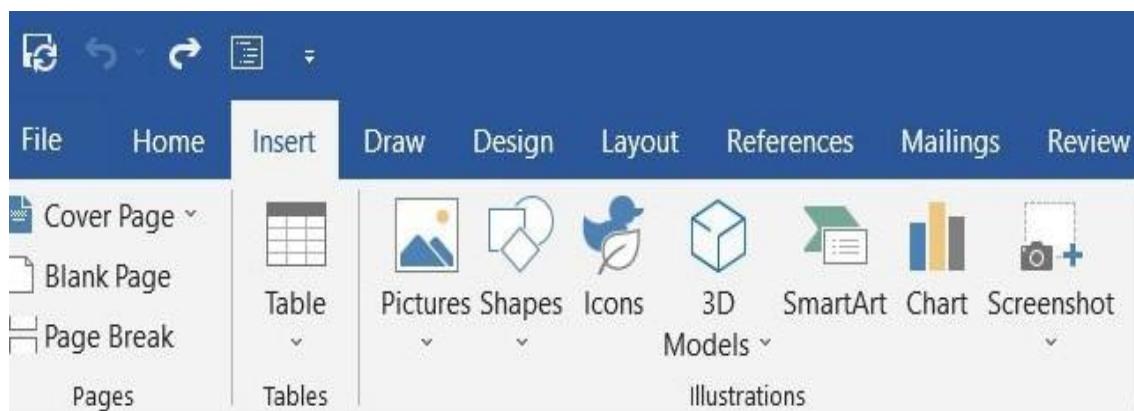
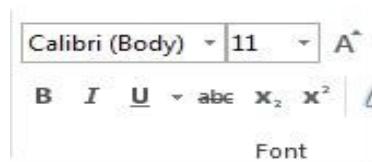
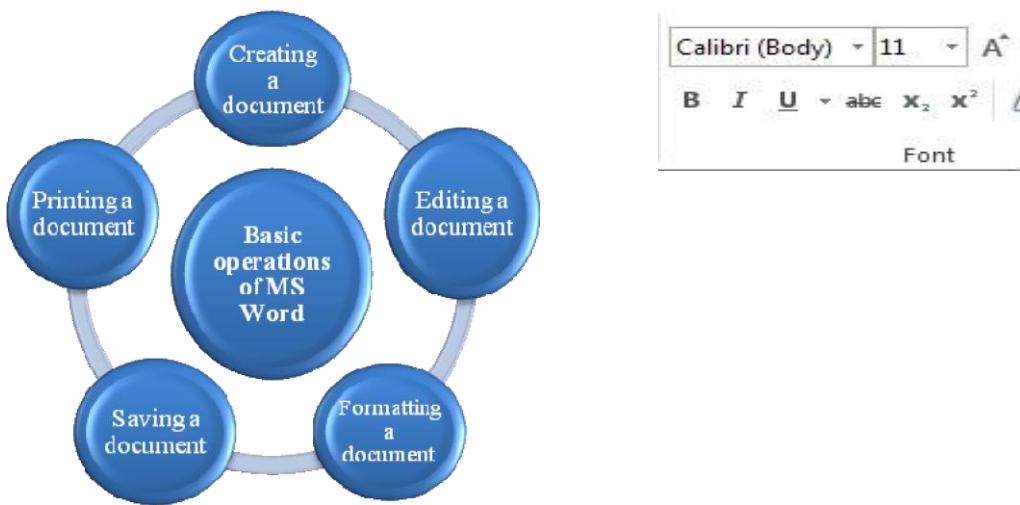


Outlining

Annotations for the OUTLINING tab:

- Quickly refer to each level of your list
- When this is checked, it shows your stylized/designed text, rather than the normal text format, which looks more like the text of this explanatory caption
- Insert other documents into or create documents of portions of your outline
- FILE: OUTLINING
- HOME: Insert, Design, Page Layout, References, Mailings
- DESIGN: Show Level: Level 9, Show Text Formatting, Show First Line Only
- PAGE LAYOUT: Outline Tools
- REFERENCES: Show Document Subdocuments, Collapse Master Document
- MAILINGS: Close Outline View, Close

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-

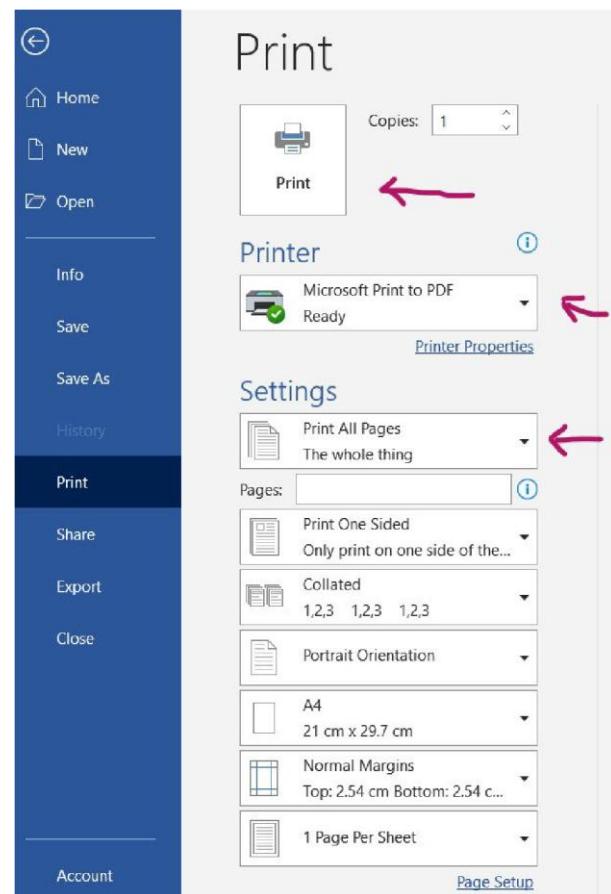
1. Place the cursor and type some text
2. To format, select the text and then

Add Pictures, Shapes, SmartArt and more

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

Step-2: Select what you want to add:

- o **Tables** - select **Table**, hover over the size you want, and select it.
- o **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**.
- o **Shapes** - select **Shapes**, and choose a shape from the drop-down.
- o **Icons** - select **Icons**, pick the one you want, and select **Insert**.
- o **3D Models** - select **3D Models**, choose from a file or online source, go to the image you want, and select **Insert**.
- o **SmartArt** - select **SmartArt**, choose a **SmartArt Graphic**, and select **OK**. o **Chart** - select **Chart**, select the chart you want, and select **OK**.
- o **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.

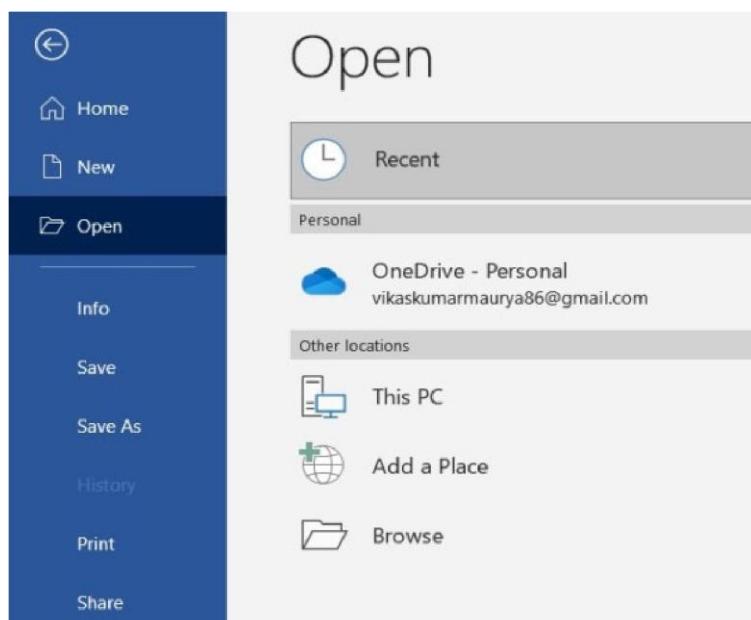
Save As→ To save a different copy of the document along with the changes made
Save As mean don't update current file and create new file with different name.

Shortcut Keys→

Ctrl + S → Save

F12 → Save As

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



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 |

| | |
|-------------------------------|--|
| 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 |
| 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 |

2. MS EXCEL SYSTEM

Accessing MS Excel-

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

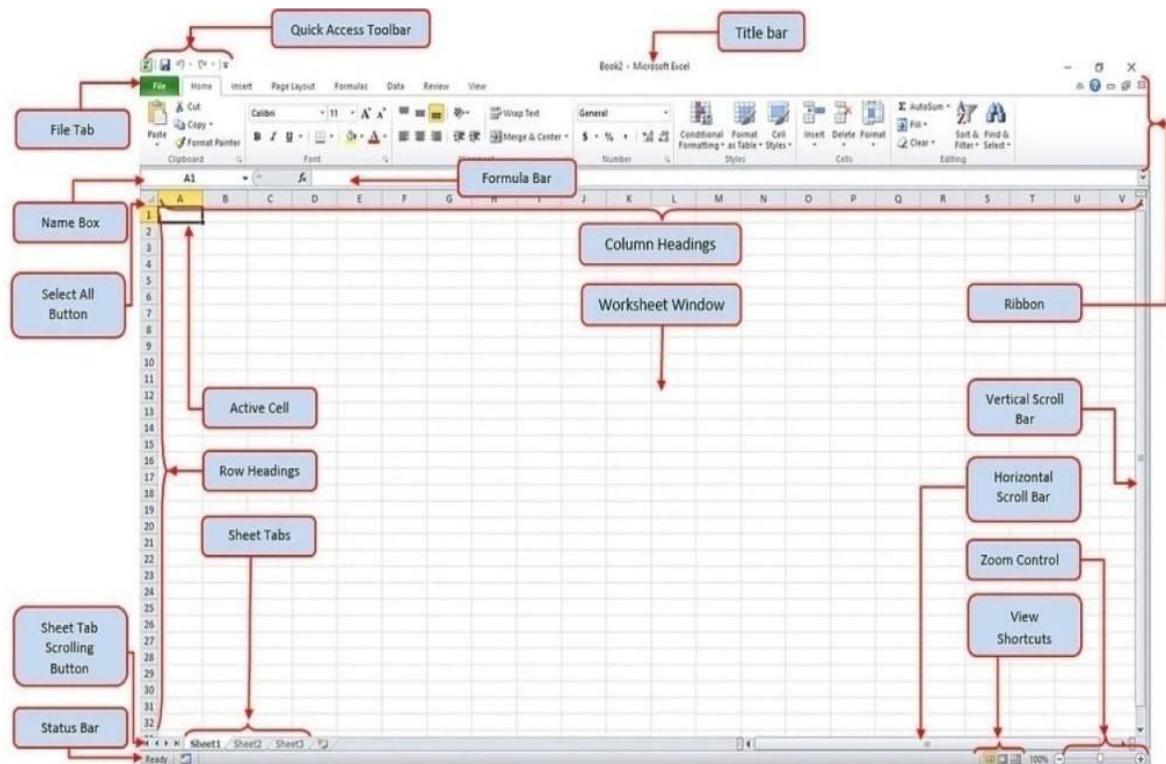
→ We can start MS Excel by using Run Command.

(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-

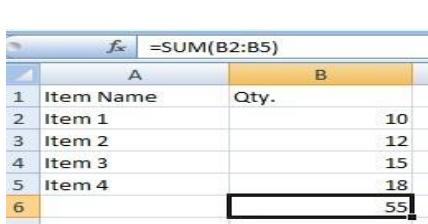


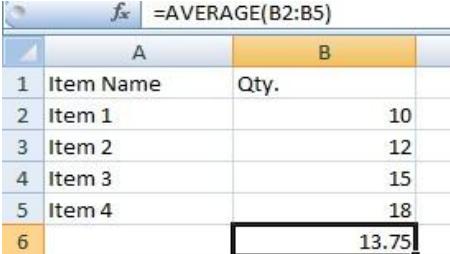
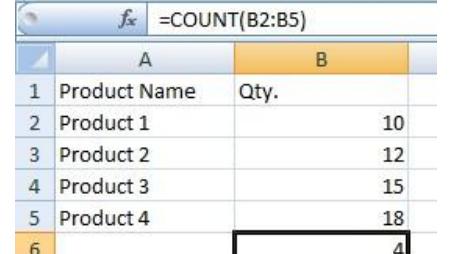
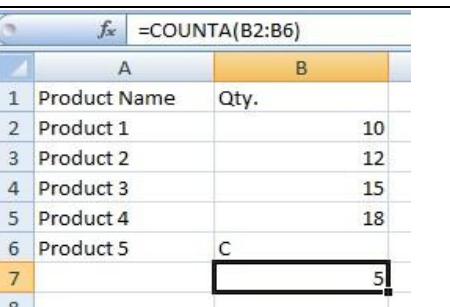
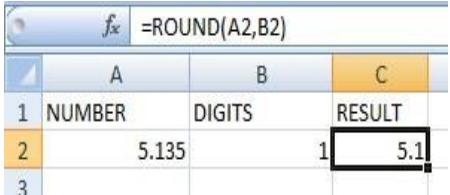
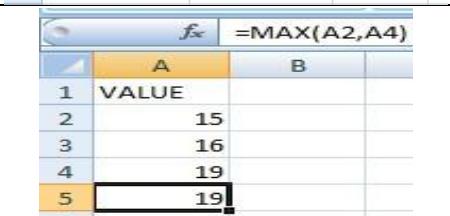
Some important terminology for MS Excel.

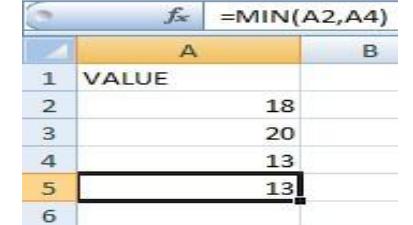
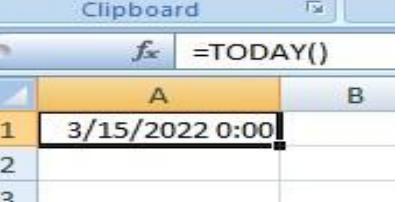
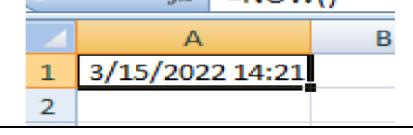
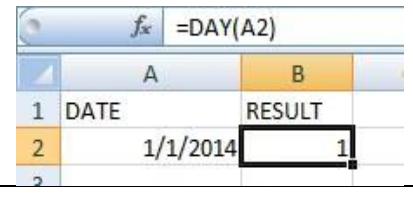
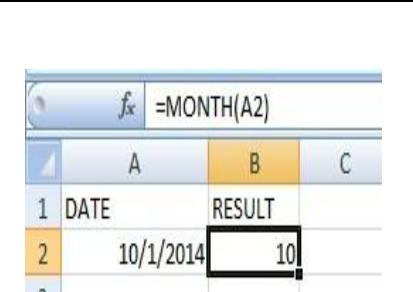
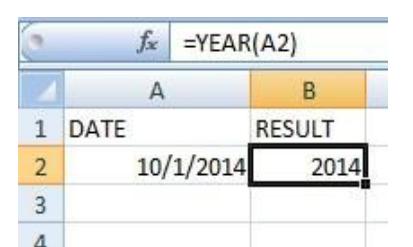
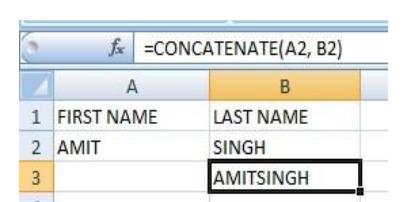
| Term | Explanation |
|-----------------------|--|
| Work book | The workbook refers to an excel spreadsheet file. It is collection of one or more spreadsheet. Opening a workbook with three work sheets by default and we can add maximum 255 worksheet within workbook. |
| Worksheet | Within the workbook is where you'll find document called worksheet. Also known as spreadsheets, you can have multiple worksheets nestled 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. |

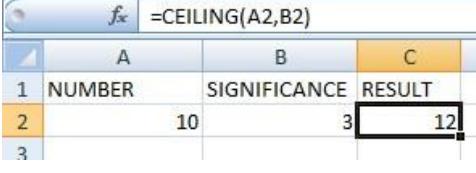
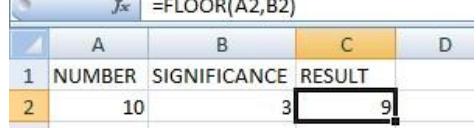
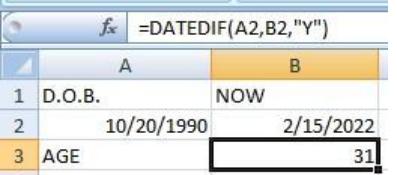
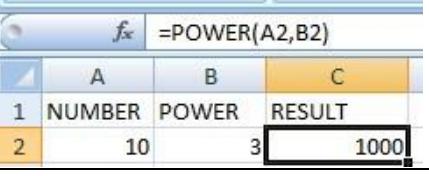
| | |
|--------------------|--|
| Formula | A sequence inside a cell that is used to produce a value. It must begin with an equal (=) sign. This could be a mathematical equation, cell references, function or operator. A formula is also known as an expression. |
| Formula Bar | Nestled between the ribbon 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. |
| 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) |  <table border="1"> <thead> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>1 Item Name</td> <td>Qty.</td> </tr> <tr> <td>2 Item 1</td> <td>10</td> </tr> <tr> <td>3 Item 2</td> <td>12</td> </tr> <tr> <td>4 Item 3</td> <td>15</td> </tr> <tr> <td>5 Item 4</td> <td>18</td> </tr> <tr> <td>6</td> <td>55</td> </tr> <tr> <td>7</td> <td></td> </tr> </tbody> </table> | A | B | 1 Item Name | Qty. | 2 Item 1 | 10 | 3 Item 2 | 12 | 4 Item 3 | 15 | 5 Item 4 | 18 | 6 | 55 | 7 | |
| A | B | | | | | | | | | | | | | | | | | | |
| 1 Item Name | Qty. | | | | | | | | | | | | | | | | | | |
| 2 Item 1 | 10 | | | | | | | | | | | | | | | | | | |
| 3 Item 2 | 12 | | | | | | | | | | | | | | | | | | |
| 4 Item 3 | 15 | | | | | | | | | | | | | | | | | | |
| 5 Item 4 | 18 | | | | | | | | | | | | | | | | | | |
| 6 | 55 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | |

| | | | |
|--------------|--|---|--|
| 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 |  |
| COUNTA() | COUNTA function returns the count of cells that contain numbers, text, logical value, error values and empty text (""). COUNTA does not count empty cells. | = COUNTA (value1, [value2],) Example- = COUNTA (1, 3, 8)//returns 3 = COUNTA (2, 5, "b", 1%)//returns 4 |  |
| ROUND() | The ROUND function rounds a number to a specific number of digits. | = 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 |  |
| MAX() | The Excel MAX function returns the largest numeric value in the data provided. | = MAX (number1, [number2],) Example- = MAX (15, 16, 19)// returns 19 |  |

| | | | |
|----------------------|--|---|--|
| MIN() | This function returns the smallest value out of a set of values. Example— $=MIN(18, 20, 13)$ //returns 13 | $=MIN(num1, [num2],)$ Example— $=MIN(18, 20, 13)$ //returns 13 |  |
| TODAY() | In MS Excel TODAY() functions returns current date. | $=TODAY()$ Example— $=TODAY()$ // Current date $=TODAY() + 90$ // 90 days from today |  |
| NOW() | In MS Excel NOW() functions returns current date and time. | $=NOW()$ |  |
| DAY() | The DAY() function returns the day value in a given date as a number between 1 to 31 from a given date. | $=DAY(date)$ |  |
| 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— $=MONTH("01_OCT")$ //Returns 11 |  |
| 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_date, 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) |  |

| 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. |

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

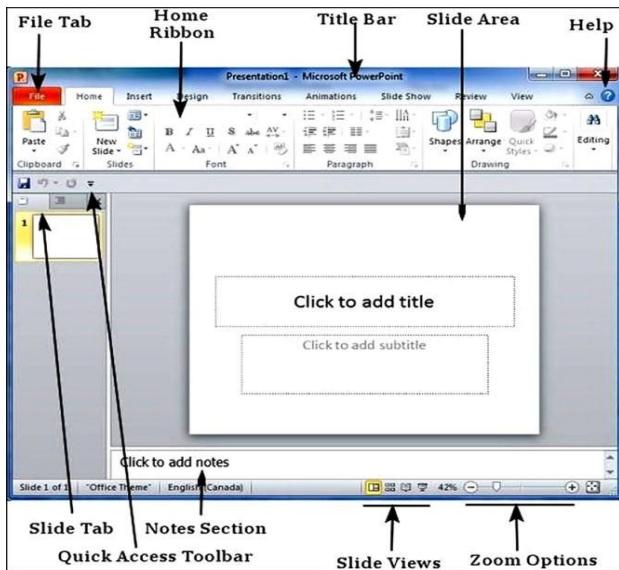
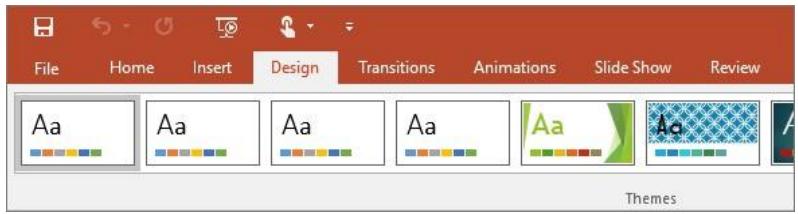
→ we can start MS Power Point by using Run Command-

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

OR

Press
'window' key
+R.

- (ii) Type 'powerpnt' 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

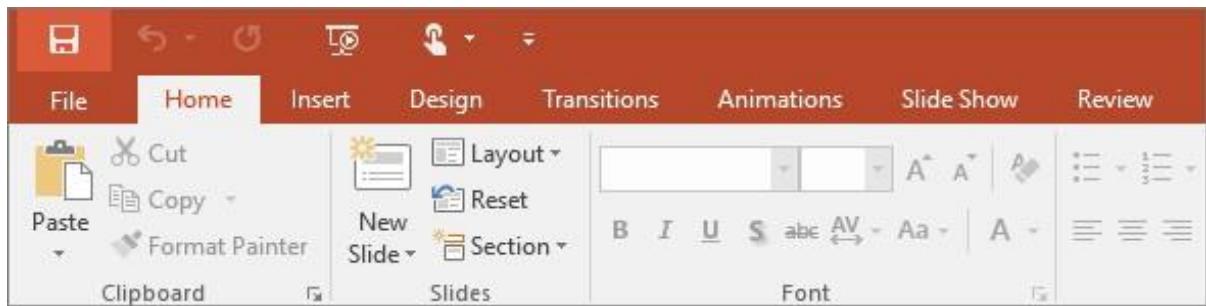
Designing the presentation

Saving a new presentation

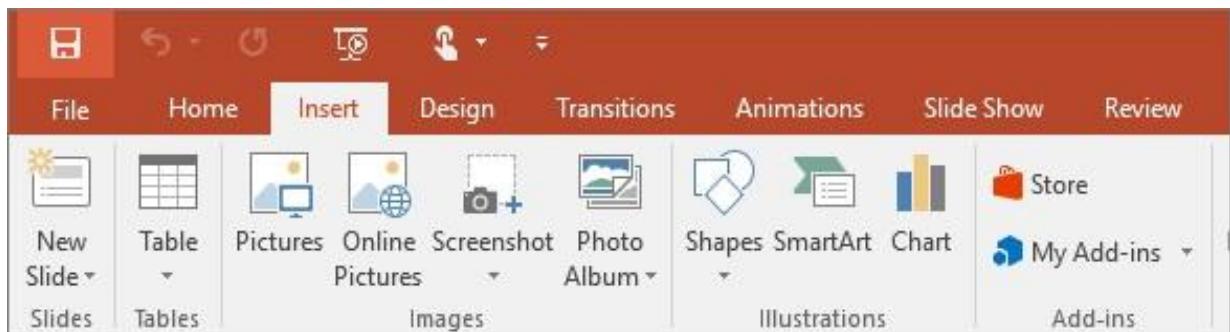
Printing the presentation

Tabs-

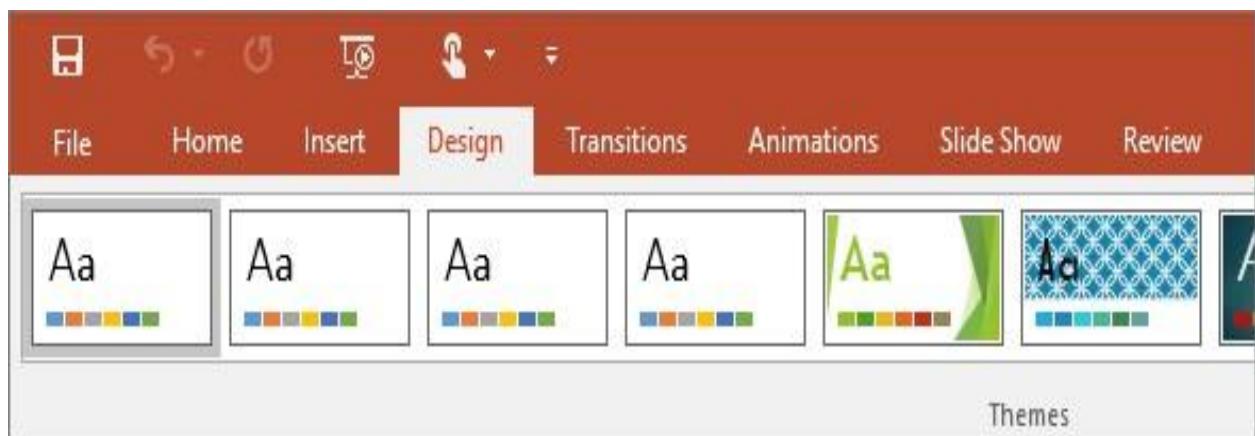
→ **Home Tab**-The home tab holds the cut and paste features, Font and Paragraph option and what you need to add organize slides.



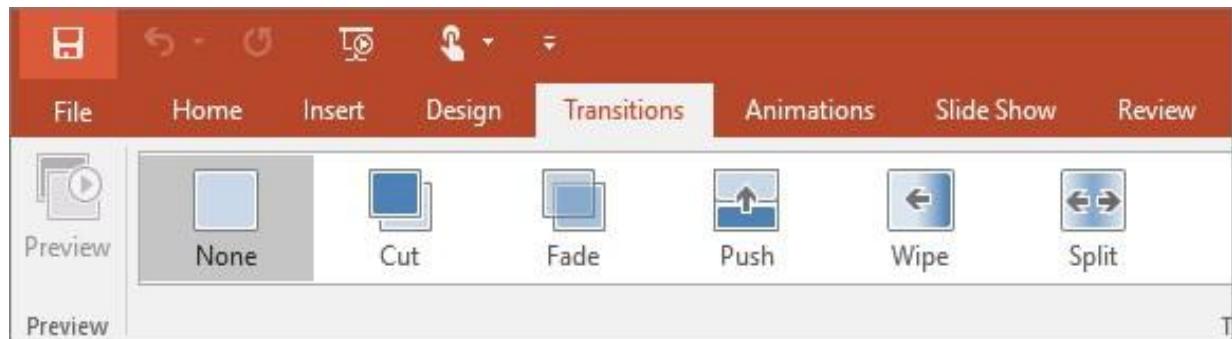
→ **Insert Tab- Insert**– Click Insert tab to add something to a slide. This includes Pictures, Charts, Links, Text boxes, Video and more.



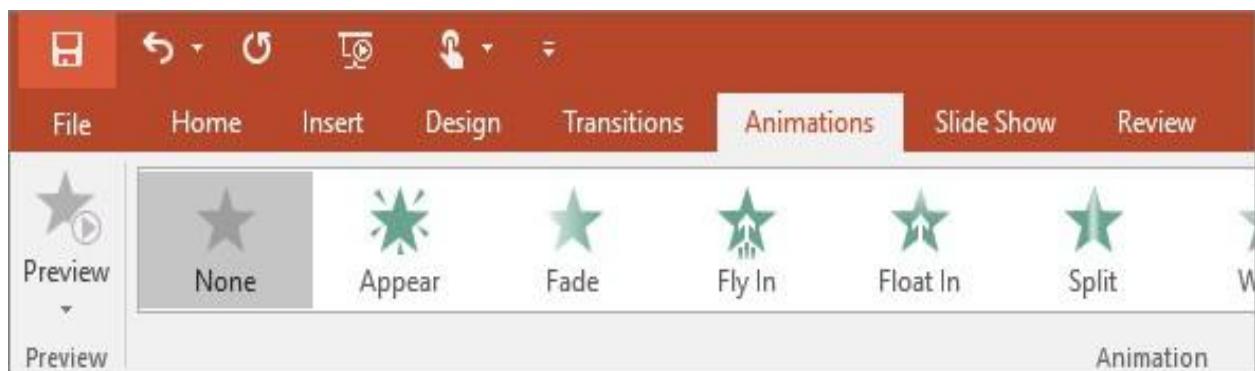
→ **Design Tab**-On the design tab, you can add a theme or color scheme or format the slide background.



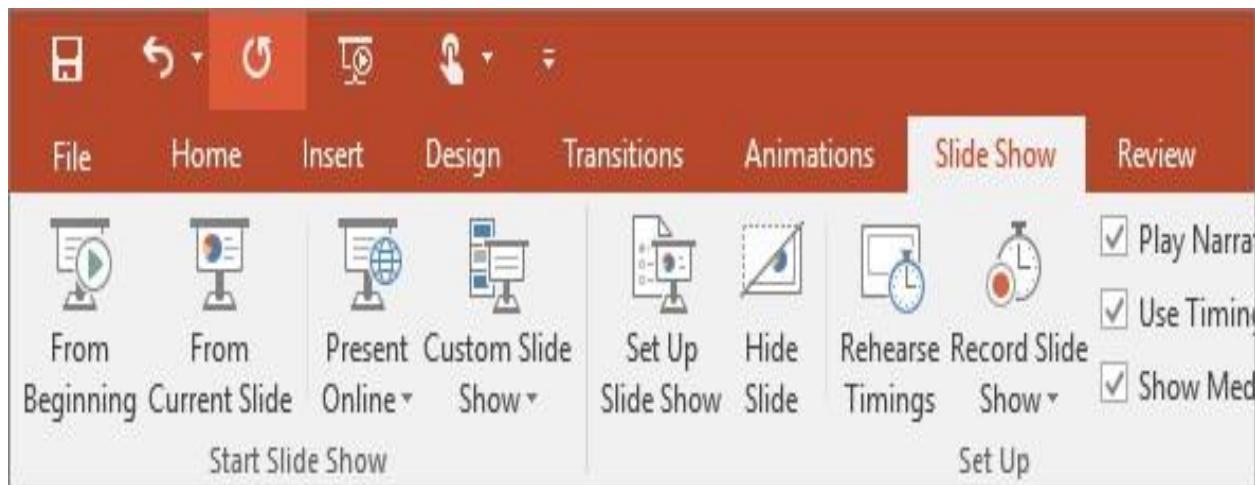
→ **Transitions Tab**– A slide transition is the visual effect that occur when you move from one slide to the next during a presentation. You can control the speed, add sound, and customize the look of the transition effect.



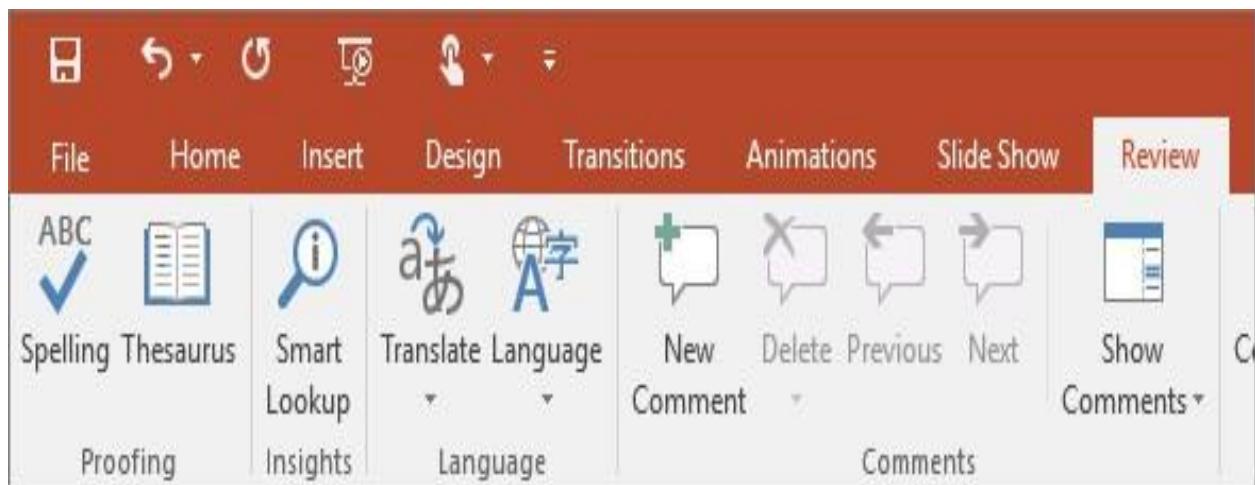
→ **Animation Tab-** Use the animations tab to apply animation to a slides and the effect based on animation type.



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



→ **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.



Create a Presentation

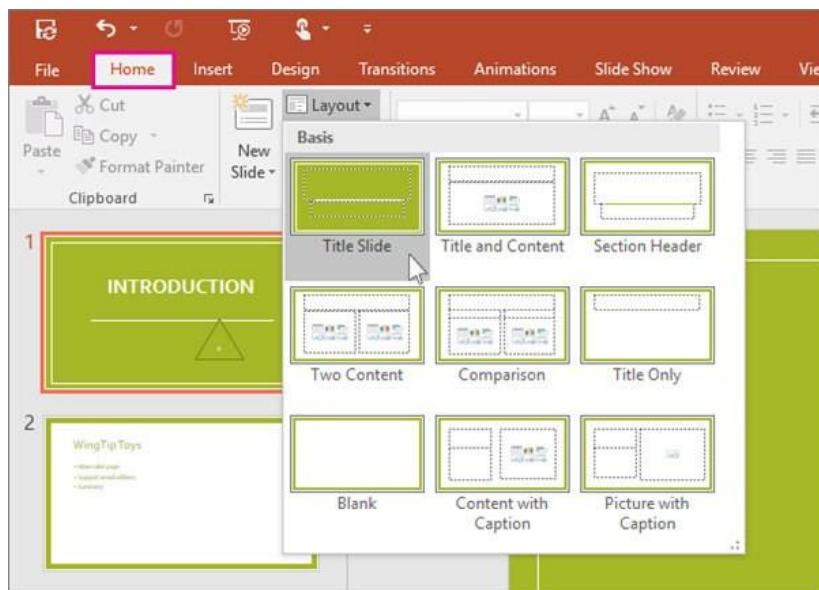
1. Open the Microsoft PowerPoint.
2. In the left pane, select new.
3. To create a presentation from scratch, select blank presentation.
4. To use a prepared design, select one of the templates.



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.

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 + N | 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. |

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. |
| 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 boxers, 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. |

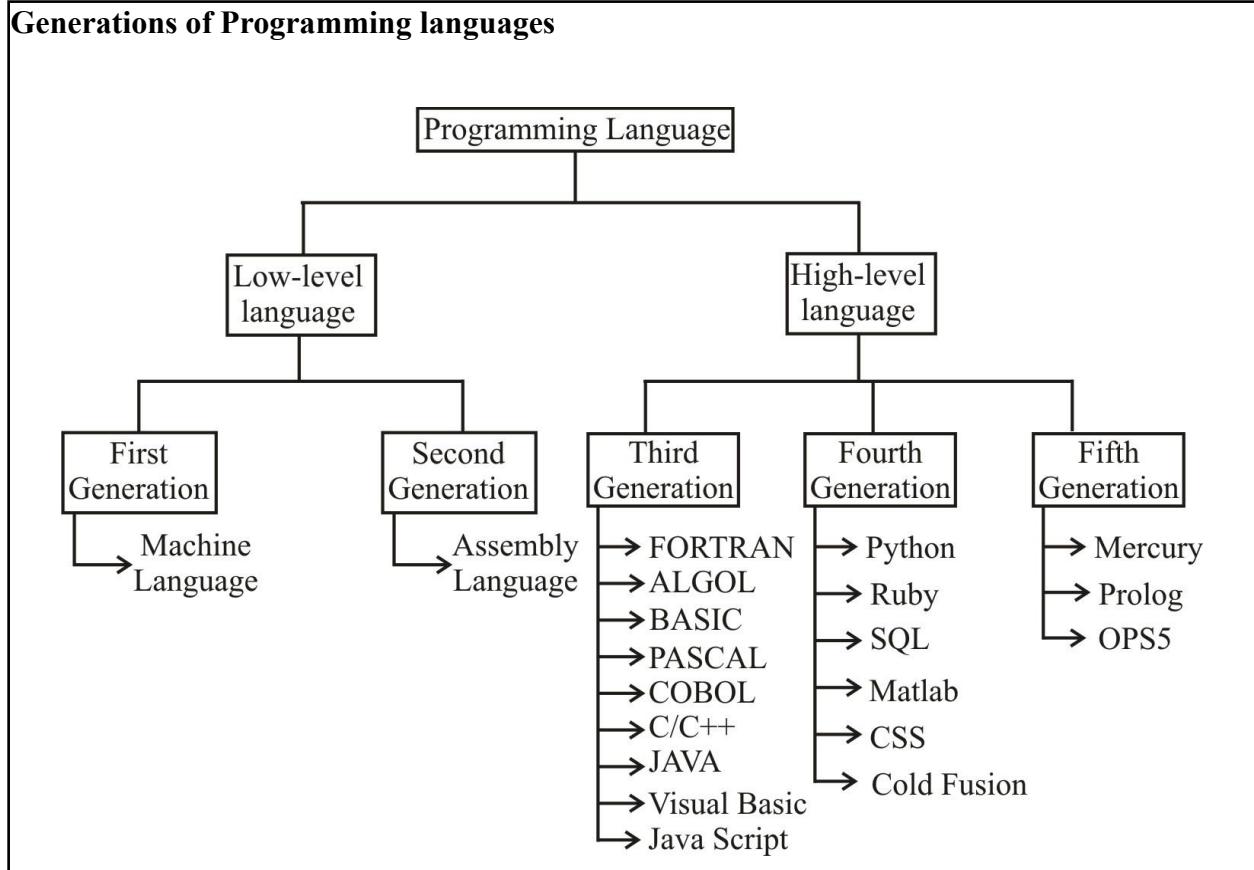
| | |
|-----------|-----------------------|
| F1 | Open the help window. |
| F7 | Check spelling. |

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 | FORTAN, 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



Language processors: Assembler, Compiler and Interpreter

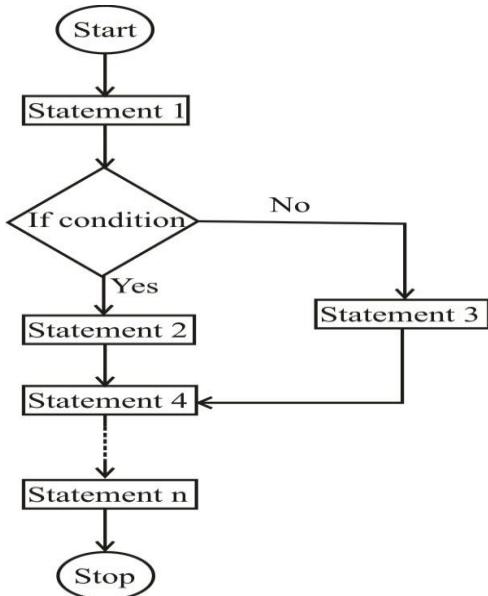
| Parameters | Compiler | Interpreter | Assembler |
|------------------------|---|---|---|
| Conversion | It converts the high defined programming language into machine language or binary code. | It also converts program developed code into machine language or binary code. | It converts programs written 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

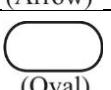
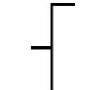
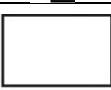
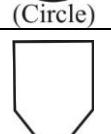
| Algorithm | Pseudo code | Program |
|--|--|---|
| <p>1. It is systematic logical approach, which is a well-defined, step-by-step procedure the allows a computer to solve a problem.</p> <p>2. Algorithms are generally written in a natural language or plain English language.</p> <p>3. Algorithm of linear search- Step 1 - Start from the left most element of arr[] and one by one compare X with each element of arr[]. Step 2 - If X matches with an element, return the index. 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, intx) { int i; for (i = 0; i < n; i++) if (arr [i] == x) return i; return - 1; }</pre> |

Flowchart



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

Symbols of Flowchart

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

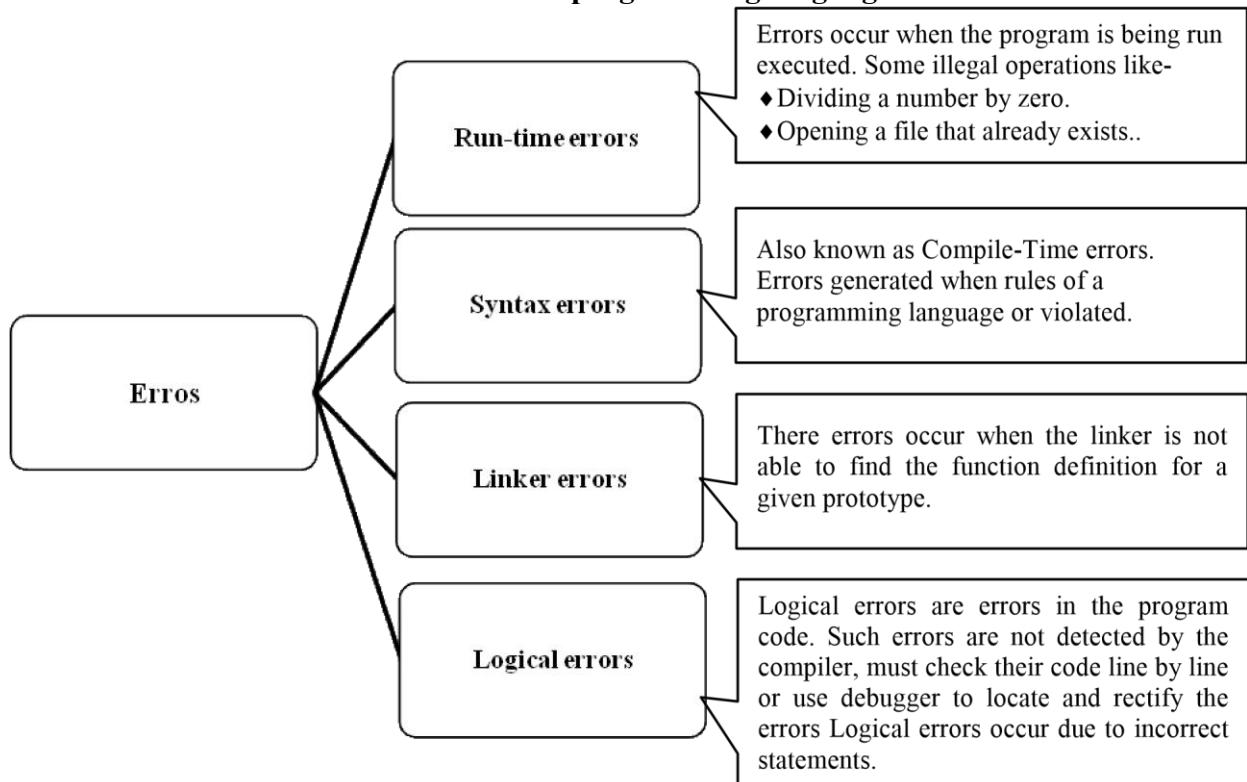
Popular High-Level Language-

| Release Date | Developer | Significant Characteristics |
|--------------|---------------|---|
| 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. |
| 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. |

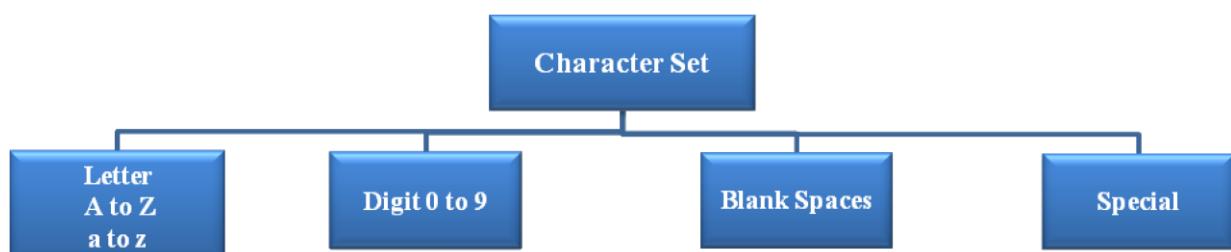
| | | |
|-----|--|---|
| 959 | COnference on DAta SYstem Languages (CODASYL) committee. | <ul style="list-style-type: none"> It has several built-in functions to automate the various tasks in business domain. It can handle and process a large amount of data at a time and in a very efficient manner. It does not implement the concept of pointers, user-defined data types, and user-defined functions and hence is simple to use. |
| 964 | 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. |
| 970 | 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. |
| 972 | 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. |
| 979 | 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. |
| 995 | 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 |
| | | 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. |
| 91 | 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. |

| | | |
|----|---------------------------------|---|
| 00 | 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.



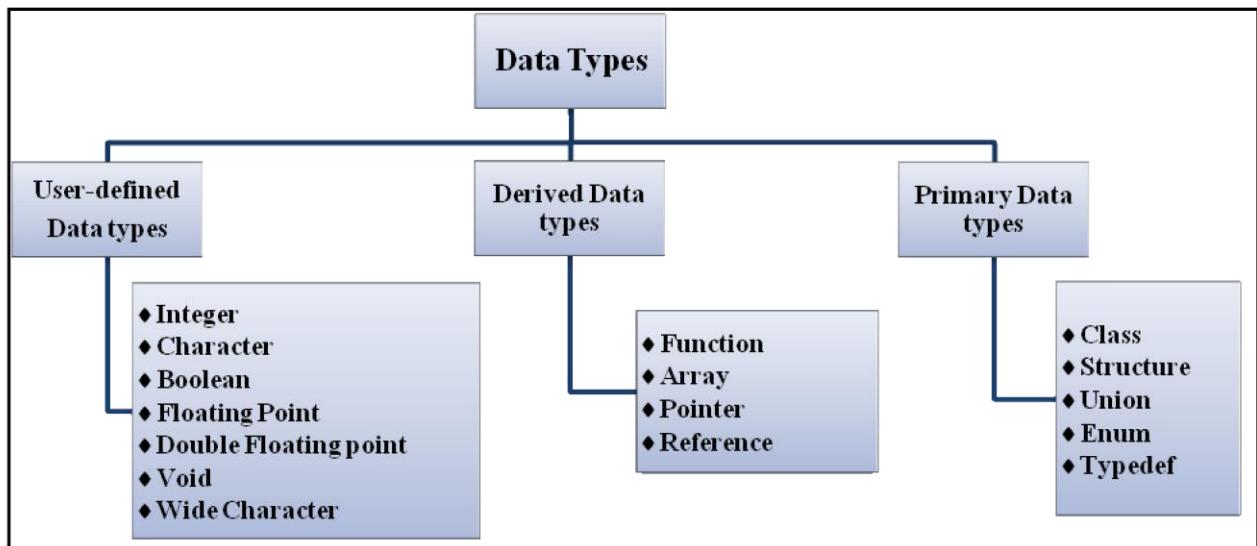
Special symbols

| 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 |



| Data type | Size (in bytes) | Range of values |
|---------------------|-----------------|---------------------------------|
| Char | 1 | -128 to 127 |
| Signed char | 1 | -128 to 127 |
| Unsigned char | 1 | 0 to 255 |
| Short | 2 | -32,768 to 32,767 |
| Singed short | 2 | -32,768 to 32,767 |
| Unsingned short | 2 | 0 to 65, 535 |
| int | 2 | -32768 to 32767 |
| Singed int | 2 | -32768 to 32767 |
| Unsingned int | 2 | 0 to 65535 |
| Short int | 2 | -32768 to 32767 |
| Singed short int | 2 | -32768 to 32767 |
| Unsingned short int | 2 | 0 to 65535 |
| Long int | 4 | -2,147,483,648 to 2,147,483,647 |
| Singed long int | 4 | -2,147,483,648 to 2,147,483,647 |
| Unsingned long int | 4 | 0 to 4,294,967,295 |
| Float | 4 | 3.4 E – 38 to 3.4 E + 38 |
| Double | 8 | 1.7 E – 308 to 1.7 E + 308 |
| Long double | 10 | 3.4 E – 4932 to 1.1 E + 4932 |

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 |
| | % | Calculates the remainder after division |
| Relational Operators | < | Less than |
| | > | Greater than |
| | <= | Less than equal to |
| | >= | Greater than equal to |
| | == | Is equal to |
| | != | Not equal to |
| Logical Operators | && | Performs logical AND operation |
| | | Performs logical OR operation |
| | ! | Performs logical NOT operation |
| Assignment Operators | = | 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 ⇒ a = +a b |

| | | |
|-----------------------------------|----------|---|
| | $- =$ | Subtracts the variables present on either side of the expression. $a - = b \Rightarrow a = -a b$ |
| | $* =$ | Multiplies 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. $a \% b = \Rightarrow a \% b =$ |
| Bit-manipulation Operators | $\&$ | 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

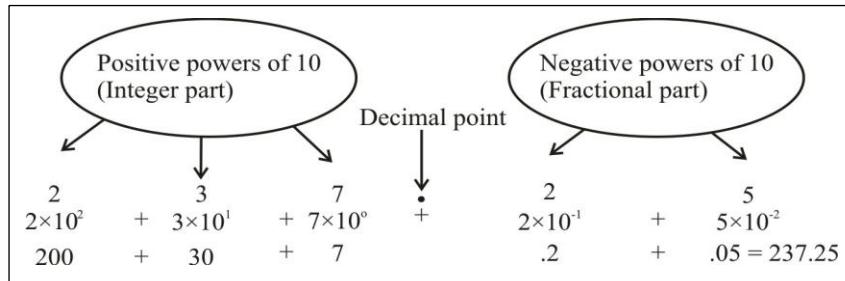
| Types of operator | Operators | Associativity |
|----------------------------|----------------------------------|---------------|
| Unary Operators | $+,-,!,\sim,++,-,$ type, size of | Right to left |
| Arithmetic operators | $*,/, \% , +,-$ | Left to right |
| Bit-manipulation operators | $<<,>>$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

| | | |
|-----------------------|----------------------------|---------------|
| Conditional operators | ? , : | Left to right |
| Assignment operators | =, + =, - =, * =, / =, % = | Right to left |

Number system

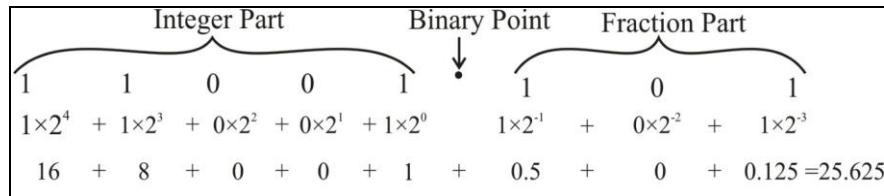
Decimal System—It is a positional number system that uses 10 as a base to represent different values. Therefore, this number system is also known as base 10 number system. In this system, 10 symbols are available for representing the value. These symbols include the digits from 0 to 9.

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 |

Octal system— The octal system is the positional number system that uses 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 |

Step 1 : Divide the decimal number by 2

Remainders

Step 2 : Write its remainder

Step 3: Keep or dividing the quotient by the base value 2 and not the remainder fill the quotient is zero.

Step 4 : Collect the remainders from bottom to top to get the binary equivalent

$(65)_{10} = (1000001)_2$

Step 1 : Divide the decimal number by 8

Remainders

Step2 : Write its remainder

Step 3: Keep or dividing the quotient by the base value 8 and not the remainder fill the quotient is zero.

Step 4 : Collect the remainders from bottom to top to get the binary equivalent

$(98)_{10} = (142)_8$

Step 1 : Divide the decimal number by 16

Remainders

Step2 : Write its remainder

F (Hexadecimal symbol F equivalent to decimal number 15)

Step 3: Keep or dividing the quotient by the base value 16 and not the remainder fill the quotient is zero.

Step 4 : Collect the remainders from bottom to top to get the hexadecimal equivalent

$(1567)_{10} = (61F)_{16}$

conversions

s can be implemented by taking the concept of place values not consideration
ert the given number with base value to its decimal equivalent, where base
and hexadecimal number system, respectively.
ach alphanumeric symbol in the given number.
symbol by raising its position number to the base value symbol in the given
pective positional value to get a decimal value.
get the equivalent decimal number.

Binary conversion– The following example illustrate the method of converting
er.

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

Octal conversion– The following example shows how to compute the decimal

$$\begin{array}{cccc} & 2 & 5 & 7 \\ \text{value} \rightarrow & 8^3 & 8^2 & 8^1 \\ \text{or} \rightarrow & 2 \times 8^2 & + & 5 \times 8^1 & + & 7 \times 8^0 \\ & + 7 & & & & = (175)_{10} \end{array} \text{ Therefore, } (257)_8 = (175)_{10}$$

Hexadecimal number conversion– The following example Shows how to compute the
 $(3A5)_{16}$.

$$\begin{array}{cccc} & 3 & A & 5 \\ \text{value} \rightarrow & 16^2 & 16^1 & 16^0 \\ \text{umber} \rightarrow & 3 \times 16^2 & + & 10 \times 16^1 & + & 5 \times 16^0 \\ & 768 & + & 160 & + & 5 & = (933)_{10} \\ \text{Therefore, } & (3A5)_{16} & = (933)_{10} \end{array}$$

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.

Make group of 3-bits of the

given binary number (Right to left) 010 101 100

Write octal number for each 3- bit group. 2 5 4

Therefore, $(10101100)_2 = (254)_8$

(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.

Octal digit → 7 0 5

Write 3-bits binary

value for each digit → 111 000 101

Therefore, $(705)_8 = (111000101)_2$

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 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)
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.

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

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.

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

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


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

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

Integer part

$$\begin{array}{r} 0.625 \times 8 = 5.000 \quad 5 \\ 0.000 \times 8 = 0.000 \quad 0 \end{array}$$


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.

Integer Part

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


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.

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

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

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

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

(iii) **Fractional part of Hexadecimal number to Decimal number**

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

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

Fractional Binary number to octal or Hexadecimal number

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

Make perfect group of 3-bits→ $\frac{010}{2} \quad \frac{101}{5} \quad \frac{100}{4} \quad . \frac{010}{2} \quad \frac{110}{6}$
Write octal symbol for each group →

$$\text{Therefore, } (10101100.01011)_2 = (254.26)_8$$

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→ 1010 1100 . 0101 1100

Write hexadecimal symbol for each group→ A C . 5 C Therefore,
 $(10101100.010111)_2 = (\text{AC.5C})_{16}$

Binary coded Decimal (BCD) systems

4-bit BCD code



BCD System



Excess-3 (XS-3) BCD Code

BCD code-

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

The given decimal number is 5327

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

| |
|-------------------------------|
| 8 4 2 1 |
| $5 \rightarrow 0 \ 1 \ 0 \ 1$ |
| $3 \rightarrow 0 \ 0 \ 1 \ 1$ |
| $2 \rightarrow 0 \ 0 \ 1 \ 0$ |
| $7 \rightarrow 0 \ 1 \ 1 \ 1$ |

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. \Rightarrow The given decimal number is 87.34

The corresponding 4-bit 8421 BCD representation of decimal digit

| |
|-------------------------------|
| 8 4 2 1 |
| $8 \rightarrow 1 \ 0 \ 0 \ 0$ |
| $7 \rightarrow 0 \ 1 \ 1 \ 1$ |
| $3 \rightarrow 0 \ 0 \ 1 \ 1$ |
| $4 \rightarrow 0 \ 1 \ 0 \ 0$ |

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

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— 8

$$+ 3 = 11$$

$$5 + 3 = 8$$

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

| |
|------------------------------------|
| 8 4 2 1 |
| $11 \longrightarrow 1 \ 0 \ 1 \ 1$ |
| $8 \longrightarrow 1 \ 0 \ 0 \ 0$ |

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

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 |

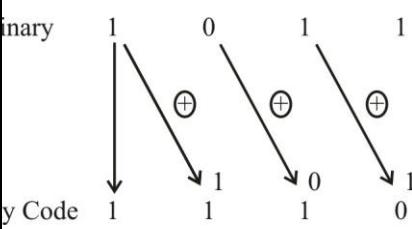
Gray Code

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 depend 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 to Gray 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.



coded equivalent of the binary number 1011 is 1110.

Convert the gray coded number to its binary equivalent by remembering the

binary code is always equal to the MSB of the given gray code.

can be obtained by checking gray code bit at that index. If current gray

code bit, else copy invert of previous binary code bit.

ber 11010011 to its binary equivalent.

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

equivalent of gray coded number 11010011 is 10011101.

One's complement system

another binary number obtained by toggling all bits in it, i.e. transforming the

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

Two's complement system

added to the 1's complement of the binary number.

example- 2's complement of 1100 is ?

nt of 1100 is 0011 added 1, to is complement.

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

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

Boolean Algebra

The basic rules of Boolean Algebra

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

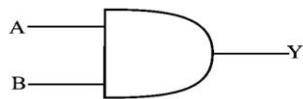
Basic laws of Boolean Algebra-

| Lawsof 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 | $A \cdot B \cdot C = (A \cdot B) \cdot C = A \cdot (B \cdot C)$ $A + A + B = A + (A + B) = A$ $(A + B) + C = A + (B + C)$ |
| 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 | $(\bar{A}) = A$ |
| 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-



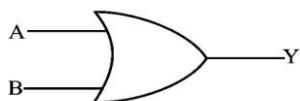
The circuit symbol of AND Gate

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 – $\boxed{Y = A \cdot B}$

2. OR Gate-



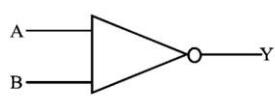
The circuit symbol of OR Gate

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 – $\boxed{Y = A + B}$

3. NOT Gate-



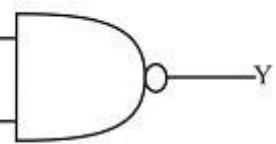
The circuit symbol of NOT Gate

The truth table of NOT gate

| Input A | Output Y |
|---------|----------|
| 0 | 1 |
| 1 | 0 |

Logical Expression – $\boxed{Y = \bar{A}}$

Derived Logic Gates

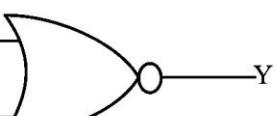


Circuit symbol of NAND gate

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

The truth table of NAND gate

| Input A | Input B | Input Y |
|---------|---------|---------|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

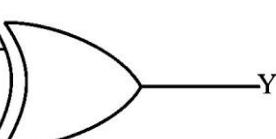


Circuit symbol of NOR Gate

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

The truth table of NOR gate

| Input A | Input B | Input Y |
|---------|---------|---------|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

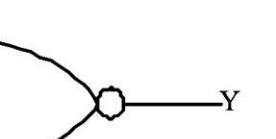


Circuit symbol of XOR Gate

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

The truth table of XOR gate

| Input A | Input B | Input Y |
|---------|---------|---------|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |



Circuit symbol of XNOR Gate

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

The truth table of XNOR gate

| Input A | Input B | Input Y |
|---------|---------|---------|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

**A ABBREVIATION RELATED TO
COMPUTER**

B

| | |
|--------------|--|
| 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 |
| 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 |



| | |
|-------------|--|
| 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 |
| 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 Verification 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, Specific Language |
| DBMS | : Database Management System |
| DFS | : Distributed File System |
| DMA | : Direct Memory Access |



| | |
|----------------|---|
| E-Mail | : Electronic Mail |
| E-Comm. | : Electronic Commerce |
| EBCDIC | : Extended Binary Coded Interchange Code |
| EBCDIC | : Extended Binary Coded Interchange Code |

EDP : Electronic Data Processing **EE-PROM**:

| | | | |
|---|--|---|------------------------------|
| Electrically Erasable Programmable Read Only Memory | | | |
| ENIAC | : Electronic Numerical Integrated and Computer | D | |
| EDVAC | : Electronic Discrete Variable Automatic Computer | e | |
| EOF | : End Of File | c | |
| EXE | : Executable | i | |
| EDD | : Enhanced Disk Drive | m | |
| EFF | : Electronic Frontier Foundation | a | |
| EFI | : Extensible Firmware Interface | l | |
| EGA | : Enhanced Graphics Array | | |
| EDSAC | : Electronic Delay Storage Automatic Calculator | | HDD : Hard Disk Drive |
| 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 | | |

Organization



| | |
|-------------------|-----------------------------------|
| 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 |
| Domain FSF | : Free Software Foundation |



| | |
|-------------|------------------------------|
| GUI | : Graphical User Interface |
| Gb | : Gigabit |
| GIGO | : Garbage In, Garbage Out |
| GB | : Gigabyte |
| GDA | : Global Document Annotation |
| GDI | : Graphical Device Interface |

HDA

Head Disk Assembly

| | | | |
|---------------|--|---------------|--|
| HDD | : Hard Disk Drive | JAM | : Java Administration Server |
| HDLC | : High Level Data Link Control Procedures | J2CE | : Java 2 Cryptographic Edition |
| HHD | : Hybrid Hard Drive | JDS | : Java Desktop System |
| HTML | : Hypertext Markup Language | JMX | : Java Management Extensions |
| HTTP | : Hypertext Transfer Protocol | JCP | : Java Community Process |
| HSTP | : High Speed Transport Protocol | JPEG | : Joint Photographic Experts Group |
| HID | : Human Interface Device | JS | : Java Script |
| HTWL | : Hyper Text Web Language | JFC | : Java Foundation Classes |
| | | | |
| IBM | : International Business Machine | KHz | : Kilohertz |
| IT | : Information Technology | KB | : Kilobyte |
| IGMP | : Internet Group Management Protocol | KBPS | : Kilobit Per Second |
| IIS | : Internet Information Services | KPA | : Key Process Area |
| IMAP | : Internet Message Access Protocol | | |
| IPC | : Inter-Process Communication | | |
| IPTV | : Internet Protocol Television | | |
| IRC | : Internet Relay Chat | | |
| IMAC | : Internet Macintosh | LSI | : Large Scale Intergration |
| IHV | : Independent Hardware Vender | LASER | : Light Amplification by Stimulated Emission of Radition |
| IFSMGR | : Instable File System Manager | LED | : Liquid/Light Emiting Diode |
| IS | : Infromation System | LPM | : Line Per Minute |
| ISDN | : Intergrated Services Digital Network | LSB | : Least Significant Bit |
| ICM | : Image Color Management | LSI | : Large Scale Integration |
| ICM | : Image Compression Manager | LA | : Laboratory Automation |
| ICMP | : Internet Control Message Protocol | LAN | : Local Area Network |
| IDT | : Internet Development Toolbox | LBP | : Laser Beam Printer |
| IGRP | : Interior Gateway Routing Protocol | LPT | : Line Printer |
| ISO | : International Organization For Standardization | LBA | : Logical Block Address |
| IVV | : Independent Verification & Validation | LCD | : Liquid Crystal Display |
| IM | : Instant Messaging | LIFO | : Last In First Out |
| I/O | : Input/Output | LU | : Logical Unit |
| I/P | : Internet Protocol | | |
| ISP | : Internet Service Provider | | |
| ITU | : International Telecommunication Union | | |
| IP SEC | : Internet Protocol Security | | |
| IIOT | : Industrial Internet of Things | MS-DOS | : Microsoft-Disc Operating System |
| IAM | : Identity and Access Management | MTNL | : Mahanagar Telephone Nigam Limited |
| IFR | : International Fedration of Robotics | MANET | : Mobile Ad-Hoc Network |
| IDL | : Interface Definition Language | MDI | : Multiple Document Interface |
| IMF | : International Monetary Fund | MOS | : Metal Oxide Semiconductor |
| | | MSB | : Most Significant Bit |
| JSP | : Java Server Pages | 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

| | | |
|--------------------------------------|---|----------------------------|
| MNG | Multiple-Image Network Graphics | PAN |
| MPEG | Motion Pictures (Coding) Experts Group | PAP |
| MMU | Memory Management Unit | PC : |
| MMX | Multimedia Extension | PIC : |
| MPM | : Multi-Programming Monitor | PIN |
| MPU | : Micro Processor Unit | PNG : |
| MODEM : Modulator-Demodulator | PAIH : | Public- |
| MUI | : Multimedia User Interface | PCP : |
| MVS | : Multiple Virtual Storage | PCT : |
| MIME | : Multipurpose Internet Mail Extensions | PDC |
| MIS | : Management Information System | POP |
| PSM | | : Printing Systems Manager |



PSTN :

| | |
|----------------|---|
| PSN | : Packet Switching Network |
| 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 |



| | |
|-------------|---------------------------------|
| 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 |



| | |
|-------------|---------------------------------|
| PDL | : Program Design Language |
| PL 1 | : Programming Language 1 |
| POS | : Point of Sales |
| PROM | : Programmable Read Only Memory |

| | |
|------------|------------------------------------|
| PAN | : Personal Area Network |
| PAP | : Password Authentication Protocol |
| PC | : Personal computer |
| PIC | : Peripheral Interface Controller |
| PIN | : Personal Identification Number |
| PNG | : Portable Network Graphics |
| PIH | : Public Internet Host |
| PCP | : Printer Control Protocol |
| PCT | : Private Communication Technology |
| PDC | : Primary Domain controller |
| POP | : Point Of Presence |

Public Switched Telephone Network

| | |
|-------------|-------------------------------------|
| PSP | : Passport Seva Project |
| 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 | : Popnt-To-Point Tunneling Protocol |
| P2P | : Peer-To-Peer |



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



| | |
|--------------|---|
| 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 RAM : Static Ram

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

SCSI Port : Small Computer System Interface Port

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



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



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



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



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



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



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



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