

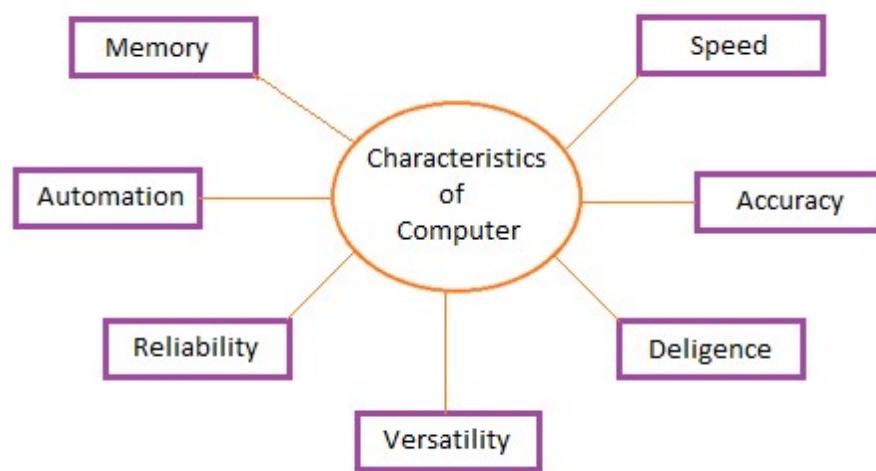
## What is a Computer?

A **computer** is an electronic device that accepts data from the user, processes it, produces results, displays them to the users, and stores the results for future usage.

**Data** is a collection of unorganized facts & figures and does not provide any further information regarding patterns, context, etc. Hence data means "unstructured facts and figures".

**Information** is a structured data i.e. organized meaningful and processed data. To process the data and convert into information, a computer is used.

## Characteristics of Computer System



### Speed

A computer works with much higher speed and accuracy compared to humans while performing mathematical calculations. Computers can process millions (1,000,000) of instructions per second. The time taken by computers for their operations is microseconds and nanoseconds.

### Accuracy

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

### Diligence

A computer can perform millions of tasks or calculations with the same consistency and accuracy. It doesn't feel any fatigue or lack of concentration. Its memory also makes it superior to that of human beings.

### Versatility

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

### Reliability

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

## **Automation**

Computer performs all the tasks automatically i.e. it performs tasks without manual intervention.

## **Memory**

A computer has built-in memory called primary memory where it stores data. Secondary storage are removable devices such as CDs, pen drives, etc., which are also used to store data.

## **Generations of Computers**

### **First Generation Computers: Vacuum Tubes (1940-1956)**

**Main characteristics of first generation computers are:**

<b>Main electronic component</b>	Vacuum tube.
<b>Programming language</b>	Machine language.
<b>Main memory</b>	Magnetic tapes and magnetic drums.
<b>Input/output devices</b>	Paper tape and punched cards.
<b>Speed and size</b>	Very slow and very large in size (often taking up entire room).
<b>Examples of the first generation</b>	IBM 650, IBM 701, ENIAC, UNIVAC1, etc.

### **Second Generation Computers: Transistors (1956-1963)**

<b>Main electronic component</b>	Transistor.
<b>Programming language</b>	Machine language and assembly language.
<b>Memory</b>	Magnetic core and magnetic tape/disk.
<b>Input/output devices</b>	Magnetic tape and punched cards.
<b>Power and size</b>	Smaller in size, low power consumption, and generated less heat (in comparison with the first generation computers).
<b>Examples of second generation</b>	PDP-8, IBM1400 series, IBM 7090 and 7094, UNIVAC 1107, CDC 3600 etc.

### **Third Generation Computers: Integrated Circuits. (1964-1971)**

**Main characteristics of third generation computers are:**

<b>Main electronic component</b>	Integrated circuits (ICs)
<b>Programming language</b>	High-level language
<b>Memory</b>	Large magnetic core, magnetic tape/disk
<b>Input / output devices</b>	Magnetic tape, monitor, keyboard, printer, etc.
<b>Examples of third generation</b>	IBM 360, IBM 370, PDP-11, NCR 395, B6500, UNIVAC 1108, etc.

### **Fourth Generation Computers: Micro-processors (1971-Present)**

**Main characteristics of fourth generation computers are:**

<b>Main electronic component</b>	Very large-scale integration (VLSI) and the microprocessor (VLSI has thousands of transistors on a single microchip).
<b>Memory</b>	semiconductor memory (such as RAM, ROM, etc.)
<b>Input/output devices</b>	pointing devices, optical scanning, keyboard, monitor, printer, etc.
<b>Examples of fourth generation</b>	IBM PC, STAR 1000, APPLE II, Apple Macintosh, Alter 8800, etc.

### **Fifth Generation Computers**

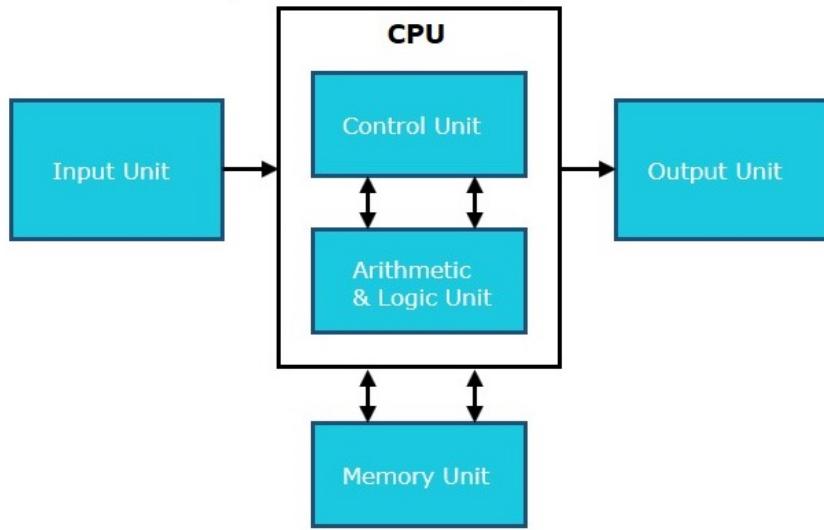
**Main characteristics of fifth generation computers are:**

<b>Main electronic component</b>	Based on artificial intelligence, uses the Ultra Large-Scale Integration (ULSI) technology and parallel processing method (ULSI has millions of transistors on a single microchip and Parallel processing method use two or more microprocessors to run tasks simultaneously).
<b>Language</b>	Understand natural language (human language).
<b>Size</b>	Portable and small in size.

<b>Input / output device</b>	Trackpad (or touchpad), touchscreen, pen, speech input (recognize voice/speech), light scanner, printer, keyboard, monitor, mouse, etc.
<b>Example of fifth generation</b>	Desktops, laptops, tablets, smartphones, etc.

Block Diagram of Computer

S.No.	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.



### **Input Unit**

This unit contains devices with the help of which we enter data into the computer. This unit creates a link between the user and the computer. The input devices translate the information into a form understandable by the computer.

### **CPU (Central Processing Unit)**

CPU is considered as the brain of the computer. CPU performs all types of data processing operations. It stores data, intermediate results, and instructions (program). It controls the operation of all parts of the computer.

CPU itself has the following three components –

- ALU (Arithmetic Logic Unit)
- Memory Unit
- Control Unit

### **Output Unit**

The output unit consists of devices with the help of which we get the information from the computer. This unit is a link between the computer and the users. Output devices translate the computer's output into a form understandable by the users.

## **Classification of Computers**

### **PC (Personal Computer)**



A PC can be defined as a small, relatively inexpensive computer designed for an individual user. PCs are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip.

### **Workstation**



The workstation is a computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other such types of applications which require a moderate amount of computing power and relatively high-quality graphics capabilities.

Workstations generally come with a large, high-resolution graphics screen, a large amount of RAM, inbuilt network support, and a graphical user interface.

## **Minicomputer**

It is a midsize multi-processing system capable of supporting up to 250 users simultaneously.



## **Mainframe**

The mainframe is very large in size and is an expensive computer capable of supporting hundreds or even thousands of users simultaneously. Mainframe executes many programs concurrently and supports much simultaneous execution of programs.



## **Supercomputer**

Supercomputers are one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require an immense amount of mathematical calculations (number-crunching).



For example, weather forecasting, scientific simulations, (animated)graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting).

## **Computer - Applications Business**

Computer is used in business organizations for –

- Payroll calculations
- Budgeting
- Sales analysis
- Financial forecasting
- Managing employee database
- Maintenance of stocks, etc.

## **Banking**

Banks provide the following facilities –

- Online accounting facility, which includes checking current balance, making deposits and overdrafts, checking interest charges, shares, and trustee records.
- ATM machines which are completely automated are making it even easier for customers to deal with banks.

## **Insurance**

Insurance companies are maintaining a database of all clients with information showing –

- Procedure to continue with policies
- Starting date of the policies
- Next due installment of a policy
- Maturity date
- Interests due
- Survival benefits
- Bonus

## **Education**

The computer helps in providing a lot of facilities in the education system.

- The computer provides a tool in the education system known as CBE (Computer Based Education).
- CBE involves control, delivery, and evaluation of learning.
- Computer education is rapidly increasing the graph of number of computer students.
- There are a number of methods in which educational institutions can use a computer to educate the students.
- It is used to prepare a database about performance of a student and analysis is carried out on this basis.

## **Marketing**

In marketing, uses of the computer are following –

- Advertising –
- Home Shopping –
- Diagnostic System –
- Lab-diagnostic System –

- Patient Monitoring System –
- Pharma Information System –
- Surgery –

### **Engineering Design**

- Structural Engineering –
- Industrial Engineering –
- Architectural Engineering –

### **Military**

- Missile Control
- Military Communication
- Military Operation and Planning
- Smart Weapons

### **Communication**

- E-mail
- Chatting
- Usenet
- FTP
- Telnet
- Video-conferencing

### **Government**

Computers play an important role in government services. Some major fields in this category are –

- Budgets
- Sales tax department
- Income tax department
- Computation of male/female ratio
- Computerization of voters lists
- Computerization of PAN card
- Weather forecasting

## Computer - Input Devices

Following are some of the important input devices which are used in a computer –

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

### Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

The keys on the keyboard are as follows –

S.No	Keys & Description
1	<b>Typing Keys</b> - These keys include the letter keys (A-Z) and digit keys (0-9) which generally give the same layout as that of typewriters.
2	<b>Numeric Keypad</b> - It is used to enter the numeric data or cursor movement. Generally, it consists of a set of 17 keys.
3	<b>Function Keys</b> - The twelve function keys are present on the keyboard which are arranged in a row at the top of the keyboard. Each function key has a unique meaning and is used for some specific purpose.
4	<b>Control keys</b> - These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5	<b>Special Purpose Keys</b> - Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

### Mouse

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.

### Joystick

Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. The joystick can be moved in all four directions.



The function of the joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

### **Light Pen**

Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen.



When the tip of a light pen is moved over the monitor screen and the pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

### **Track Ball**

Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse.



### **Scanner**

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.



### **Digitizer**

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of numbers that could be stored in a computer.



Digitizer is also known as Tablet or Graphics Tablet as it converts graphics and pictorial data into binary inputs.

### **Microphone**

Microphone is an input device to input sound that is then stored in a digital form.



### **Magnetic Ink Card Reader (MICR)**

MICR input device is generally used in banks as there are large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.



### **Optical Character Reader (OCR)**

OCR is an input device used to read a printed text.



OCR scans the text optically, character by character, converts them into a machine readable code, and stores the text on the system memory.

## **Bar Code Readers**

Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books, etc.



Bar Code Reader scans a bar code image, converts it into an alphanumeric value, which is then fed to the computer that the bar code reader is connected to.

## **Optical Mark Reader (OMR)**

OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked.



## **Computer - Output Devices**

Following are some of the important output devices used in a computer.

- Monitors
- Graphic Plotter
- Printer

### **Monitors**

Monitors, commonly called as **Visual Display Unit (VDU)**, are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

### **Cathode-Ray Tube (CRT) Monitor**

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter 'e' in the word help.



A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically.

There are some disadvantages of CRT –

- Large in Size
- High power consumption

### **Flat-Panel Display Monitor**

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists.



### **Printers**

Printer is an output device, which is used to print information on paper.

There are two types of printers –

- Impact Printers
- Non-Impact Printers

### **Impact Printers**

Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.

Characteristics of Impact Printers are the following –

- Very low consumable costs
- Very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

These printers are of two types –

- Character printers
- Line printers

## **Character Printers**

Character printers are the printers which print one character at a time.

These are further divided into two types:

- Dot Matrix Printer(DMP)
- Daisy Wheel

### **Dot Matrix Printer**

In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in the form of pattern of dots and head consists of a Matrix of Pins of size (5\*7, 7\*9, 9\*7 or 9\*9) which come out to form a character which is why it is called Dot Matrix Printer.



#### **Advantages**

- Inexpensive
- Widely Used
- Other language characters can be printed

#### **Disadvantages**

- Slow Speed
- Poor Quality

## **Daisy Wheel**

Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower) which is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices that require a few letters to be sent here and there with very nice quality.



#### **Advantages**

- More reliable than DMP
- Better quality
- Fonts of character can be easily changed

### **Disadvantages**

- Slower than DMP
- Noisy
- More expensive than DMP

### **Line Printers**

Line printers are the printers which print one line at a time.



These are of two types –

- Drum Printer
- Chain Printer

### **Drum Printer**

This printer is like a drum in shape hence it is called drum printer. The surface of the drum is divided into a number of tracks. Total tracks are equal to the size of the paper, i.e. for a paper width of 132 characters, drum will have 132 tracks. A character set is embossed on the track. Different character sets available in the market are 48 character set, 64 and 96 characters set. One rotation of drum prints one line. Drum printers are fast in speed and can print 300 to 2000 lines per minute.

### **Advantages**

- Very high speed

### **Disadvantages**

- Very expensive
- Characters fonts cannot be changed

### **Chain Printer**

In this printer, a chain of character sets is used, hence it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.

### **Advantages**

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

### **Disadvantages**

- Noisy

## **Non-impact Printers**

Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.

These printers are of two types –

- Laser Printers
- Inkjet Printers

## **Characteristics of Non-impact Printers**

- Faster than impact printers
- They are not noisy
- High quality
- Supports many fonts and different character size

### **Laser Printers**

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.



#### **Advantages**

- Very high speed
- Very high quality output
- Good graphics quality
- Supports many fonts and different character size

#### **Disadvantages**

- Expensive
- Cannot be used to produce multiple copies of a document in a single printing

## **Inkjet Printers**

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.



They make less noise because no hammering is done and these have many styles of printing modes available. Color printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

**Advantages**

- High quality printing
- More reliable

**Disadvantages**

- Expensive as the cost per page is high
- Slow as compared to laser printer

## **Computer - Memory**

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored. The memory is divided into large number of small parts called cells. Each location or cell has a unique address, which varies from zero to memory size minus one. For example, if the computer has 64k words, then this memory unit has  $64 * 1024 = 65536$  memory locations. The address of these locations varies from 0 to 65535.

Memory is primarily of three types –

- **Cache Memory**
- **Primary Memory/Main Memory**
- **Secondary Memory**

### **Cache Memory**

Cache memory is a very high speed semiconductor memory which can speed up the CPU. It acts as a buffer between the CPU and the main memory. It is used to hold those parts of data and program which are most frequently used by the CPU. The parts of data and programs are transferred from the disk to cache memory by the operating system, from where the CPU can access them.



### **Advantages**

The advantages of cache memory are as follows –

- Cache memory is faster than main memory.
- It consumes less access time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

### **Disadvantages**

The disadvantages of cache memory are as follows –

- Cache memory has limited capacity.
- It is very expensive.

## **Primary Memory (Main Memory)**

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.



### **Characteristics of Main Memory**

- These are semiconductor memories.
- It is known as the main memory.
- Usually volatile memory.
- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.

## **Secondary Memory**

This type of memory is also known as external memory or non-volatile. It is slower than the main memory. These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.



### Characteristics of Secondary Memory

- These are magnetic and optical memories.
- It is known as the backup memory.
- It is a non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of data in a computer.
- Computer may run without the secondary memory.
- Slower than primary memories.

### Random Access Memory (RAM)

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

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

RAM is of two types –

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

#### Static RAM (SRAM)

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

### Characteristic of Static RAM

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

### Dynamic RAM (DRAM)

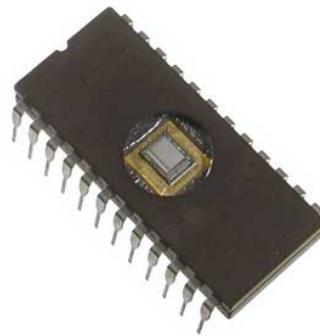
DRAM, unlike SRAM, must be continually **refreshed** in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small. All DRAMs are made up of memory cells, which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

### Characteristics of Dynamic RAM

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

### Read Only Memory (ROM)

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



### **MROM (Masked ROM)**

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions.

### **PROM (Programmable Read Only Memory)**

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program.

### **EPROM (Erasable and Programmable Read Only Memory)**

EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes.

### **EEPROM (Electrically Erasable and Programmable Read Only Memory)**

EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond).

#### **Advantages of ROM**

The advantages of ROM are as follows –

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

### **Memory Units**

The following table explains the main memory storage units –

S.No.	Unit & Description
-------	--------------------

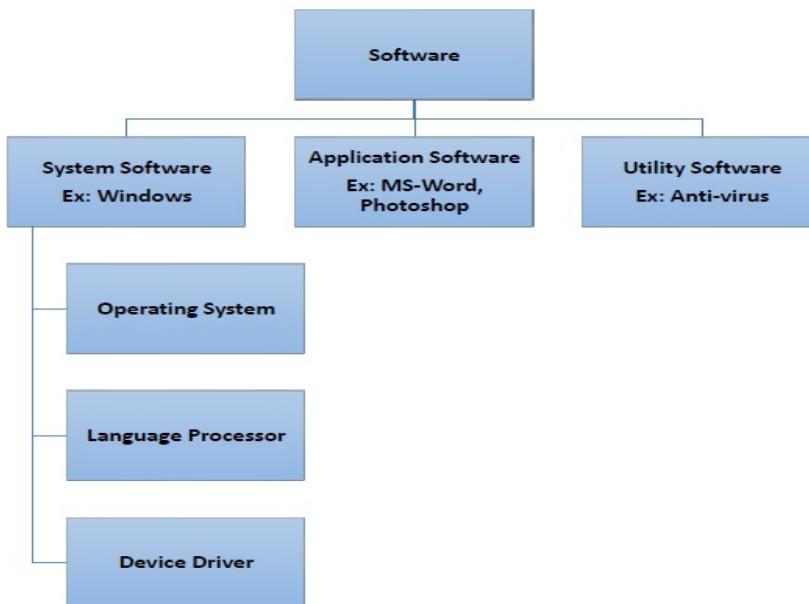
	<b>Bit (Binary Digit)</b>
1	A binary digit is logical 0 and 1 representing a passive or an active state of a component in an electric circuit.
2	<b>Nibble</b> A group of 4 bits is called nibble.
3	<b>Byte</b> A group of 8 bits is called byte. A byte is the smallest unit, which can represent a data item or a character.
4	<b>Word</b> A computer word, like a byte, is a group of fixed number of bits processed as a unit, which varies from computer to computer but is fixed for each computer.

# Software

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software –

- System Software
- Application Software
- Utility Software



## System Software

Software required to run the hardware parts of the computer and other application software are called system software. System software acts as interface between hardware and user applications.

Machines understand only binary language i.e. 0 and 1 while humans speak in English, French, German, Tamil, Hindi and many other languages. Software is required to convert all human instructions into machine understandable instructions. And this is exactly what system software does.

Based on its function, system software is of three types –

- Operating System
- Language Processor
- Device Drivers

**Operating System** - OS is the first software to be loaded into computer memory when the computer is switched on and this is called booting. OS manages a computer's basic functions like storing data in memory, retrieving files from storage devices, scheduling tasks based on priority, etc.

- Most Popular Operating Systems
- Microsoft Windows.
- Apple macOS.
- Google's Android OS.
- Apple iOS.
- Linux Operating System.

### Language Processor

- Machine-level language – This language is nothing but a string of 0s and 1s that the machines can understand. It is completely machine dependent.
- Assembly-level language – This language introduces a layer of abstraction by defining mnemonics. Mnemonics are English like words or symbols used to denote a long string of 0s and 1s. For example, the word “READ” can be defined to mean that computer has to retrieve data from the memory.
- High level language – This language uses English like statements and is completely independent of machines.

Program written in high level programming languages like Java, C++, etc. is called source code. Set of instructions in machine readable form is called object code or machine code. System software that converts source code to object code is called language processor. There are three types of language interpreters—

- Assembler – Converts assembly level program into machine level program.
- Interpreter – Converts high level programs into machine level program line by line.
- Compiler – Converts high level programs into machine level programs at one go rather than line by line.

### Device Drivers

System software that controls and monitors functioning of a specific device on computer is called device driver. Each device like printer, scanner, microphone, speaker, etc.

## Application Software

A software that performs a single task and nothing else is called application software. Application software are very specialized in their function and approach to solving a problem.

Here are some commonly used application software –

- Word processing
- Spreadsheet
- Presentation
- Database management
- Multimedia tools

## Utility Software

Application software that assist system software in doing their work is called utility software. Thus utility software is actually a cross between system software and application software. Examples of utility software include –

- Antivirus software
- Disk management tools
- File management tools
- Compression tools
- Backup tools

## Differences between Hardware and Software

Hardware	Software
Hardware is a physical component of computers that executes the instruction.	Software is a program that enables users to interact with the computer, its hardware.
It is manufactured in factories.	It is developed by software programmers or software development companies.
Storage Devices, Input Devices, Output Devices, and Internal components are the primary categories of hardware.	Operating Systems, Application Software, and Programming Software are the main categories of software.
Hardware can be seen and touch as it is a physical, electronic device.	The software can be seen but cannot be touched as it is virtual, not physical.
Computer viruses cannot affect hardware.	Computer viruses can affect software.
Hardware can be replaced with a new one if it is damaged.	The software is reinstalled if it gets damaged.
Through the network, hardware cannot be transferred electrically. Only, it can be physically transferred.	The software can be transferred easily.
Examples of hardware are RAM, ROM, Printer, Monitor, Mouse, Hard disk and more.	Examples of software are Google Chrome, MySQL, MS Word, Excel, PowerPoint, Notepad, Photoshop and more.

# Programming Languages

A program is a set of instructions that help computer to perform tasks. This set of instructions is also called as scripts. Programs are executed by processor whereas scripts are interpreted. The languages that are used to write a program or set of instructions are called "Programming languages". Programming languages are broadly categorized into three types –

- Machine level language
- Assembly level language
- High-level language

## Machine Level Language

Machine language is lowest level of programming language. It handles binary data i.e. 0's and 1's. It directly interacts with system. Machine language is difficult for human beings to understand as it comprises combination of 0's and 1's. There is software which translate programs into machine level language. Examples include operating systems like Linux, UNIX, Windows, etc. In this language, there is no need of compilers and interpreters for conversion.

```
0001111100001010101  
001100111001101010  
0101010101010000000  
1010101010101010101  
1010100000111110000  
1010101000111000101  
10101010010100100
```

## Assembly Level Language

Assembly language is a middle-level language. It consists of a set of instructions in a specific format called commands. It uses symbols to represent field of instructions. It is very close to machine level language. The computer should have assembler to translate assembly level program to machine level program.

Assembly Language	Machine Code
SUB AX, BX	0010101110000011
MOV CX, AX	100010111001000
MOV DX, 0	101101000000000000000000

## High-level Language

High-level language uses format or language that is most familiar to users. The instructions in this language are called codes or scripts. The computer needs a compiler and interpreter to convert high-level language program to machine level language.

```
if age < 18 {  
    printf("You are not eligible to vote");  
} else {  
    printf("You are eligible to vote");  
}
```

}

## Characteristics of good programming

- ❖ Clarity and Simplicity of Expression:
- ❖ Use of proper names for identifiers :
- ❖ Comments :
- ❖ Indentation:
- ❖ Flexibility:
- ❖ User Friendly:
- ❖ Portability:
- ❖ Reliability:
- ❖ Self-Documenting Code:

## Unit - I

### What is Operating System?

An Operating System (OS) is an interface between a computer user and computer hardware. An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

### Operating System - Examples

- **Windows:** This is one of the most popular and commercial operating systems developed and marketed by Microsoft. It has different versions in the market like Windows 8, Windows 10 etc and most of them are paid.
- **Linux** This is a Unix based and the most loved operating system first released on September 17, 1991 by Linus Torvalds. Today, it has 30+ variants available like Fedora, OpenSUSE, CentOS, UBuntu etc. Most of them are available free of charges though you can have their enterprise versions by paying a nominal license fee.
- **MacOS** This is again a kind of Unix operating system developed and marketed by Apple Inc. since 2001.
- **iOS** This is a mobile operating system created and developed by Apple Inc. exclusively for its mobile devices like iPhone and iPad etc.
- **Android** This is a mobile Operating System based on a modified version of the Linux kernel and other open source software, designed primarily for touchscreen mobile devices such as smartphones and tablets.

### Operating System - Functions

To brief, Following are some of important functions of an operating System which we will look in more detail in upcoming chapters:

- Process Management
- I/O Device Management
- File Management
- Network Management
- Main Memory Management

- Secondary Storage Management
- Security Management
- Command Interpreter System
- Control over system performance
- Job Accounting
- Error Detection and Correction
- Coordination between other software and users
- Many more other important tasks
- Examples of file systems

**FAT:** FAT is a type of file system, which is developed for hard drives. It stands for file allocation table and was first introduced in 1977, which is used for 12 or 16 bits for each and every cluster access into the file allocation table (FAT).

Today, FAT is not used by later versions of Microsoft Windows like Windows XP, Vista, 7, and 10 as they use NTFS. The **FAT8**, **FAT12**, **FAT32**, **FAT16** are all the different types of FAT (for file allocation table).

**NTFS:** NTFS is the file system, which stands for NT file system and stores and retrieves files on Windows NT operating system and other versions of Windows like Windows 2000, Windows XP, Windows 7, and Windows 10. Sometimes, it is known as the New Technology File System. As compared to the FAT and HPFS file system, it provides better methods of file recovery and data protection and offers a number of improvements in terms of extendibility, security, and performance.

### What is a directory?

Directory can be defined as the listing of the related files on the disk. The directory may store some or the entire file attributes.

To get the benefit of different file systems on the different operating systems, A hard disk can be divided into the number of partitions of different sizes. The partitions are also called volumes or mini disks.

## What is File?

A file a container in a computer system that stores data, information, settings, or commands, which are used with a computer program. In graphical user interface (GUI), such as Microsoft operating systems, represent the files as icons, which associate to the program that opens the file. For instance, the picture is shown as an icon; it is related to **Microsoft Word**. If your computer contains this file and you double-click on the icon, it will open in Microsoft Word installed on the computer.

## Common file formats

Below is a table that contains common file formats you are most likely to see while working on a computer.

File type	File extension
<b>Image</b>	.bmp .eps .gif .jpg .pict .png .psd .tif
<b>Text</b>	.asc .doc .docx .rtf .msg .txt .wpd .wps
<b>Video</b>	.avi .mp4 .mpg .mov .wmv
<b>Compressed</b>	.arc .arj .gz .hqx .rar .sit .tar .z .zip
<b>Program</b>	.bat .com .exe
<b>Sound</b>	aac .au .mid .mp3 .ra .snd .wma .wav

## File naming rules

The name of each file must be unique within the directory where it is stored. This ensures that the file also has a unique path name in the file system.

File naming guidelines are:

- ❖ A file name can be up to 255 characters long and can contain letters, numbers, and underscores.
- ❖ The operating system is case-sensitive.
- ❖ Therefore, SHARMA, Sharma, and sharma are three different file names, even if they reside in the same directory.
- ❖ File names should be as descriptive and meaningful as possible.
- ❖ Certain characters have special meaning to the operating system. Avoid using these characters when you are naming files. These characters include the following:

## Booting Process in Operating System

Booting is the process of starting a computer. It can be initiated by hardware such as a button press or by a software command. After it is switched on, a CPU has no software in its main memory, so some processes must load software into memory before execution. This may be done by hardware or firmware in the [CPU](#) or by a separate processor in the computer system.

### Types of Booting

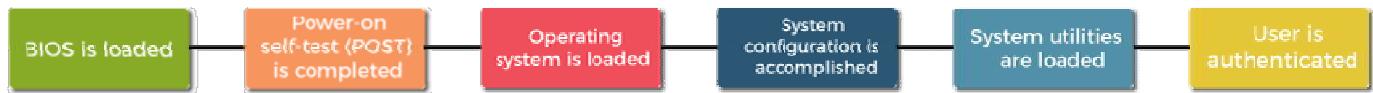
**Cold Booting:** When the computer starts for the first time or is in a shut-down state and switch on the power button to start the system, this type of process to start the computer is called cold booting.

**Warm Booting:** Warm or Hot Booting process is when computer systems come to no response or hang state, and then the system is allowed to restart during on condition. It is also referred to as rebooting.

## Booting Process in Operating System

# What is a File System?

A file system is a process of managing how and where data on a storage disk, which is also referred to as file management or FS. It is a logical disk component that compresses files separated into groups, which is known as directories.



## What is a File System?

A file system is a process of managing how and where data on a storage disk, which is also referred to as file management or FS. It is a logical disk component that compresses files separated into groups, which is known as directories.

### Examples of file systems

**FAT:** It stands for file allocation table.

**GFS:** A GFS is a file system, which stands for Global File System.

**HFS:** HFS (Hierarchical file system)

**NTFS:** NTFS is the file system, which stands for NT file system.

**UDF:** A UDF is a file system, stands for Universal Disk.

## MS-DOS Operating System

A disk operating system (DOS) is an operating system for x86 based personal computers mostly developed by Microsoft. MS-DOS, its rebranding as IBM PC DOS.

- MS-DOS does not offer GUI (Graphical User Interface) and doesn't accept mouse inputs.
- A disk operating system manages files, folders and allows program loading and execution.
- MS-DOS offers a file system to organize, read and write files to the disk storage.
- It is a single-user operating system and performs various tasks to ensure the proper operation of systems.
- It uses a 16-bit file allocation table (FAT16), and a 16-bit interface is used to define the location of the memory of each file uniquely.
- MS-DOS does not support a multiuser operating system, and it is less secure and does not have a concept of user roles.

## **Internal DOS Commands**

### **DATE**

This command is used to display the system current date setting and prompt you to enter a new date.

### **TIME**

This command is used to displays or set the system time.

### **COPY CON**

It is used to create a file in the existing directory. Here CON is a DOS reserved word which stands for console.

Syntax is: **COPY CON filename** after that press Enter and start typing your text and after you're done typing your text, to save and exit hit F6 key.

### **TYPE**

This command is used to display the contents of a text file or files.

### **CLS**

It is used to clear the screen. Syntax is **CLS**

### **REN**

This command is used to change/modify the name of a file or files.

### **DIR**

This command displays a list of files and subdirectories in a directory.

### **VER**

This command displays the version of the Microsoft Windows running on your computer.

**MD (or MKDIR)** command stand for make directory and it is used to create a directory. Syntax is **MD [drive:]path**

**CD (or CHDIR)** stands for create or change directory and it allows to display the name of or change the current directory or rather we can say come out of a directory.

**RD (or RMDIR)** command removes or deletes a directory.

## **External DOS Commands**

### **EDIT**

This command is used to modify or change the data of a file.

### **DISKCOPY**

This command copies the contents of one floppy from the source drive to a formatted or un-formatted floppy disk in the destination drive.

### **CHKDSK**

This command is used to check a disk and display a status report with properties of disk like serial number, volume label, memory and other properties along with errors on the disk if any.

This command is generally used to edits command lines and recalls commands.

### **FORMAT**

This command creates a new root directory and a File Allocation Table (FAT) for the disk. In order for MS-DOS to be able to use a new disk you must use this command to format the disk.

### **What is Windows?**

Windows is a **graphical operating system** developed by Microsoft. It allows users to view and store files, run the software, play games, watch videos, and provides a way to connect to the internet. It was released for both home computing and professional works. Microsoft introduced the first version as 1.0

## **What is Taskbar**

The Windows taskbar is **an element of a graphical user interface for the Windows operating system used for various purposes**. It shows the running programs on your system. The design and layout of a taskbar vary according to Windows versions.

## **What is Start Menu**

The Start menu is **a graphical user interface element used in Microsoft Windows since Windows 95 and in other operating systems**. It provides a central launching point for computer programs and performing other tasks in the Windows shell. It is named Start screen in Windows 8.

## **The Purpose Of The Recycle Bin**

The Recycle Bin **acts a 'holding bay' for deleted items, such as files and folders** (and even shortcuts!). When you delete a file or folder, it is not deleted from your computer permanently. Instead, Windows 7 places the deleted items into the Recycle Bin.

## **What is the use of calculator?**

A Calculator is an electronic hardware device or software capable of **performing mathematical calculations, such as addition, multiplication, subtraction, or division**.

## **What is the use of Notepad?**

Microsoft Notepad is a word processing tool included with Windows. You can use it **to create a log-type file that adds the current date and time each time the Notepad file is opened**.

## **What is the use of Paint?**

Microsoft Paint is **a simple raster graphics editor** that has been included with all versions of Microsoft Windows. The program opens and saves files in BMP, JPEG, GIF, PNG, and single-page TIFF formats.

## **What is the use of Wordpad?**

WordPad is a basic text-editing app you can use to **create and edit files, include text with different fonts and colors, insert pictures, and add links to other files**.

**What is the use of Character Map?**

Character Map is a utility included with Microsoft Windows operating systems and is used **to view the characters in any installed font, to check what keyboard input (Alt code) is used to enter those characters, and to copy characters to the clipboard.**

**What is the use of Windows Explorer?**

Microsoft Windows Explorer is a **graphical file management utility for the Windows operating system (OS)**. Windows Explorer was introduced with Windows 95 and later renamed File Explorer. Each time that a computer user accesses a disk or opens a folder containing files, they are using the Windows/File Explorer utility.

**What is the use of System Tools?**

It is **used for conversion of assembly or machine code to high-level programming language**. Assembler: Assembler is embedded system tool used for translating a computer instruction written in assembly language into a pattern of bits which is used by the computer processor for performing its basic operations.

**What is sharing information between programs**

Office can convert data or text from one format to another using a technology known as **object linking and embedding (OLE)**. OLE allows you to move text or data between programs in much the same way as you move them within a program. All Office programs have special ways to move information from one program to another, including importing, exporting, embedding, linking, and hyperlinking.

## Unit – II

### **What is Microsoft Office?**

Microsoft Office or MS Office Suite is **an all-in-one package of several programs that help us perform most office-related tasks, such as creating documents, spreadsheets, presentations, databases, etc.**

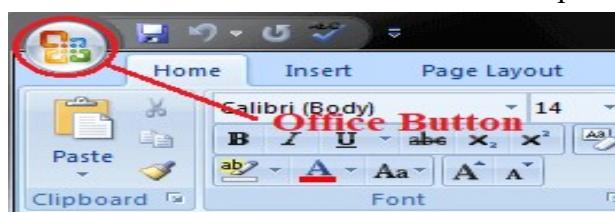
### **What is Microsoft Word?**

Microsoft Word is word processing software. It is developed by Microsoft and is part of Microsoft Office Suite. It enables you to create, edit and save professional documents like letters and reports.

### **Office Button**

The office button is an essential element of Microsoft Office Suite 2007. It displays some useful options to open, save, print any document, or perform other common functions.

- **New:** This option allows us to create a new, blank file in the corresponding Office program, such as MS Word, MS Excel, PowerPoint, etc.
- **Open:** This option allows us to open an existing file from the local storage on our computer.
- **Save:** This option allows us to permanently save a temporary file to our computer after finishing the work.
- **Save As:** This option allows us to save a copy of the active file with the desired file name and file extension to a desired location on the computer storage.
- **Print:** This option allows us to take a hard copy of the desired document on paper through a printer.
- **Send:** This option enables us to send or share the desired files directly through the opened Office program with others.
- **Close:** This option helps us to close an active document in a corresponding Office program.



### **Quick Access Toolbar**

It is a customizable toolbar that comes with a set of independent commands. It gives you quick access to commonly used commands such as Save, Undo, Redo, etc.

When you click the drop-down arrow next to toolbar it offers more commands. With a left click you can add any of these commands to Quick Access Toolbar. You can also remove the commands added to the tool bar.



**Undo** - (Ctrl + Z). Allows you to undo changes, even after you have saved the document, as long as you are within the undo limits. By default Office saves the last 100 undoable actions.

**Redo** - (Ctrl + Y). Allows you to redo several actions at the same time using the drop-down. The Redo button only appears after you've undone an action.

## Title Bar

It displays the title of the currently open document or application. It is present on almost all windows displayed on your computer.

## Ribbon and Tabs

It is located below the Quick Access Toolbar and the Title Bar. It comprises seven tabs; Home, Insert, Page layout, References, Mailing, Review and View. Each tab has specific groups of related commands. It gives you quick access to the commonly used commands that you need to complete a task.



## Ruler:

The Ruler is located below the Ribbon around the edge of the document. It is used to change the format of the document, i.e. it helps you align the text, tables, graphics and other elements of your document.

## Home Tab:

The Home tab is the default tab in Microsoft Word. It has five groups of related commands; Clipboard, Font, Paragraph, Styles and Editing. It helps you change document settings like font size, adding bullets, adjusting styles and many other common features.

The groups on the Home Tab are as follows:

- ❖ Clipboard

- ❖ Font
  - ❖ Paragraph
  - ❖ Styles
  - ❖ Editing
- Clipboard
1. Cut (Ctrl+X) - This option is used to cut selected content and save it in the clipboard.
  2. Copy (Ctrl+C) - This option is used to copy selected content and save it to the clipboard.
  3. Paste (Ctrl+V) - This option is used to access cut or copied content in the same file or new file.
  4. Format Painter (Ctrl+Shift+C) - Through this option, we can copy the format of any text and access the new text.

## ➤ Font Group



**Font** - (Ctrl + Shift + F). - Provides a list of all the available fonts (based on your current printer selection).

**Font Size** - (Ctrl + Shift + P). Lets you adjust the character size (based on your current printer selection).

Drop Down list Min font Size = 8 and Max Size = 72) Max Size is = 1938

**Increase Font Size** - (Ctrl + Shift + >). Increases the font size of the current selection to the next larger size in the Font Size box.

**Decrease Font Size** - (Ctrl + Shift + <). Decreases the font size of the current selection to the next smaller size in the Font Size box.

**Change Case** - Drop-Down. Changes the selected text to either uppercase, lowercase or another type of capitalisation. The drop-down contains the commands: Sentence Case, Lowercase, Uppercase, Capitalize Each Word and Toggle Case.

**Clear All Formatting** - (Ctrl + Spacebar). Clears all the formatting from the current selection.

**Bold** - (Ctrl + B). Toggles bold on the current selection.

**Italic** - (Ctrl + I). Toggles italics on the current selection.

**Underline** - (Ctrl + U). Button with Drop-Down. The button toggles bold on the current selection. The drop-down contains the commands: Underline, Double Underline, Thick Underline, Dotted Underline, Dashed Underline.

**Strikethrough** - Draws a line through the middle of the selected text.

**Subscript** - (Ctrl + =). Converts the selection to small letters below the text baseline.

**Superscript** - (Ctrl + Shift + +). Converts the selection to small letters above the text baseline.

**Text Effects and Typography** - Drop-Down. Apply text effects such as Outline, Shadow, Reflection, Glow, Number Styles, Ligatures and Stylistic Sets.

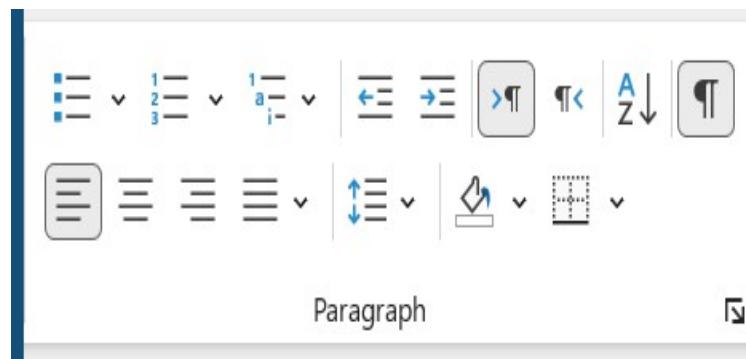
**Text Highlight Color** - Button with Drop-Down. Shades the background behind the current selection. The drop-down contains the commands: No Color and Stop Highlighting.

**Font Color** - Button with Drop-Down. The button changes the colour of the font of the current selection. The drop-down contains the commands: Automatic, Theme Colors, Standard Colors and More Colors.

## Paragraph

This group provides access to all the Paragraph Formatting commands.

You can quickly display the "Paragraph" dialog box, Indents and Spacing Tab, by clicking on the dialog box launcher in the bottom right corner of this group.



**Bullets** - Button with Drop-Down. The button toggles single level bullets from the selected paragraphs. The drop-down contains the commands: Recently Used Bullets, Bullet Library, Document Bullets, Change List Level and Define New Bullet.

**Numbering** - Button with Drop-Down. The button toggles single level numbering from the selected paragraphs. The drop-down contains the commands: Recently Used Numbering, Change List Level, Define New Number Format and Set Numbering Value.

**Multilevel List** - Drop-Down. The drop-down contains the commands: Current List, List Library, Change List Level, Define New Multilevel List and Define New List Style. A multilevel list shows the list of items at different levels, rather than just at one level.

**Increase Indent** - Increases the indent by 1. (Ctrl+M)

**Decrease Indent** - Decreases the indent by 1 or removes the indent completely. (Ctrl+Shift+M)

**Sort** - Displays the "Sort Text" or "Sort" dialog boxes allowing you to sort paragraphs of text or text within tables. If your current selection is not in a table then the "Sort Text" dialog box is displayed. If the current selection is in a Table then the "Sort" dialog box is displayed.

**Show/Hide Paragraph Marks** - (Ctrl + \*). Toggles the display of paragraph marks and other hidden formatting.

**Align Left** - (Ctrl + L). Aligns text to the left.

**Center** - (Ctrl + E). Aligns text to the center.

**Align Right** - (Ctrl + R). Aligns text to the right.

**Justify** - (Ctrl + J). Aligns text to both left and right margins adding extra space between words where necessary.

**Line Spacing** - Drop-Down. The drop-down contains the commands: 1.0, 1.15, 1.5, 2.0, 2.5, 3.0, Line Spacing Options, Add Space Before Paragraph and Add Space After Paragraph. The Line Spacing Options command displays the "Paragraphs" dialog box (Indents and Spacing tab). The default line spacing is 1.15.

**Shading** - Button with Drop-Down. The button applies the selected shading to the current selection. The drop-down contains the commands: Theme Colors, Standard Colors, No Color and More Colors.

**Border** - Button with Drop-Down. The button applies the selected border to the current selection. The drop-down contains the commands: Bottom Border, Top Border, Left Border, Right Border, No Border, All Borders, Outside Borders, Inside Borders, Inside Horizontal Border, Inside Vertical

Border, Diagonal Down Border, Diagonal Up Border, Horizontal Line, Draw Table, View Gridlines and Borders and Shading.

## Styles

You can quickly toggle the display of the Styles Task Pane by clicking on the dialog box launcher in the bottom right corner of this group.



## Editing



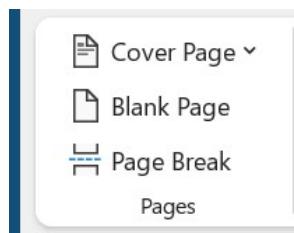
**Find** - Button with Drop-Down. The button displays the "Find and Replace" dialog box and displays the Find tab. The drop-down contains the commands: Find and GoTo.

**Replace** - This displays the "Find and Replace" dialog box and displays the Replace tab.

**Select** - Drop-Down. The drop-down contains the commands: Select All, Select Objects and Select Text with similar Formatting. The Select Text will select text with similar formatting.

## Insert Tab

### Pages



**Cover Page** - Microsoft Word offers a gallery of convenient pre-designed cover pages to accent your resume. Choose a cover page and replace the sample text with your own. The list of built-in cover pages is Alphabet, Annual, Contrast, Mod, Motion, Stacks, Tiles etc.

**Blank Page** - Inserts a blank page by inserting two page breaks, one above the current insertion point and one below it.

**Page Break** - (Ctrl + Enter). Inserts a page break instead of displaying the Breaks dialog box.

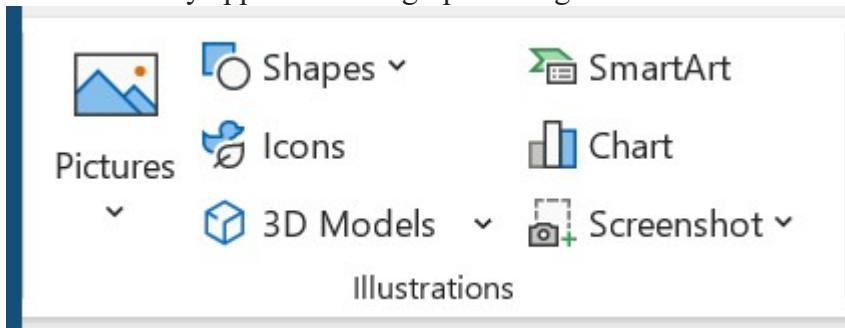
## Tables

The maximum size you can drag is (10 by 8). The drop-down contains the commands: Insert Table, Draw Table, Convert Text to Table, Excel Spreadsheet and Quick Tables.

The Insert Table displays the "Insert Table" dialog box. The Draw Table lets you create a table by inserting horizontal and vertical lines using the mouse. The Convert Text to Table displays the "Convert Text to Table" dialog box. The Excel Spreadsheet command inserts an Excel worksheet into the document.

## Illustrations

The Microsoft Illustrations group allows you to insert pictures, shapes, smart art, and charts into your document. These options will enhance the layout and appearance of your documents. Drawing Tools and Picture Tools tabs only appear when a graphic image is selected.



In MS Word we have the following under Illustrations

- Pictures
- Shapes
- SmartArt
- Chart

### Pictures

Pictures are images taken by a camera; follow the steps below to insert and format a picture. Click on the Insert Tab on the MS Word Ribbon and select Pictures under illustrations

A pop up window ask for the directory in which your pictures has been saved. In other words which folder did you save your pictures. Select any picture and click on insert.

### Shapes

The Shapes option allows you to insert a variety of shapes on to your document, such as rectangles, circles, arrows, lines, flowchart symbols, and callouts. From the Insert ribbon, add a shape to your document from the multiple selections:

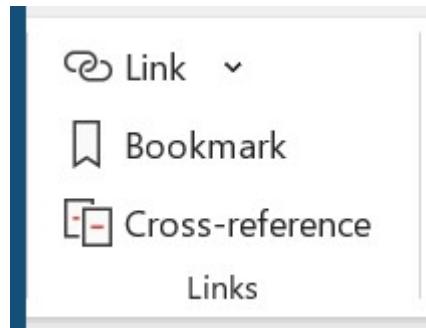
### **SmartArt**

SmartArt allows you to change graphic images into visual communication information including graphical lists, process diagrams, organizational charts, etc.

### **Chart**

To compare data you are able to utilize the chart option. This is similar to the Excel chart feature.

## **Links**



### **Link/Hyperlink**

You can add hyperlinks to your document that give your readers instant access to information in another part of the same document. The hyperlink can be text or graphics. By using hyperlinks, you can provide information to your readers without repeating the same information on different pages.

### **Bookmark**

A bookmark in Word works like a bookmark you might place in a book: it marks a place that you want to find again easily. You can enter as many bookmarks as you want in your document or Outlook message, and you can give each one a unique name so they're easy to identify.

### **Cross Reference**

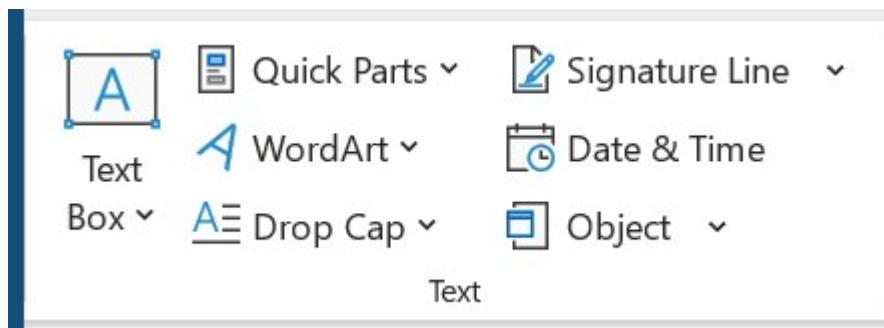
A cross-reference allows you to link to other parts of the same document. For example, you might use a cross-reference to link to a chart or graphic that appears elsewhere in the document.

## Header & Footer



A header is text that is placed at the top of a page, while footer is placed at the bottom, or foot, of a page. Typically these areas are used for inserting document information, such as the name of the document, the chapter heading, page numbers, creation date and the like.

## Text



## Text Box

A text box is an object you can add to your document that lets you put and type text anywhere in your file. Text boxes can be useful for drawing attention to specific text and can also be helpful when you need to move text around in your document.

## Quick Parts

Use the Quick Parts Gallery in Word and Outlook to create, store, and find reusable pieces of content, including AutoText, document properties such as title and author, and fields.

## Word Art

WordArt is a gallery of text styles that you can add to your publications to create decorative effects, such as shadowed or mirrored (reflected) text. You can use WordArt to add special text effects to your document.

## Drop Cap

A drop cap (dropped capital) is a large capital letter used as a decorative element at the beginning of a paragraph or section. The size of a drop cap is usually two or more lines.

## Signature Line

Your handwritten signature gives your document a personal touch. You can scan your signature and store it as a picture to insert in the document. You can also insert a signature line to indicate where a signature should be written.

## Date & Time

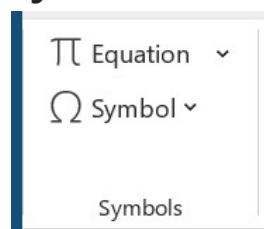
### Insert a date that updates automatically

If you'd like the date to be updated every time someone opens the document, you can insert the date as a field. On the Insert tab, in the Text group, click Date & Time. In the Date and time dialog box, select the format you want.

## Object

An object is a combination of data and the application needed to modify that data. You can thus embed objects in or link them to documents created with a different application. For instance, an Excel spreadsheet can be embedded within a Microsoft Word document using OLE.

## Symbols



## Equation

In MS Word you can insert different types of mathematical symbols or text by using the equations tools. Microsoft Word uses the Equation Editor to create multiple mathematical equations, which include fractions, integrations, matrices, mathematical symbols, etc.

## Symbol

Use the Symbol dialog box to locate symbols, characters from other languages, arrows, and other characters. Symbols inserted into documents can then be formatted as regular text.

## Page Layout Tab

The *Page Layout Tab* lets you control the look and feel of your document in Microsoft Word. You can apply a global design to your document by using one of the available themes and color schemes. You can also change the document orientation, page size, margins, indentation, line spacing and paragraph settings.



### Themes Group

A style is a predefined combination of font style, color, and size of text that can be applied to selected text. A theme is a set of formatting choices that can be applied to an entire document and includes theme colors, fonts, and effects.

### Page Setup Group

#### Margins

Margins are the blank spaces that line the top, bottom, and left and right sides of a document. They are important because they help make a document look neat and professional.

#### Orientation

Word offers two page orientation options: landscape and portrait - Landscape means the page is oriented horizontally. Portrait means the page is oriented vertically.

## **Size**

Word's default paper size is "Letter," which is 8.5 x 11 inches. If you use a different size more frequently than the default, you can change the default size of all new documents. This way, you won't have to change the paper size of each new document you create.

## **Columns**

Columns can help improve readability with certain types of documents—like newspaper articles, newsletters, and flyers. Word also allows you to adjust your columns by adding column breaks.

## **Breaks**

When you're working on a multi-page document, there may be times when you want to have more control over how exactly the text flows. Breaks can be helpful in these cases. There are many types of breaks to choose from depending on what you need, including page breaks, section breaks, and column breaks etc.

## **Line**

Word can automatically count the lines in a document and display the appropriate number beside each line of text. This is useful when you need to refer to specific lines in a document, such as a script or a legal contract.

## **Hyphenation**

You can have Word hyphenate your text automatically as you type your text, or later, in one pass. You can also use manual hyphenation to have Word make hyphenation suggestions. Automatic hyphenation is quicker and easier

## **Page Background Group**

Watermark is used to indicate the purpose of a document such as CONFIDENTIAL, DO NOT COPY, DRAFT, ASAP, URGENT, SAMPLE, etc.

### **Page Color**

In MS Word there is a special feature called Page Color in which you can add color to the pages of your document. It has a range of beautiful colors. Also, you can customize your own background color. Adding page color makes your document more attractive and beautiful.

### **Page Border**

A page border gives a border around the page or a border around the text on the page.

### **Paragraph Group**

This group is set of left or right indent and set after or before spacing of document.

### **Arrange**

You can arrange all open windows in Word if you have multiple document windows open. Doing this lets you organize them, so you can view the contents of each at the same time. You have many different window arrangement options available in Word.

## References Tab

It contains resources for researchers and anyone in the professional field. The References Tab allows you to now create a table of contents, footnotes, cross-references, and so on.

### Table of Contents Group

The table of contents is a snapshot of the headings and page numbers in your document, and does not automatically update itself as you make changes. At any time, you can update it by right-clicking on it and selecting Update field.

Endnote (Alt+Ctrl+D) - Use footnotes and endnotes to explain, comment on, or provide references to something in a document. Usually, footnotes appear at the bottom of the page, while endnotes come at the end of the document or section.

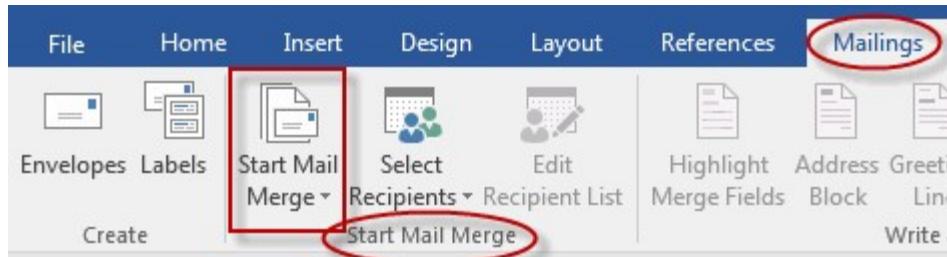
## Mailings Tab

### How to Use Mail Merge in Microsoft Word

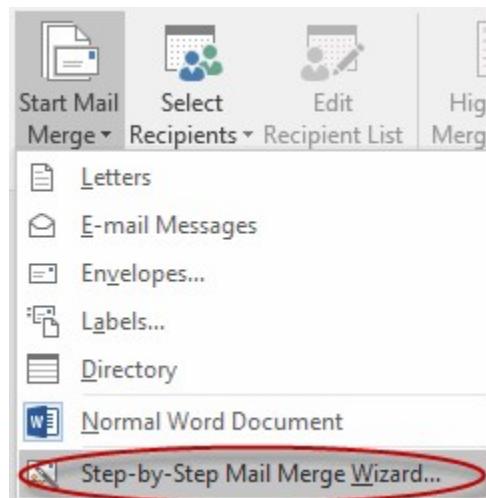
Mail Merge is most often used to print or email form letters to multiple recipients. Using Mail Merge, you can easily customize form letters for individual recipients. Mail merge is also used to create envelopes or labels in bulk.

This feature works the same in all modern versions of Microsoft Word: 2010, 2013, and 2016.

1. In a blank Microsoft Word document, click on the **Mailings** tab, and in the **Start Mail Merge** group,
2. click **Start Mail Merge**.



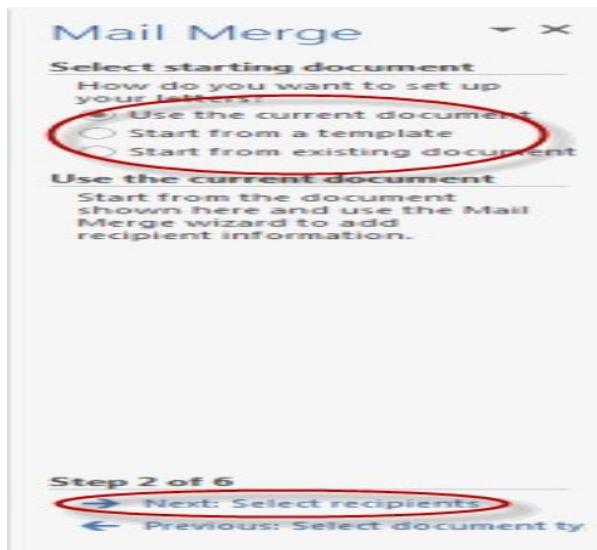
3. Click **Step-by-Step Mail Merge Wizard**.



4. Select your document type. In this demo we will select **Letters**. Click **Next: Starting document**.

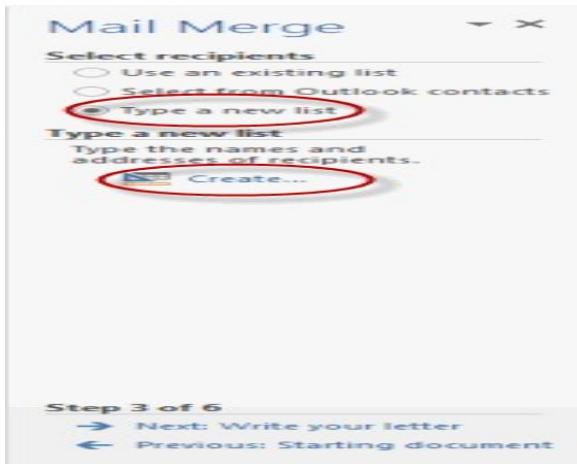


5. Select the starting document. In this demo we will use the current (blank) document. Select **Use the current document** and then click **Next: Select recipients**

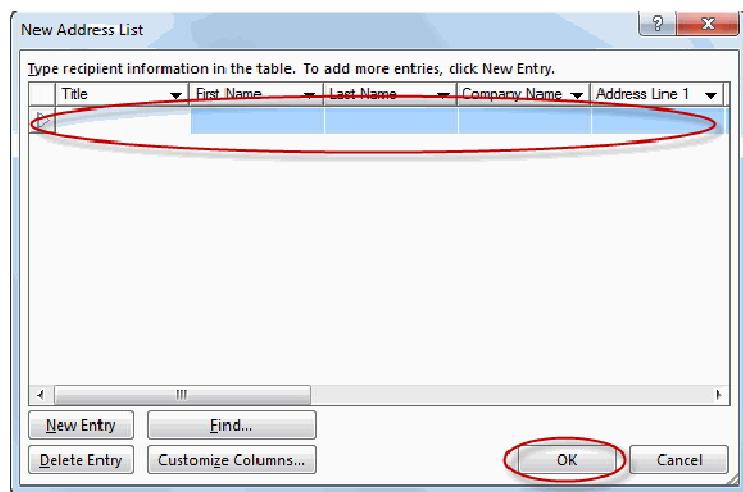


Note that selecting **Start from existing document** (which we are not doing in this demo) changes the view and gives you the option to choose your document. After you choose it, the Mail Merge Wizard reverts to **Use the current document**.

6. Select recipients. In this demo we will create a new list, so select **Type a new list** and then click **Create**.

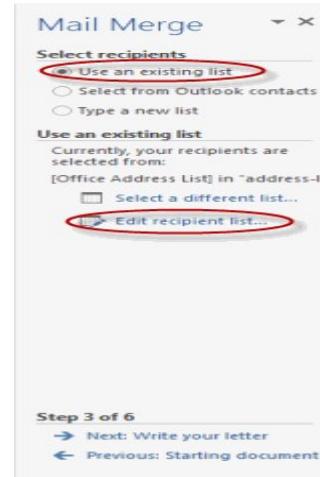


Create a list by adding data in the **New Address List** dialog box and clicking **OK**.

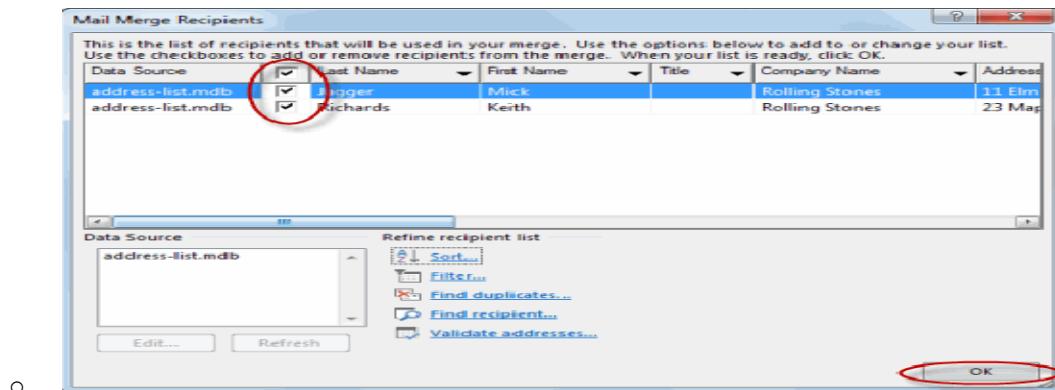


Save the list.

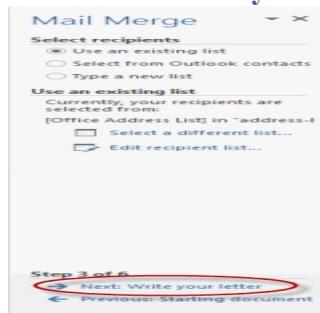
Note that now that a list has been created, the Mail Merge Wizard reverts to **Use an existing list** and you have the option to edit the recipient list.



- Selecting **Edit recipient list** opens up the **Mail Merge Recipients** dialog box, where you can edit the list and select or unselect records. Click **OK** to accept the list as is.



- Click **Next: Write your letter**.

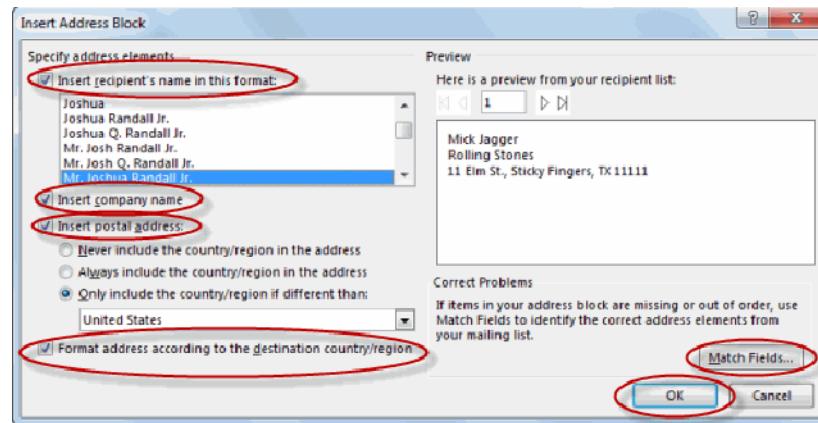


- Write the letter and add custom fields.

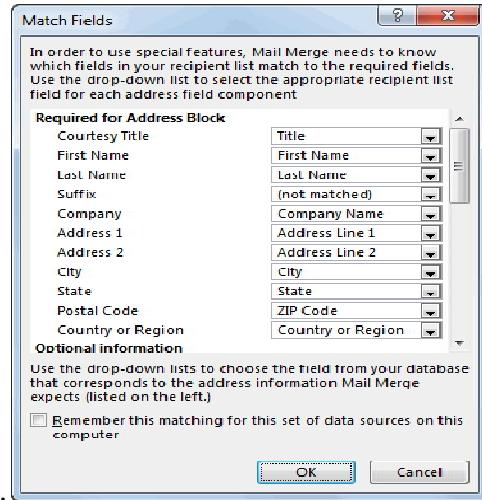
- Click **Address block** to add the recipients' addresses at the top of the document.



- In the **Insert Address Block** dialog box, check or uncheck boxes and select options on the left until the address appears the way you want it to.



- Note that you can use **Match Fields** to correct any problems. Clicking **Match Fields** opens up the **Match Fields** dialog box, in which you can associate the fields from your list with the fields required by the wizard

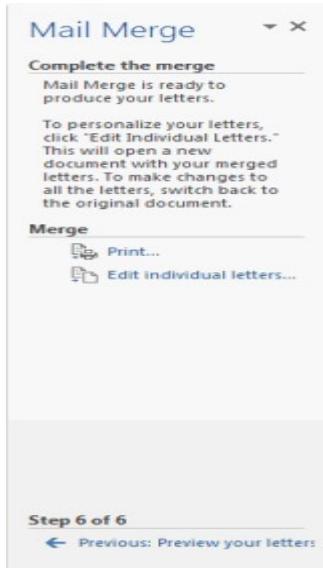


8. Press **Enter** on your keyboard and click **Greeting line...** to enter a greeting.



9. In the **Insert Greeting Line** dialog box, choose the greeting line format by clicking the drop-down arrows and selecting the options of your choice, and then click **OK**.
10. Note that the address block and greeting line are surrounded by chevrons (« »). Write a short letter and click **Next: Preview your letters**.
- Preview your letter and click **Next: Complete the merge**.
  -

- Click **Print** to print your letters or **Edit individual letters** to further personalize some or all of the Letters



## **Review Tab**

Review Tab is for proofing your document and providing possibilities for seeking feedback on your final edits.

### **Proofing Group**

Spelling & Grammar (F7) - If Word finds a potential error, the Spelling & Grammar dialog box will open, spelling errors will be shown as red text, and grammatical errors will be shown as green text.

Research - Helps you research topics, find reliable sources, and add content with citations all within Word.

Thesaurus - You can look up synonyms (different words with the same meaning) and antonyms (words with the opposite meaning)

Translate - When you open a document in a language other than a language you have installed in Word, Word will intelligently offer to translate the document for you.

Word Count - Word counts the number of words in a document while you type. Word also counts pages, paragraphs, lines, and characters. When you need to know how many words, pages, characters, paragraphs, or lines are in a document, check the status bar.

### **Comments Groups**

New Comments - Comments can be added to a document that does not change the document. You can insert a comment inside balloons that will appear in the document margins. They can also be hidden until you want to edit your paper.

### **Compare Group**

You can compare two versions of a document to see how they differ. You can also merge two versions of the same document into one new document. In both cases, Word shows the differences with revision marks. Open one of the two versions of the document that you want to compare.

## Protect Document Group

You can protect a document from being viewed by an unauthorized user, by using a password, which combine upper and lowercase letters, numbers, and symbols.

## View Tab

The View tab enables you to switch between Normal or Master Page, and Single Page or Two-Page Spread views. This tab also gives you control over showing boundaries, rulers, and other layout tools, zooming the size of your view of the publication, and managing Publisher windows you have open.

## Document Views Group



### Print Layout View

This is the default view you'll find yourself in when opening a document. This view is best used when your document will contain things like images, headers, and footers, columns, etc. Each of these components will be visible. In this view you can see how the document will print according to its page breaks.

### Full Screen Reading View

Full Screen Reading view is optimized for reading a document on the computer screen. In Full Screen Reading view, you also have the option of seeing the document as it would appear on a printed page. You should view the document in full screen reading view to maximise the space available for reading or commenting on the document.

### Web Layout View

Use web layout view to view the document as it would look like as a web page. In this view you can see the background, text is wrapped to fit the window, and images appear as they would online.

### **Outline View**

Using outline view you can view the document as an outline and show the outlining tools. This is useful if you are moving sections of your document, or creating an outline.

### **Draft View**

Use draft view to view the document as a draft, to enable you to quickly edit the text. Certain elements of the document, such as headers and footers, will not be visible in this view.

### **Show and Hide Group**

### **Ruler**

The ruler bar is used as a measuring tool for adjusting indents, the tabs and the width of margins for a document.

### **Document Map**

The document map in Word is a useful aspect that enables easy navigation in long documents. You can find your way in the document using the headings or pages.

### **Gridlines**

Gridlines help give you visual cues when you're formatting in Office.

### **Thumbnails**

A thumbnail is a miniature representation of a page or image that is used to identify a file by its contents.

### **Zoom Group**

You can zoom in to get a close-up view of your file or zoom out to see more of the page at a reduced size. You can also save a particular zoom setting. We can set one page, two page and

page width. Min. zoom percentage 10% and Max percentage 500% or by default zoom percentage 100%.

### **Window group**

The commands for managing multiple documents, views, and windows are in the View tab's Window group. In the Window group, the three commands on the left New Window, Arrange All, and Splitlet you open and view your work from multiple vantage points.

### **Macro group**

Allow you to automate frequently used formatting settings. Macros are especially useful when you find yourself making the same formatting changes over and over again to multiple documents. Rather than repeat all of those steps every single time, a macro allows you to record the steps and then execute all of them at once using a single button or keyboard command.

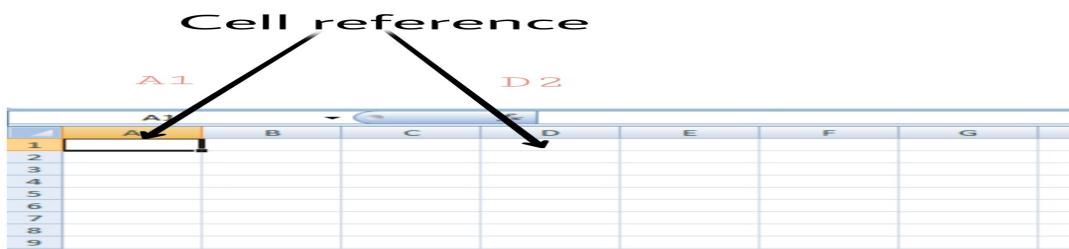
## Introduction to MS-Excel

**MS-EXCEL** is a part of Microsoft Office suite software. It is an electronic spreadsheet with numerous rows and columns, used for organizing data, graphically represent data(s), and performing different calculations. It consists of 1048576 rows and 16384 columns, a row and column together make a cell. Each cell has an address defined by column name and row number example A1, D2, etc. this is also known as a cell reference.

**Cell references:** The address or name of a cell or a range of cells is known as Cell reference. It helps the software to identify the cell from where the data/value is to be used in the formula.

There are three types of cell references in Excel:

1. Relative reference.
  2. Absolute reference.
  3. Mixed reference.
- 1- Relative Reference - A cell reference is a relative reference, which means that **the reference is relative to the location of the cell**. If, for example, you refer to cell A2 from cell C2.



- 2- Absolute Reference - Absolute references are **used when you want to fix a cell location**. These cell references are preceded by a dollar sign. By doing this, you are fixing the value of a particular cell reference.
- 3- Mixed Reference - A mixed reference in Excel is **a type of cell reference different from the other two absolute and relative**. We only refer to the cell's column or row in the mixed cell reference. So, for example, in cell A1 if we want to refer to only the A column, the mixed reference would be \$A1.

## Worksheets

In Excel, Worksheets are kind of like sheets of paper in a notebook with graph paper. Each worksheet has its own grid full of “Cells.” A Cell is a container for data and each little rectangle you see in the worksheet is a cell. Cells are organized by columns (A, B, C, ...) and rows (1, 2, 3, ...).

- Number of Rows per Worksheet: **1,048,576**
- Number of Column per Worksheet: **16,384**
- Total cells per Worksheet: **17,179,869,184**

A collection of cells is called a Cell Range.

## Workbook

An Excel workbook is a collection of worksheets that stores the data inside rows and columns. A new Excel workbook is default named as **Book1** (see at the top of the Excel).

### What is a Row?

A row is a horizontal data record stored in a table. Each row has a unique number, starting from 1.

### What is a Column?

A column is a vertical data record stored in a table. Each column has a unique number, starting from the letter A.

## Formula Bar

The Formula Bar is an area to display a cell’s data. If the cell uses a formula, it will display the formula; if not, it will show the value.

## What is the Formula in Excel?

One essential point to note while using the formulas in Excel is that we must always start them with an equal sign (=). If we don't start the formulas with an equal sign, they are not treated as formulas but only as a text string.

## The Difference between a Formula and Function

An Excel formula is a statement or an equation structured manually by a user to perform any calculation. At the same time, the Excel function is the pre-defined calculation in the spreadsheet program. We can use more than one function in a formula.

**Example of Formula:** =A1+A2+A3

**Example of Function:** =SUM(A1:A3)

### Syntax of IF Function

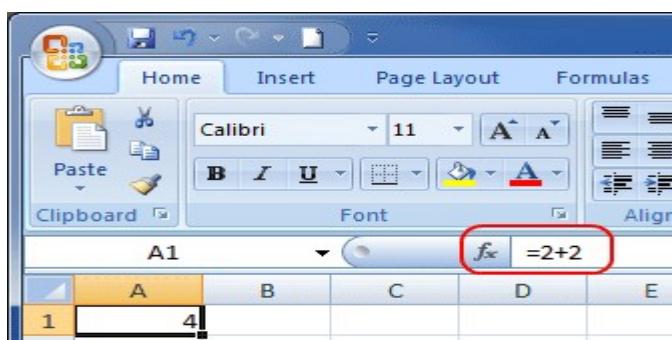
The syntax of the Excel IF function is defined as below:

=IF(logical\_test, value\_if\_true, value\_if\_false)

Where, the 'logical\_test', 'value\_if\_true', and 'value\_if\_false' are the three parts or arguments in the IF function.

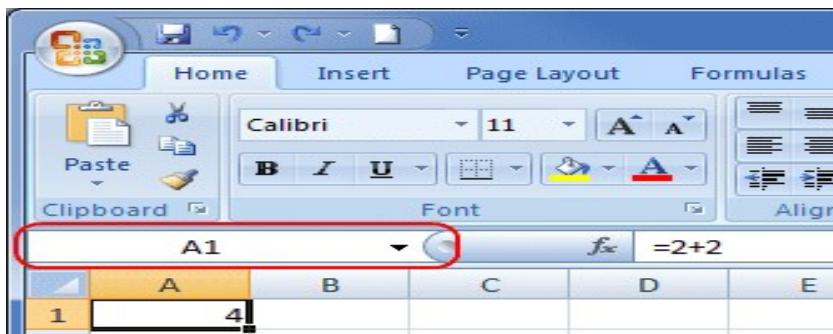
Based on the above syntax, the general format of the Excel IF function is defined as below:

=IF(A1>B2, "TRUE", "FALSE")

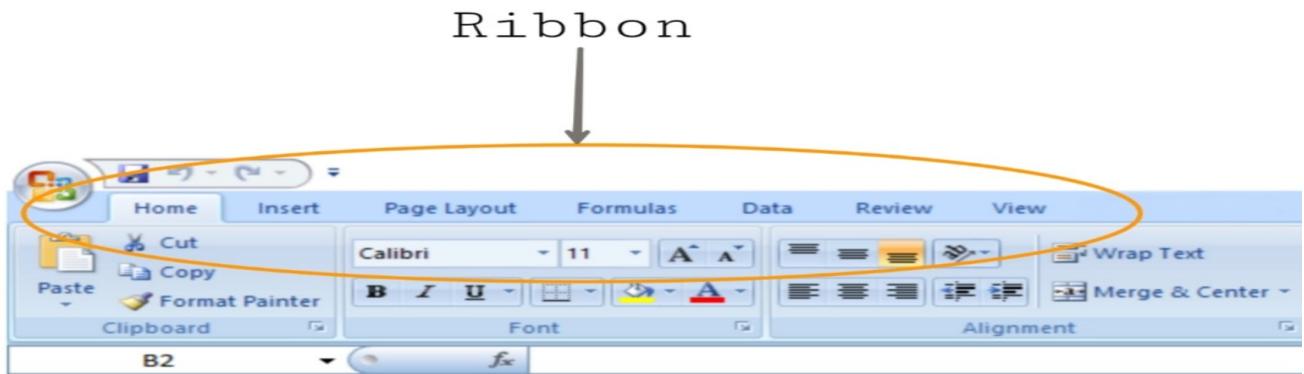


**Name Box**

Finally, we come to the Name Box. Located just to the left of the Formula Bar, the Name Box displays a reference to the selected cell. The Name Box will also display a “Named Range” if a cell range was given a name.



**The Ribbon** in MS-Excel is the topmost row of tabs that provide the user with different facilities/functionalities. These tabs are:



1. **Home Tab:** It provides the basic facilities like changing the font, size of text, editing the cells in the spreadsheet, autosum, etc.
2. **Insert Tab:** It provides the facilities like inserting tables, pivot tables, images, clip art, charts, links, etc.
3. **Page layout:** It provides all the facilities related to the spreadsheet-like margins, orientation, height, width, background etc. The worksheet appearance will be the same in the hard copy as well.
4. **Formulas:** It is a package of different in-built formulas/functions which can be used by user just by selecting the cell or range of cells for values.
5. **Data:** The Data Tab helps to perform different operations on a vast set of data like analysis through what-if analysis tools and many other data analysis tools,

removing duplicate data, transpose the row and column, etc. It also helps to access data(s) from different sources as well, such as from Ms-Access, from web, etc.

6. **Review:** This tab provides the facility of thesaurus, checking spellings, translating the text, and helps to protect and share the worksheet and workbook.
7. **View:** It contains the commands to manage the view of the workbook, show/hide ruler, gridlines, etc, freezing panes, and adding macros.

### **Excel Shortcuts**

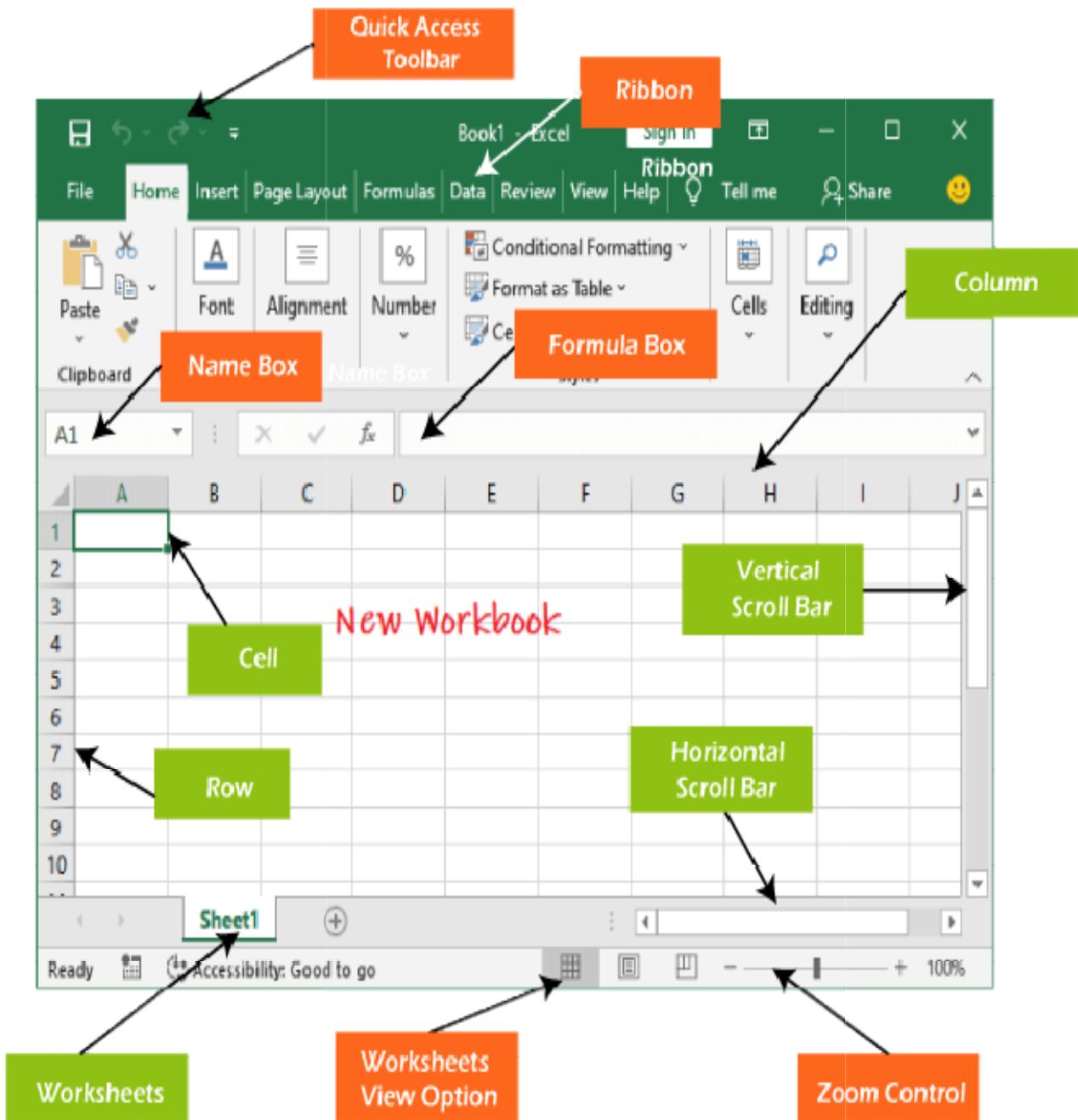
Action/ Description	Shortcut Key(s)
Shift + F11	It is used to <b>create a new worksheet</b> .
Shift + F3	It is used to <b>launch an insert function dialog</b> .
Ctrl + F	It is used to <b>launch a 'Find and Replace' dialog</b> where the find tab is a default selected tab.'
Ctrl + K	It is used to <b>launch the insert/ edit hyperlink dialog</b> .
Shift + Space	It is used to <b>select the row of the table</b> .
Ctrl + Space	It is used to <b>select the column of the table</b> .
Ctrl + W	It is used to <b>close a workbook</b> .
Ctrl + F4	It is used to <b>close Excel</b> .
Ctrl + Z	It is used to <b>undo the applied/ previous changes</b> when the file has not been closed.
Ctrl + Y	It is used to <b>redo the applied/ previous changes</b> when the file has not been closed.

### **Microsoft Excel Features**

1. **AutoFormat:** It allows the Excel users to use predefined table formatting options.
2. **AutoSum:** AutoSum feature helps us to calculate the sum of a row or column automatically by inserting an addition formula for a range of cells.
3. **List AutoFill:** It automatically develops cell formatting when a new component is added to the end of a list.
4. **AutoFill:** This feature allows us to quickly fill cells with a repetitive or sequential record such as chronological dates or numbers and repeated documents. AutoFill can also be used to copy functions. We can also alter text and numbers with this feature.
5. **AutoShapes:** AutoShapes toolbar will allow us to draw some geometrical shapes, arrows, flowchart items, stars, and more. With these shapes, we can draw our graphs.
6. **Wizard:** It guides us to work effectively while we work by displaying several helpful tips and techniques based on what we are doing. Drag and Drop feature will help us to reposition the record and text by simply dragging the data with the help of the mouse.
7. **Charts:** This feature will help you to present the data in graphical form by using Pie, Bar, Line charts, and more.
8. **PivotTable:** It flips and sums data in seconds and allows us to execute data analysis and generating documents like periodic financial statements, statistical documents, etc. We can also analyze complex data relationships graphically.
9. **Shortcut Menus:** The shortcut menu helps users to make the work done through shortcut commands that need a lengthy process.

### **Zoom Control**

To use a **Zoom control**, click and drag the **slider**. The number to the right of the slider reverse the **zoom percentage**. It presents at the bottom right corner of the Excel worksheet.

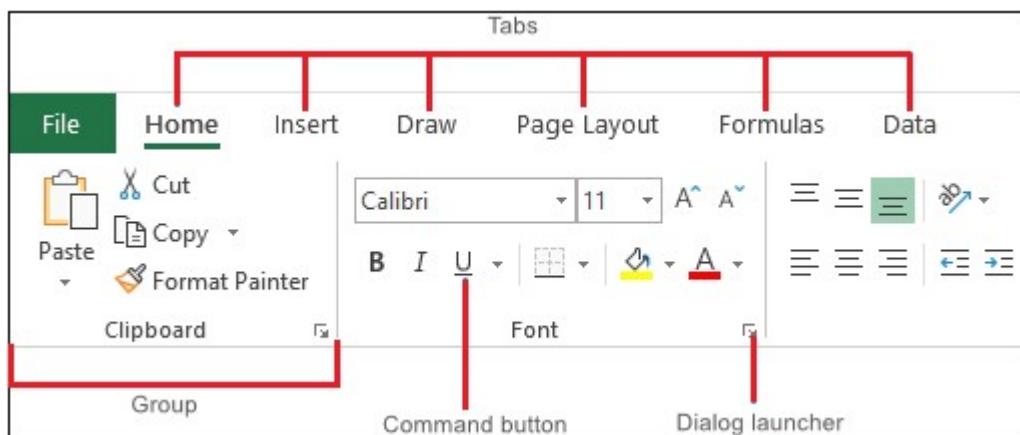


## Ribbon and Tabs in Excel

**Excel ribbon** is the row of tabs and icons at the top of the Excel window that allows you to find, understand and use commands for completing a certain task. Excel ribbon is the primary interface that contains every command and feature. The Ribbon has multiple display options according to your preferences. (Ribbon hide short cut key= Ctrl+F1)

In Excel Ribbon, the buttons and icons are grouped into different tabs based on the category of their functionalities. It contains seven tabs: **Home**, **Insert**, **Page Layout**, **Formulas**, **Data**, **Review**, and **View**.

Each tab has its specific groups of related commands. These groups have several additional commands that can view by clicking the arrow at the right bottom corner of any group.



In Excel, the Ribbon is made up of these four basic components, such as:

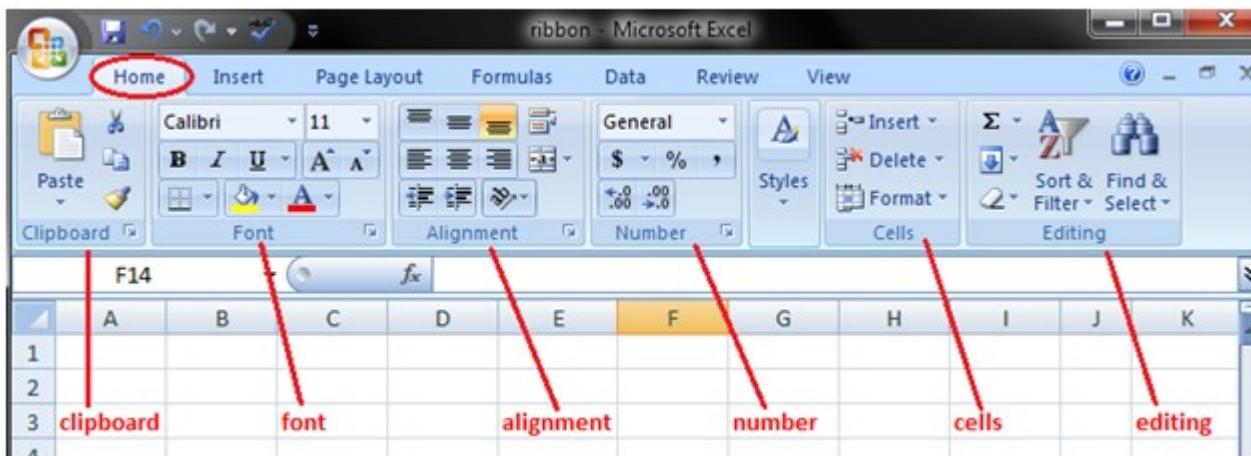
1. **Ribbon tab:** It contains multiple commands logically subdivided into groups.
2. **Ribbon group:** A set of closely related commands normally performed as part of a larger task.
3. **Dialog launcher:** A small arrow in the lower-right corner of a group brings up more related commands. Dialog launchers appear in groups that contain more commands than available space.
4. **Command button:** It is the button you click to perform a particular action.

## Excel Fill Handle

The **Fill handle** is an Excel feature that is used to **fill the data automatically with a specific pattern**. You can extend a series of numbers, dates and text combinations to the desired number of cells.

## Home Tab

The excel Home Tab is used to execute regular instructions like bold, underline, copy, and paste. It is also used to apply formats to cells in a worksheet. It contains Clipboard, Font, Alignment, Number, Cells, and Editing.



**1. Clipboard:** This Clipboard Group is primarily used for Cut copy and paste. It means, if you want to transfer data from one place to another, then you have two choices, either COPY (preserves the data in the original location) or CUT (deletes the data from the original location).

- There are options of **Paste Special**, which implies copy in the desired format.
- And there is also **Format Painter** Excel, which is used to copy the format from the original cell location to the destination cell location.

**2. Fonts:** This font group within the Home tab is used for choosing the desired Font and size. There are hundreds of fonts available in the dropdown, which we can use for.

**3. Alignment:** This group is used to align tabs, such as Top, Middle, or Bottom alignment of text within the cell. And there are other standard alignment options like Left, middle, and right alignment. There is also an orientation option that can be used to place the text vertically or diagonally.

- **Merge and Center** is used to combine more than one cell and place its content in the middle. It is a great feature to use for table formatting etc.
- **Wrap text** can be used when there is a lot of content in the cell, making all the text visible.

**4. Number:** This group provides options for displaying number format. There are various formats available, such as general, accounting, percentage, comma style in excel, etc. You can also increase and decrease the decimals using this group.

**5. Styles:** You can have various styles for cells like Good, Bad, and Neutral. Other sets of styles are available for Data and Models like Calculation, Check, Warning, etc.

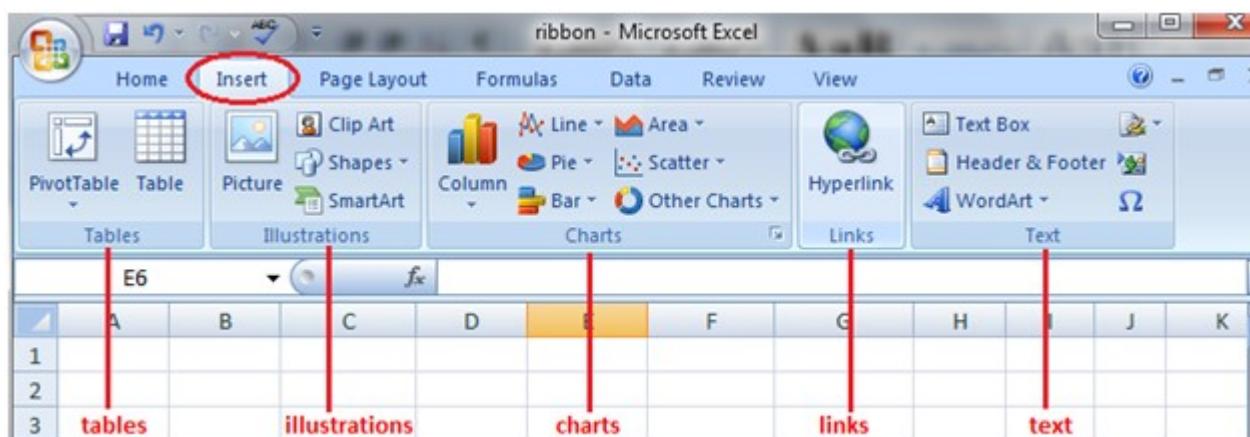
- The **format Table** allows you to convert mundane data into an aesthetically pleasing data table quickly.
- **Conditional formatting** is used to format cells based on certain predefined conditions. These are very helpful in spotting the patterns across an excel sheet.

**6. Cells:** This group is used to modify the cell according to its height and width etc. Also, you can hide and protect the cell using Format Feature. You can also insert and delete new cells and rows from this group.

**7. Editing:** This group within the Home Tab is useful for Editing the data on an excel sheet. The most prominent of the commands here is the Find and Replace in Excel. Also, you can use the sort feature to analyze your data (sort from A to Z or Z to A), or you can do a custom sort here.

## Insert Tab

The Insert Tab is used to insert distinct features like tables, pictures, clip art, shapes, charts, page numbers, word art, headers, and footers into a document. It contains Tables, Illustrations, Add-Ins, Charts, Tours, Sparklines, Filters, Links, Text, and Symbols groups. The below table describes each of the teams and buttons present on this tab.



**1. Tables:** This group provides an excellent way to organize the data. You can use a table to sort, filter, and format the data within the sheet. You can also use Pivot Tables to analyze complex data very easily.

**2. Illustrations:** This group provides a way to insert pictures, shapes, or artwork into excel. You can insert the pictures directly from the computer or use Online Picture Option to search for relevant pictures.

- The **shapes** provide additional ready-made square, circle, arrow kinds of shapes that can use in excel.
- **SmartArt** provides an awesome graphical representation to visually communicate data in List, organizational charts, Venn diagrams, and process diagrams.

**3. Charts:** It helps you visualize the data in a graphical format. You can make graphs on your own, and excel provides various options like Pie-chart, Line Chart, Column Chart in Excel, Bubble Chart k in Excel, combo chart in excel, Radar Chart in Excel, and Pivot Charts in Excel. Recommended charts allow Excel to come up with the best possible graphical combination.

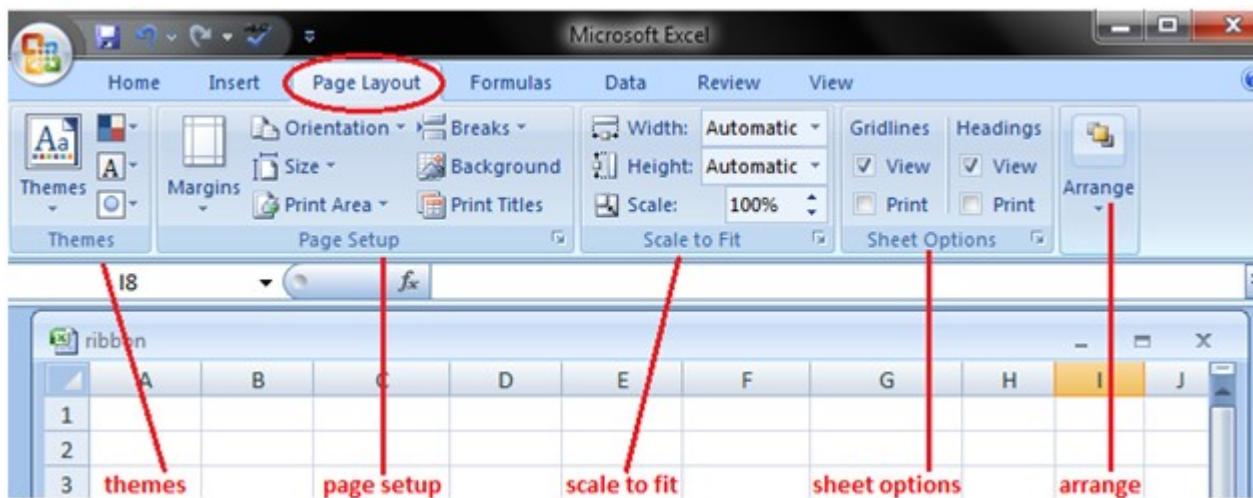
**4. Hyperlink:** This is a great tool to provide hyperlinks from the excel sheet to an external URL or files. Hyperlinks can also use to create a navigation structure with the excel sheet that is easy to use.

**5. Text:** This group is used to text in the desired format, such as add header and footer.

- **WordArt** allows you to use different styling for text.
- You can also create your signature using the **Signature line**
- **Symbols** are special characters that we may want to insert in the excel sheet for better representation.
- **The equation** allows you to write mathematical equations that we cannot ordinarily write in an Excel sheet.

## Page Layout Tab

The Page Layout Tab holds all the choices that permit you to rearrange your document pages simply in the manner you wish them. You can set margins, apply themes, manage page orientation and size, add sections and line breaks, show line numbers, and set paragraph indentation and lines. It contains Themes, Page Setup, Scale to fit, Sheet Options, Arrange.



**1. Themes:** Themes allow you to change the style and visual look of excel. You can choose various styles available from the menu. You can also customize the colors, fonts, and effects in the excel workbook.

**2. Page Setup:** This is an important group primarily used along with printing an excel sheet.

- You can choose **margins** for the print.
- You can choose your printing **orientation** from Portrait to Landscape.
- You can choose the **size** of paper like A3, A4, Letterhead, etc.
- The **print area** allows you to see the print area within the excel sheet and helps make the necessary adjustments.
- We can also add a **break** where we want the next page to begin in the printed copy.
- Also, you can add a **background** to the worksheet to create a style.
- **Print Titles** is like a header and footer in excel that we want them to be repeated on each printed copy of the excel sheet.

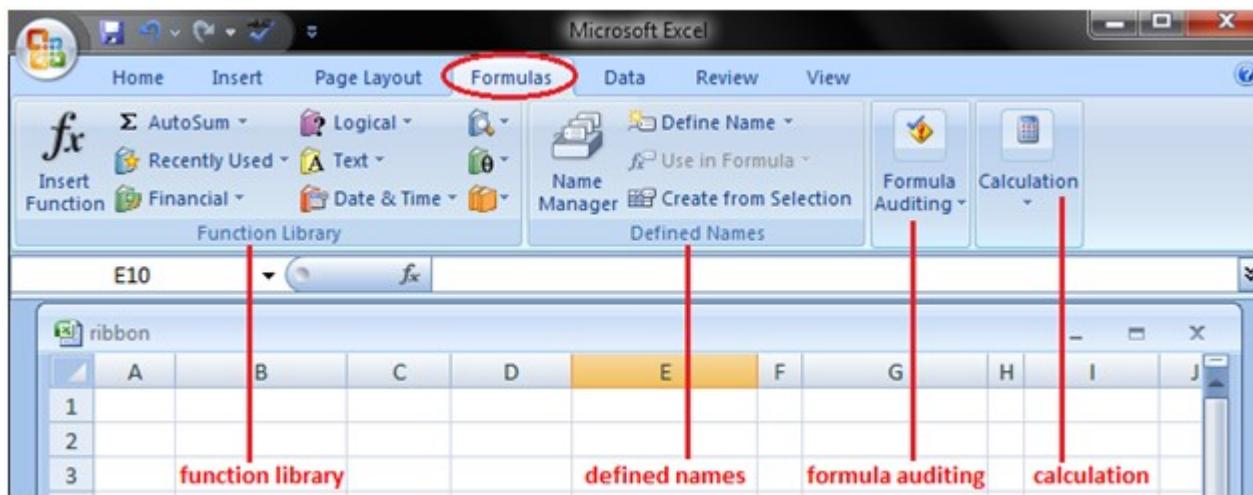
**3. Scale to Fit:** This option is used to stretch or shrink the printout of the page to a percentage of the original size. You can also shrink the width as well as height to fit in a certain number of pages.

**4. Sheet Options:** It is another useful feature for printing. If we want to print the grid, then we can check the print gridlines option. If we want to print the Row and column numbers in the excel sheet, we can also do the same using this feature.

**5. Arrange:** Here, we have different options for objects inserted in Excel like Bringforward, Send Backward, Selection Pane, Align, Group Objects, and Rotate.

## Formula Tab

The formula tab is used to insert functions, outline the name, produce the name, review the formula, etc. In the ribbon, the Formulas tab has vital and most helpful functions to form dynamic reports. It contains Function Library, Defined Names, Formula Auditing, and Calculation.



**1. Function Library:** This is a very useful group that contains all the formulas that one uses in excel. This group is subdivided into important functions like Financial Functions, Logical Functions, Date & Timing, Lookup & References, Maths and Trigonometry, and other functions. One can also make use of Insert Function capabilities to insert the function in a cell.

**2. Defined Names:** This feature can be used to name the cell, and these named cells can be called from any part of the worksheet without working about its exact locations.

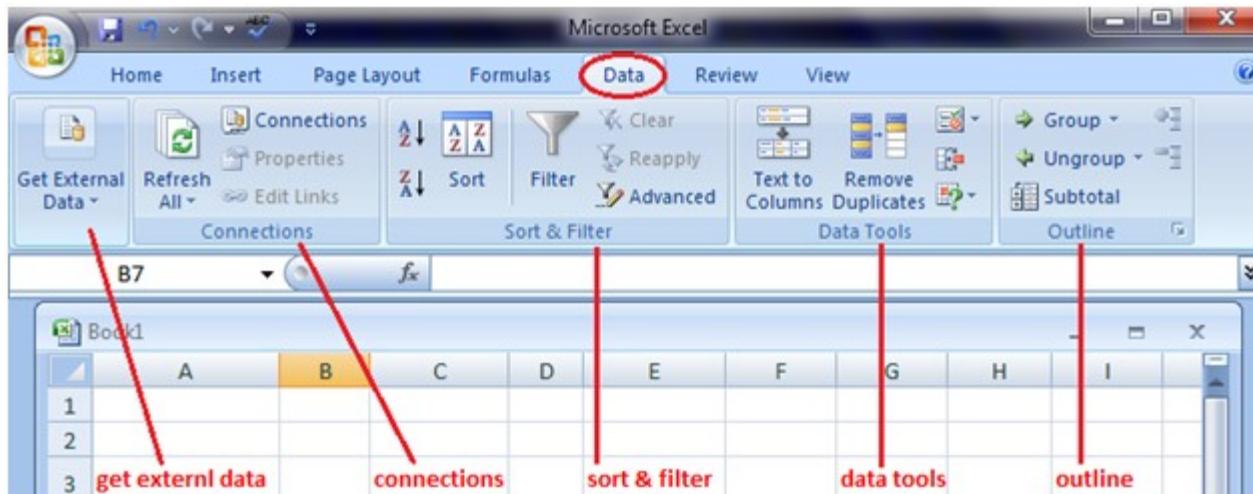
**3. Formula Auditing:** This is used for auditing the flow of formulas and their linkages.

- It can **trace the precedents** (origin of data set) and show which dataset depends on this.
- **Show formula** can also use to debug errors in the formula.
- The **Watch window** in excel is also useful for keeping a tab on their values as you update other formulas and datasets in the excel sheet.

**4. Calculations:** The option selected for calculation is automatic. However, one can also change this option to manual.

## Data Tab

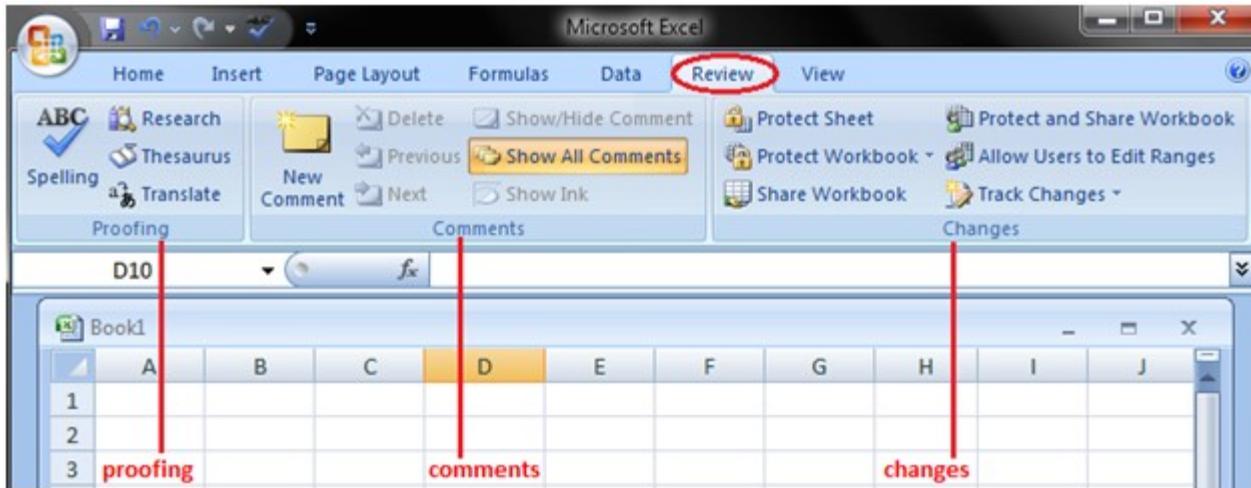
The data tab contains options mainly for filtering, sorting, and manipulating data. It has options for importing external data.



1. **Get External Data:** This option is used to import external data from various sources like Access, Web, Text, SQL Server, XML, etc.
2. **Power Query:** This is an advanced feature used to combine data from multiple sources and present it in the desired format.
3. **Connections:** This feature is used to refresh the excel sheet when the data in the current excel sheet comes from outside sources. You can also display the external links as well as edit those links from this feature.
4. **Sort & Filter:** This feature can be used to sort the data from A to Z or Z to A, and also you can filter the data using the dropdown menus. Also, one can choose advanced features to filter using complex criteria.
5. **Data Tools:** This is very useful for advanced excel users. One can create various scenario analyses using Whatif analysis - Data Tables, Goal Seek in Excel, and Scenario Manager. Also, one can convert Text to Column, remove duplicates and consolidate from this group.
6. **Forecast:** This Forecast function can be used to predict the values based on historical values.
7. **Outline:** One can easily present the data in an intuitive format using the Group and Ungroup options.

## Review Tab

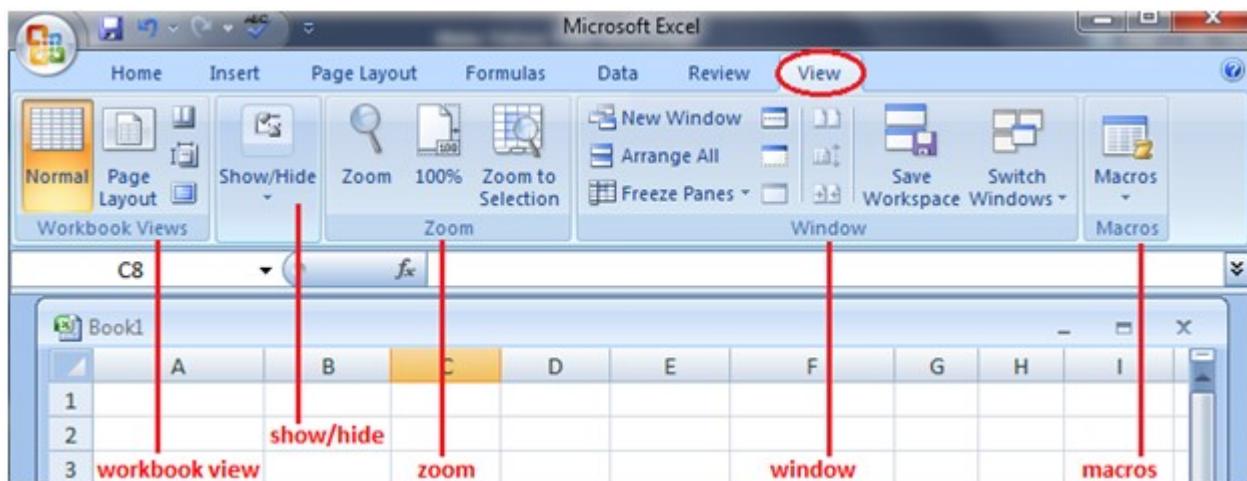
The review tab contains tools mainly for spell checking, thesaurus, sharing, protecting, and tracking changes in Excel Worksheets.



- Proofing:** Proofing allows you to run spell checks in excel. In addition to spell checks, one can also use a thesaurus if you find the right word. There is also a research button that helps you navigate the encyclopedia, dictionaries, etc., to perform tasks better.
- Language:** You can translate the excelsheet from English to any other language by using this feature.
- Comments:** This feature is used to write an additional note for important cells. It helps the user understand clearly the reasons behind your calculations etc.
- Changes:** If you want to keep track of the changes made, one can use the Track Changes option. Also, you can protect the worksheet or the workbook using a password from this option.

## View Tab

View tab contains mainly commands to view the Excel worksheet, like change views, freeze panes, arrange multiple windows, etc.



- Workbook Views:** You can choose the viewing option of the excel sheet from this group. You can view the excel sheet in the default normal view, or you can choose Page Break view, Page Layout view, or any other custom view of your choice.
- Show:** This feature can be used to show or not show Formula bars, grid lines, or Heading in the excel sheet.
- Zoom:** Sometimes, an excel sheet may contain a lot of data, and you may want to change zoom in or zoom out desired areas of the excel sheet.
- Window:** The new window is a helpful feature that allows the user to open the second window and work on both simultaneously. Also, freeze panes are another useful feature that allows freezing of particular rows and columns such that they are always visible even when one scrolls to the extreme positions. You can also split the worksheet into two parts for separate navigation.
- Macros:** This is again a fairly advanced feature, and you can use this feature to automate certain tasks in Excel Sheet. Macros are nothing but a recorder of actions taken in excel, and they can execute the same actions again if required.

# Type of charts in Excel

Excel provides charts to take advantage of graphical representation. The data represented through charts is more understandable than the data stored in an Excel table. This makes the process of analyzing data fast. Excel users can fast analyze the data.

Graphical representation of data using charts makes complex data analysis easier to understand. Excel has a variety of charts, each with its own different functionality and representation style.

## Charts offered by Excel

Excel offers many charts to represent the data in different manners, such as - Pie charts, Bar charts, Line charts, Stock charts, Surface charts, Radar charts, and many more. You can use them according to your data and analysis. All these charts

There is a list of basic and advanced level of charts used for different purposes to interpret the data.

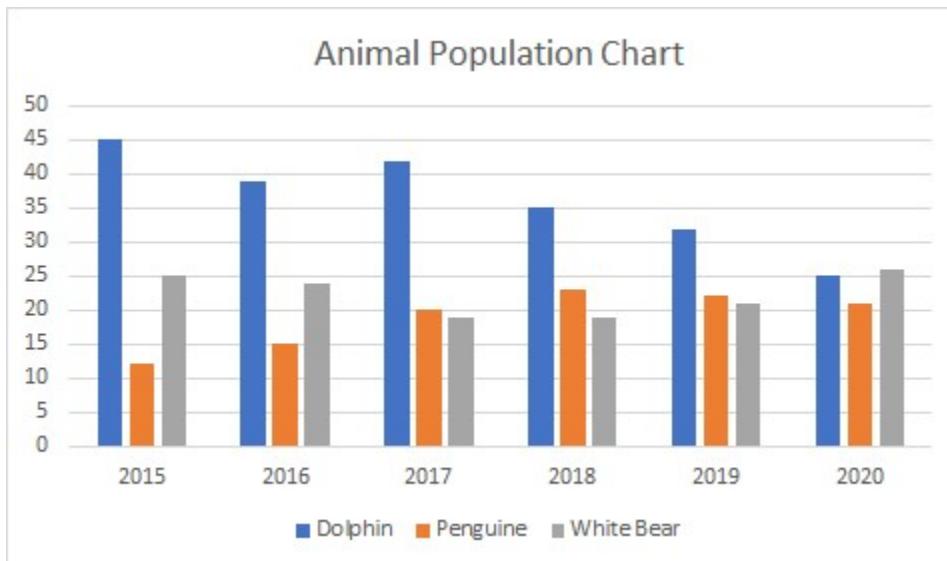
- ❖ Column Chart
- ❖ Line Chart
- ❖ Bar Chart
- ❖ Area chart
- ❖ Pie chart or Doughnut chart
- ❖ Surface chart

These are the most used charts of Excel that an Excel user usually requires.

### Column Charts

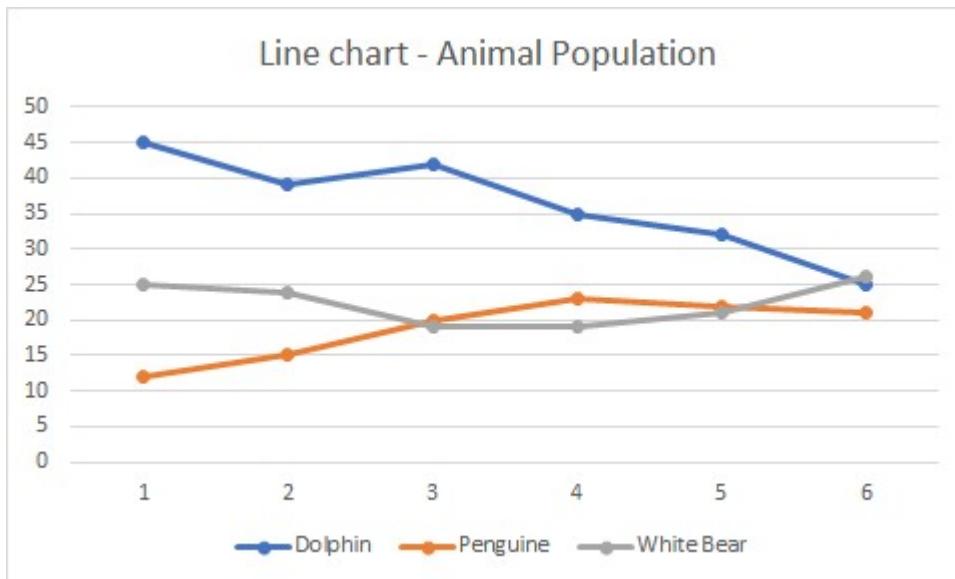
A column chart is basically a vertical chart that is used to represent the data in vertical bars. It works efficiently with different types of data, but it is usually used for comparing the information.

**For example,** a company wants to see each month sell graphically and also wants to compare them. Column charts are best for it that help to analyze and compare each month's data with each other.



## Line Chart

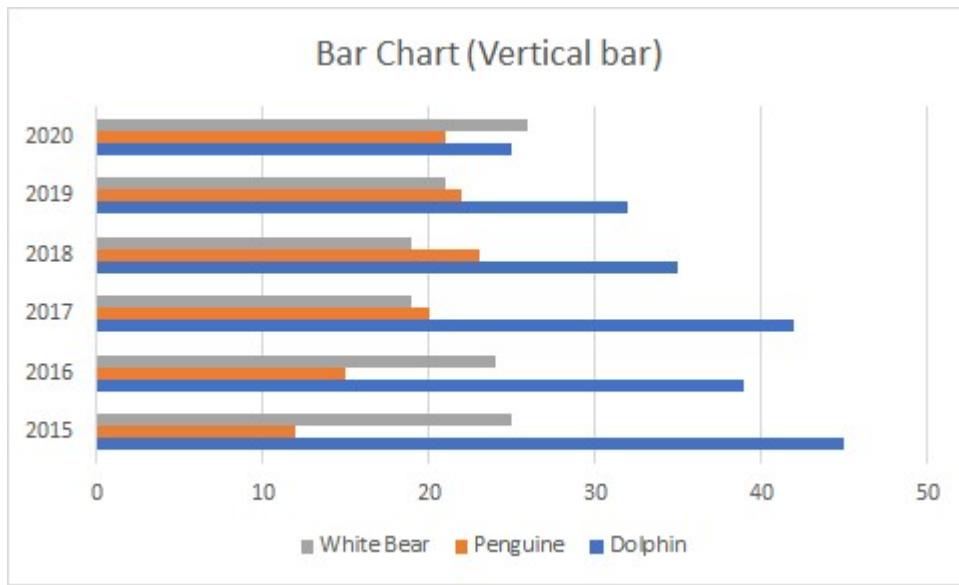
Line charts are most useful for showing trends. Using this chart, you can easily analyze the ups and downs in your data over time. In this chart, data points are connected with lines.



Excel offers 2D and 3D line charts.

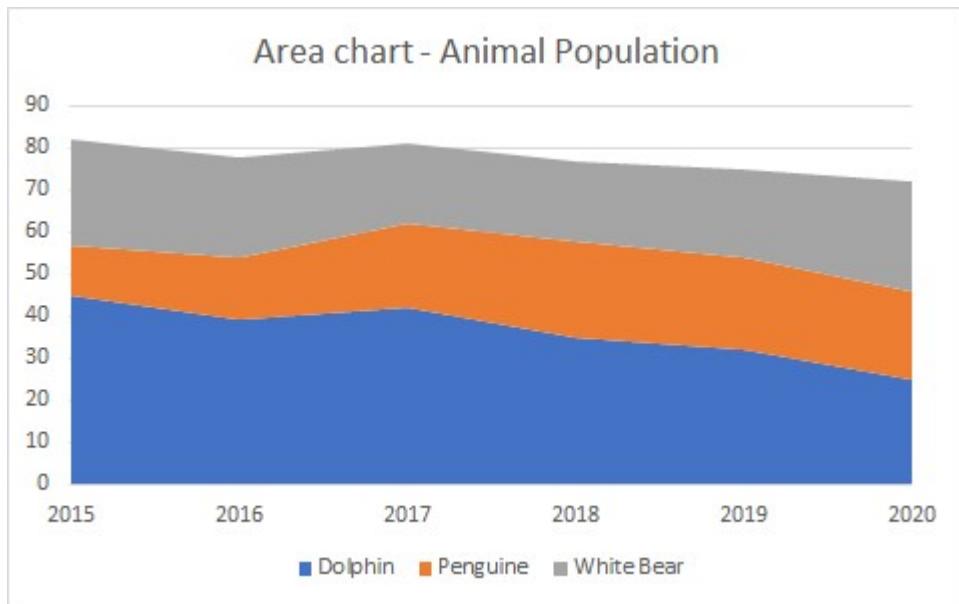
## Bar chart

Bar charts are horizontal bars that work like column charts. Unlike column charts, Bar charts are horizontally plotted. Or you can say that bar charts and column charts are just opposite to each other.



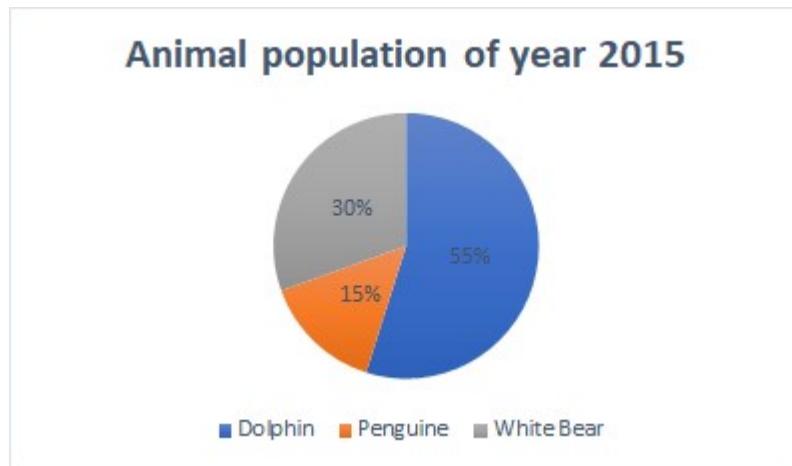
## Area chart

Area charts are just like line charts. Unlike the line charts, gaps are filled with color in area charts. Area charts are easy to analyze the growth in business as its shows ups and downs through line.



## Pie chart

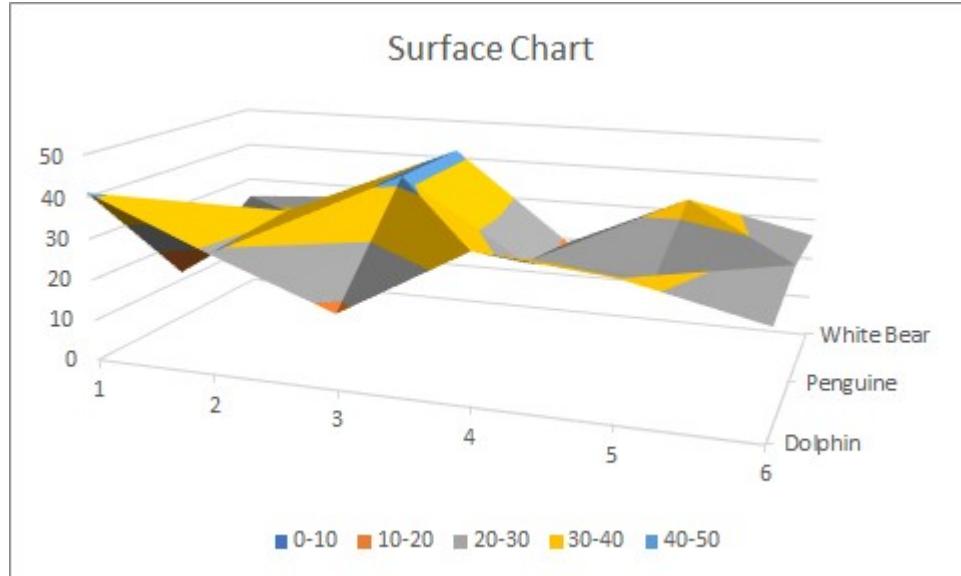
A pie chart is a rounded shape graph that is divided into slices of pie. Using this chart, you can easily analyze data that is divided into slices. It makes the data easy to compare the proportion.



Pie charts make it easy to analyze which values make up the percentage of whole. Pie chart is also known as **Doughnut chart**. Excel offers 2D and 3D pie charts.

## Surface chart

Surface chart is actually a 3D chart that helps to represent the data into a 3D landscape. These charts are best to use with a large dataset. This chart allows to displaying a variety of data at the same time.



A large dataset is not easy to represent using other charts. Surface chart solve this problem that allows displaying large datasets using this 3D chart.

## Choose your charts wisely

Excel offers too many charts as well as their 2D and 3D type. You can use any of them but choose them wisely according to your data. Different scenario requires different charts. Though, it can display all and correct information.

We have a list of some points for each type of chart that helps you to choose the chart wisely. Read them carefully -

<b>Chart Type</b>	<b>When to choose this chart</b>
1. Column Chart	Use the column chart when you want to compare the multiple values across a few categories. The values are shown through vertical bars.
2. Line Chart	Choose this chart when you want to show the treads (ups and downs) over a period of time, like for months or years.
3. Bar Chart	Like the column chart, use this chart to compare the values across a few categories. In this chart, values are displayed in the horizontal bar.
4. Area chart	Area chart has the same pattern as the line chart. This chart is best to use for indicating a change among different sets.
5. Pie or Doughnut chart	Pie chart is best to use when you want to quantify the values and show them as percentage.
6. Surface chart	Surface chart is different than other charts. Use it when you need to analyze the optimum combination between two sets of data.

## Different types of Function of Excel

### 1. SUM

The SUM() function, as the name suggests, gives the total of the selected range of cell values. It performs the mathematical operation which is addition. Here's an example of it below:

A screenshot of Microsoft Excel showing a table with four columns (A, B, C, D) and five rows (1 to 5). Row 1 contains headers: 'Qty' in A1, 'Price per Unit' in B1, and 'Total Sales' in C1. Rows 2, 3, and 4 contain data: (10, 30, 300), (11, 35, 385), and (12, 40, 480) respectively. Row 5 is a summary row with 'Total' in C2 and 1165 in C5. The formula bar at the top shows '=SUM(C2:C4)'.

	A	B	C	D
1	Qty	Price per Unit	Total Sales	
2	10	30	300	
3	11	35	385	
4	12	40	480	
5		Total	1165	

Fig: Sum function in Excel

As you can see above, to find the total amount of sales for every unit, we had to simply type in the function “=SUM(C2:C4)”. This automatically adds up 300, 385, and 480. The result is stored in C5.

### 2. AVERAGE

The AVERAGE() function focuses on calculating the average of the selected range of cell values. As seen from the below example, to find the avg of the total sales, you have to simply type in “AVERAGE(C2, C3, C4)”.

A screenshot of Microsoft Excel showing a table with four columns (A, B, C, D) and six rows (1 to 6). Row 1 contains headers: 'Qty' in A1, 'Price per Unit' in B1, and 'Total Sales' in C1. Rows 2, 3, and 4 contain data: (10, 30, 300), (11, 35, 385), and (12, 40, 480) respectively. Row 5 is a summary row with 'Total' in C2 and 1165 in C5. Row 6 is a summary row with 'Average' in C6 and 388.3333333 in C6. The formula bar at the top shows '=AVERAGE(C2,C3,C4)'.

	A	B	C	D	E
1	Qty	Price per Unit	Total Sales		
2	10	30	300		
3	11	35	385		
4	12	40	480		
5		Total	1165		
6		Average	388.3333333		

Fig: Average function in Excel

It automatically calculates the average, and you can store the result in your desired location.

### 3. COUNT

The function [\*\*COUNT\(\)\*\*](#) counts the total number of cells in a range that contains a number. It does not include the cell, which is blank, and the ones that hold data in any other format apart from numeric.



A screenshot of Microsoft Excel showing a table with four rows and four columns. The columns are labeled A, B, C, and D. The first row contains headers: 'Qty' in A1, 'Price per Unit' in B1, and 'Total Sales' in C1. Rows 2, 3, and 4 contain numerical values: Row 2 has 10 in A2, 30 in B2, and 300 in C2; Row 3 has 11 in A3, 35 in B3, and 385 in C3; Row 4 has 12 in A4, 40 in B4, and 480 in C4. Row 5 is a summary row with 'Count' in A5 and '3' in C5. The formula bar at the top shows '=COUNT(C1:C4)'. The cell C5 is highlighted in green.

	A	B	C	D
1	Qty	Price per Unit	Total Sales	
2	10	30	300	
3	11	35	385	
4	12	40	480	
5	Count		3	

Fig: Microsoft Excel Function - Count

As seen above, here, we are counting from C1 to C4, ideally four cells. But since the COUNT function takes only the cells with numerical values into consideration, the answer is 3 as the cell containing “Total Sales” is omitted here.

If you are required to count all the cells with numerical values, text, and any other data format, you must use the function ‘COUNTA()’. However, COUNTA() does not count any blank cells.

To count the number of blank cells present in a range of cells, COUNTBLANK() is used.

### 4. SUBTOTAL

Moving ahead, let's now understand how the subtotal function works. The SUBTOTAL() function returns the subtotal in a database. Depending on what you want, you can select either average, count, sum, min, max, min, and others. Let's have a look at two such examples.

	A	B	C	D	E
1	Qty	Price per Unit	Total Sales		
2	10	30	300		
3	11	35	385		
4	12	40	480		
5		Subtotal	11		

Fig: Subtotal function in Excel

In the example above, we have performed the subtotal calculation on cells ranging from A2 to A4. As you can see, the function used is “=SUBTOTAL(1, A2: A4), in the subtotal list “1” refers to average. Hence, the above function will give the average of A2: A4 and the answer to it is 11, which is stored in C5.

Similarly, “=SUBTOTAL(4, A2: A4)” selects the cell with the maximum value from A2 to A4, which is 12. Incorporating “4” in the function provides the maximum result.

	A	B	C	D	E
1	Qty	Price per Unit	Total Sales		
2	10	30	300		
3	11	35	385		
4	12	40	480		
5		Subtotal	12		

Fig: Count function in Excel

## 5. MODULUS

The MOD() function works on returning the remainder when a particular number is divided by a divisor. Let's now have a look at the examples below for better understanding.

- In the first example, we have divided 10 by 3. The remainder is calculated using the function “=MOD(A2,3)”. The result is stored in B2. We can also directly type “=MOD(10,3)” as it will give the same answer.

B2	A	B	C	D	E
1	Modulus				
2	10	1			
3	12	0			
4	45	3			

Fig: Modulus function in Excel

- Similarly, here, we have divided 12 by 4. The remainder is 0 is, which is stored in B3.

B3	A	B	C	D	E
1	Modulus				
2	10	1			
3	12	0			
4	45	3			

Fig: Modulus function in Excel

## 6. POWER

The function “Power()” returns the result of a number raised to a certain power. Let’s have a look at the examples shown below:

B2	A	B	C	D	E
1	Power				
2	10	1000			
3	4	256			
4					

Fig: Power function in Excel

As you can see above, to find the power of 10 stored in A2 raised to 3, we have to type “=POWER(A2,3)”. This is how power function works in Excel.

## 7. CEILING

Next, we have the ceiling function. The CEILING() function rounds a number up to its nearest multiple of significance.

B2				X	✓	fx	=CEILING(A2,5)
	A	B	C	D	E		
1	<b>Ceiling</b>						
2	35.316	40					

Fig: Ceiling function in Excel

The nearest highest multiple of 5 for 35.316 is 40.

## 8. FLOOR

Contrary to the Ceiling function, the floor function rounds a number down to the nearest multiple of significance.

B2				X	✓	fx	=FLOOR(A2,5)
	A	B	C	D	E		
1	<b>Floor</b>						
2	35.316	35					

Fig: Floor function in Excel

The nearest lowest multiple of 5 for 35.316 is 35.

## 9. CONCATENATE

This function merges or joins several text strings into one text string. Given below are the different ways to perform this function.

- In this example, we have operated with the syntax =CONCATENATE(A25, " ", B25)

A26	<input type="button" value="X"/> <input type="button" value="V"/> <input type="button" value="fx"/> =CONCATENATE(A25, " ", B25)
23	
24	<b>Concatenate - combines strings</b>
25	Hello
26	World
27	Hello World
Excel is	fun to learn
28	Excel is fun to learn

Fig: Concatenate function in Excel

- In this example, we have operated with the syntax =CONCATENATE(A27&" "&B27)

A28	<input type="button" value="X"/> <input type="button" value="V"/> <input type="button" value="fx"/> =CONCATENATE(A27&" "&B27)
23	
24	<b>Concatenate - combines strings</b>
25	Hello
26	World
27	Hello World
Excel is	fun to learn
28	Excel is fun to learn

Fig: Concatenate function in Excel

Those were the two ways to implement the concatenation operation in Excel.

Also Read: [How to Use Concatenate in Excel?](#)

## 10. LEN

The function LEN() returns the total number of characters in a string. So, it will count the overall characters, including spaces and special characters. Given below is an example of the Len function.

B7	<input type="button" value="X"/> <input type="button" value="V"/> <input type="button" value="fx"/> =LEN(A7)
6	
7	<b>length</b>
World	5
Microsoft	9

Fig: Len function in Excel

Let's now move onto the next Excel function on our list of this article.

## 11. UPPER, LOWER, PROPER

The **UPPER()** function converts any text string to uppercase. In contrast, the **LOWER()** function converts any text string to lowercase. The **PROPER()** function converts any text string to proper case, i.e., the first letter in each word will be in uppercase, and all the other will be in lowercase.

Let's understand this better with the following examples:

- Here, we have converted the text in A6 to a full uppercase one in A7.

A	B	C	D
4			
5	Upper		
6	Simplilearn		
7	SIMPLILEARN		

Fig: Upper function in Excel

- Now, we have converted the text in A6 to a full lowercase one, as seen in A7.

A	B	C	D
4			
5	Lower		
6	SIMPLILEARN		
7	simplilearn		

Fig: Lower function in Excel

- Finally, we have converted the improper text in A6 to a clean and proper format in A7.

A	B	C	D
4			
5	Proper		
6	SimPlileaRn		
7	Simplilearn		

Fig: Proper function in Excel

Now, let us hop on to exploring some date and time functions in Excel.

## 12. NOW()

The NOW() function in Excel gives the current system date and time.



Fig: Now function in Excel

The result of the NOW() function will change based on your system date and time.

## 13. VLOOKUP

Next up in this article is the [VLOOKUP\(\) function](#). This stands for the vertical lookup that is responsible for looking for a particular value in the leftmost column of a table. It then returns a value in the same row from a column you specify.

Below are the arguments for the VLOOKUP function:

**lookup\_value** - This is the value that you have to look for in the first column of a table.

**table** - This indicates the table from which the value is retrieved.

**col\_index** - The column in the table from the value is to be retrieved.

**range\_lookup** - [optional] TRUE = approximate match (default). FALSE = exact match.

We will use the below table to learn how the VLOOKUP function works.

If you wanted to find the department to which Stuart belongs, you could use the VLOOKUP function as shown below:

#### 14. IF Formula

The [IF\(\) function](#) checks a given condition and returns a particular value if it is TRUE. It will return another value if the condition is FALSE.

In the below example, we want to check if the value in cell A2 is greater than 5. If it's greater than 5, the function will return "Yes 4 is greater", else it will return "No".

A	B	C	D
1	IF		
2	=IF(A2>5, "Yes 4 is greater", "No")		

Fig: If function in Excel

#### 15. COUNTIF

The function COUNTIF() is used to count the total number of cells within a range that meet the given condition.

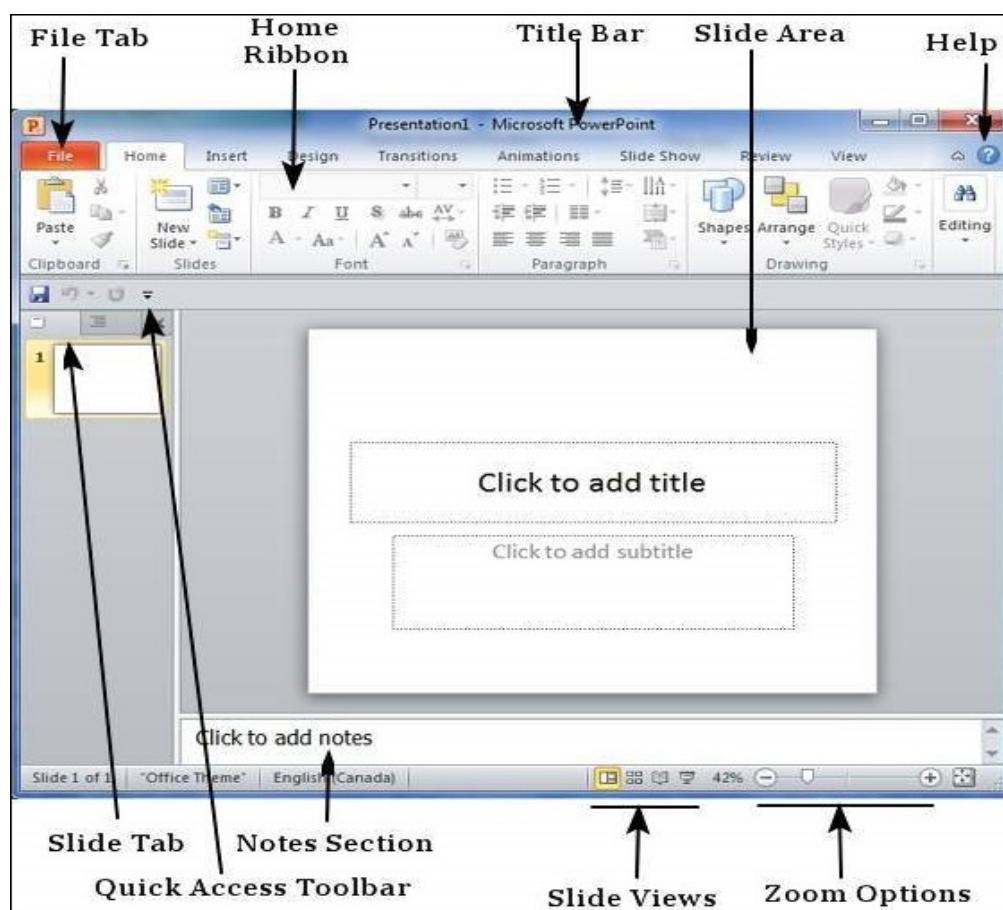
Below is a coronavirus sample dataset with information regarding the coronavirus cases and deaths in each country and region.

# PowerPoint

## Introduction

Microsoft PowerPoint is a commercial presentation application written and distributed by Microsoft for Microsoft Windows and Mac OS X. The current versions at the time of writing this tutorial are 2010 for Microsoft Windows and 2011 for Mac OS X. Microsoft PowerPoint is a presentation tool that supports text, shapes, graphics, pictures and multimedia along with integration with other Microsoft Office products like Excel. By default, documents saved in PowerPoint 2010 are saved with the **.pptx** extension whereas, the file extension of the prior PowerPoint versions is **.ppt**.

## Powerpoint Window



# PowerPoint

Menu Category	Ribbon Commands
Home	Clipboard functions, manipulating slides, fonts, paragraph settings, drawing objects and editing functions.
Insert	Insert tables, pictures, images, shapes, charts, special texts, multimedia and symbols.
Design	Slide setup, slide orientation, presentation themes and background.
Transitions	Commands related to slide transitions.
Animations	Commands related to animation within the individual slides.
Slide Show	Commands related to slideshow set up and previews.
Review	Proofing content, language selection, comments and comparing presentations.
View	Commands related to presentation views, Master slides, color settings and window arrangements.

## Slide, Placeholder and Notes

**Slide:** Presentation is created on slides. It lies in the centre of the PowerPoint window.

**Placeholder:** By default two placeholders appear in the slide when you open the PowerPoint.

**Click to add notes:** This space is provided to create notes if needed.

## Rearranging slides

Rearranging slides is important when it comes to organizing the overall presentation flow. While it is vital that you get the right content in every slide, it

## PowerPoint

is equally important that you are able to present them in a format that makes it easier for the audience to understand the content too; most times this will require rearranging the slides.

You can rearrange slides from two views in PowerPoint - Normal View and Slide Sorter View. Given below are the steps to rearrange slides from different views.

### **Adding Slide notes**

Slide notes can be very useful tools for presentation. These notes are not displayed on the screen in the **Slideshow** mode, but the presenter can see them so they can prepare well to present the slides. Depending on your Print settings, you can also print the slide notes along with the slides.

### **Working With Outlines**

PowerPoint is a great program that allows you to bring together text, images, shapes and multimedia. However, sometimes you may just want to review the text without focusing on the non-text aspects of the slide deck. This is where the **Outline** view in PowerPoint is quite useful. The Outline view can be accessed from the tab adjacent to the Slide tab in the **Normal** view.

### **Template**

A *Template* contains slide default settings. These characteristics include colors, fonts, bullet types, and special elements such as graphics.

# PowerPoint

## Slides Tab

This tab shows all the slides stacked vertically in a sequential manner. You can select individual slides from this tab and also perform some tasks like changing slide layouts, reordering slides, inserting new slides, deleting slides, etc. Although you cannot edit the slide contents from this tab, you can select the slide and make edits from the slide displayed to the right.

## Outline Tab

This is the tab right next to the Slides tab and as the name suggests, this provides the outline for the slide. This section just displays all the textual content from every slide - this can be very useful if there is a lot of non-text content in the slide and reviewing just the written part gets difficult. Unlike in the slides tab, you can edit the text from this section.

## Presentation Views

PowerPoint supports multiple views to allow users to gain the maximum from the features available in the program. Each view supports a different set of functions and is designed accordingly.

PowerPoint views can be accessed from two locations.

- Views can be accessed quickly from the bottom bar just to the left of the zoom settings.
- Views can also be accessed from the **Presentation Views** section in the View ribbon

## Normal View

This is the default view in PowerPoint and this is primarily used to create and edit slides. You can create/ delete/ edit/ rearrange slides, add/ remove/ modify content and manipulate sections from this view.

# PowerPoint

## **Slide Sorter View**

This view is primarily used to sort slides and rearrange them. This view is also ideal to add or remove sections as it presents the slides in a more compact manner making it easier to rearrange them.

## **Reading View**

This view is new to PowerPoint 2010 and it was created mainly to review the slideshow without losing access to rest of the Windows applications. Typically, when you run the slideshow, the presentation takes up the entire screen so other applications cannot be accessed from the taskbar. In the reading view the taskbar is still available while viewing the slideshow which is convenient. You cannot make any modifications when on this view.

## **Slides Show**

This is the traditional slideshow view available in all the earlier versions of PowerPoint. This view is used to run the slideshow during presentation.

## **Slide Orientations**

In the recent years, presentations are being used for more than just as a high end replacement for transparencies and projectors. With its unique features, PowerPoint is becoming quite versatile in the kind of information it can depict and very flexible in its usage. The slide orientations are invaluable part of this improved list of PowerPoint features. Like most other applications PowerPoint supports two orientations: **landscape** and **portrait**.

## PowerPoint

The **Landscape** layout is the default PowerPoint layout and it is probably the more commonly used one. In the landscape layout, the longer edge is horizontal so the slides align better with the screens and projectors.

The **Portrait** layout is where the shorter edge is horizontal. This is sometimes better for print depending on the kind of content you want to present.

Slide orientations in PowerPoint can be changed from the **Design** ribbon using the **Slide Orientation** command.

## Review Presentation

Review Section	Functions
Proofing	<ul style="list-style-type: none"><li><b>Spellchecking</b> – Identify spelling and grammar based on selected language preference</li><li><b>Research</b> – Reference language related research tools based on specific reference books and research sites</li><li><b>Thesaurus</b> – Provide synonyms for selected text</li></ul>
Language	<ul style="list-style-type: none"><li><b>Translate</b> – Provides translation services for selected words for multilingual support</li><li><b>Language</b> – Sets the default language for the presentation - this will be used as default language for proofing</li></ul>

## PowerPoint

<b>Comments</b>	<ul style="list-style-type: none"><li>• <b>Show Marking</b> – Show/hide the user comments in the slide</li><li>• <b>New Comment</b> – Add new comment against the selected content</li><li>• <b>Edit Comment</b> – Edit an existing comment</li><li>• <b>Delete Comment</b> – Delete a selected comment, all comments in the selected slide or all the comments in the presentation</li><li>• <b>Previous / Next Comment</b> – Move to previous / next comments</li></ul>
<b>Compare</b>	<ul style="list-style-type: none"><li>• <b>Compare</b> – Compare the current presentation with another presentation and identify the differences</li><li>• <b>Accept/ Reject</b> – Accept or reject the differences to be incorporated into the current presentation</li><li>• <b>Previous/ Next</b> – Move to the previous or the next difference in the comparison.</li><li>• <b>End Review</b> – End the review and discard any unapplied changes</li></ul>

## What is MS Access?

**MS-Access** is application software for managing the databases. It is released by **Microsoft** in November 1992. It actually stores the data on the basis of the **relational Jet Database Engine**. It mainly provides the graphical user interface for accessing the data and the tools for software development.

It helps the users for managing the related data more efficiently than Microsoft Excel or other applications of spreadsheets. Users can easily analyze the large amount of data stored in it.

- ❖ The users who work with Microsoft Access can easily view their reports in following different ways:
  - Print preview
  - Design View
  - Layout View
  - Report View

## Components of Microsoft Access

Following are the seven main components, which comes under the MS access

- **Tables**  
It is the main component of the MS Access software. In the MS Access database, tables are mainly used for storing the data or information in the form of rows and columns. The Access tables which contain the data or information look similar to the tables in MS Excel or MS Word.  
Whenever, you create a new database in MS Access, firstly, you have to create a table in that database. You can also relate a specific table to other tables, and easily define the primary key in that table.
- **Relationships**  
Relationships are the links or connections, which are formed between the one or more tables in the database. There exist following four types of relationships:
  1. One-to-One Relationship
  2. One-to-Many Relationship
  3. Many-to-One Relationship
  4. Many-to-Many Relationship
- **Queries**  
Queries are the commands, which are used to retrieve the data or information from the database. It also allows you to insert the information in the MS Access database.
- **Forms**  
It is an object or a component, which helps the users for entering the data in the table of any database by an interface. Any user can easily display the data of the database.

- **Reports**  
When the users inserted the data in the database, then they can easily view their information in an organized manner by running the reports. Unlike forms, the reports cannot be edited.
- **Macros**  
Macros are used for performing the repetitive tasks on reports and forms in the MS Access database. It also allows the user for adding functionalities to forms, controls, and reports.
- **Modules**  
Modules are used to perform the automating routine operations and user-defined functions which are written in VBA. Any user can easily use these modules from anywhere in the MS Access database.

## Microsoft Access Data Types

Type of Data	Description	Size
Short Text	Text, including numbers which does not need calculation. (e.g., Mobile numbers).	Up to 255 characters.
Long Text	This data type is used for lengthy text or alphanumeric data.	Maximum 63, 999 characters.
Number	Numeric data type used for storing mathematical calculations.	1, 2, 4, 8, and 16 bytes.
Date/Time	Store Date/time for the years 100 through 9999.	8 bytes.
Currency	It allows you to store currency values and numeric data with one to four decimal places.	8 bytes.
Auto Number	Assign a unique number or assigned by Microsoft Access when any new record is created. Usually used as the primary key	Four bytes (16 bytes if it is set as a Replication ID).
Yes/No	It only stores logical values Yes and No.	1 bit
Attachment	It stores files, such as digital photos. Multiple files can be attached per record.	Up to 2 GB Data can be stored.
OLE objects	OLE objects can store audio, video, other Binary Large Objects.	Up to 2 GB data can be stored.
Hyperlink	Text or combinations of text and numbers stored. That text is used as hyperlink address.	Each part of a Hyperlink data type allows you to store a maximum 2048 characters.
Calculated	Helps you to create an expression that uses data from one or more fields.	You can create an expression which uses data from one or more fields.

## What is datasheet view

A datasheet is a useful way of viewing data in Access. Most importantly, datasheet view **allows a user to view many table records at the same time**. In datasheet view, information is displayed in rows and columns—similar to a spreadsheet. Records are displayed as rows, so each row is an individual record.

## What is datasheet view

Design view **gives you a more detailed view of the structure of the form**. You can see the Header, Detail, and Footer sections for the form. You cannot see the underlying data while you are making design changes; however, there are certain tasks you can perform more easily in Design view than in Layout view.

## What is query in ms access

A query can give you an answer to a simple question, perform calculations, combine data from different tables, add, change, or delete data from a database.

## What is Primary Key

A primary key is a field or set of fields with values that are unique throughout a table. Values of the key can be used to refer to entire records, because each record has a different value for the key. Each table can only have one primary key.

## What is Relationship

A relationship in Access **helps you combine data from two different tables**. Each relationship consists of fields in two tables with corresponding data. For example, you might have a ProductID field in a Products table and in an OrderDetails table.

- One to One Relationship
- One to Many Relationship
- Many to One Relationship
- Many to Many Relationship