INTRODUCTION TO COMPUTERS

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14-06-2021

II BSc Biochemistry

Introduction

- Computer Stands for Common Oriented Machine Particularly Used for Trade, Education and Research.
- Computer can also be defined as Common Operated Machine Particularly Used for Trade, Education and Research.

Contd…

- A Computer is an electronic device that accepts raw data as input, can store and processes the data (typically in binary form) according to a set of instructions (programs) to produce the desired result (Output) as information.
- **Data** – Data is defined as an unprocessed collection of raw facts, suitable for communication and processing.

For Example, Praveen, CS Department, APCAS are data. This will not give any meaningful data.

- **Information** is a collection of facts from which conclusions of facts from which conclusions maybe drawn. In Simple words, data is the raw facts that is processed to give meaningful , ordered or structured information.

Example: Praveen from CS Department of APCAS. This information conveys some meaning.

- Computer data is considered as the information processed or stored by a computer. This information may be in the form of text documents, images, audio clips, software programs, or other types of data.
- An **Instruction** is a group of bits that define operations such as add, subtract, multiply, shift and compliment.

Characteristics of a Computer

- The characteristics of computer are high speed of operations, accuracy, reliability, flexibility, and economy coupled with efficiency in storing and processing data.
  - High Speed: Computers have the ability to perform routine tasks at a greater speed than human beings. They can perform millions of calculations in seconds.
  - Accuracy: Computers are used to perform tasks in a way that ensures total accuracy.
  - Storage: Computers can store a large amount of information. An item of data or any instruction stored in the memory can be retrieved by the computer at lightning speeds.

- Automation: Computers can be instructed to perform comp) tasks automatically (which increases productivity).
- Diligence: Computers can perform the same task repeatedly and with the same accuracy without getting tired.
- Versatility: Computers are flexible to perform both simple and complex tasks.
- Cost-effectiveness: Computers reduce the amount of paperwork, and human effort, thereby reducing costs.

Application/ Uses of Computers

- Computers are used everywhere. There are several uses of computers which are as follows.
  - Desktop publishing - With desktop publishing, you can create page layouts for entire books on your personal computer.
  - Computers in Medicine - You can diagnose diseases. Software is used in magnetic resonance imaging to examine the internal organs of the human body. Software is used for performing surgery. Computers are used to store patient data.
  - Mathematical Calculations - Thanks to computers, which have computing speeds of over a million calculations per second, we can perform the biggest of mathematical calculations.

- Banks - All financial transactions are done by computer software. They provide security, speed, and convenience.
- Travel - One can book air tickets or railway tickets and make hotel reservations online.
- Telecommunications - Software is widely used here. Also, all mobile phones have software embedded in them.
- Defence - There is software embedded in almost every weapon. Software is used for controlling the flight and targeting ballistic missiles. Software is used to control access to atomic bombs.
- E-Learning - Instead of a book, it is easier to learn from E-learning software.

- Gambling - You can gamble online instead of going to a casino.
- Examinations - You can take online exams and get instant results. You can check your examination results online.
- Computers in Business - Shops and supermarkets use the software, which calculates the bills. Taxes can be calculated and paid online. Accounting is done using computers. One can predict future trends of business using an artificial intelligence software. Software is used in major stock markets. One can do trading online. There are fully automated factories running on software.

- Certificates - Different types of certificates can be generated. It is very easy to create and change layouts.
- ATM machines - The computer software authenticates the user and dispenses cash.
- Marriage - There are matrimonial sites through which one can search for a suitable groom or bride.
- News - There are many websites through which you can read the latest or earlier news.
- Alumni Associations - There are many alumni websites through which you can regain contact with your classmates.

- Robotics - Robots are controlled by software.
- Washing Machines - They operate using the software.
- Microwave Oven - They are operated by software.
- Planning and Scheduling - Software can be used to store contact information, generating plans, scheduling appointments, and deadlines.
- Plagiarism - Software is available that can examine content for plagiarism.

- Greeting Cards - You can send and receive greetings online, suiting different occasions.
- Sports - Software is used for making umpiring decisions in games. There is simulation software by using which sportsperson can practice his skills. Computers also to identify flaws in technique.
- Aero planes — Pilots train on software, which simulates flying.
- Weather analysis — Supercomputers are used to analyze predict the weather.

APPLICATIONS OF COMPUTERS IN DIFFERENT FIELDS

Applications of Computers in Education

- Computer education is becoming mandatory in most universities across the world. They basically teach the subjects which enable the students to acquire a job in the software engineering Industry, Teachers use computers as teaching aids with a provision for spare time to enable students to interact with teacher at the end of the session. Nowadays, colleges are setting up such a system where student and faculty attendance, syllabus, schedule of tests, exams, etc., are put on the web, and students, their parents, and faculties can access it from anywhere and get updated.

Applications of Computers in Industries

- Mostly, the software or the hardware that is produced by companies would be used to automate the manual task. An industry, capable of producing such products is called the software industry. Other companies that use these services are called clients. Computers can be used to produce patterns in textile industries, color combinations in paint industries, automate the operation of a machine in an industry using robotics, etc.

Applications of Computers in Business

- They are used in commercial organizations to accomplish clerical and administrative work. Tax calculations, salary slip preparations, etc., can be done using computers. Stock market predictions can be, done. Banks are using computers to maintain the accounts and. transactions. E-banking is picking up popularity because of the flexibility of banking from an armchair. Excluding the matter of much-talked security, they are used comfortably by the customers. E - 'Shopping is one more concept gaining popularity in an industry where a customer can buy the displayed items by paying through credit card or cash on delivery options.

Applications of Computers in Entertainment

- Animations and Special Effects for the movies are done using high-end workstations. In the Titanic movie, they used 100 high-end Linux workstations in parallel to produce special effects. Also, the movies and music are available in the form of CDs, VCDs, and DVDs which cost less compared to watching movies at theatres. People prefer to watch them through these media in their leisure time. Kids enjoy playing games using computers.

Data Representation

- **Computer data** is a piece of information processed or stored by a computer. This information may be in the form of text documents, images, audio clips, software programs, or other types of data. Computer data may be processed by the computer's CPU and is stored in files and folders on the computer's hard disk.
- Computer data is a bunch of ones and zeros, known as binary data. Because all computer data is in binary format, it can be created, processed, saved, and stored digitally. This allows data to be transferred from one computer to another using a network connection or various media devices. It also does not deteriorate over time or lose quality after being used multiple times.
- **A Computer program** is a collection of instructions that can be executed by a computer to perform a specific task.
- A computer program is usually written by a computer programmer using a programming language.

- A bit is the short form of Binary digit which can be ‘0’ or ‘1’. It is the basic unit of data in computers.
- A nibble is a collection of 4 bits (Binary digits).
- A collection of 8 bits is called Byte.
- A byte is considered as the basic unit of measuring the memory size in the computer.

- A collection of 1024 bytes is called Kilo Byte (KB).
- A collection of 1024 Kilo bytes is called Mega Byte (MB).
- A collection of 1024 mega bytes is called Giga Byte (GB).
- A collection of 1024 Giga bytes is called Terra Byte (TB).
- A collection of 1024 Terra Bytes is called Peta Byte (PB).
- A collection of 1024 Peta bytes is called Exa Byte (EB).
- A collection of 1024 Exa bytes is called Zetta Byte (ZB).
- A collection of 1024 Zetta bytes is called Yotta Byte (YB).

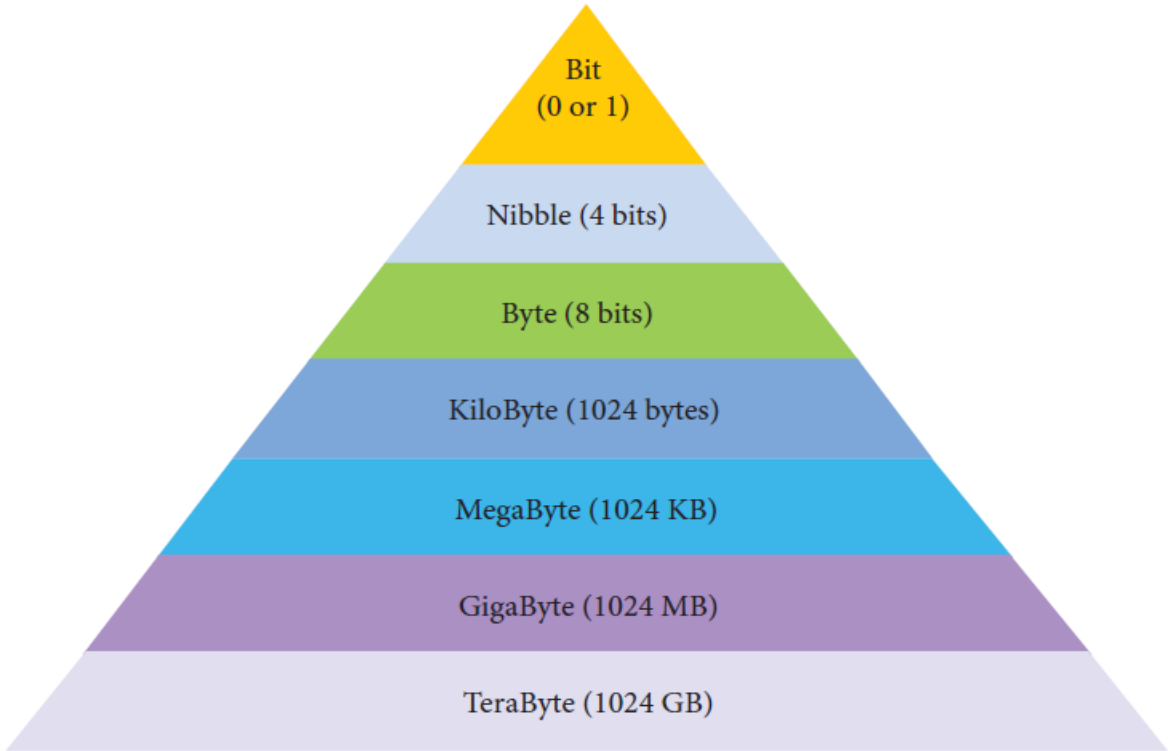


Figure 2.2 Data Representation

Types of Computers

- Computers can be also classified by size and power as follows, though there is considerable overlap:
- **Supercomputer:** An extremely fast computer that can perform Billions of instructions per second.
- **Mainframe:** A powerful multi-user computer capable of supporting many hundreds or thousands of users simultaneously.
- **Minicomputer:** A multi-user computer capable of supporting up to hundreds of users simultaneously.
- **Workstation:** A powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and, in general, a higher-quality monitor.
- **Macro Computer:** A small, single-user computer based on a microprocessor.

Super Computer

- A Supercomputer is a computer with a high level of performance compared to a general-purpose computer. The performance of a supercomputer is commonly measured in FLoating-point Operations Per Second (FLOPS) instead of Million Instructions Per Second (MIPS). Super Computers can process billions of instructions per second.
- Supercomputers are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations (number crunching).
- For example, weather forecasting requires a supercomputer. Other uses of supercomputers scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, Stock Analysis, electronic design, and analysis of geological data (e.g. in petrochemical prospecting).

Table 1: Examples of Super Computers

Supercomputer	**Peak speed (Rmax)**
IBM Summit	122.3 PFLOPS
Sunway TaihuLight	93.01 PFLOPS
NUDT Tianhe-2	33.86 PFLOPS
Cray Titan	17.59 PFLOPS
IBM Sequoia	17.17 PFLOPS
Fujitsu K computer	10.51 PFLOPS
Tianhe-IA	2.566 PFLOPS
Cray Jaguar	1.759 PFLOPS
IBM Roadrunner	1.026 PFLOPS
	1.105 PFLOPS

Main Frame Computers

- Mainframes are a type of computer that generally are known for their large size, amount of storage, processing power and high level of reliability.
- Nearly all mainframes can run (or host) multiple operating systems. Mainframes are designed to handle very high-volume input and output (I/O) and emphasize throughput computing.
- A single mainframe can replace dozens or even hundreds of smaller servers.
- Mainframe computers are primarily used by large organizations for critical applications such as bulk data processing, census, industry and consumer statistics, enterprise resource planning; and transaction processing.
- The chief difference between a Supercomputer and a Mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently.

- In some ways, mainframes are more powerful than supercomputers because they support more simultaneous programs. But supercomputers can execute a single program faster than a mainframe.
- Some examples of Mainframe computers are
  - 1. IBM zEnterprise System.
  - 2. IBM System z9.
  - 3. IBM System z10.
  - 4. Fujitsu's ICL VME.
  - 5. Hitachi's Z800.

Mini Computer

- A minicomputer is a computer which has all the features of a large size computer, but its size is smaller than those.
- A minicomputer lies between the mainframe and the microcomputer because its size is smaller than the former one and larger than the latter one.
- Minicomputers are mainly multi-users systems where more than one user can work simultaneously.
- Also, the power of processing of minicomputers is not larger than the power of mainframe and supercomputers. These minicomputers can do time-sharing, batch processing, and online processing.

- **The Notable examples of Minicomputers are**
  - Control Data's CDC 160A and CDC 1700
  - DEC PDP and VAX series
  - Data General Nova
  - Hewlett-Packard HP 3000 series and HP 2100 series
  - Honeywell-Bull DPS 6/DPS 6000 series
  - IBM midrange computers
  - Interdata 7/32 and 8/32

Workstation

- It is a type of computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other types of applications that require a moderate amount of computing power and relatively high-quality graphics capabilities.
- Workstations generally come with a large, high-resolution graphics screen, at large amount of RAM, built-in network support, and a graphical user interface.

- The most common operating systems for workstations are UNIX and Windows NT.
- Like personal computers, most workstations are single-user computers. However, workstations are typically linked together to form a local-area network, although they can also be used as stand-alone systems.

Micro computers

- Desktop computers, laptops, personal digital assistant (PDA), tablets & smartphones are all types of microcomputers.
- The micro-computers are widely used & the fastest growing computers. These computers are the cheapest among the other three types of computers.

- The Micro-computers are specially designed for general usage like entertainment, education and work purposes.
- Well known manufacturers of Micro-computer are Dell, Apple, Samsung, Sony & Toshiba.
- A Microcomputer contains a microprocessor (a central processing unit on microchip), memory in the form of read-only memory and random-access memory, I/O ports and a bus or system of interconnecting wires, that is usually called as motherboard.

Programming Languages

- Language is defined as a means of communication.
- A programming language is a formal language comprising a set of instructions that produce various kinds of output. Programming languages are used in computer programming to implement algorithms.
- Programming Language provides communication between human and the machine.
- There are three types of programming language
  - Machine Language
  - Assembly Language
  - High Level Language

- **Machine language** is the low level programming language.
- Machine language can only be represented by 0s and 1s.
- In earlier when we have to create a picture or show data on the screen of the computer then it is very difficult to draw using only binary digits(0s and 1s).
- For example: To write 120 in the computer system its representation is 1111000. So it is very difficult to learn. To overcome this problem the assembly language is invented.

- **Assembly language** is the more than low level and less than high-level language so it is intermediary language.
- Assembly languages use numbers, symbols, and abbreviations instead of 0s and 1s.

For example:

- For addition, subtraction and multiplications it uses symbols likes Add, sub and Mul, etc.


Assembly Language
Assembler
Machine language
(Low level language)

Machine Language	Assembly Language
Machine language is only understood by the computers.	Assembly language is only understand by human beings not by the computers.
In machine language data only represented with the help of binary format(0s and 1s), hexadecimal and octadecimal.	In assembly language data can be represented with the help of mnemonics such as Mov, Add, Sub, End etc.
Machine language is very difficult to understand by the human beings.	Assembly language is easy to understand by the human being as compare to machine language.
Modifications and error fixing cannot be done in machine language.	Modifications and error fixing can be done in assembly language.

Machine Language	Assembly Language
Machine language is very difficult to memorize so it is not possible to learn the machine language.	Easy to memorize the assembly language because some alphabets and mnemonics are used.
Execution is fast in machine language because all data is already present in binary format.	Execution is slow as compared to machine language.
There is no need of translator.The machine understandable form is the machine language.	Assembler is used as translator to convert mnemonics into machine understandable form.
Machine language is hardware dependent.	Assembly language is the machine dependent and it is not portable.
Machine language is very difficult to memorize so it is not possible to learn the machine language.	Easy to memorize the assembly language because some alphabets and mnemonics are used.

High level Language

- High level languages are instructions, which are called as statements that use brief statements or arithmetic expressions.
- High level language statements resemble the phrases or mathematics expression required to express the problem or procedure being programmed.
- Most common programming languages are considered high-level languages. Examples include C++,C#, Cobol, Java, JavaScript, PHP, Python, etc.,

- Each of these languages use different syntax.
- Some are designed for writing desktop software programs, while others are best-suited for web development. But they all are considered high-level since they must be processed by a compiler or interpreter before the code is executed.
- Source code written in languages like C++ and C# must be compiled into machine code in order to run. The compilation process converts the human-readble syntax of the high-level language into low-level code for a specific processor.
- Source code written in scripting languages like Perl and PHP can be run through an interpreter, which converts the high-level code into a low-level language on-the-fly.

Advantages

1. High level languages are programmer friendly. They are easy to write, debug and maintain.
2. It provide higher level of abstraction from machine languages.
3. It is machine independent language.
4. Easy to learn.
5. Less error prone, easy to find and debug errors.
6. High level programming results in better programming productivity.

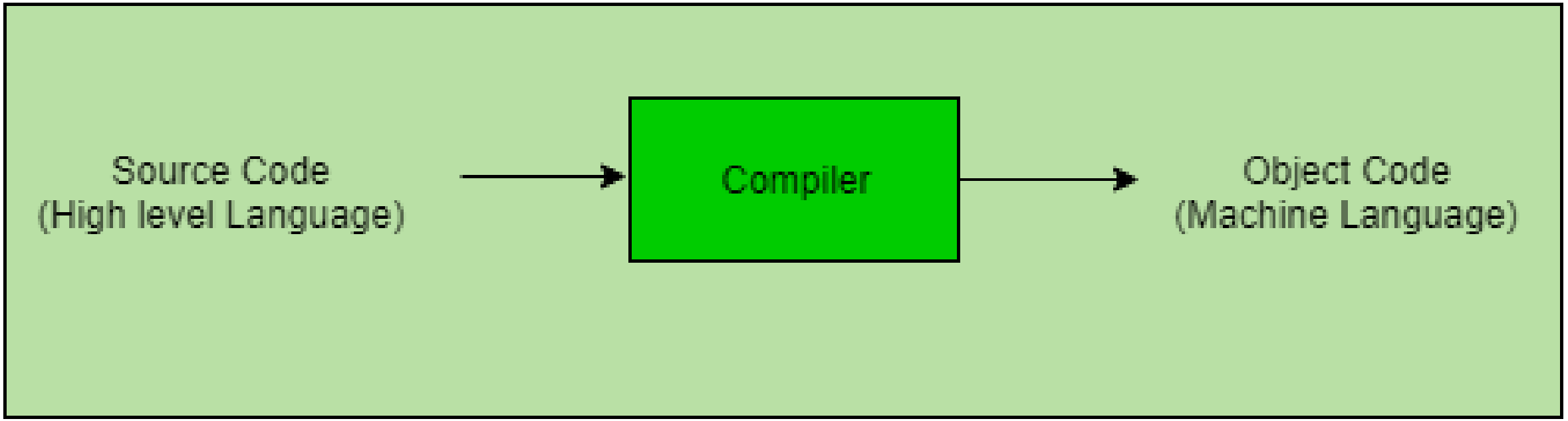
Disadvantages

1. It takes additional translation times to translate the source to machine code.
2. High level programs are comparatively slower than low level programs.
3. Compared to low level programs, they are generally less memory efficient.
4. Cannot communicate directly with the hardware.

High Level Language	Low Level Language
It is programmer friendly language.	It is a machine friendly language.
High level language is less memory efficient.	Low level language is high memory efficient.
It is easy to understand.	It is tough to understand.
It is simple to debug.	It is complex to debug comparatively.
It is simple to maintain.	It is complex to maintain comparatively.
It is portable.	It is non-portable.
It can run on any platform.	It is machine-dependent.
It needs compiler or interpreter for translation.	It needs assembler for translation.
It is used widely for programming.	It is not commonly used now-a-days in programming.

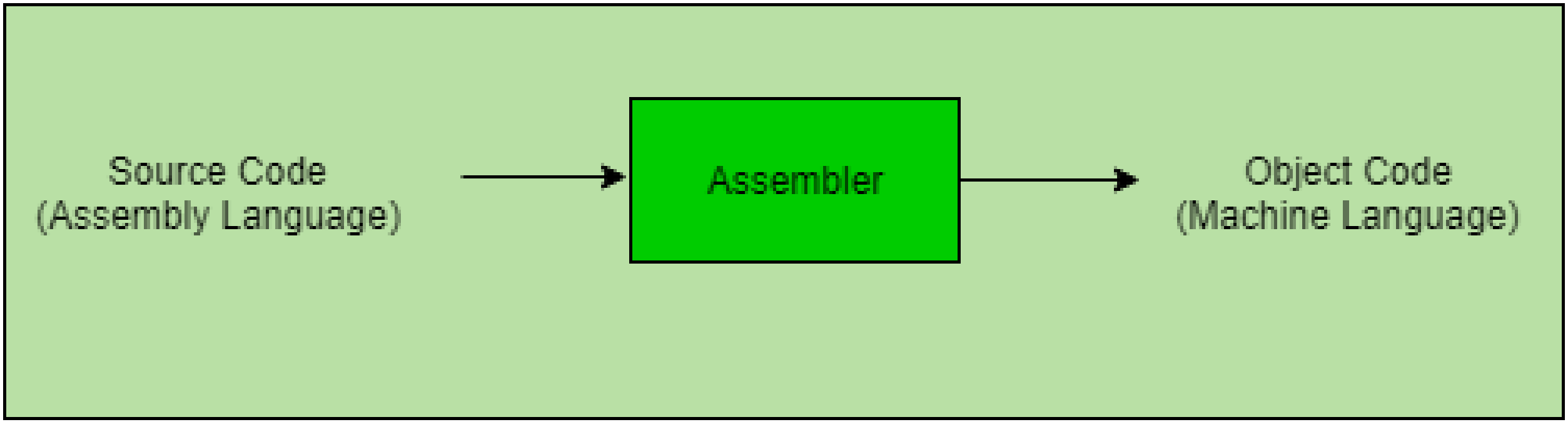
Language Processors

- The language processor that reads the complete source program written in high level language in one go and translates it into an equivalent program in machine language is called as a **Compiler**.
  - **Example:** C, C++, C#, Java.
- In a compiler, the source code is translated to object code successfully if it is free of errors. The compiler specifies the errors at the end of compilation with line numbers when there are any errors in the source code. The errors must be removed before the compiler can successfully recompile the source code again


Source Code
(High level Language)
Compiler
Object Code
(Machine Language)

Assembler

- The **Assembler** is used to translate the program written in Assembly language into machine code. The source program is an input of assembler that contains assembly language instructions. The output generated by assembler is the object code or machine code understandable by the computer.


Source Code
(Assembly Language)
Assembler
Object Code
(Machine Language)

Interpreter

- The translation of single statement of source program into machine code is done by language processor and executes it immediately before moving on to the next line is called an interpreter.
- If there is an error in the statement, the interpreter terminates its translating process at that statement and displays an error message.
- The interpreter moves on to the next line for execution only after removal of the error.
- An Interpreter directly executes instructions written in a programming or scripting language without previously converting them to an object code or machine code.
  - **Example:** Perl, Python and Matlab.

Compiler	Interpreter
A compiler is a program which coverts the entire source code of a programming language into executable machine code for a CPU.	interpreter takes a source program and runs it line by line, translating each line as it comes to it.
Compiler takes large amount of time to analyze the entire source code but the overall execution time of the program is comparatively faster.	Interpreter takes less amount of time to analyze the source code but the overall execution time of the program is slower.
Compiler generates the error message only after scanning the whole program, so debugging is comparatively hard as the error can be present any where in the program.	Its Debugging is easier as it continues translating the program until the error is met
Generates intermediate object code.	No intermediate object code is generated.
Examples: C, C++, Java	Examples: Python, Perl

Components of Computer System

- Computer System is composed of Hardware, Software, Memory and Users.

Hardware:

- Hardware consists of the mechanical parts that makeup the computer as a machine.
- Those devices are required for input, output, store the data and process the data.
- Such devices are keyboard, Mouse, Hard disk, CD Drive, Printer, Mother board, ROM, RAM, etc.,

Software

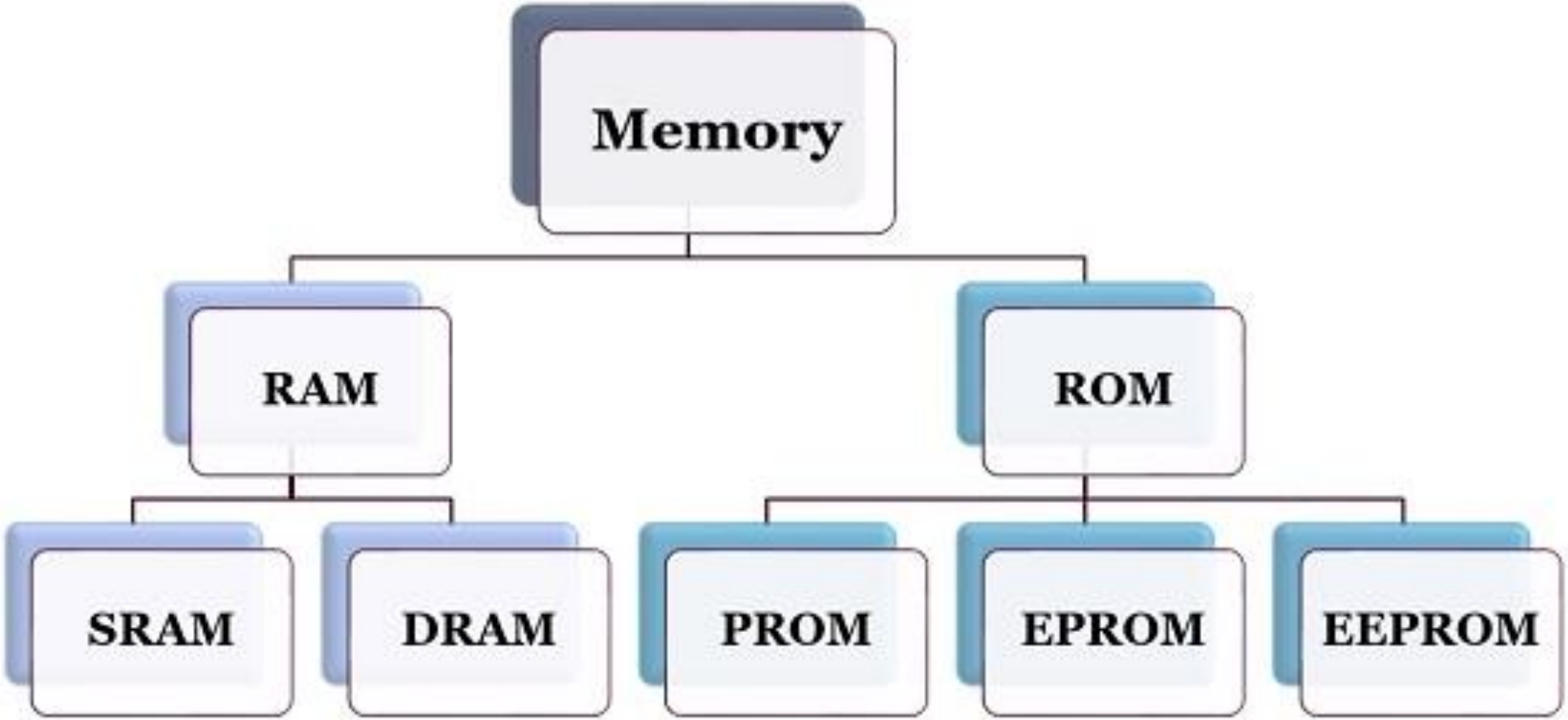
- Software is a collection of data or computer instructions that tell the computer how to work.
- *Software* comprises the entire set of *programs*, procedures, and routines associated with the operation of a computer system.
- A set of instructions that directs a computer's hardware to perform a task is called a program, or *software* program.
- **Examples** of applications include Office suites, Database programs, Web browsers, Word processors

Memory

- Computer memory is a device that is used to store data or programs (sequences of instructions) on a temporary or permanent basis.
- Computer memory is divided into Main (or Primary) memory and Auxiliary (or secondary) memory.
- Main memory holds instructions and data when a program is executing, while auxiliary memory holds data and programs not currently in use and provides long-term storage.

Main Memory

- Main memory is accessible directly by the CPU.
- 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.
- The data and instruction required to be processed resides in the main memory.
- It is divided into four subcategories RAM, ROM, Cache and Registers.

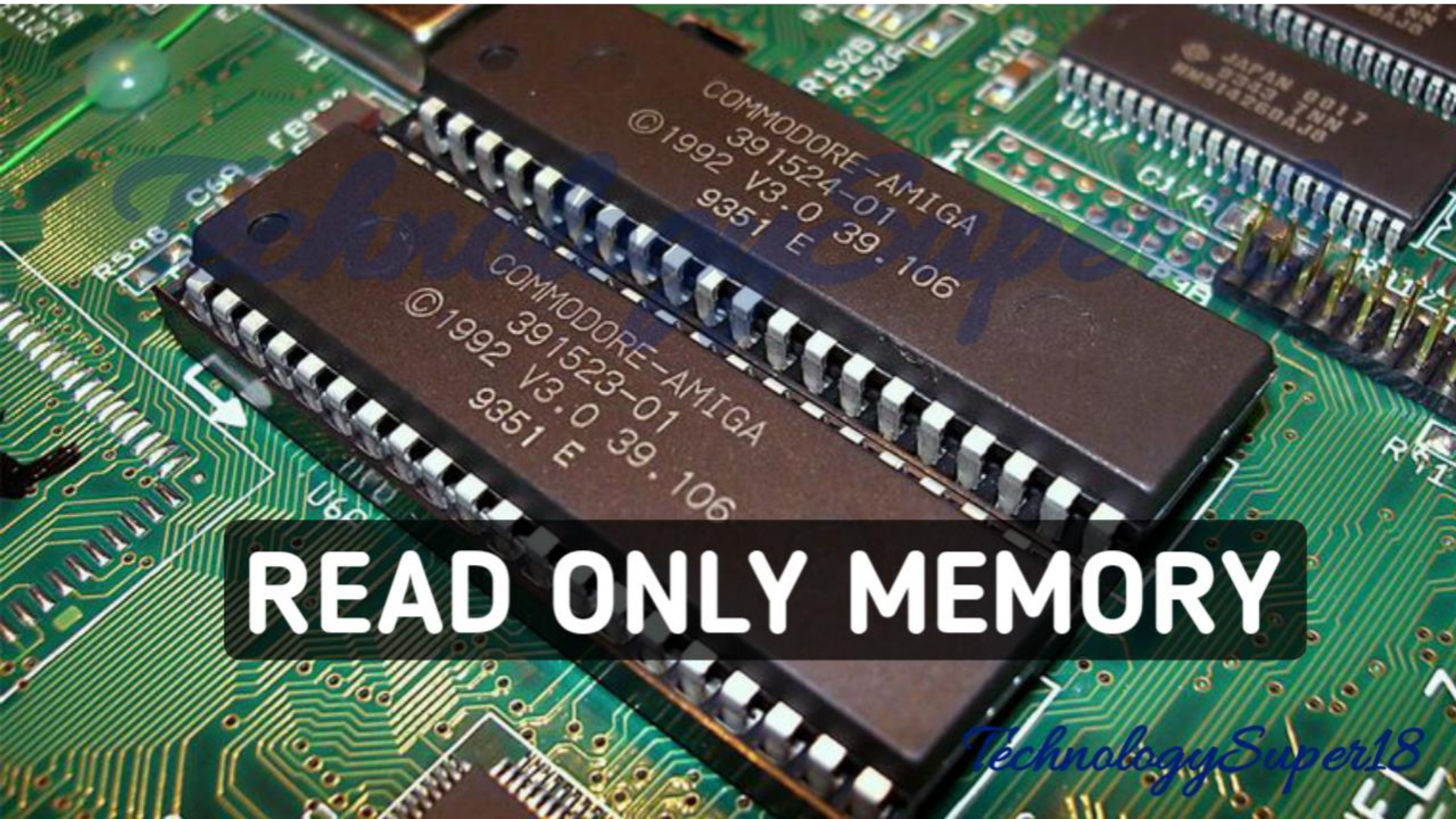

Memory
RAM
ROM
SRAM
DRAM
PROM
EPROM
EEPROM

Characteristic of Primary Memory

- The computer can't run without primary memory
- It is known as the main memory.
- It is a working memory of the computer.
- Primary memory is faster comparing to secondary memory.

Read Only Memory (ROM)

- ROM stands for Read only Memory
- ROM is non-volatile memory.
- The user cannot write data to the ROM without special access.
- ROM is usually found as a chip(s) on the motherboard and is used to store the Basic Input and Output System (BIOS) of the computer along with other important information that is needed to function.
- ROM was designed so that the BIOS could be accessed by the computer without the need for other parts of hardware.



READ ONLY MEMORY

TechnologySuper18

Types of ROM

- Programmable Read Only memory (PROM)
- Erasable Programmable Read Only memory (EPROM).
- Electrically Erasable Programmable Read Only memory (EEPROM).

Programmable Read Only memory (PROM)

- PROM or Programmable ROM (Programmable Read-Only Memory) is a 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.
- Inside the PROM chip, there are small fuses which are burnt open during programming.
- PROM was first developed by Wen Tsing Chow in 1956.
- An example of a PROM is a computer BIOS in early computers.
- Today, PROM in computers has been replaced by EEPROM.

PROM CHIP

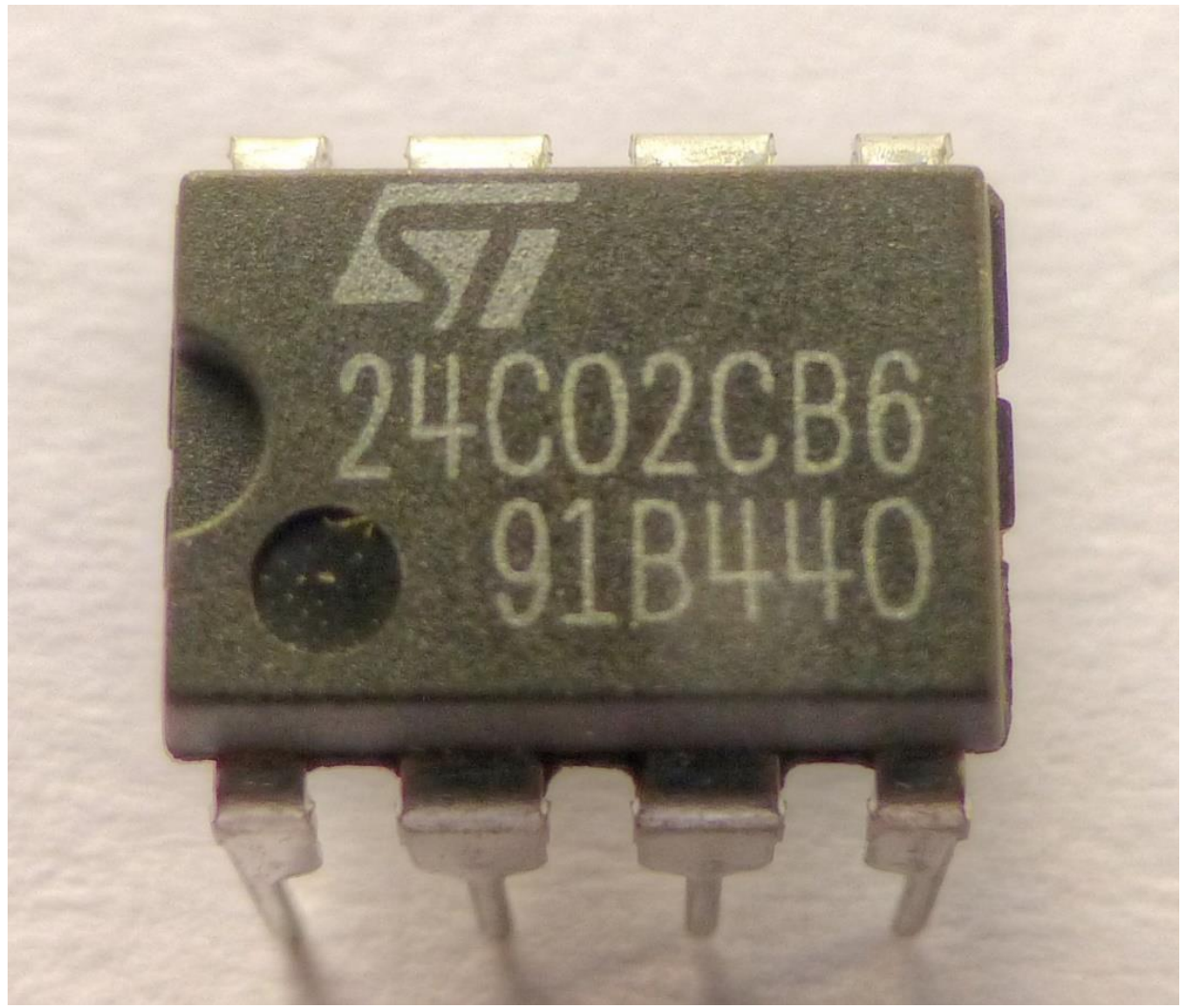
EPROM.

- **EPROM** (Erasable programmable read-only **memory**) that can be erased and re-used. Erasure is caused by shining an intense ultraviolet light through a window that is designed into the **memory** chip.
- This type of memory you can rewrite data over the old data, but you cannot keep the old data.
- So once you burn the new data into the ROM chip, the old data is gone.
- EPROM ensures each process will be performed repeatedly and is more expensive then PROM, the advantages over PROM is that is capable of multiple updates.

EPROM CHIP

EEPROM

- EEPROM -Electrically Erasable Programmable ROM.
- It can be erased and reprogrammed about ten thousand times.
- Both erasing and programming take about 4 to 10 ms (millisecond).
- In EEPROM, any location can be selectively erased and programmed.
- EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of reprogramming is flexible but slow.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Cache Memory

- CACHE is a hardware or software component that stores data so that future requests for that data can be served faster; the data stored in a cache might be the result of an earlier computation or a copy of data stored elsewhere.
- Cache is used to store small bits of frequently accessed data from the RAM so that the processor doesn't have to wait for the RAM to respond every time it wants the same piece of information.
- Cache is volatile, like RAM, so it wipes clear whenever the computer gets turned off.
- Cache memory lies on the path between the CPU and the main memory.
- It facilitates the transfer of data between the processor and the main memory at the speed which matches to the speed of the processor.

CACHE MEMORY

- Processor registers are located inside the processor.
- Each register typically holds a word of data (often 32 or 64 bits).
- CPU instructions instruct the arithmetic logic unit to perform various calculations or other operations on this data (or with the help of it).
- Registers are the fastest of all forms of computer data storage.

Random Access Memory (RAM)

- RAM is a type of data storage used in computers, it acts as a mediator between the CPU and the storage device which helps speed up the computer.
- When the user try to access a piece of information, such as opening an application, it gets moved from the hard drive to the RAM.
- The CPU then reads from the RAM instead of the hard drive as it can access the RAM and read from it much faster than it can if the data was still on the hard drive.

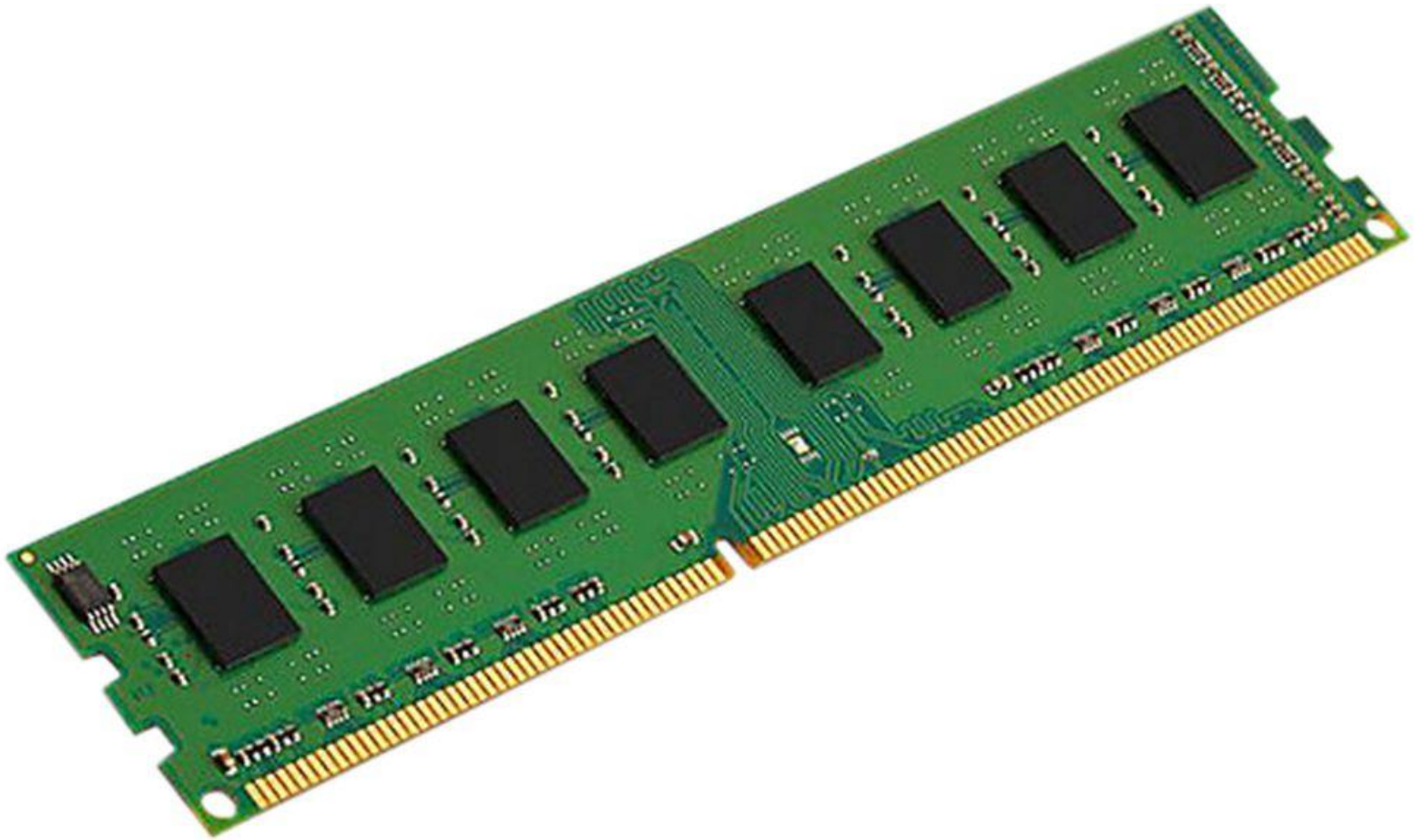
- RAM is of two types –
  - Static RAM (SRAM)
  - Dynamic RAM (DRAM)
- The word **static** indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature.
- DRAM must be continually **refreshed** in order to maintain 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.

Differences Between RAM and ROM

1. RAM is a temporary **storage type** of memory as data lasts only till the time the power supply is on. On the contrary, ROM is a permanent memory that retains the data for a longer duration.
2. Random-access memory is volatile in nature. But read-only memory is non-volatile in nature.
3. The **operating speed** of RAM is faster than the ROM.
4. RAM offers **memory capacity** in GB usually 1 to 256 GB per chip. On the contrary, ROM permits the storage capacity in MB, usually in the range 4 to 8 MB per chip.

5. RAM stores data on transistors thus requires a continuous **source of power.** While data stored in ROM remain unaffected with power failure.
6. The data stored in RAM is changeable by the user. Whereas the data in ROM cannot be altered by the user.
7. RAM offers the user to read as well as write data but data in ROM is pre-written and thus can only be read by the user.
8. The processor can directly access the data present in RAM. However, the data present in ROM do not permit direct access to the processor.
9. The **cost** of Random access memory is comparatively higher than the read-only memory.

RAM



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.

Magnetic Tape

- In magnetic tape only one side of the ribbon is used for storing data.
- It is sequential memory which contains thin plastic ribbon to store data and coated by magnetic oxide.
- Data read/write speed is slower because of sequential access. It is highly reliable which requires magnetic tape drive writing and reading data.
- The width of the ribbon varies from 4mm to 1 Inch.

Advantages

1. These are inexpensive, i.e., low cost memories.
2. It provides backup or archival storage.
3. It can be used for large files.
4. It can be used for copying from disk files.
5. It is a reusable memory.
6. It is compact and easy to store on racks.

Disadvantages

1. Sequential access is the disadvantage, means it does not allow access randomly or directly.
2. It requires caring to store, i.e., vulnerable humidity, dust free, and suitable environment.
3. It stored data cannot be easily updated or modified, i.e., difficult to make updates on data.

Hard Disk

- •The Hard disk drive is the main and usually largest data storage device in a computer.
- It is located inside the system case (cabinet).
- •It can store anywhere from 250 gigabytes to 2 terabytes.
- •Hard disk speed is the speed at which content can be read and written on a hard disk.
- •A hard disk unit comes with a set rotation speed varying from 4500 to 7200rpm.
- •Disk access time is measured in milliseconds.

Floppy Disk

- The floppy disk (or a 3 1/2) is a removable Magnetic Storage Medium.
- Floppy disks are used for moving information between computers, laptops or other devices.
- Floppy disks are inserted into a floppy disk drive which allows data to be read or stored.
- Floppy disks store much less data than a CD-ROM disk or USB flash drive.

- A normal 3½ inch disk can store 1.44 megabytes of data. This is usually enough for simple text documents.
- A special type of floppy disk was made in the late 1980s. It could store 2.88 MB of data.
- Floppy disk technology has been around since the early 1970s (the 8-inch floppy was the first).
- Today, floppy disks have been replaced by other storage media, like USB flash drives.
- Floppy disks and drives are no longer manufactured.

Compact Disk (CD):

- It stores data and it has circular plastic; single side of the plastic is coated by aluminum alloy which stores data. It is protected by additional thin plastic covering. CD requires a CD drive for its operation.
- CDs can hold up to 700 MB worth of data, which is about 80 minutes of music.
- CD's can be Classified as CD-R, CD-RW,CD-Audio, Video CD or VCD and DVD.

USB

- A USB flash drive (USB stands for Universal Serial Bus) is a popular way to store digital information.
- Flash drives are an easy way to share data (information).
- A USB flash drive can be attached to a USB port, and provides a certain amount of storage space, which can be used to store data.
- They are called "flash drive" because they use flash memory to store files. Flash memory is a type of computer chip.

- USB flash drives have some advantages over other portable storage devices.
- They are physically much smaller and more rugged than floppy disks. They can read data faster and store more data than floppy disks.
- Flash drives are used to store any type of data file, or to move data from one computer to another.
- USB flash drives have a lot of storage space. It is often easier to use a flash drive than to carry many CD-ROMs.

- Some computer programs can be run from a USB flash drive. These special versions of programs are called "portable" versions.
- Computer administrators, or people who manage the computer systems, sometimes use flash drives.
- Sometimes flash drives are also used to run a computer virus scanner. They are often used to repair a computer system that was damaged or faulty.
- Most computers today can boot from a USB drive. Special operating systems can run from a bootable flash drive.

DVD

- A DVD (which means Digital Versatile Disc or a Digital Video Disc) is an optical disc capable of storing up to 4.7 GB of data, more than six times what a CD can hold.
- DVDs are often used to store movies at better quality than a VHS.
- Like CDs, DVDs are read with a laser.

- The disc can have one or two sides, and one or two layers of data per side; the number of sides and layers determines how much it can hold. A 12 cm diameter disc may have one of the following storage capacities:
  - DVD-5: single sided, single layer, 4.7 gigabytes (GB)
  - DVD-9: single sided, double layer, 8.5 GB .
  - DVD-10: double sided, single layer on both sides, 9.4 GB DVD-14: double sided, double layer on one side, single layer on other, 13.3 GB)
  - DVD-18: double sided, double layer on both sides, 17.1 GB

Blue Ray Disc

- Blu-ray Disc is a high-density optical disc format similar to DVD.
- A dual-layer Blu-ray disc can store up to 50GB (gigabytes) of data. This is over five times the capacity of a DVD, and over 70 times more than a CD or VCD.
- The disc was developed by the Blu-ray Disc Association (BDA) and released in 2006. The format was developed for recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data.
- Older optical disc technologies such as DVD, DVD±R, DVD±RW, and DVD-RAM used a red laser to read and write data. The new format used a blue-violet laser instead.


Blu-ray Disc

Optical Disc

	CD	DVD	BD
Capacity	700MB	4.7GB – 17GB	50GB
Wavelength	780nm	650nm	405nm
Read/Write Speed	1200KB/s	10.5MB/s	36MB/s
Example	• CD-ROM, • CD-R • CD-RW	• DVD-ROM • DVD+R/RW • DVD-R/RW • DVD-RAM	• BD-R • BD-RE

History of Computers

- The first generation of the computer used vacuum tubes for the circuitry and the magnetic drums for the memory and taking up the big rooms.
- A vacuum tube was a fragile glass device, which filaments as a source of electronics and could control and amplify electronic signals.
- It was the only high – speed electronic switching devices available in those days.

First Generation: Vacuum Tubes (1940–1956)

- The first-generation computers were very expensive to operate and uses a great amount of electricity and produced a large amount of heat.
- The first generation of the computer relied on the machine language. It can solve the one problem at a time can't do the multitasking work. The input was based on the punched cards and the paper tape and the output was displayed on the printouts.

- Advantages
  - Vacuum tubes were the only electronic component available during those days.
  - Vacuum tube technology made possible to make electronic digital computers.
- Disadvantages
  - The computers were very large in size.
  - They consumed a large amount of energy.
  - They heated very soon due to thousands of vacuum tubes.
  - They were not very reliable.
  - Air conditioning was required.

- Constant maintenance was required.
- Non-portable.
- Costly commercial production.
- Limited commercial use.
- Very slow speed.
- Limited programming capabilities.
- Used machine language only.
- Used magnetic drums which provide very less data storage.
- Used punch cards for input.

Vacuum Tubes

Second Generation (1956-1964)

- John Bardeen, William Shockley, and Walter Brattain invented a new electronic switching device called transistors at Bell laboratories in 1947.
- Transistors were used in the second generation of the computer and transistors replaced the vacuum tubes.
- Due to the transistor's computer becomes smaller, cheaper and faster. It is very reliable than the first generation of the computer.

- Transistors were also produced the large amount of heat that subjected the computer to damage. But some improvement was shown that in the second generation of the computer.
- High-level programming languages were also developed at the same time. The first computer of the second generation was developed for the atomic energy industry.

Advantages

✓ More reliable than the first generation.

✓ Good speed and can calculate the data in the microseconds.

✓ Also used assembly languages.

✓ Smaller in the size as compared to the first generation.

✓ Use less amount of energy.

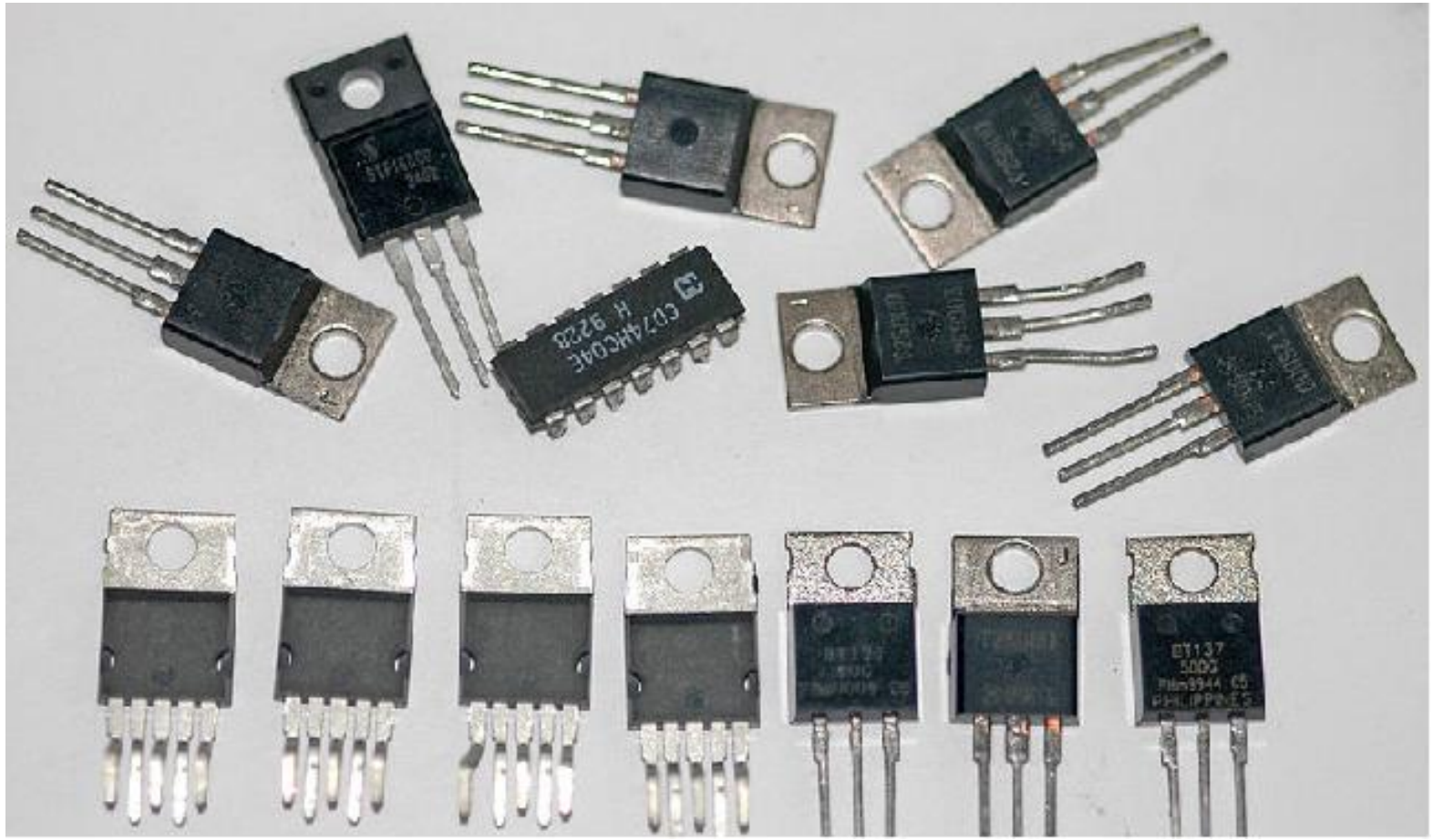
✓ Portable

✓ Accuracy is improved than its predecessor.

Disadvantages

- ✓ Constant maintenance is required to work properly.
- ✓ Commercial production was very difficult.
- ✓ Still punched cards were used for input.
- ✓ The cooling system is required.
- ✓ More expensive and non-versatile.
- ✓ Used for specific purposes.

Transistors



Third Generation Computers (1965-1970)

- Third generation of computers are Integrated Circuits (IC) which was founded by Jack St. Clair Kilby and Robert Noyce in 1958.
- Integrated circuits are the circuits consisting of several electronic components like transistors, capacitors, and resistors.
- Transistors were placed on the silicon chips known as semiconductors which increases the speed and efficiency of the computer drastically.

- A single IC chip may contain thousands of transistors.
- Instead of the punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an OS (operating system), which allowed the device to run many applications at one time.
- This generation of the computer is small, cheaper and reliable than its predecessors.

- Another salient feature of these computers was that they were much more reliable and consumed far less power.
- The input languages for such computers were COBOL, FORTRAN-II up to FORTRAN-IV, PASCAL, ALGOL-68, BASIC, etc. These languages were much better and could represent more information.
- Consequently, more and more complex calculations are possible.

Advantages

✓ Smaller in size as compared to previous generations.

✓ More reliable.

✓ Used less energy

✓ Produced less heat as compared to the previous two generations of computers.

✓ Better speed and could calculate data in nanoseconds.

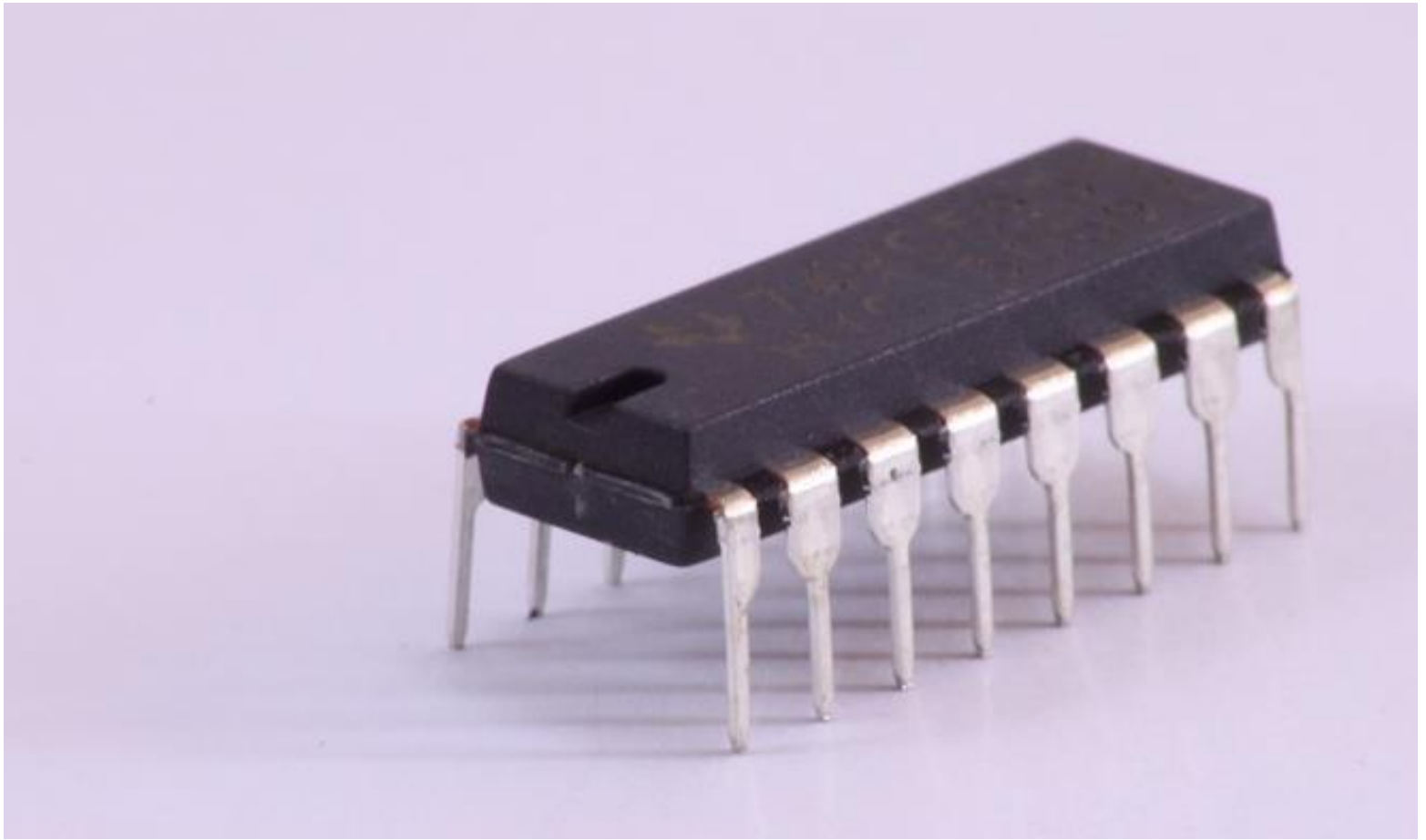
- ✓ Used fan for heat discharge to prevent damage.
- ✓ Maintenance cost was low because hardware failure is rare.
- ✓ Could be used for high-level languages.
- ✓ Versatile to an extent
- ✓ Less expensive
- ✓ Better accuracy
- ✓ Commercial production increased.
- ✓ Used mouse and keyboard for input.

Disadvantages

✓ Air conditioning was required.

✓ Highly sophisticated technology required for the manufacturing of IC chips

Integrated Circuits



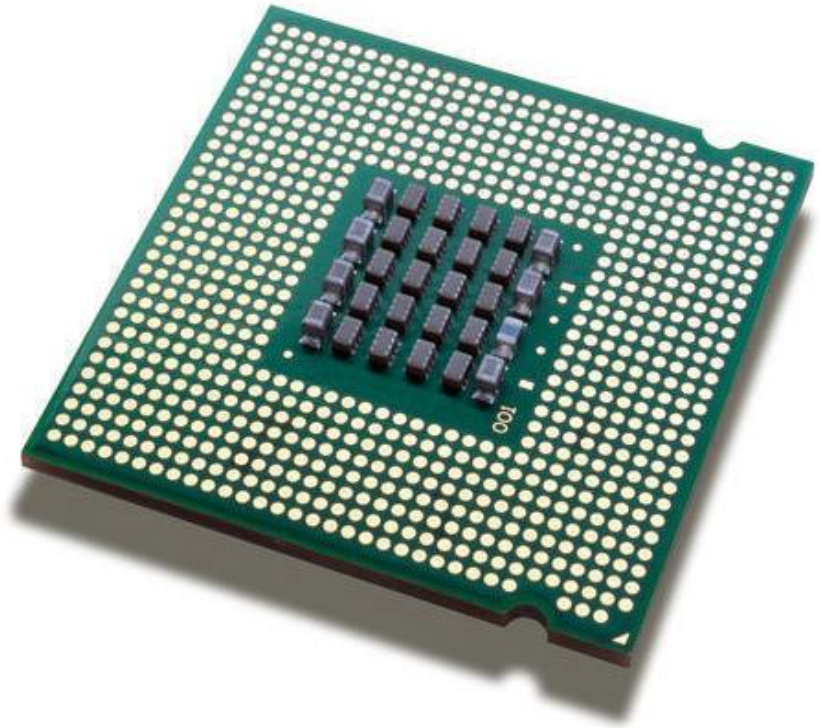
Fourth Generation Computers (1975-Present)

- The fourth-generation computers started with the invention of Microprocessor.
- The Microprocessor contains thousands of ICs.
- Ted Hoff produced the first microprocessor in 1971 for Intel. It was known as Intel 4004.
- It greatly reduced the size of computer.
- The size of modern Microprocessors is usually one square inch.
- During the fourth generation, semiconductors memories replaced magnetic core memories resulting in large random-access memories with very fast access time.

- On another side, Hard disks became cheaper, smaller, and larger in capacity.
- On the software side, several new developments came to match the new technologies of the fourth generation.
- This generation of computers had the first “supercomputers” that could perform many calculations accurately.
- The computer languages like languages like C, C+, C++, DBASE etc. were the input for these computers.

- Advantages
  - More powerful and reliable than previous generations.
  - Smaller in size
  - Fast processing power with less power consumption
  - Fan for heat discharging and thus to keep cold.
  - No air conditioning required.
  - Cheapest among all generations
  - All types of High-level languages can be used in this type of computers
- Disadvantages
  - The latest technology is required for manufacturing of Microprocessors.

Micro Processor

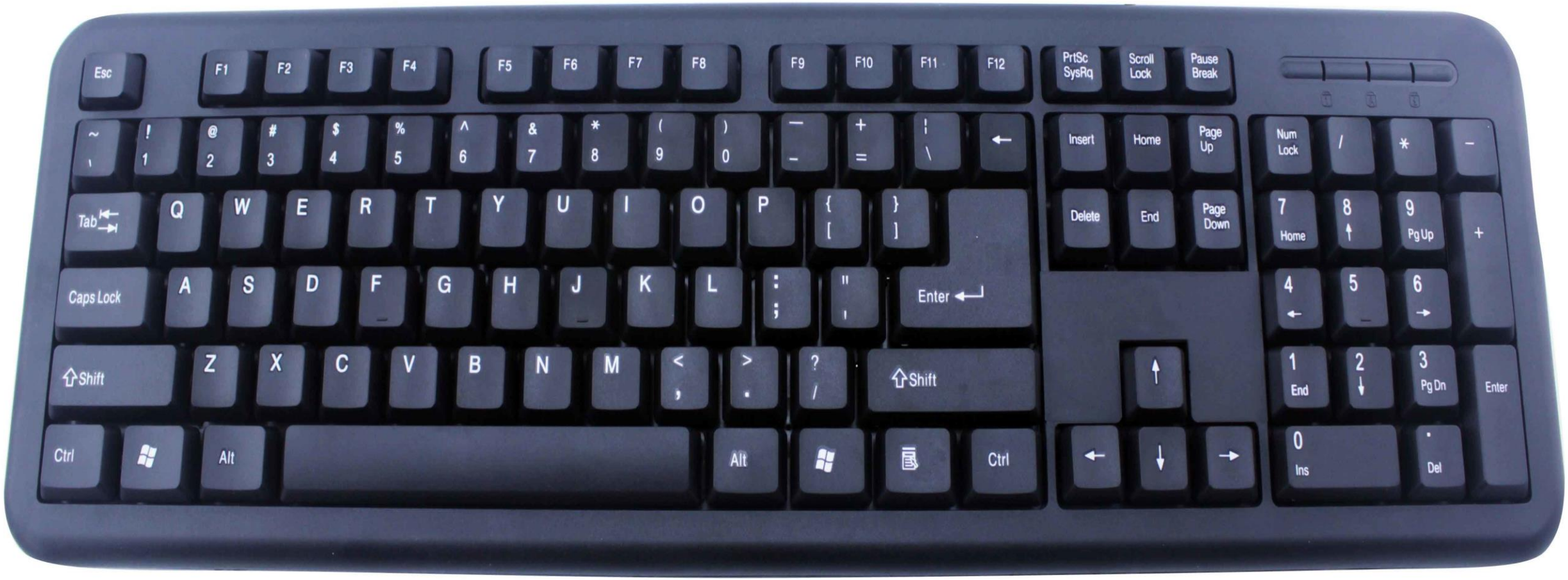


Input Devices

- Any device that allows information from outside the computer to be communicated to the computer is considered as an Input Device.
- These include a **Keyboard, Mouse, Trackball, Spaceball, Joystick, Light Pens, Barcode readers, Image Scanners, Touch Panels and Magnetic Ink Character Recognition (MICR).**
- Analog- Mouse, Trackball, Scanner, Joystick.
- Digital- Keyboard, Light pen, Touch panels.

Keyboards

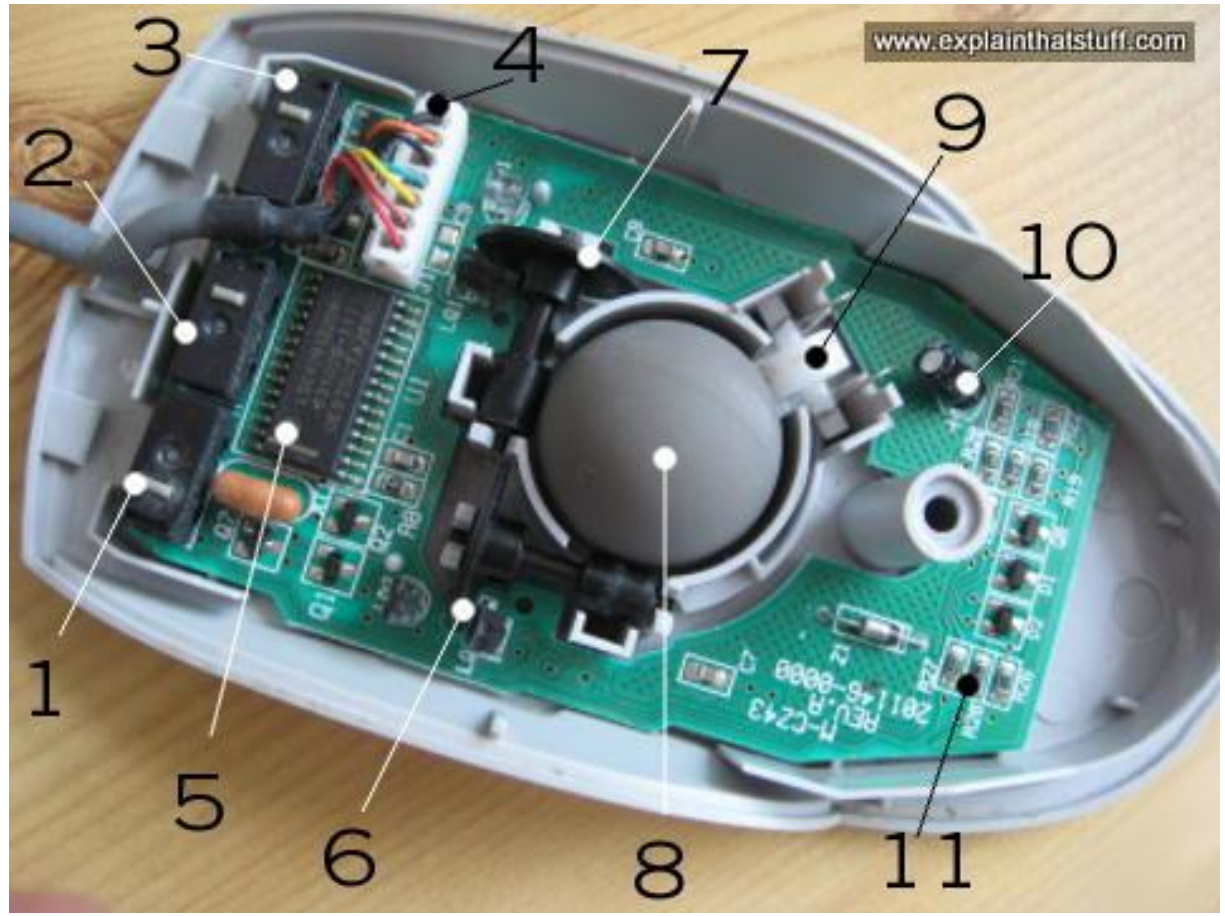
- Keyboard is used to enter the data into a computer.
- Generally 108 keys are in keyboard.
- It consists of Alphanumeric keys, function keys , Cursor control keys and Control Keys.
- Alphanumeric Keys include (A-Z),(0-9),(`~!@#$%^&*()_-+={}:";<>?,./)
- Cursor-control keys and function keys are common features on general purpose keyboards.
- Function keys (F1 to F12) allow users to enter frequently used operations in a single keystroke, and cursor-control keys can be used to select displayed objects or coordinate positions by positioning the screen cursor.
- Special Keys include Enter Key, Backspace, Number Lock, Caps Lock, Ctrl, Shift.


Esc
F1 F2 F3 F4
F5 F6 F7 F8
F9 F10 F11 F12
PrtSc SysRq
Scroll Lock
Pause Break
Tab
Q W E R T Y U I O P
Caps Lock
A S D F G H J K L
Enter
Shift
Z X C V B N M
Shift
Ctrl
Alt
Alt
Ctrl
Insert
Home
Page Up
Delete
End
Page Down
Num Lock
7 Home
8
9 Pg Up
4
5
6
1 End
2
3 Pg Dn
Enter
0 Ins
Del

Mouse

- A mouse is small hand-held box used to position the screen cursor.
- Wheels or rollers on the bottom of the mouse can be used to record the amount and direction of movement.
- Another method for detecting mouse motion is with an optical sensor. For these systems, the mouse is moved over a special mouse pad that has a grid of horizontal and vertical lines.
- The optical sensor detects movement across the lines in the grid.

- There are three types of mouse.
- **Mechanical mouse:** Houses a hard rubber ball that rolls as the mouse is moved. Sensors inside the mouse body detect the movement and translate it into information that the computer interprets.
- **Optical mouse:** Uses an LED sensor to detect tabletop movement and then sends off that information to the computer for merry munching.
- **Infrared (IR) or radio frequency cordless mouse:** With both these types, the mouse relays a signal to a base station wired to the computer's mouse port. The cordless mouse requires power, which comes in the form of batteries.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Trackball

- A trackball is a computer pointing device which can perform the same functions as a mouse.
- With a trackball, The user rolls the ball to direct the cursor to the desired place on the screen and can click one of two buttons (identical to mouse buttons) near the trackball to select desktop objects or position the cursor for text entry.
- A trackball spins very freely, so a simple flick of your fingers will produce a scroll much longer than a movement with a mouse.


Simply Works


Logitech

Spaceball

- A graphical input device that is based on a fixed spherical ball. It allows complex objects to be positioned and rotated in three-dimensional space using the single input device.
- While a trackball is a two-dimensional positioning device, whereas a Spaceballs provides six degrees of freedom.
- Unlike the trackball, a Spaceballs does not actually move.
- Strain gauges measure the amount of pressure applied to the spaceballs to provide input for spatial positioning and orientation as the ball is pushed or pulled in various directions.
- Spaceballs are used for three-dimensional positioning and selection operations in virtual-reality systems, modeling, animation, CAD, and other applications.


COMPAQ

Joystick

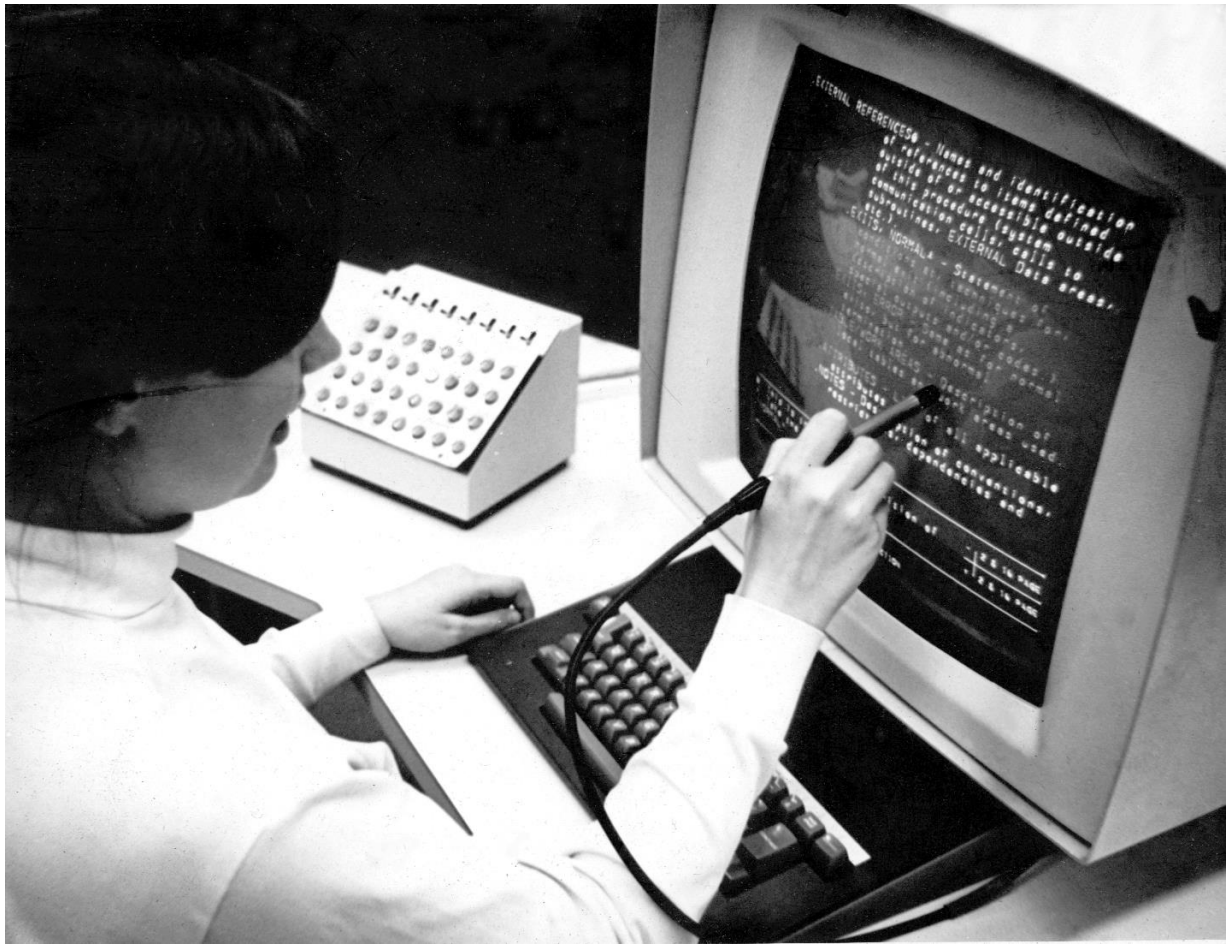
- A joystick consists of a small, vertical lever (called the stick) mounted on a base that is used to steer the screen cursor around.
- Most joysticks select screen positions with actual stick movement; others respond to pressure on the stick.
- Some joysticks are mounted on a keyboard; others function as stand-alone units.
- The distance that the stick is moved in any direction from its center position corresponds to screen-cursor movement in that direction.
- Potentiometers mounted at the base of the joystick measure the amount of movement, and springs return the stick to the center position when it is released.
- One or more buttons can be programmed to act as input switches to signal certain actions once a screen position has been selected.


5
6
3
4
2
11
12

Light Pen

- A **light pen** is a computer input device in the form of a light-sensitive wand used in conjunction with a computer's cathode-ray tube (CRT) display.
- It allows the user to point to displayed objects or draw on the screen in a similar way to a touchscreen but with greater positional accuracy.
- A light pen can work with any CRT-based display, but its ability to be used with LCDs.
- A **light pen** may also be used to describe the pen (stylus) used with a graphics tablet.
- Today, light pens are no longer used due to the invention of touch screens.

Light pen



Touch Panels

- Touch panels allow displayed objects or screen positions to be selected with the touch of a finger.
- A typical application of touch panels is for the selection of processing options that are represented with graphical icons.
- Some systems can be adapted for touch input by fitting a transparent device with a touch sensing mechanism over the video monitor screen.
- Touch input can be recorded using optical, electrical, or acoustical methods.
- Optical touch panels employ a line of infrared light-emitting diodes (LEDs) along one vertical edge and along one horizontal edge of the frame.
- The opposite vertical and horizontal edges contain light detectors. These detectors are used to record which beams are interrupted when the panel is touched.


Display Source
CNN
NBC
HBO
XBOX
Air Condition
Security
Lights
Weather
Blinds
Audio
cue

Image Scanners

- A Scanner is a device that optically scans **Images, Printed Text, Handwriting or An Object** and converts it to a digital image.
- Generally in the Flatbed scanners, the document is placed on a Glass Window for scanning.
- Drawings, Graphs, Color and Black-and-white photos, or Text can be stored for computer processing with an Image Scanner by passing an optical scanning mechanism over the information to be stored.
- Finally, it stores the image information in a specific file format such as JPEG, GIF, TIFF, BMP, PDF documents and so on.

Types of Scanner

- **Flat bed Scanners-** also called as Desktop Scanners, are the most versatile and commonly used scanners.
- **Sheet bed Scanners-** are similar to the flatbed scanners except the document is moved and the scan head is immoveable. A sheet bed scanner looks a lot like a small portable printer.
- **Hand held Scanners-** uses the same basic technology as a flatbed scanner, but rely on the user to move them instead of a motorized belt. This type of scanner typically does not provide good image quality. However, it can be useful for capturing an image quickly.

- **Drum Scanners-** are used by the publishing industry to capture incredibly detailed images.
- They use a technology called **Photo Multiplier Tube (PMT).**
- In PMT, the document to be scanned is mounted on a glass cylinder. Located at the center of the cylinder is a sensor that splits light bounced from the document into three beams.
- Each beam is sent through a colour filter into a photo multiplier tube where the light is changed into electrical signal.

Flat bed Scanner

Sheet fed Scanner

Hand held Scanner

Drum Scanner

Magnetic Ink Character Recognition (MICR)

- **Magnetic ink character recognition code,** known in short as **MICR code,** is a character recognition technology used mainly by the banking industry to streamline the processing and clearance of cheques and other documents.
- MICR encoding, called the *MICR line*, is at the bottom of cheques and other vouchers and typically includes the document-type indicator, bank code, bank account number, cheque number, cheque amount (usually added after a cheque is presented for payment), and a control indicator.
- The **MICR** read head is a device built into the scanner designed to read the magnetic signal emitted by the **MICR** ink characters on the check. Each character produces a unique waveform which is read and translated by the **MICR** read head.

BANK LOGO

245272327

SB No. 7683173

BANK NAME

Date:

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ACCOUNT NUMBER

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CHEQUE NUMBER ROUTING NUMBER ACCOUNT NUMBER TRANSACTION CODE

NCR Systemedia / 72927/01/09


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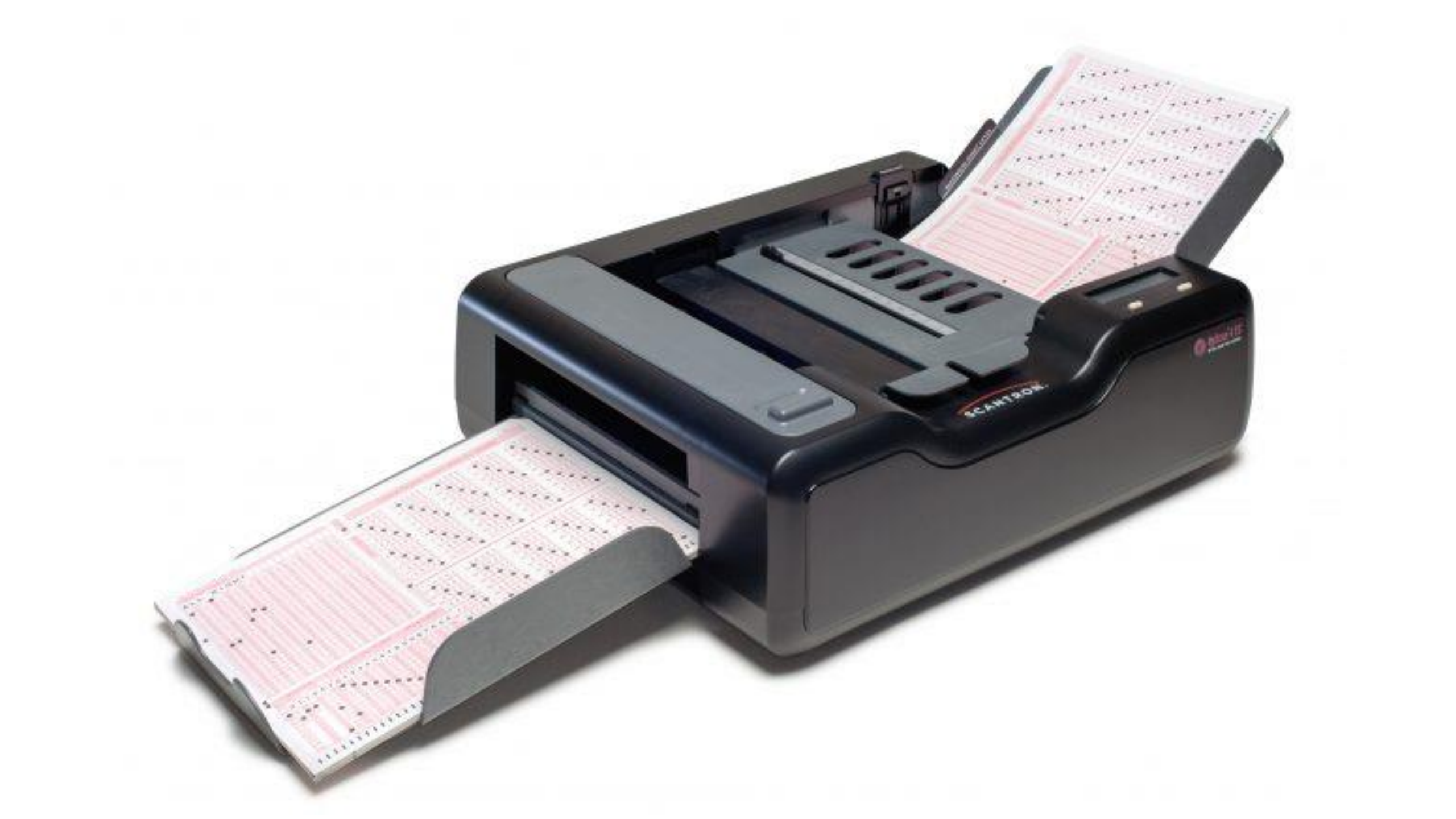
NON-NEGOTIABLE DO NOT CASH
MAGTEK

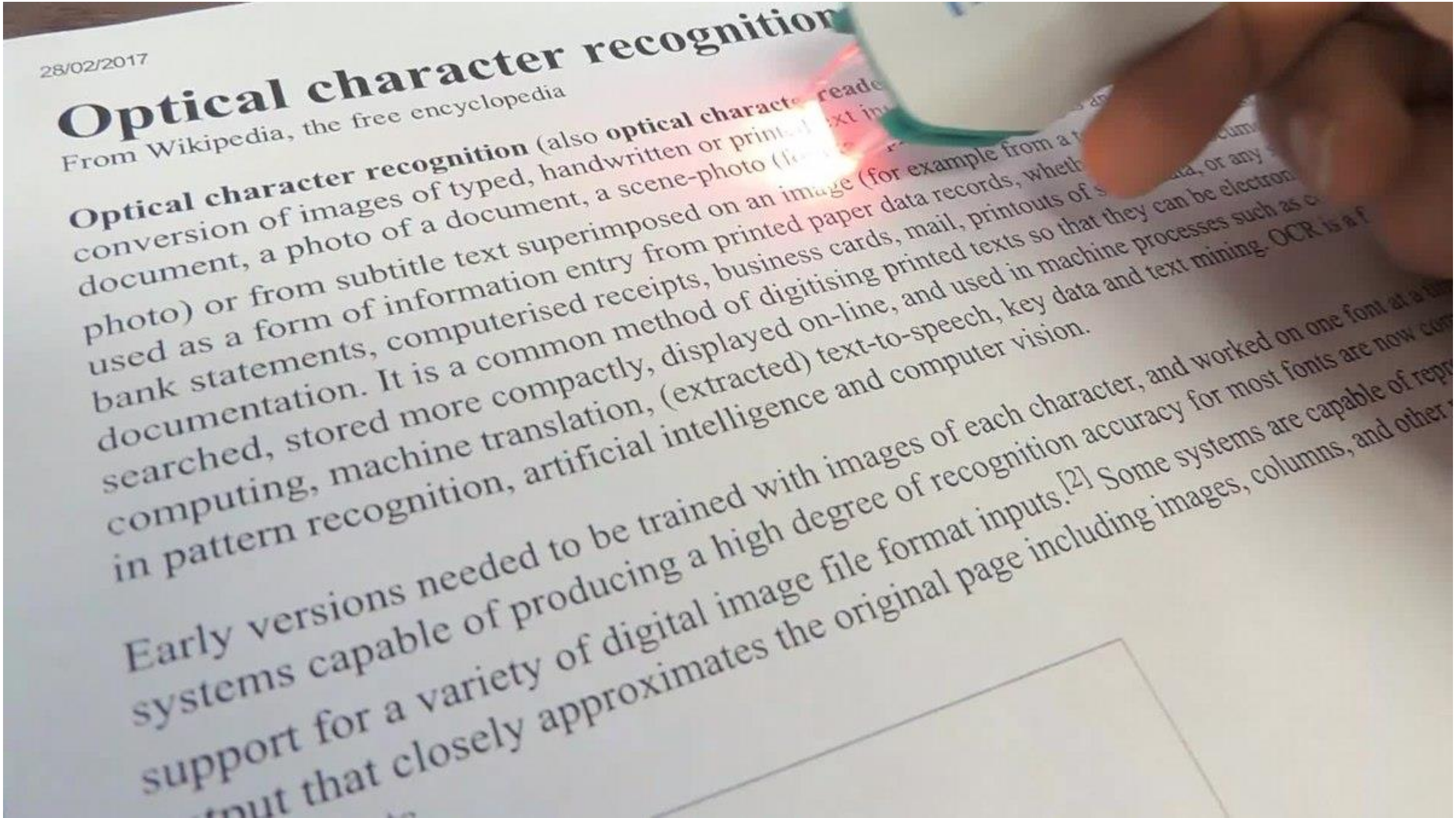
Optical Mark Recognition(OMR)

- **Optical mark recognition** (also called optical mark reading and *OMR*) is the process of capturing human-marked data from document forms such as surveys and tests.
- They are used to read questionnaires, multiple choice examination paper in the form of lines or shaded areas.
- Optical Mark Readers reads pencil or pen marks made in pre-defined positions on paper forms as responses to questions or tick list prompts.


SCANTRON

Optical Character Recognition

- *Optical character recognition* or optical character reader (*OCR*) is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo)


28/02/2017
Optical character recognition
From Wikipedia, the free encyclopedia
Optical character recognition (also optical
conversion of images of typed, handwritten or
document, a photo of a document, a scene-photo
photo) or from subtitle text superimposed on an
used as a form of information entry from printed paper data records,
bank statements, computerised receipts, business cards, mail, printouts of
documentation. It is a common method of digitising printed texts so that they can be electron
searched, stored more compactly, displayed on-line, and used in machine processes such as
computing, machine translation, (extracted) text-to-speech, key data and text mining. OCR is a f
in pattern recognition, artificial intelligence and computer vision.
Early versions needed to be trained with images of each character, and worked on one font at a
systems capable of producing a high degree of recognition accuracy for most fonts are now
support for a variety of digital image file format inputs.[2] Some systems are capable of
put that closely approximates the original page including images, columns, and other

HARD COPY DEVICES

Hard copy devices

- The computer processes input data to produce useful information.
- This information can be displayed or viewed on a monitor, printed on a printer or listened through speakers or headset or it can be stored in the secondary memory device for further processing or future reference.
- The different ways of output can be broadly classified as
  - ✓ Hard copy
  - ✓ Soft copy.

- **Soft Copy:** The electronic version of an output, which usually resides in computer memory and/or on disk is known as Soft Copy. Soft copy output also includes audio and visual form of output generated using computer.
- **Hard Copy:** Hard-copy devices are the entities that produce the output which can be retained over the time. That is, nothing but printing over the paper.
- Hard- copy devices can be classified into two categories; one is the **Printers** and second is the **Plotters**.
- The quality of the pictures obtained from a device depends on dot size and the number of dots per inch, or Lines per inch, that can be displayed.
- To produce smooth characters in printed text strings, higher -quality printers shift dot positions so that adjacent dots overlap.

Monitors

- A computer **monitor** is an output device that displays information in pictorial form.
- The **monitor** displays the computer's user interface and open programs, allowing the user to interact with the computer, typically using the keyboard and mouse.
- The size of the computer screen is measured diagonally from corner to corner in inches.
- For desktop computers, common sizes are 13,15,17,19 and 21 inches.
- For laptop computers, 12.1,13.3,14.1 inches.
- There are two types of monitors: 1) Cathode Ray Tubes, 2) Liquid Crystal Display.

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** print the characters by striking them on the ribbon, which is then pressed on the paper.
- **Non-impact printers** print the characters without using the ribbon. These printers print a complete page at a time,

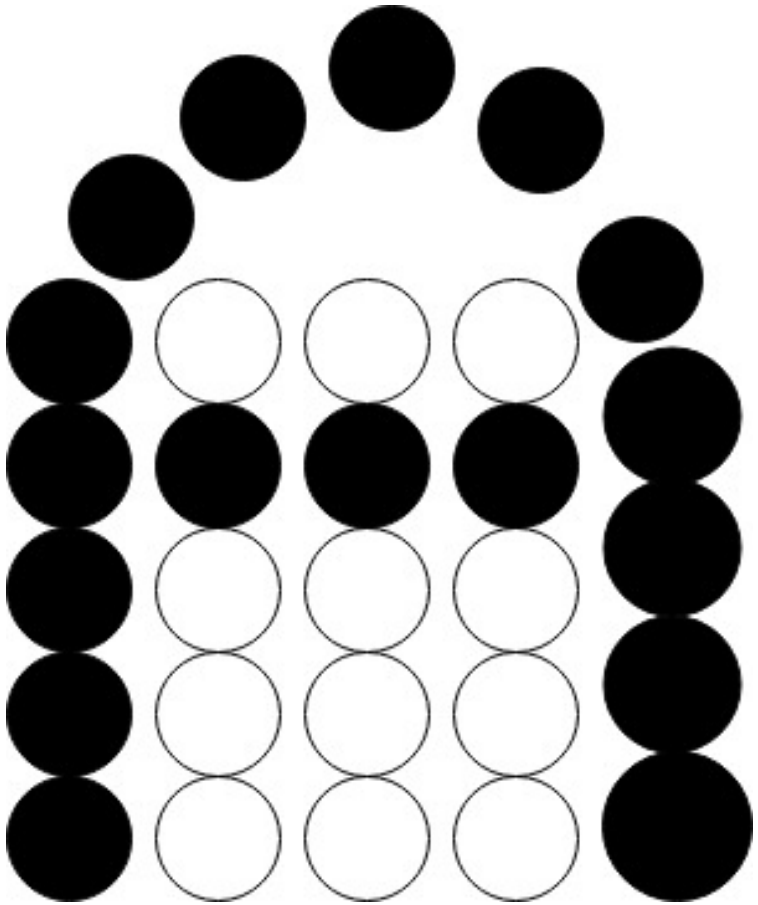
Impact printers

- 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

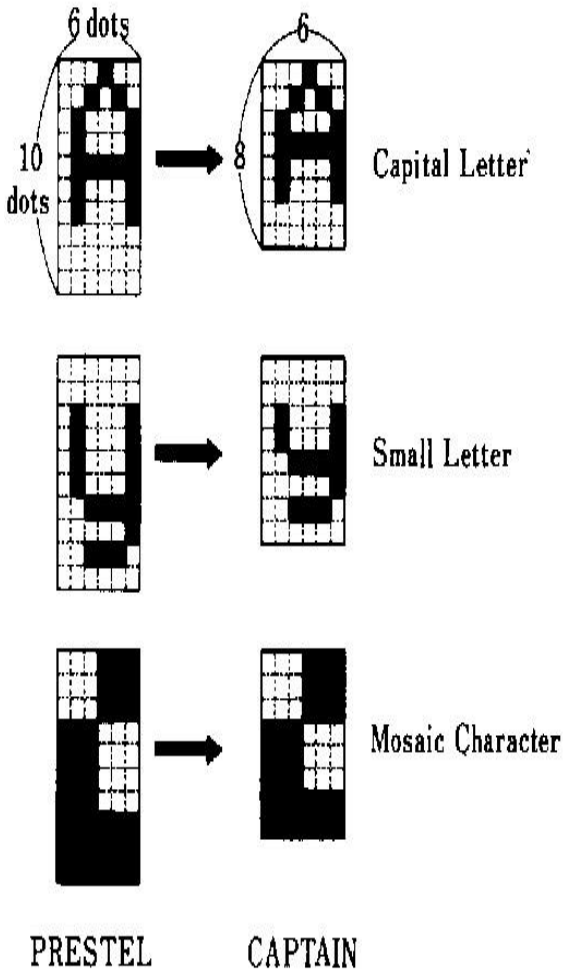
Character Printers

- Character printers are the printers which print one character at a time.
- **Dot Matrix Printer**
- Dot matrix has printed in the form of dots. A printer has a head which contains nine pins. The nine pins are arranged one below other. Each pin can be activated independently. All or only the same needles are activated at a time. When needless is not activated, and then the tip of needle stay in the head. When pin work, it comes out of the print head. In nine pin printer, pins are arranged in 5 * 7 matrixes.

- Advantages
  - Inexpensive
  - Widely Used
  - Other language characters can be printed
- Disadvantages
  - Slow Speed
  - Poor Quality



Dot Matrix Printer


6 dots
10 dots
6
8
Capital Letter
Small Letter
Mosaic Character
PRESTEL
CAPTAIN

(a)

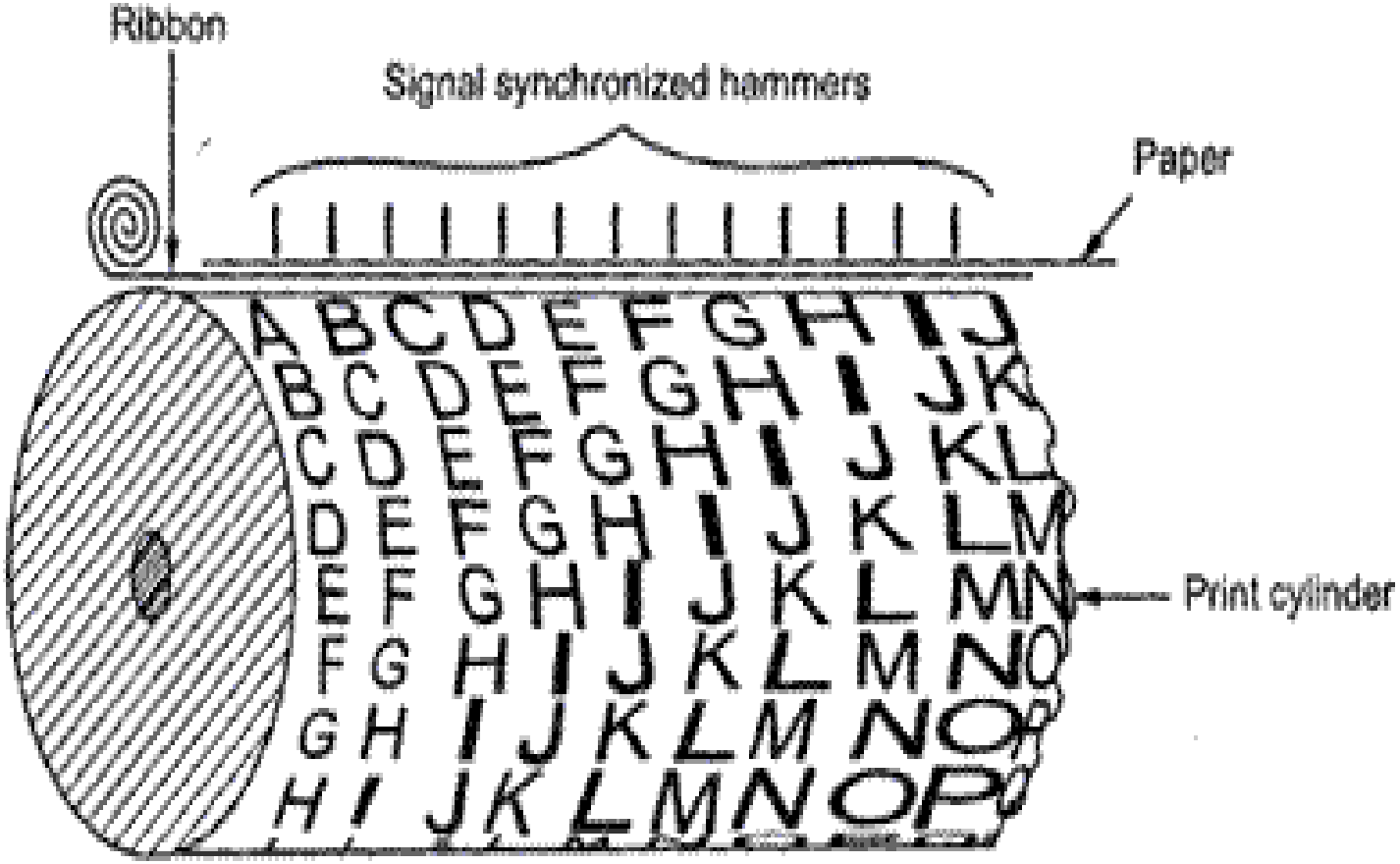
Line Printers

- **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 several 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.

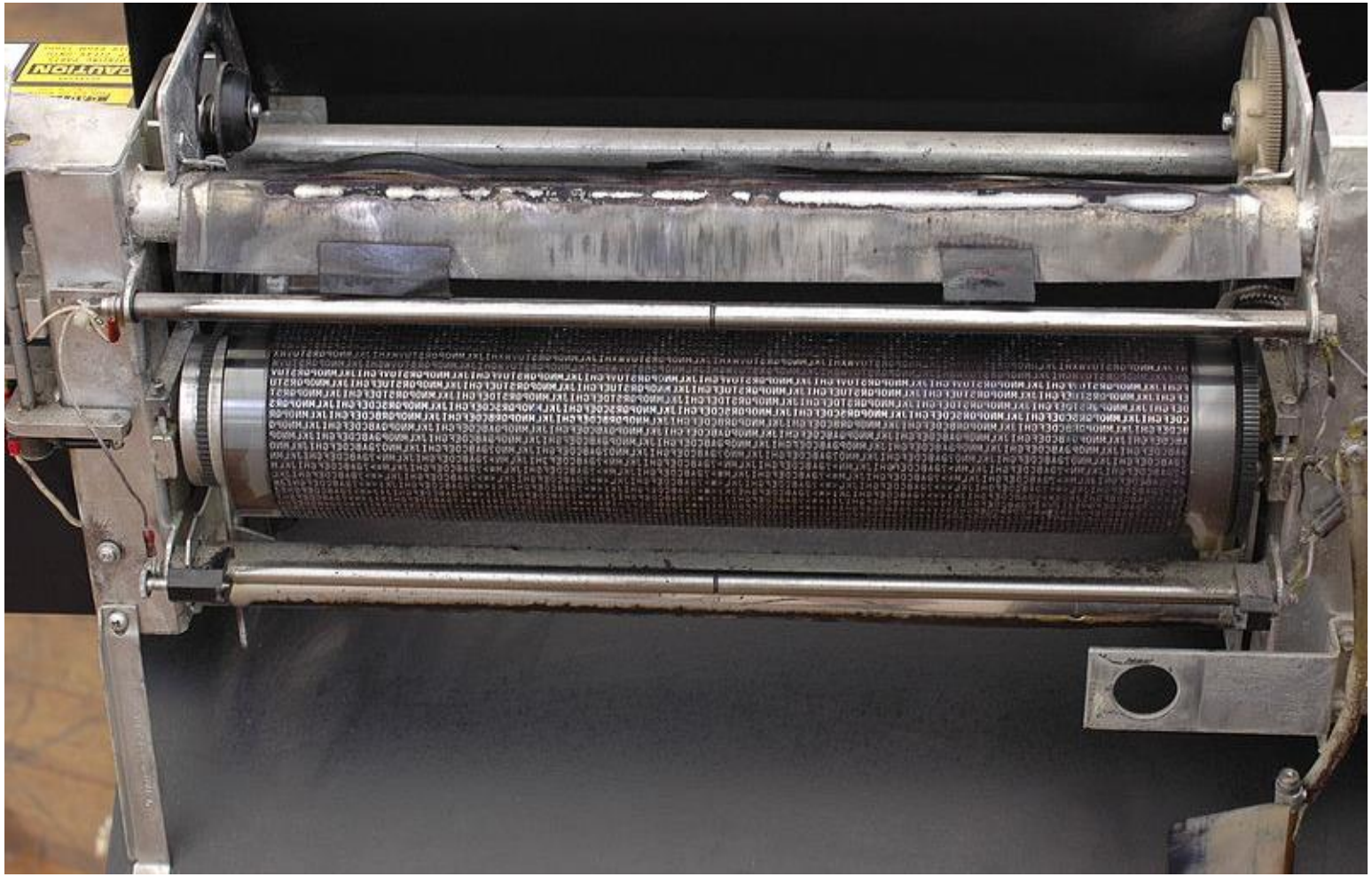
- A character set is embossed on the track. Different character sets available in the market are 48-character set, 64 and 96 characters set.
- One rotation of drum prints one line.
- Drum printers are fast in speed and can print 300 to 2000 lines per minute.
- **Advantages**
  - Very high speed
- **Disadvantages**
  - Very expensive
  - Characters fonts cannot be changed

Chain Printer

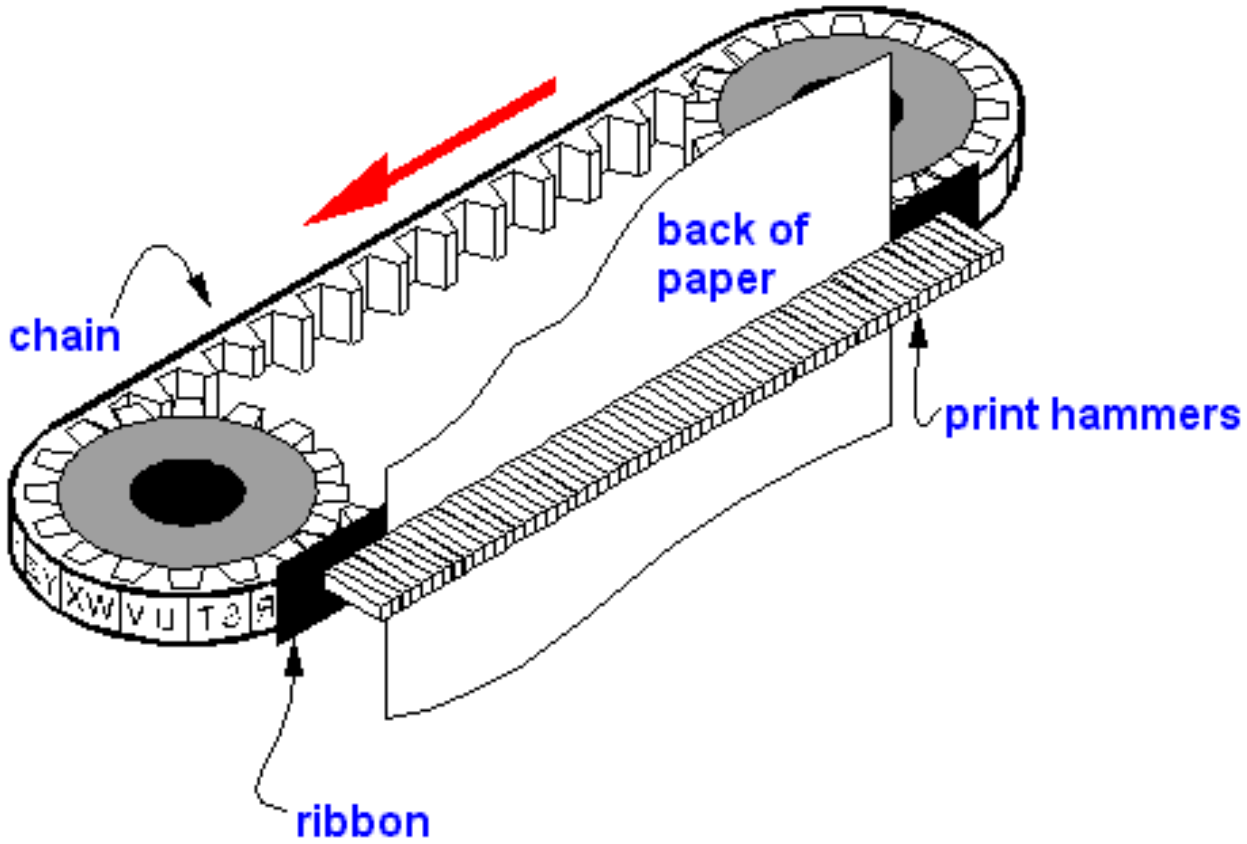
- In this printer, a chain of character sets is used, hence it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.
- **Advantages**
  - Character fonts can easily be changed.
  - Different languages can be used with the same printer.
- **Disadvantages**
  - Noisy



Cylinder of Drum Printer



Drum Printers



Chain Printers

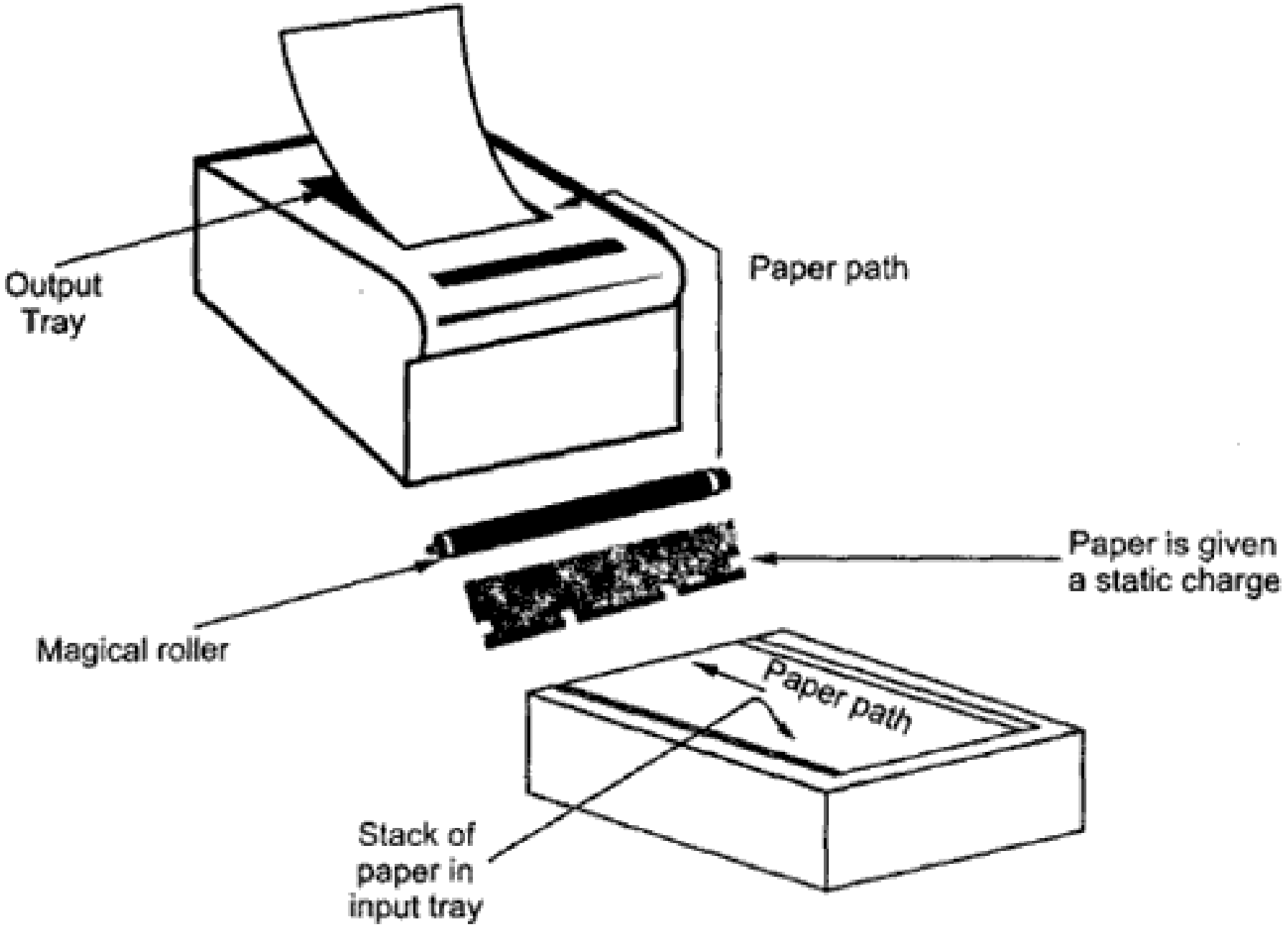
Line Printers

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

- 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


Output Tray
Paper path
Paper is given a static charge
Magical roller
Paper path
Stack of paper in input tray

Colour Laser Printer

- A colour laser printer works like a single laser printer, except that the process is repeated four times with four different ink colours: Cyan, magenta, yellow and black.
- Laser printers have high resolution from 600 dots per inch upto 1200 per inch.
- These printers print 4 to 16 page of text per minute.
- The high quality and speed of laser printers make them ideal for office environment.

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

Ink jet Printers

Plotters

- Plotters are a special type of output device. It is suitable for applications:
  - Architectural plan of the building.
  - CAD applications like the design of mechanical components of aircraft.
  - Many engineering applications.

Advantage:

- It can produce high-quality output on large sheets.
- It is used to provide the high precision drawing.
- It can produce graphics of various sizes.
- The speed of producing output is high.

- **Drum Plotter:**
- It consists of a drum. Paper on which design is made is kept on the drum. The drum can rotate in both directions. Plotters comprised of one or more pen and penholders. The holders are mounted perpendicular to drum surface. The pens are kept in the holder, which can move left to the right as well as right to the left. The graph plotting program controls the movement of pen and drum.
- **Flatbed Plotter:**
- It is used to draw complex design and graphs, charts. The Flatbed plotter can be kept over the table. The plotter consists of pen and holder. The pen can draw characters of various sizes. There can be one or more pens and pen holding mechanism. Each pen has ink of different color. Different colors help to produce multicolor design of document. The area of plotting is also variable. It can vary A4 to 21'*52'.

Drum Plotter

Flatbed Plotter

MICROSOFT WORD

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Department of Computer Science
Adhiparasakthi College of Arts & Science,
Kalavai.

II BSc Bio

Fundamentals of Computer

- Word Processing is the manipulation of character set, word, text, numbers, sentences, and paragraphs in the document so that it is error free and looks attractive.
- The work of preparing and formatting document was done manually with the help of typewriter.
- A word processor is an application software for word processing, with a word processing program, you can create letters, tables, newsletters, and academic papers that are easy to revise.
- Word processor is a software package that enables you to create, edit, print and save documents for future retrieval and reference.
- Word processors can create multiple types of files, including text files (.txt), rich text files (.rtf), HTML files (.htm & .html), and Word files (.doc & .docx). Some word processors can also be used to create XML files (.xml).

Word processing Softwares

- Abiword (Free).
- Apple iWork.
- Corel WordPerfect.
- Google Docs (online and free).
- LibreOffice -> Writer (free).
- Microsoft Office -> Microsoft Word.
- Apache OpenOffice (free).
- Sun StarOffice (Free)
- LibreOffice Writer (Free)

Benefits of Word Processor

- Book - Write a book.
- Document - Any text document that requires formatting.
- Help documentation - Support documentation for a product or service.
- Journal - Keep a digital version of your daily, weekly, or monthly journal.
- Letter - Write a letter to one or more people. Mail merge could also be used to automatically fill in the name, address, and other fields of the letter.
- Marketing plan - An overview of a plan to help market a new product or service.
- Memo - Create a memo for employees.
- Report - A status report or book report.
- Résumé - Create or maintain your résumé.
- Calendars- Yearly calendar of various types.

Features of word processing

Text formatting - Changing the font, font size, font color, bold, italicizing, underline, etc.

Copying, cutting, and pasting - Once text is entered into a document, it can be copied or cut and pasted in the current document or another document.

Multimedia - Insert clip art, charts, images, pictures, and video into a document.

Spelling and Grammar - Checks for spelling and grammar errors in a document.

Adjust the layout - Capable of modifying the margins, size, and layout of a document.

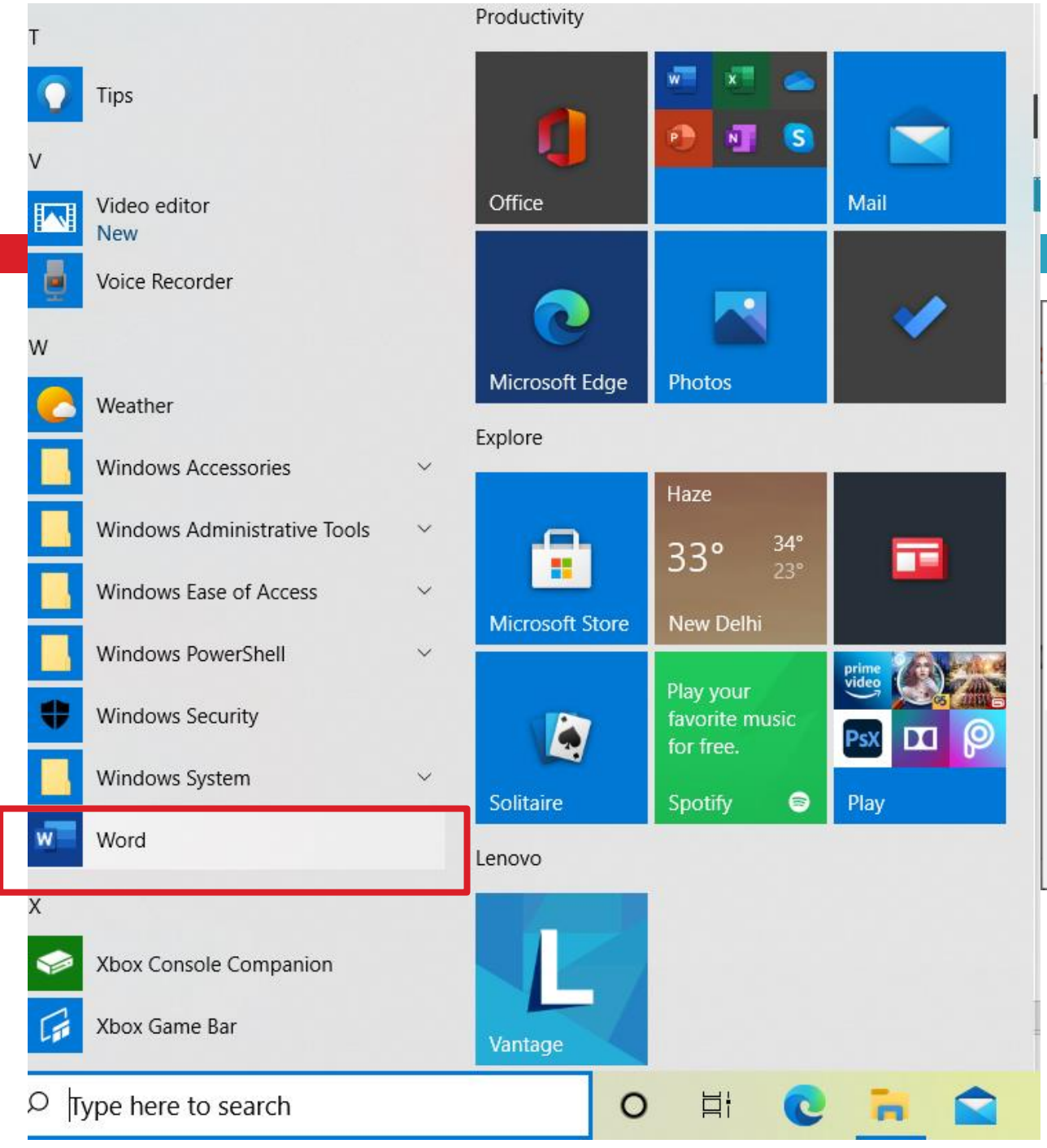
Find - Word processors give you the ability to quickly find any word or text in any size of the document.

- **Search and Replace -** You can use the Search and Replace feature to replace any text throughout a document.
- **Indentation and lists -** Set and format tabs, bullet lists, and number lists.
- **Insert tables -** Add tables to a document.
- **Word wrap -** Word processors can detect the edges of a page or container and automatically wrap the text using word wrap.
- **Header and footer -** Being able to adjust and change text in the header and footer of a document.
- **Thesaurus -** Look up alternatives to a word without leaving the program.
- **Multiple windows -** While working on a document, you can have additional windows with other documents for comparison or move text between documents.

- **AutoCorrect -** Automatically correct common errors (e.g., typing "teh" and having it autocorrected to "the").
- **Mailers and labels -** Create mailers or print labels.
- **Import data -** Import and format data from CSV, database, or another source.
- **Headers and footers -** The headers and footers of a document can be customized to contain page numbers, dates, footnotes, or text for all pages or specific pages of the document.
- **Merge -** Word processors allow data from other documents and files to be automatically merged into a new document. For example, you can mail merge names into a letter.
- **Macros -** Setup macros to perform common tasks.
- **Collaboration -** More modern word processors help multiple people work on the same document at the same time.

MS Word

- Microsoft word is one of the most popular word processing programs supported by both Mac and PC platforms.
- Microsoft word is used to create documents, brochures, leaflets, outlines, resumes, lists and simple web pages.
- To begin Microsoft Word, goto Start→ Programs→Microsoft Office → Microsoft Word. (or)
- Select Windows Key + R to obtain Run Command, there type Winword and click Ok to start Microsoft Word.


T
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Voice Recorder
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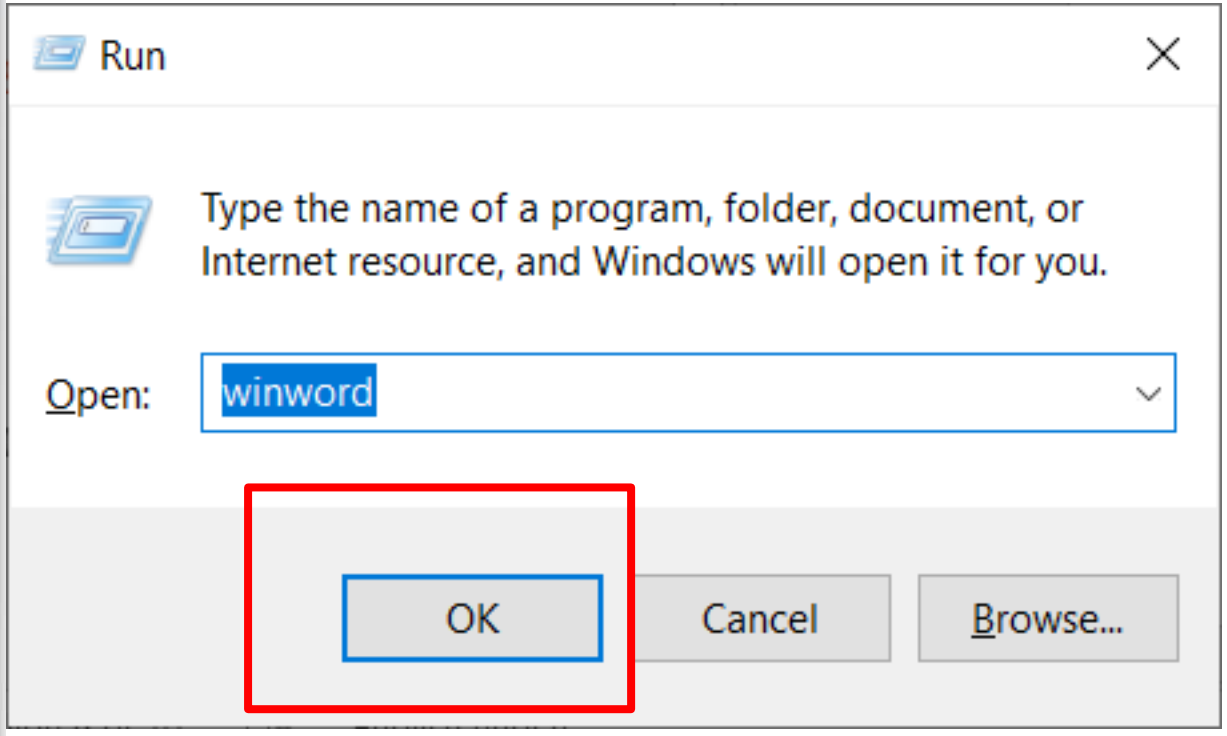
Weather
Windows Accessories
Windows Administrative Tools
Windows Ease of Access
Windows PowerShell
Windows Security
Windows System
Word
X
Xbox Console Companion
Xbox Game Bar
Productivity
Office
Mail
Microsoft Edge
Photos
Explore
Microsoft Store
Haze
33°
34°
23°
New Delhi
Solitaire
Play your favorite music for free.
Spotify
prime video
PsX
Play
Lenovo
Vantage
Type here to search


Run
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.
Open:
winword
OK
Cancel
Browse...

New

Word
Home
New
Open
Account
Feedback
Options


Adjacency letter


Adjacency report


Adjacency resume


Apothecary letter


Apothecary newsletter

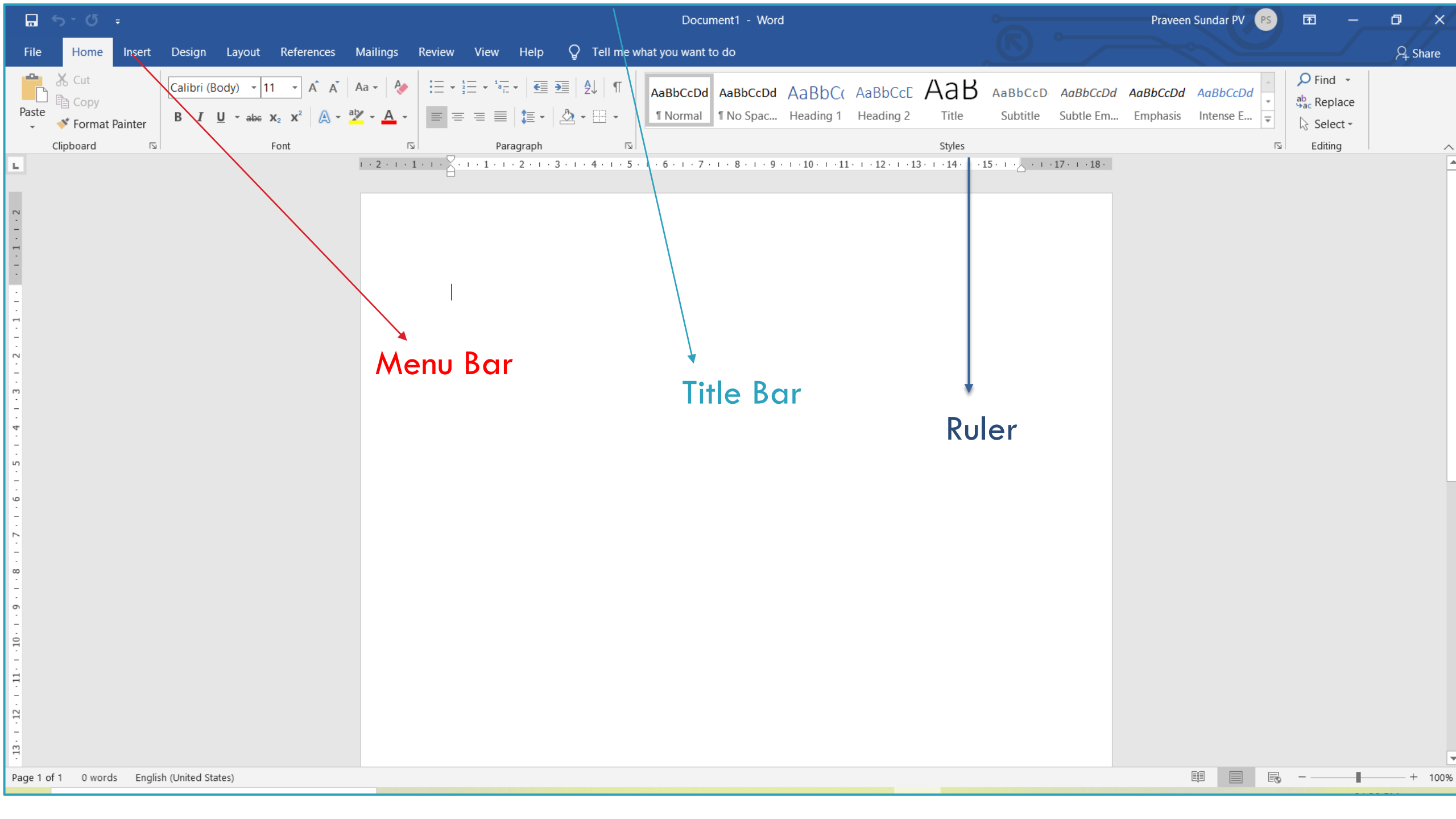

Apothecary resume


Blog post

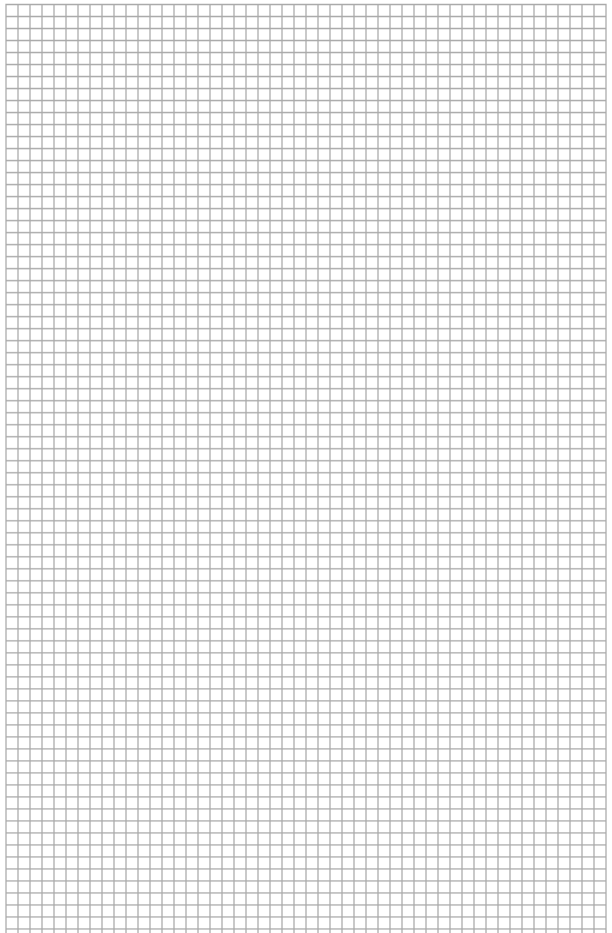

Chronological letter

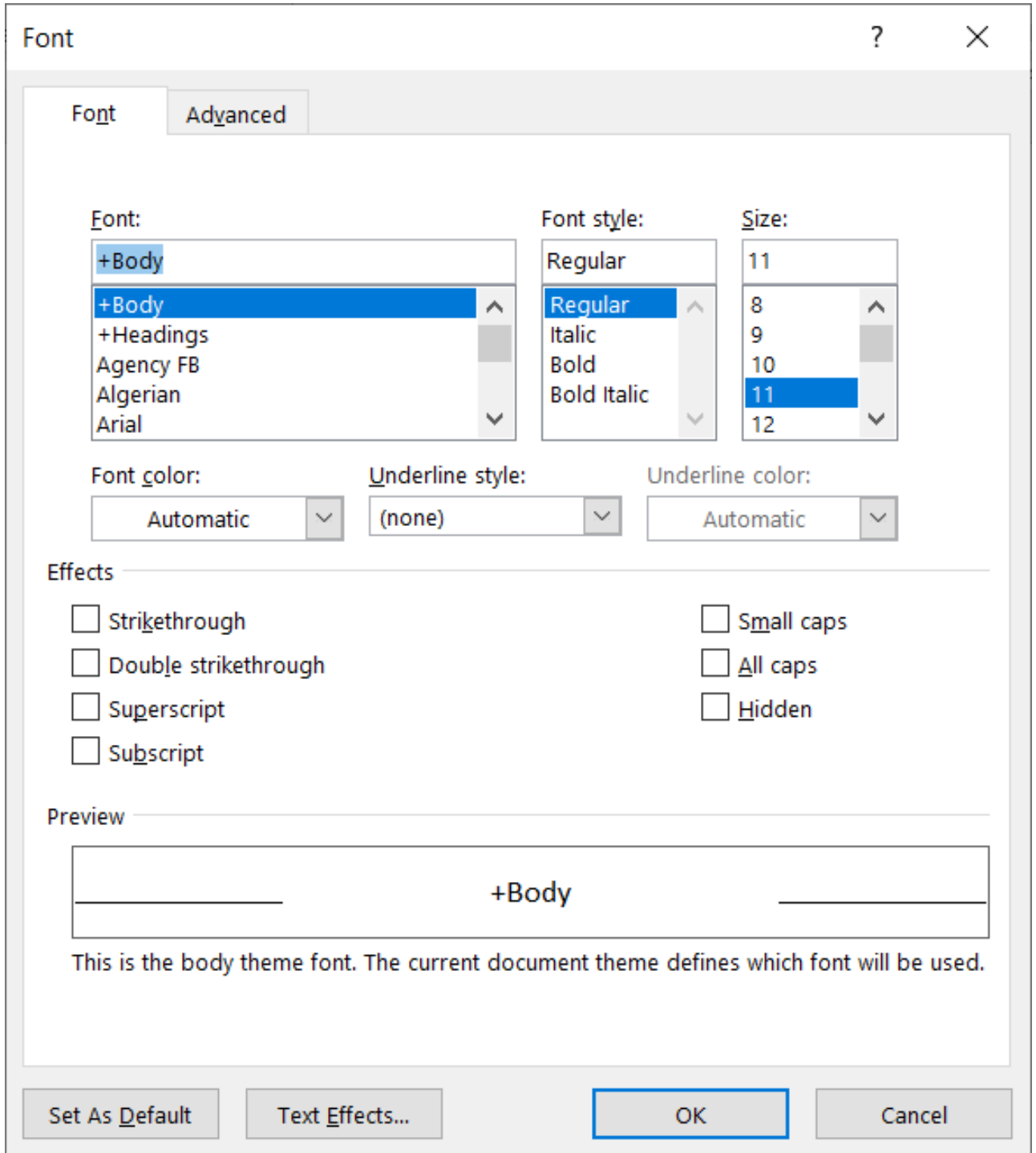

Chronological resume


Essential letter


Document1 - Word
Praveen Sundar PV
File
Home
Insert
Design
Layout
References
Mailings
Review
View
Help
Tell me what you want to do
Share
Cut
Copy
Format Painter
Paste
Clipboard
Calibri (Body)
11
Font
Paragraph
AaBbCcDd ¶ Normal
AaBbCcDd ¶ No Spac...
AaBbC Heading 1
AaBbCcE Heading 2
AaB Title
AaBbCcD Subtitle
AaBbCcDd Subtle Em...
AaBbCcDd Emphasis
AaBbCcDd Intense E...
Styles
Find
Replace
Select
Editing
Menu Bar
Title Bar
Ruler
Page 1 of 1
0 words
English (United States)
100%

Views: Read Mode, Print Layout, Web Layout, Outline, Draft
Immersive: Immersive Reader
Page Movement: Vertical, Side to Side
Show: Ruler, Gridlines, Navigation Pane
Zoom: Zoom, 100%, One Page, Multiple Pages, Page Width
Window: New Window, Arrange All, Split, View Side by Side, Synchronous Scrolling, Reset Window Position, Switch Windows
Macros: Macros
SharePoint: Properties




Font
Font
Advanced
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+Body
+Body
+Headings
Agency FB
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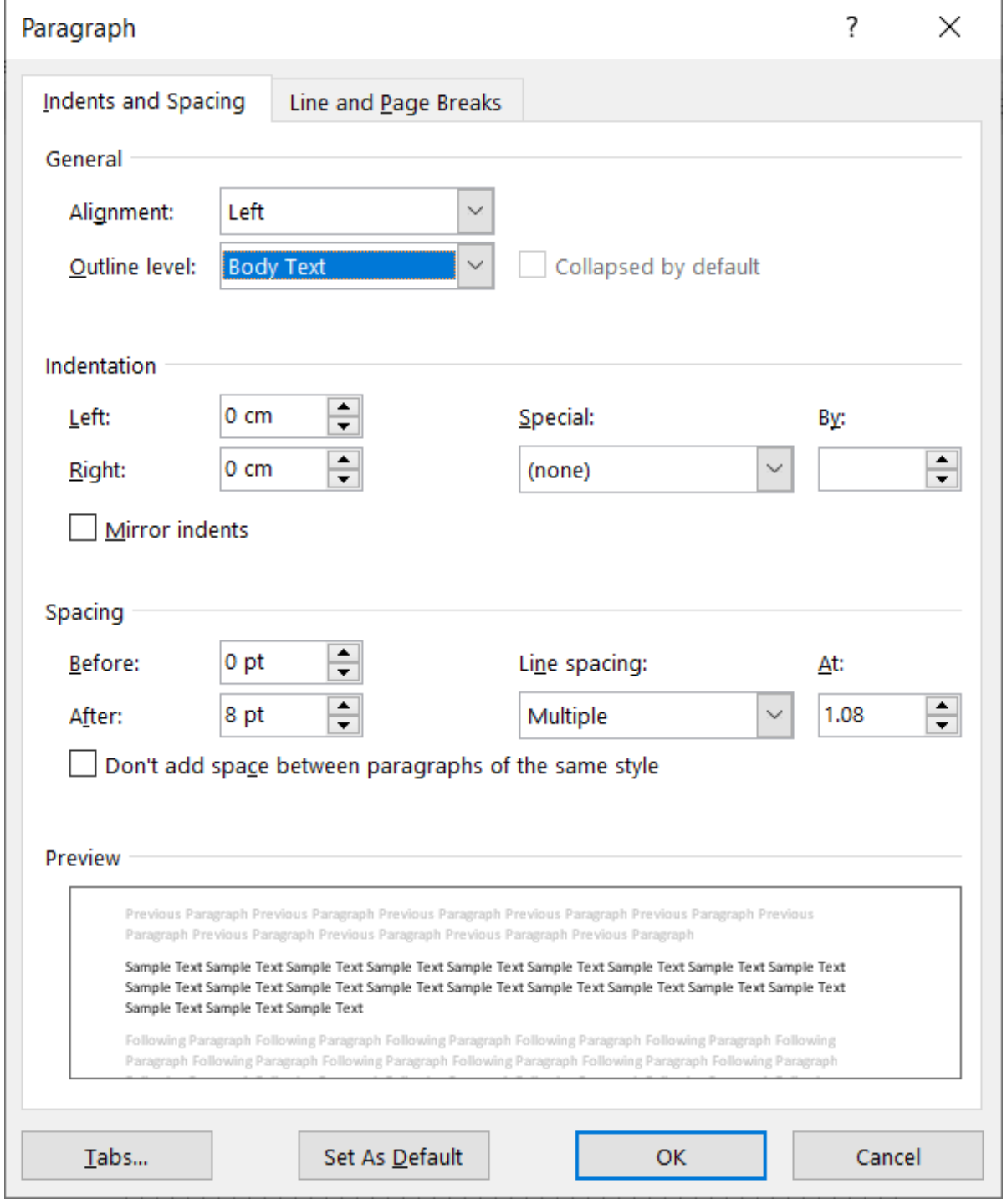
Arial
Font style:
Regular
Regular
Italic
Bold
Bold Italic
Size:
11
8
9
10
11
12
Font color:
Automatic
Underline style:
(none)
Underline color:
Automatic
Effects
Strikethrough
Double strikethrough
Superscript
Subscript
Small caps
All caps
Hidden
Preview
+Body
This is the body theme font. The current document theme defines which font will be used.
Set As Default
Text Effects...
OK
Cancel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Indents and Spacing
Line and Page Breaks
General
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Left
Outline level:
Body Text
Collapsed by default
Indentation
Left:
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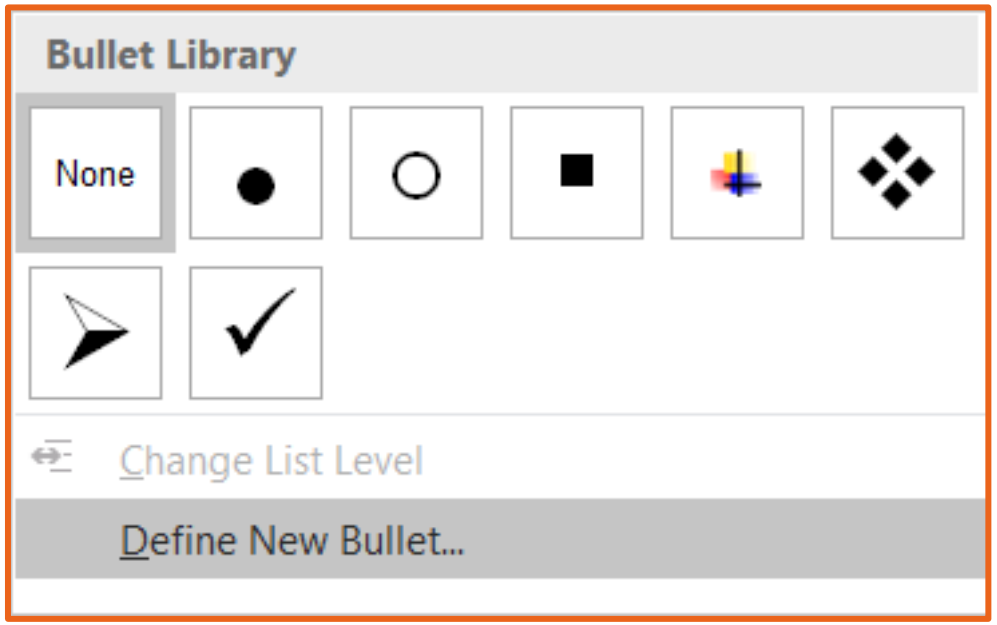
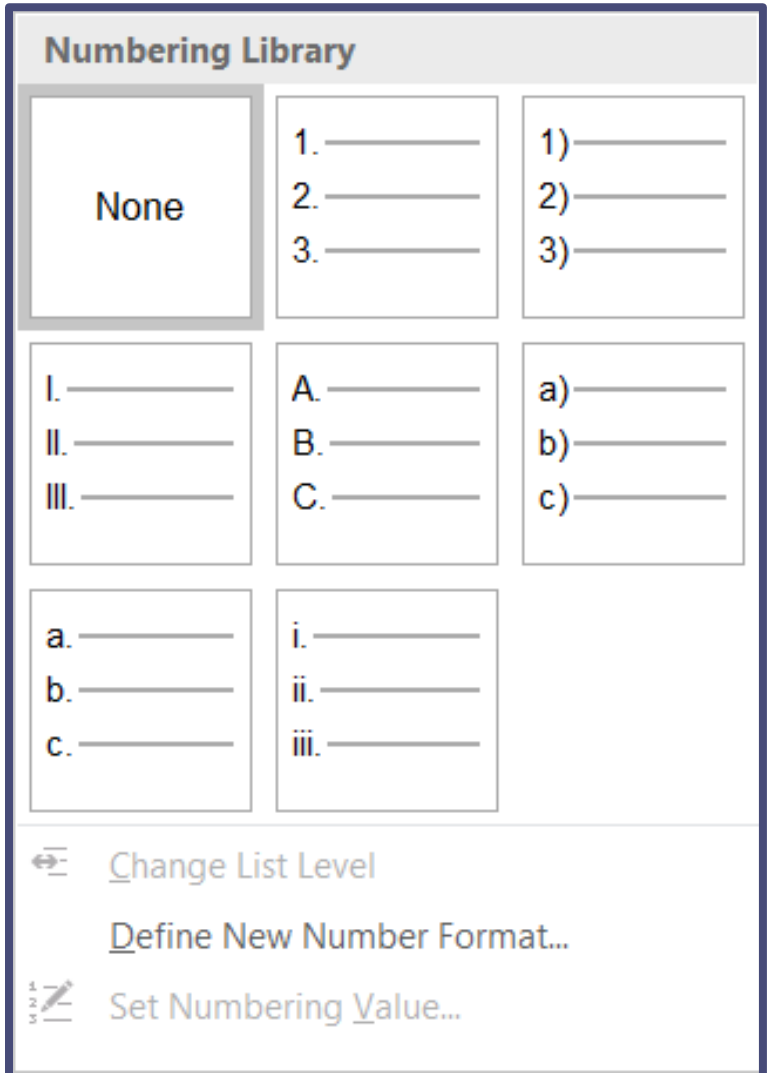
Right:
0 cm
Special:
(none)
By:
Mirror indents
Spacing
Before:
0 pt
After:
8 pt
Line spacing:
Multiple
At:
1.08
Don't add space between paragraphs of the same style
Preview
Previous Paragraph Previous Paragraph Previous Paragraph Previous Paragraph Previous Paragraph Previous Paragraph Previous Paragraph Previous Paragraph Previous Paragraph Previous Paragraph
Sample Text Sample Text
Following Paragraph Following Paragraph Following Paragraph Following Paragraph Following Paragraph Following Paragraph Following Paragraph Following Paragraph Following Paragraph Following Paragraph Following Paragraph
Tabs...
Set As Default
OK
Cancel

Bullets and Numbering

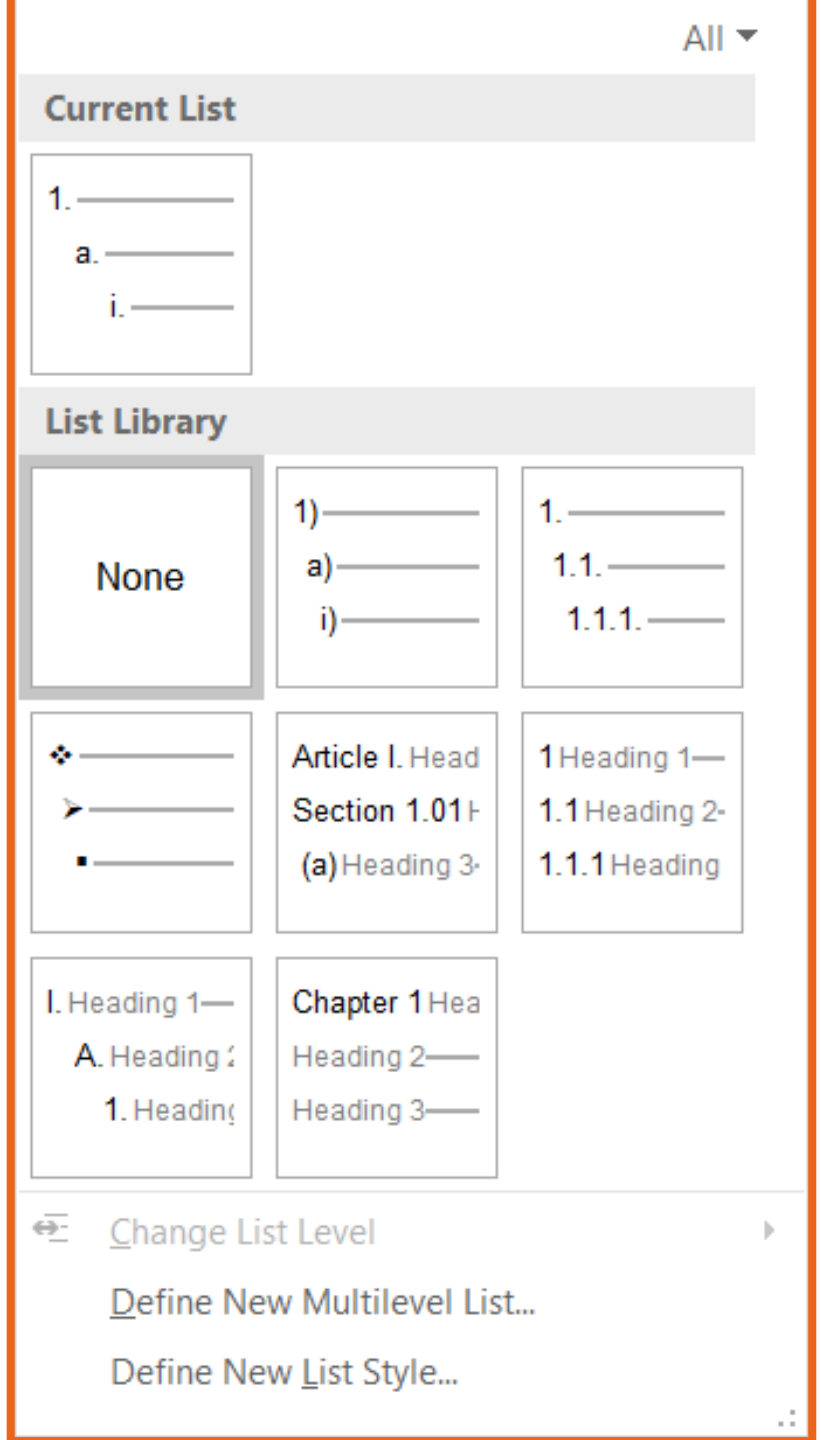




- UG Courses
  - BA English
  - BA Tamil
  - B.sc Physics
  - B.sc Chemistry
  - B.sc Biology
  - B.sc Micro
  - B. Com
  - BCA
  - Bsc CS

PG Courses

1) MA English
2) MA Tamil
3) M. Com
4) MCA


All
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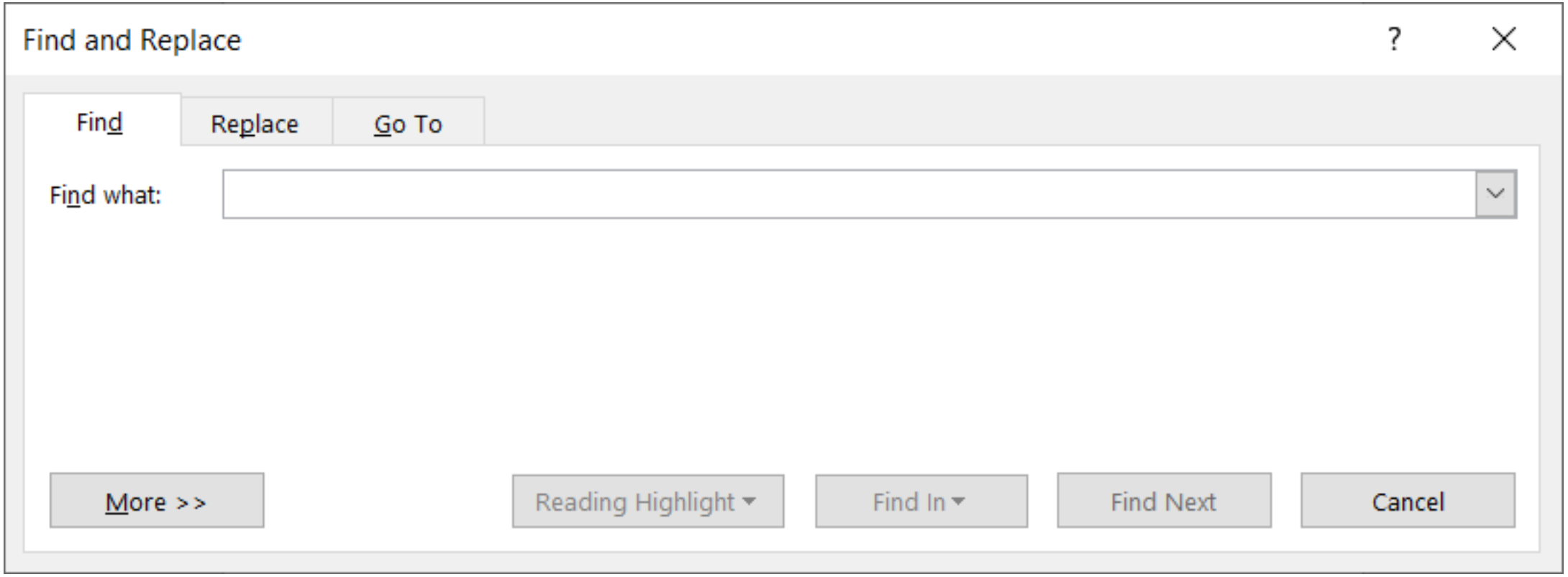
1.1.1.
Article I. Head
Section 1.01
(a) Heading 3
1 Heading 1
1.1 Heading 2
1.1.1 Heading
I. Heading 1
A. Heading
1. Heading
Chapter 1 Hea
Heading 2
Heading 3
Change List Level
Define New Multilevel List...
Define New List Style...

Find


Find and Replace
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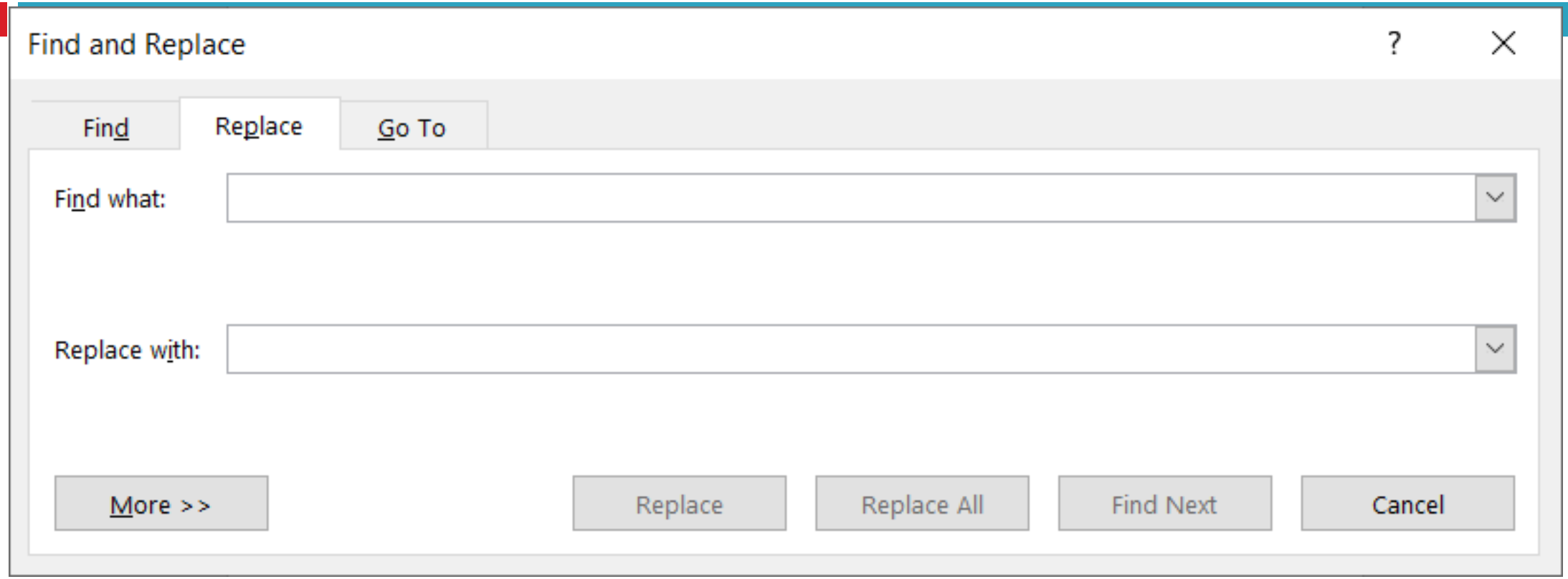
Replace


Find and Replace
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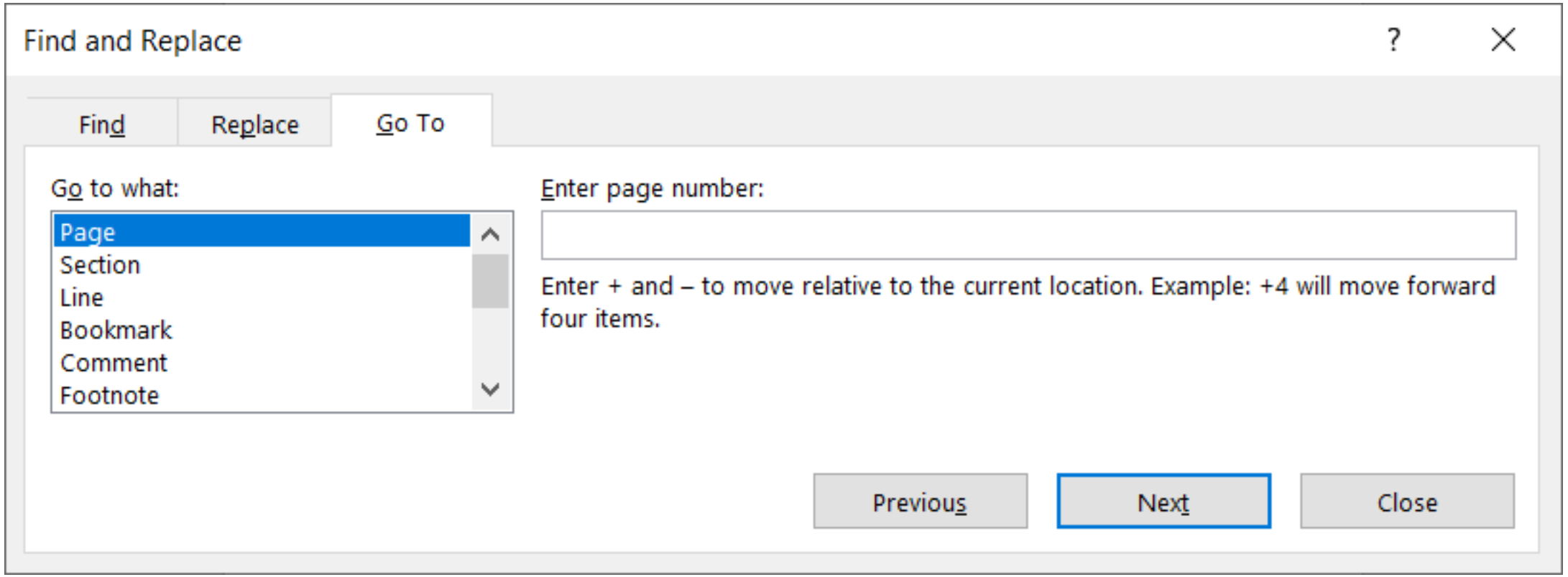
Find and Replace
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Enter page number:
Enter + and – to move relative to the current location. Example: +4 will move forward four items.
Previous
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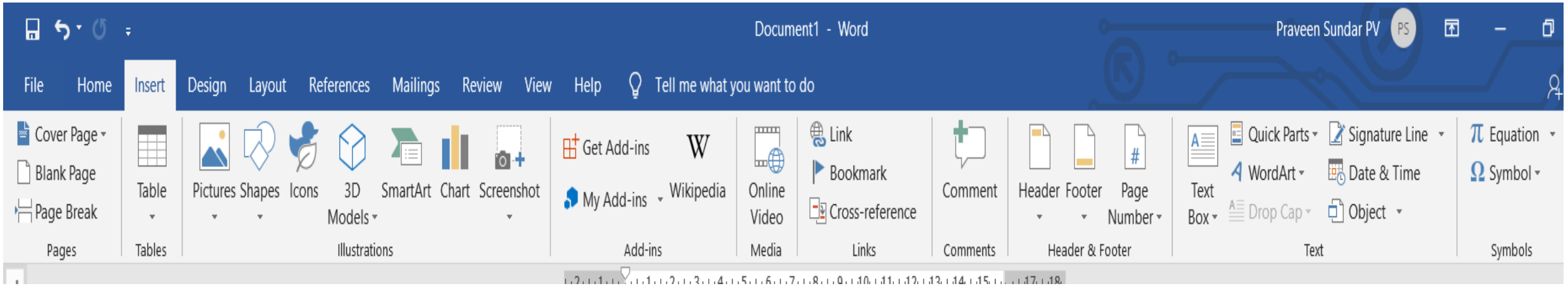
Close

Insert Menu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Page Break
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Pictures
Shapes
Icons
3D Models
SmartArt
Chart
Screenshot
Illustrations
Get Add-ins
My Add-ins
Wikipedia
Add-ins
Online Video
Media
Link
Bookmark
Cross-reference
Links
Comment
Comments
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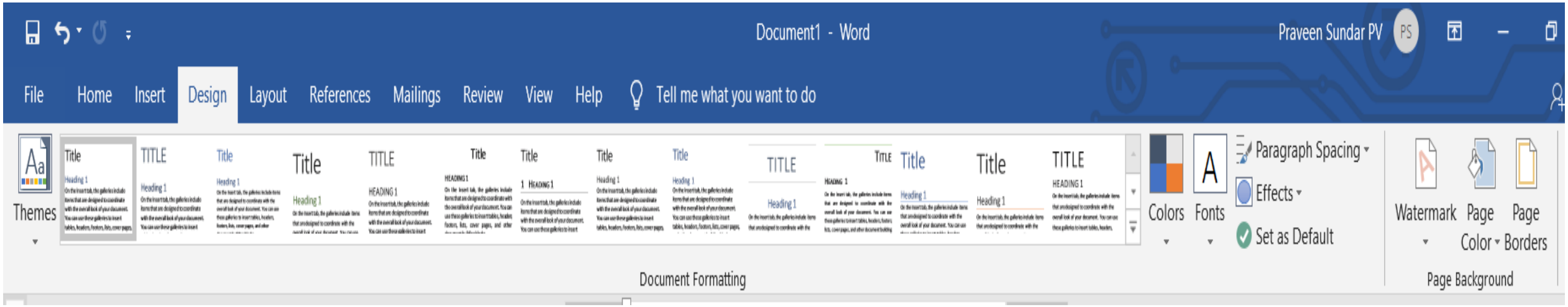
WordArt
Drop Cap
Signature Line
Date & Time
Object
Text
Equation
Symbol
Symbols

Design Menu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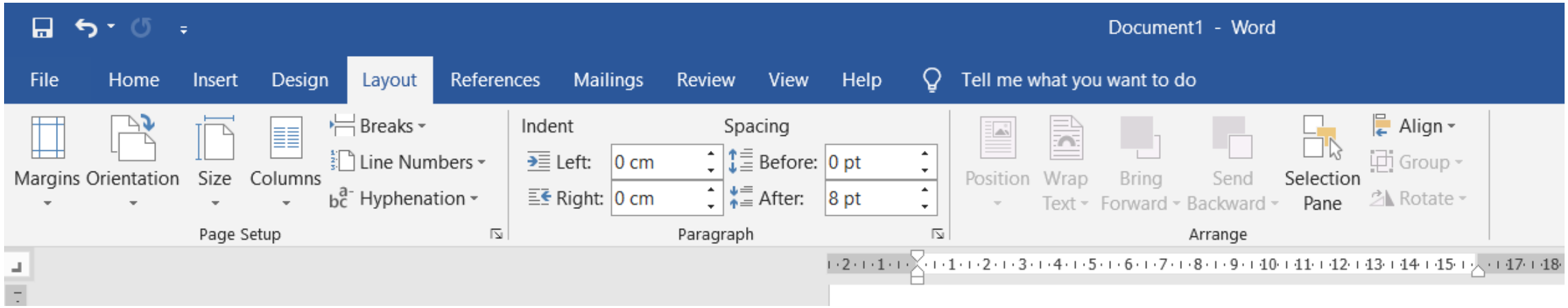
Layout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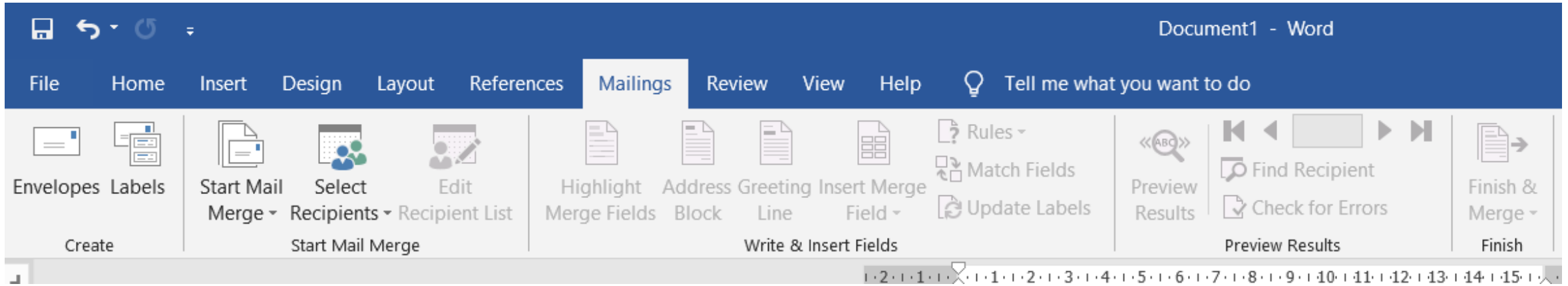
Mailings


Document1 - Word
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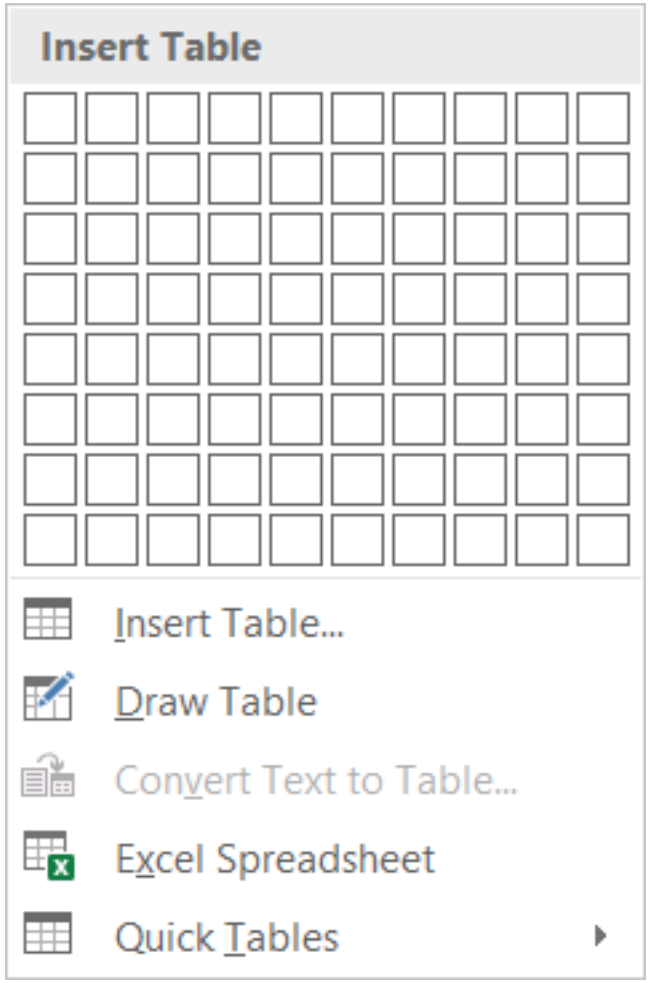
Envelopes
Labels
Create
Start Mail Merge
Select Recipients
Edit Recipient List
Start Mail Merge
Highlight Merge Fields
Address Block
Greeting Line
Insert Merge Field
Rules
Match Fields
Update Labels
Write & Insert Fields
Preview Results
Find Recipient
Check for Errors
Preview Results
Finish & Merge
Finish

Inserting Tables

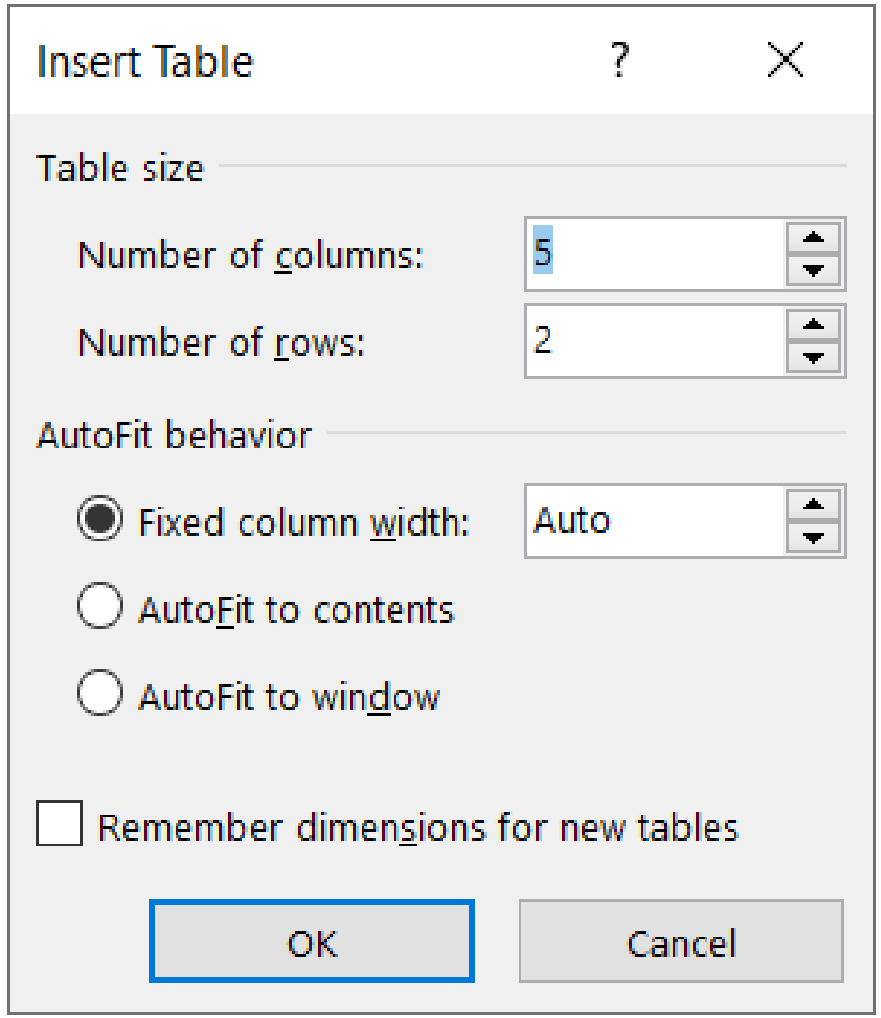
- *Tables* organize text into rows and columns, which can make the text easy to type, edit, and format while spacing it correctly in your document. Tables organize text into cells, where a *cell* is the intersection of a row and a column.
- Word provides four ways to create a table:
  - Click the Insert tab, click the Table icon, and then highlight the number of rows and columns for your table (up to a maximum of eight rows and ten columns).
  - Use the Insert Table dialog box.
  - Draw the size and position of the table with the mouse.
  - Convert existing text (divided by a delimiter character such as a tab or a comma).

Creating a table by highlighting rows and columns



- Creating a table by highlighting rows and columns can be fast, but it limits the size of your table to a maximum of eight rows and ten columns. To create a table by highlighting rows and columns, follow these steps:
  1. Click the Insert tab.
  2. Move the cursor where you want to insert a table in your document.
  3. Click the Table icon. A pull-down menu appears.
  4. Move the mouse pointer to highlight the number of rows and columns you want to create for your table.
  5. When you highlight rows and columns, Word displays your table directly in your document so you can see exactly what your table will look like.
  6. Click the left mouse button when you're happy with the size of your table.

Insert Table dialog box



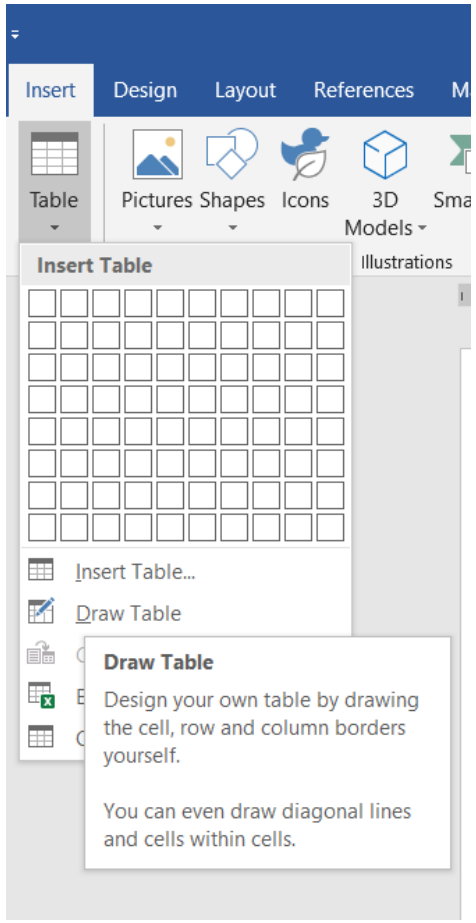
- To create a table by defining a specific number of rows and columns (up to a maximum of 63 columns), follow these steps:
  1. Click the Insert tab.
  2. Move the cursor where you want to insert a table.
  3. Click the Table icon. A pull-down menu appears.
  4. Click Insert Table. The Insert Table dialog box appears.
  5. Click in the Number of Columns text box and type a number between 1 and 63, or click the up or down arrow to define the number of columns.
  6. Click in the Number of Rows text box and type a number or click the up or down arrow to define the number of rows.

In the AutoFit Behavior group, select one of the following radio buttons:

- Fixed Column Width: Defines a fixed size for the column widths, such as 0.3 inches
- AutoFit to Contents: Defines the width of a column based on the width of the largest item stored in that column
- AutoFit to Window: Expands (or shrinks) the table to fit within the current size of the document window

Click OK. Word draws the table in your document.

Drawing a Table



- Drawing a table can be especially useful when you want to place a table in the middle of a page and create rows and columns of different sizes.
- To draw a table in your Word document, follow these steps:
  1. Click the Insert tab.
  2. Click the Table icon. A pull-down menu appears.
  3. Click Draw Table. The mouse pointer turns into a Pencil icon.

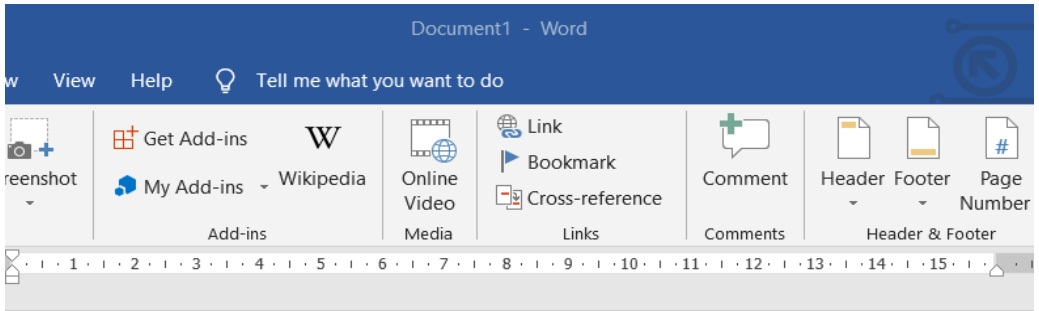
- Move the mouse pointer where you want to draw your table, hold down the left mouse button, and drag the mouse to draw your table.
- Word draws a rectangular dotted box to show where your table will appear.
- Release the left mouse button when you're happy with the size and position of your table.
- Draw the boundaries for your table's rows and columns:
  - To draw vertical lines in your table, move the mouse pointer to the top or bottom of the table, hold down the left mouse button, and drag the mouse up and down.
  - To draw horizontal lines in your table, move the mouse pointer to the left or right side of the table, hold down the left mouse button, and drag the mouse right and left to draw.

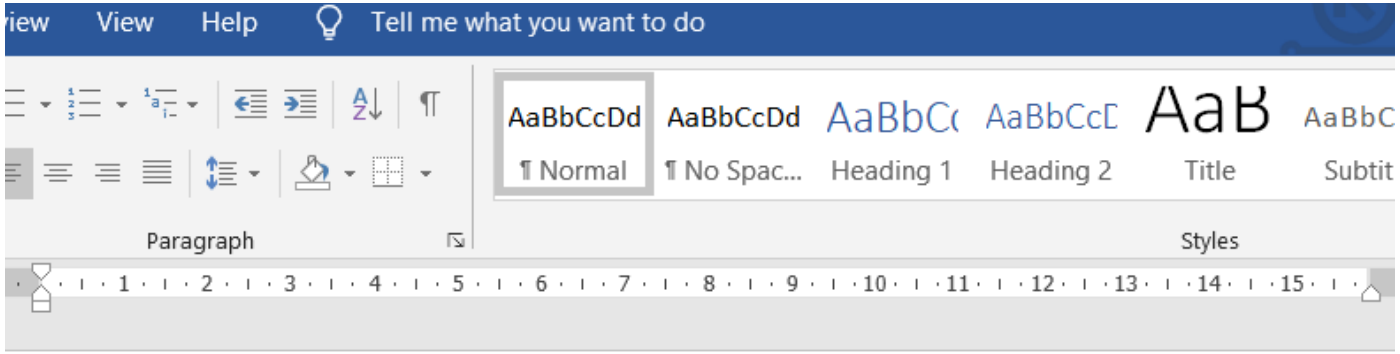
- Press Esc or double-click to turn the mouse pointer from a Pencil icon back to an I-beam pointer.
- If you need to draw new lines on a table later, click anywhere inside that table, and the Table Tools Layout tab appears. Then click the Draw Table icon to turn the mouse pointer into a Pencil icon. Now you can draw new lines in your table.

Table in Word from existing text

- If you have existing text that you'd like to turn into a table, you need to first separate it into chunks so Word knows how to place the text in individual cells in a table. To separate text, you need to use a unique character such as
  - Return (paragraph mark)
  - Tab
  - Comma.
  - Other characters, such as the # or @ characters
- By using the same unique character to divide text, you can define how you want Word to define how much text to display in each individual cell of a table.

- To convert existing text into a table, follow these steps:
  1. Click the Insert tab.
  2. Select the text that you want to convert into a table.
  3. Click the Table icon. A pull-down menu appears.
  4. Click the Convert Text to Table command. The Convert Text to Table dialog box appears
  5. Select a radio button in the Separate Text At group. Choose the option that corresponds to the way you divided your text. So if you divided your text by tabs, you would select the Tabs radio button.
  6. Click OK. Word converts your text into a table.



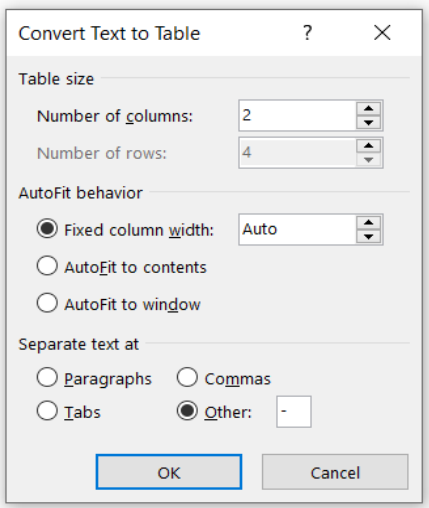


Search and Replace - You can use the Search and Replace feature to replace any text throughout a document.

Indentation and lists - Set and format tabs, bullet lists, and number lists.

Insert tables - Add tables to a document.

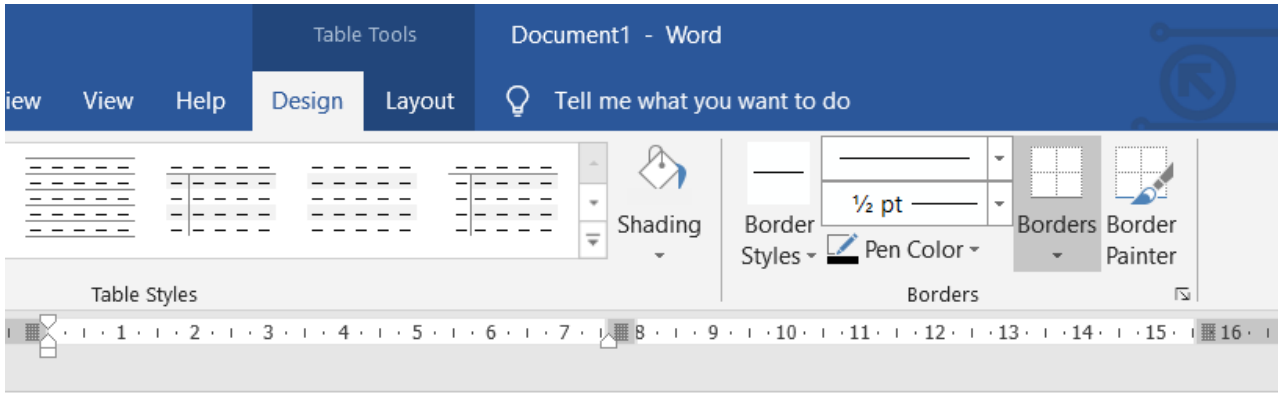
Word wrap - Word processors can detect the edges of a page or container and automatically wrap the text using word wrap.



Search and Replace	You can use the Search and Replace feature to replace any text throughout a document.
Indentation and lists	Set and format tabs, bullet lists, and number lists.
Insert tables	Add tables to a document.
Word wrap	Word processors can detect the edges of a page or container and automatically wrap the text using word wrap.

Formatting and Coloring a Table

- After you create a table, you can format individual cells (spaces formed by the intersection of a row and a column) — or entire rows and columns — by aligning text in cells, resizing columns and rows, and adding borders, shading, or colors. All these changes can make the text inside the cells easier to read.



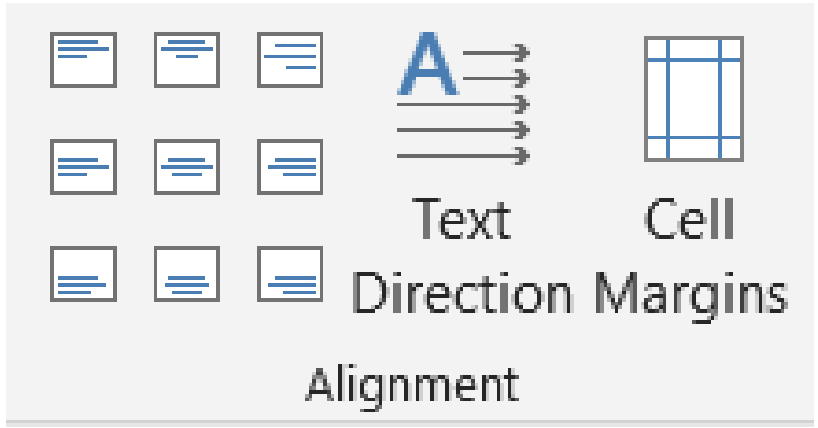
Search and Replace	You can use the Search and Replace feature to replace any text throughout a document.
Indentation and lists	Set and format tabs, bullet lists, and number lists.
Insert tables	Add tables to a document.
Word wrap	Word processors can detect the edges of a page or container and automatically wrap the text using word wrap.

Selecting all or part of a table

- Selecting all or part of a table in Word 2019
- To format and color a table, you must first select the table, row, column, or cell that you want to modify. To select all or part of a table, follow these steps:
  - Click in the table, row, column, or cell you want to modify. The Table Tools tab appears.
  - Click the Layout tab under the Table Tools heading.
  - In the Table group, click Select. A pull-down menu appears.
  - Choose an option, such as Select Row or Select Column. Word highlights your chosen item in the table. At this point, you can choose a command to modify the selected row or column (as when you choose a color or alignment).

Aligning text in a Word table cell

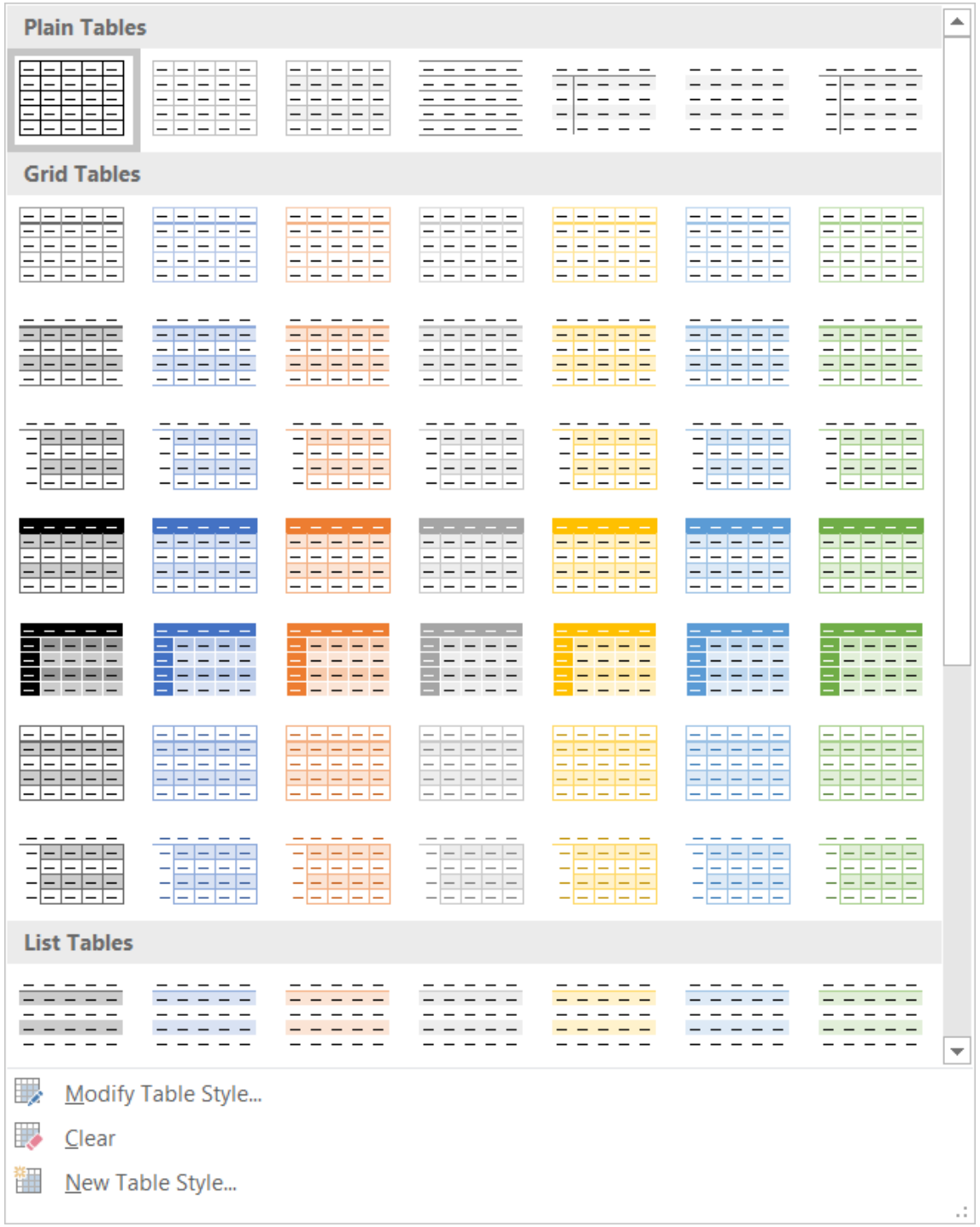
- You can align text in a table cell in nine ways: top left (the default alignment), top center, top right, center left, center, center right, bottom left, bottom center, and bottom right.
- To align one or more cells, follow these steps:
  - Click in the cell (or select multiple cells) that contains text you want to align. The Table Tools tab appears.
  - Click the Layout tab under the Table Tools heading.
  - In the Alignment group, click an alignment icon such as Top Right or Bottom Center.
- Word aligns your text. If you change the alignment of blank cells, any new text you type in those blank cells will appear according to the alignment you choose.



Top Left	Top Center	Top Right
Center Left	Center	Center Right
Bottom Left	Bottom Center	Bottom Right

Choosing a table style

- By coloring rows or columns and adding borders, you can customize the appearance of your tables. However, it can be much faster to use a predesigned table style instead, which can automatically format your text, color rows, and add borders to your tables.
- To choose a table style, follow these steps:
  - Move the cursor inside the table you want to modify.
  - Click the Design tab under the Table Tools tab.
  - In the Table Style Options group, select or clear check boxes, such as the Header Row or Last Column check box.
  - In the Table Styles group, click the More button. A pull-down menu of styles appears. As you move the mouse pointer over a table style, Word displays a live preview of your table formatted in the selected style.
  - Click a table style. Word formats your table according to the style you chose.


Plain Tables
Grid Tables
List Tables
Modify Table Style...
Clear
New Table Style...

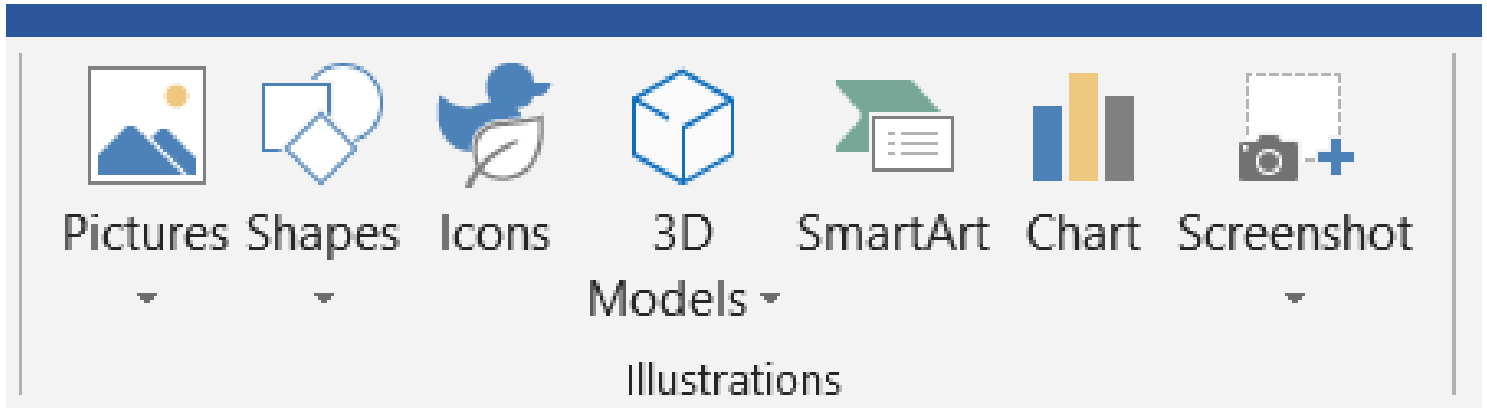
Resizing columns and rows

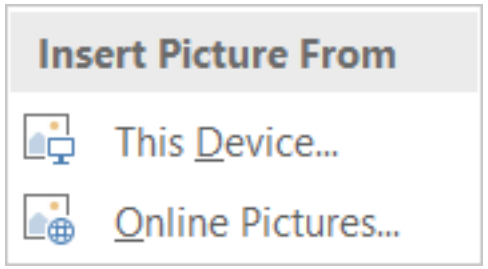
- You may need to resize a column or row in your table to expand or shrink it so your text doesn't appear crowded or surrounded by empty space. You can resize a column or row by using the mouse or by defining row heights and column widths.
- To resize a row or column with the mouse, follow these steps:
  - Click anywhere inside the table you want to adjust, then move the mouse pointer over the row or column border that you want to resize. The mouse pointer turns into a two-way pointing arrow.
  - Hold the left mouse button down and drag the mouse to resize the row or column. Release the left mouse button when you're happy with the size of the row or column.

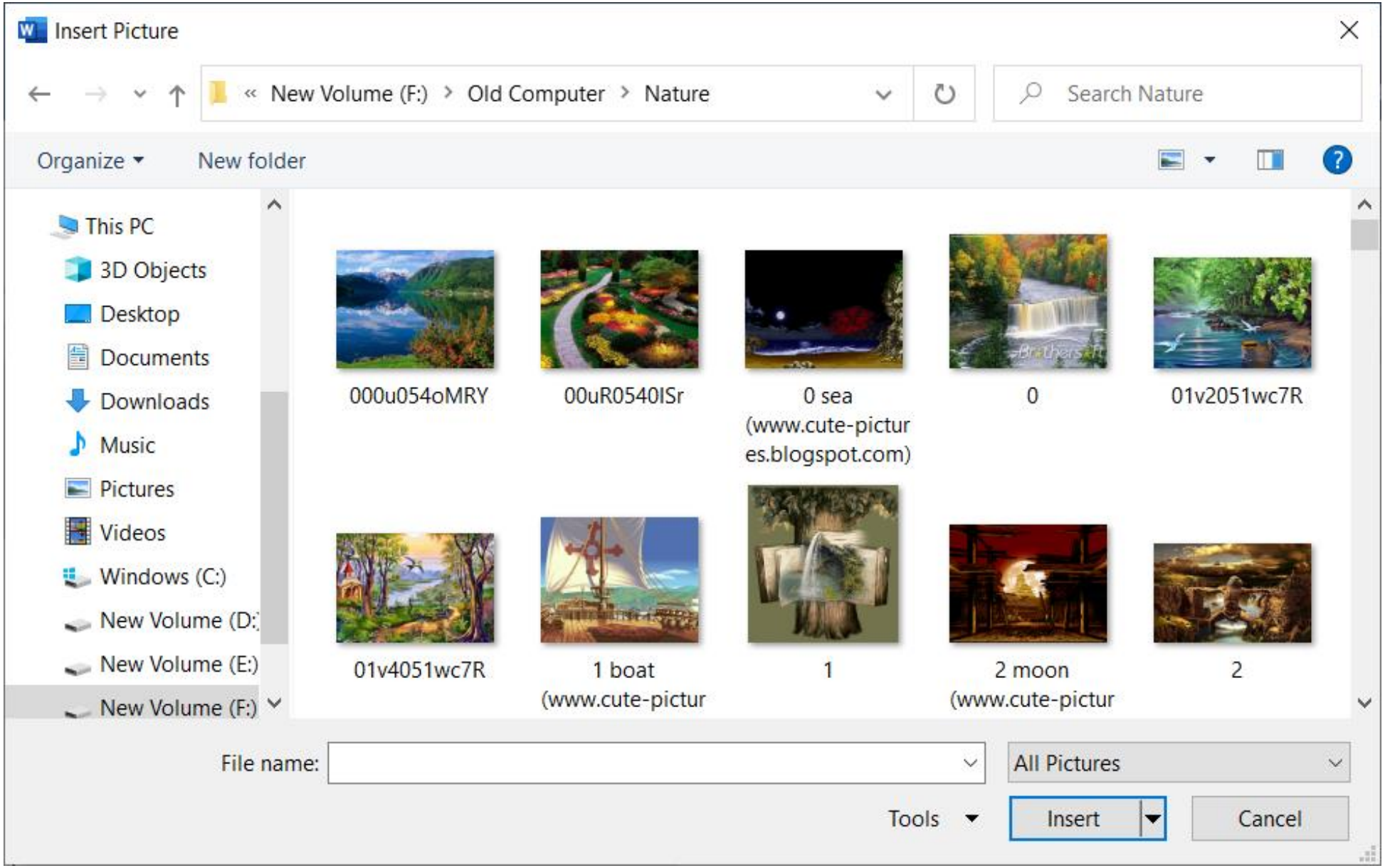
- Using the mouse to resize a row or column can be fast, but if you want to resize a row or column to a specific height or width, you can type the specific dimensions by following these steps:
  - Select the row, column, or table that you want to modify.
  - If you select the entire table, you can adjust the width or height of rows and columns for the entire table.
  - Click the Layout tab under the Table Tools tab.
  - Click the Width text box and type a value (or click the up or down arrow to choose a value).
  - Click the Height text box and type a value (or click the up or down arrow to choose a value).

Inserting Pictures

- Pictures make our text more attractive and readable. You can insert relevant pictures in your text by following these steps;
  - Place the cursor where you want to insert the picture
  - Select the Insert tab on Ribbon
  - In Illustrations group click the Picture command;
  - It displays 'Insert Picture' dialog box
  - Select the desired image
  - Click Insert to insert the picture


Pictures
Shapes
Icons
3D Models
SmartArt
Chart
Screenshot
Illustrations


Insert Picture From
This Device...
Online Pictures...

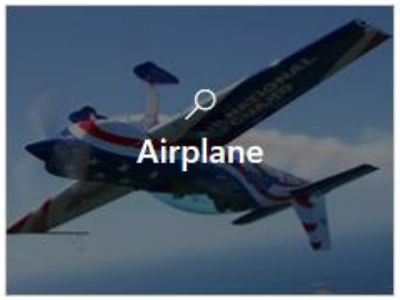

Insert Picture
New Volume (F:) › Old Computer › Nature
Search Nature
Organize
New folder
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Windows (C:)
New Volume (D:)
New Volume (E:)
New Volume (F:)
000u054oMRY
00uR0540ISr
0 sea (www.cute-pictures.blogspot.com)
0
01v2051wc7R
01v4051wc7R
1 boat (www.cute-pictur
1
2 moon (www.cute-pictur
2
File name:
All Pictures
Tools
Insert
Cancel

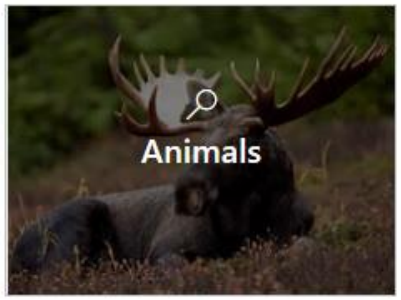
Inserting Images from the Web

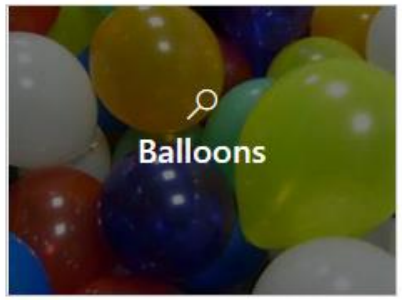
- Place the cursor where you want to insert the picture
- Select the Insert tab on Ribbon
- In Illustrations group click the Picture command;
- Choose Insert⟶ Online Pictures.
- Click in the Office.com Clip Art search box, type poinsettia, and press Enter. A selection of pictures that have poinsettia as a keyword appear in the task pane.
- Scroll through the resulting clips.
- Click one of the clips and then click the Insert button to insert it.

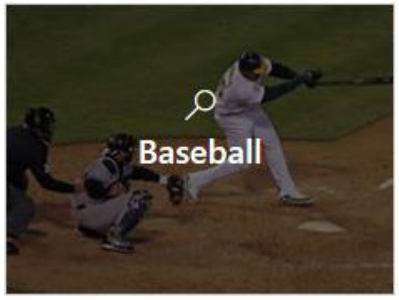
Online Pictures

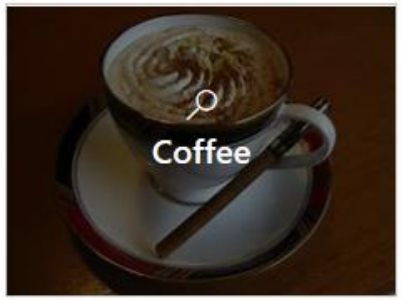
Powered by Bing

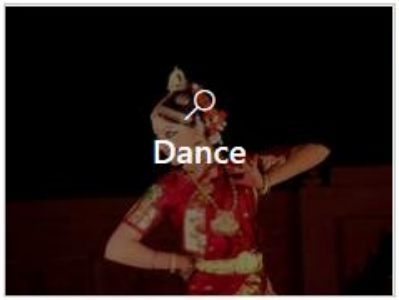






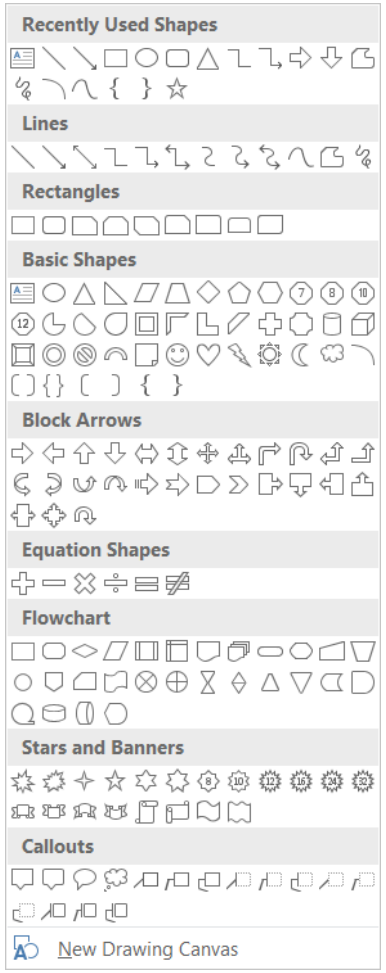






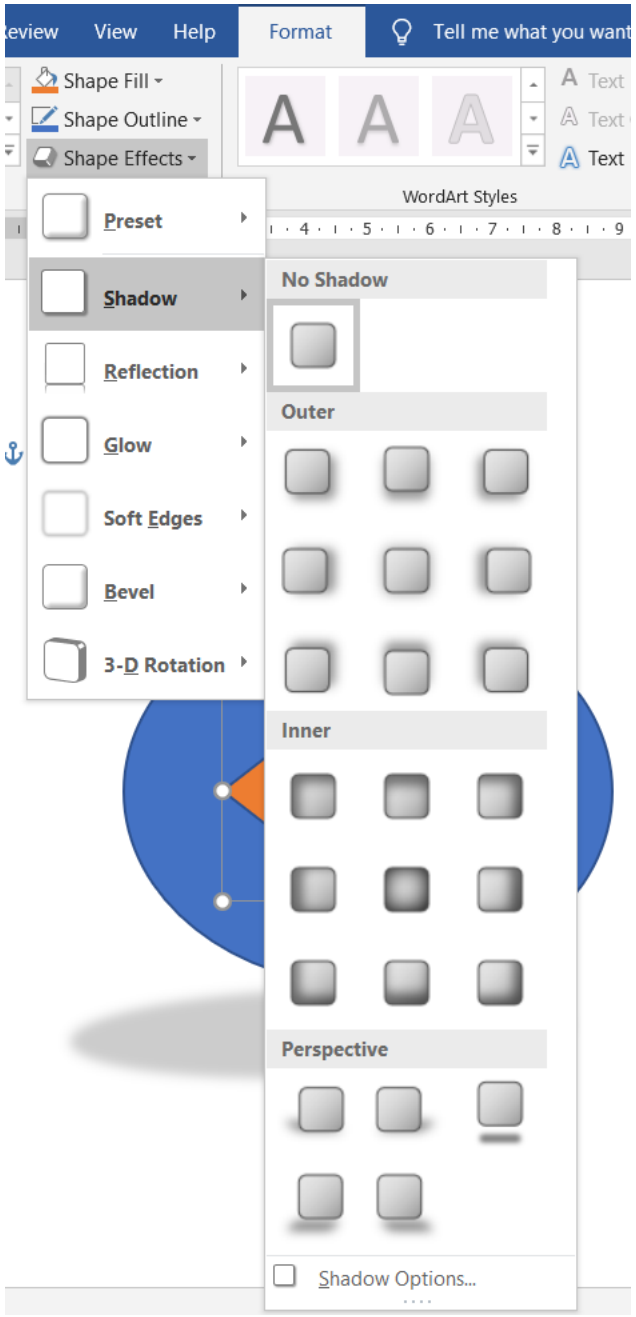
OneDrive

Insert Shapes



- Word comes with a library of common shapes ready to insert in a document. These include basic shapes, such as squares, circles, geometric figures, lines, and arrows — plus popular symbols.
- Graphics professionals refer to these types of images as **line art**.
- To place some line art in a document, follow these steps:
  - Click the Insert tab.
  - In the Illustrations group, click the Shapes button.
  - The button holds a menu that lists shapes organized by type.
  - Choose a predefined shape.
  - The mouse pointer changes to a plus sign (+).
  - Drag to create the shape.
  - The shape is placed into the document, floating in front of the text.

- At this point, you can adjust the shape: Change its size, location, or colors.
- Use the Drawing Tools Format tab, conveniently shown on the Ribbon while the shape is selected, to affect those changes.
- Instantly change the image by using the Shape Styles group on the Ribbon's Drawing Tools Format tab. Choose a new style from the Shape Gallery.
- Other items in the Shape Styles group affect the selected shape specifically:
  - Click the Shape Fill button to set the fill color;
  - Use the Shape Outline button to set the shape's outline color;
  - Choose an outline thickness from the Shape Outline button's menu, on the Weight submenu;
  - Use the Shape Effects button to apply 3D effects, shadows, and other fancy formatting to the shape.


eview
View
Help
Format
Tell me what you want
Shape Fill
Shape Outline
Shape Effects
A
A
A
Text
Text
Text
WordArt Styles
Preset
Shadow
Reflection
Glow
Soft Edges
Bevel
3-D Rotation
No Shadow
Outer
Inner
Perspective
Shadow Options...

Charts

- A **chart** is a tool you can use to **communicate data graphically**. Including a chart in your document can allow your reader to see the **meaning behind the numbers,** and it can make showing **comparisons** and **trends** easier.
- Word has several types of charts, allowing you to choose the one that best fits your data. In order to use charts effectively, you'll need to understand how different charts are used.
- Word uses a **spreadsheet** as a placeholder for entering chart data, much like **Excel**. The process of entering data is fairly simple,

Adding charts to Word

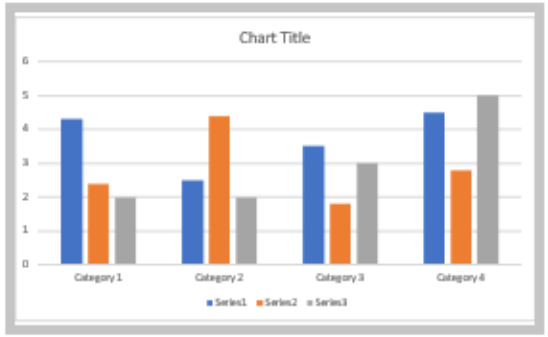
- Microsoft Word enables adding charts and graphs of many kinds in your document, from simple pie charts to 3D surface graphs. To do this, simply:
  1. Place the cursor where you want your chart to appear
  2. Go to “Insert” on the main ribbon and select “Chart” from the “Illustrations” section
  3. In the new window, pick the type of chart you want in your document and click “OK”
  4. Your chart will now appear in the position selected and an Excel spreadsheet window will open (called “Chart in Microsoft Word”)
  5. Edit the values and labels in the Excel window to reflect the data required for your chart

Insert Chart

All Charts

- Recent
- Templates
- Column
- Line
- Pie
- Bar
- Area
- X Y (Scatter)
- Map
- Stock
- Surface
- Radar
- Treemap
- Sunburst
- Histogram
- Box & Whisker
- Waterfall
- Funnel
- Combo

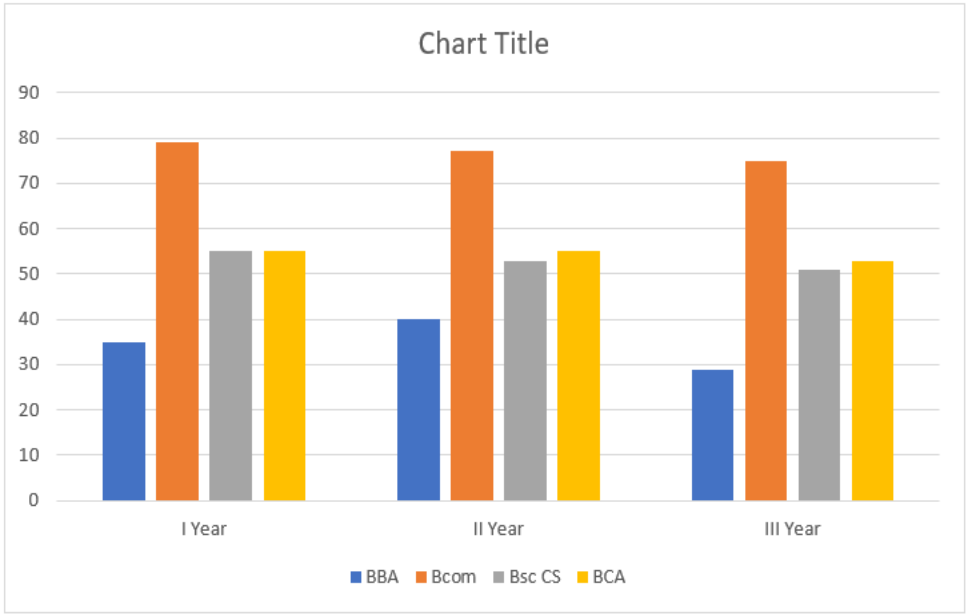
Clustered Column

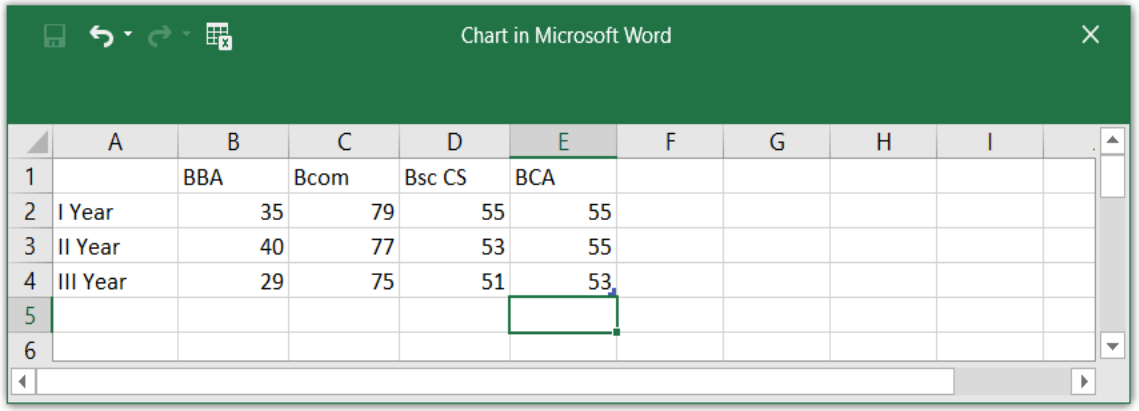


OK

Cancel

Add Chart Element | Quick Layout | Change Colors | Chart Layouts | Chart Styles | Switch Row/ Column | Select Data | Edit Data | Refresh Data | Data | Change Chart Type | Type





	A	B	C	D	E	F	G	H	I
1		BBA	Bcom	Bsc CS	BCA				
2	I Year	35	79	55	55				
3	II Year	40	77	53	55				
4	III Year	29	75	51	53				
5									
6									

To change the chart layout:

- Word's predefined chart layouts allow you to modify chart elements—including chart titles, legends, and data labels—to make your chart easier to read.
- Select the chart you want to modify. The Design tab will appear.
- From the Design tab, click the Quick Layout command.
- Select the desired predefined layout from the menu that appears.
- The chart will update to reflect the new layout.
- To change a chart element (such as the chart title), click the element and begin typing.

Adding Equations to Word

- To insert equations in Word from one of the preset equations,
- First place your cursor at the insertion point in your document where you want the equation to appear.
- Then click the “Insert” tab in the Ribbon. At the right end of the tab is the “Symbols” button group. Click the drop-down arrow on the “Equation” button in this button group to then open the menu of choices.
- Scroll through the “Built-In” section to view the available preset equations.
- After finding the preset equation to insert, then click it in either of these areas to insert it into your document.

- Alternatively, it is possible to insert equations in Word by manually entering an equation.
- To manually insert an equation, first place your cursor at the insertion point in your document where you want the equation to appear.
- Then click the “Insert” tab in the Ribbon.
- Then click the “Equation” button in the “Symbols” button group.
- A blank equation is then inserted into your document.

Built-In

Area of Circle

$$A = \pi r^2$$

Binomial Theorem

$$(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}$$

Expansion of a Sum

$$(1 + x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \cdots$$

Fourier Series

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L} \right)$$

Pythagorean Theorem

$$a^2 + b^2 = c^2$$

More Equations from Office.com

Insert New Equation

- The “Equation Tools” contextual tab then appears, with the “Design” tab selected.
- We can use the “Symbols” and “Structures” button groups, in conjunction with your keyboard, to then enter your desired equation into the equation field.
- After inserting equations in Word using either option, click the drop-down arrow in the equation field to see a menu of options.
- Selecting the “Save as New Equation…” option from the menu adds the equation to the drop-down menu of the “Equation” button.
- It is possible to choose how the equation looks by selecting the “Professional” or “Linear” options.

- The next options, “Change to Inline” or “Change to Display,” set how to insert the equation into the document.
- Selecting “Display” lets you adjust the equation’s justification by using the options in the drop-down menu under the “Justification” option.
- Selecting “Inline” locks the equation to its original insertion point.
- To delete an equation, select it in your document. Then press the “Delete” or “Del” key on your keyboard.

Procedure : Creating mail merge

1. Click Mail Merge … command under tools menu.
2. In Mail Merge helper dialog box, click the button create, which opens a menu click Form Letters… command.
3. In Microsoft Word message box, click Active Window command button.
4. Again in Mail Merge helper dialog box, click Get Data button, which opens a menu click create Data Source… command.
5. Create Data Source dialog box opens, Remove the unwanted field names from the list under Field names in header row, using the button Remove field Name. Click OK button.
6. Now 'Save As' dialog box opens to save the data file. Save the file name with .dat extension (info.dat).
7. In Microsoft word message box, click Edit Data Source button.
8. In Data form dialog box, after entering each record, click Add New button. After entering all records, click OK button.
9. In Microsoft word screen, under available toolbars, Click Insert Merge field, click the field names one by one.
10. Now, click Mail Merge… command, under Tools Menu.
11. In Mail Merge helper dialog box, click Merge… button.
12. Merge dialog box opens, Click Merge button.

Now you document is merged with the info.dat

MICROSOFT EXCEL

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Assistant Professor,
Department of Computer Science
Adhiparasakthi College of Arts & Science,
Kalavai.

II Bsc Bio

Fundamentals of Computer

Microsoft Excel: Spread Sheet

- MS-Excel is a window based powerful spreadsheet (Worksheet) package.
- Spreadsheet is wonderful analysis tool with automatic recalculation.
- Banking system, payroll system, Sales and stock maintenance also made in the MS-Excel spreadsheet.
- A spreadsheet is basically a large grid that is separated into rows and columns.
- Easy evaluation, What if analysis, Chart and report creations are one of the tools in the MS-Excel.
- Microsoft Excel is a spread sheet program that allows you to perform various calculations, estimations, and formulations with data.

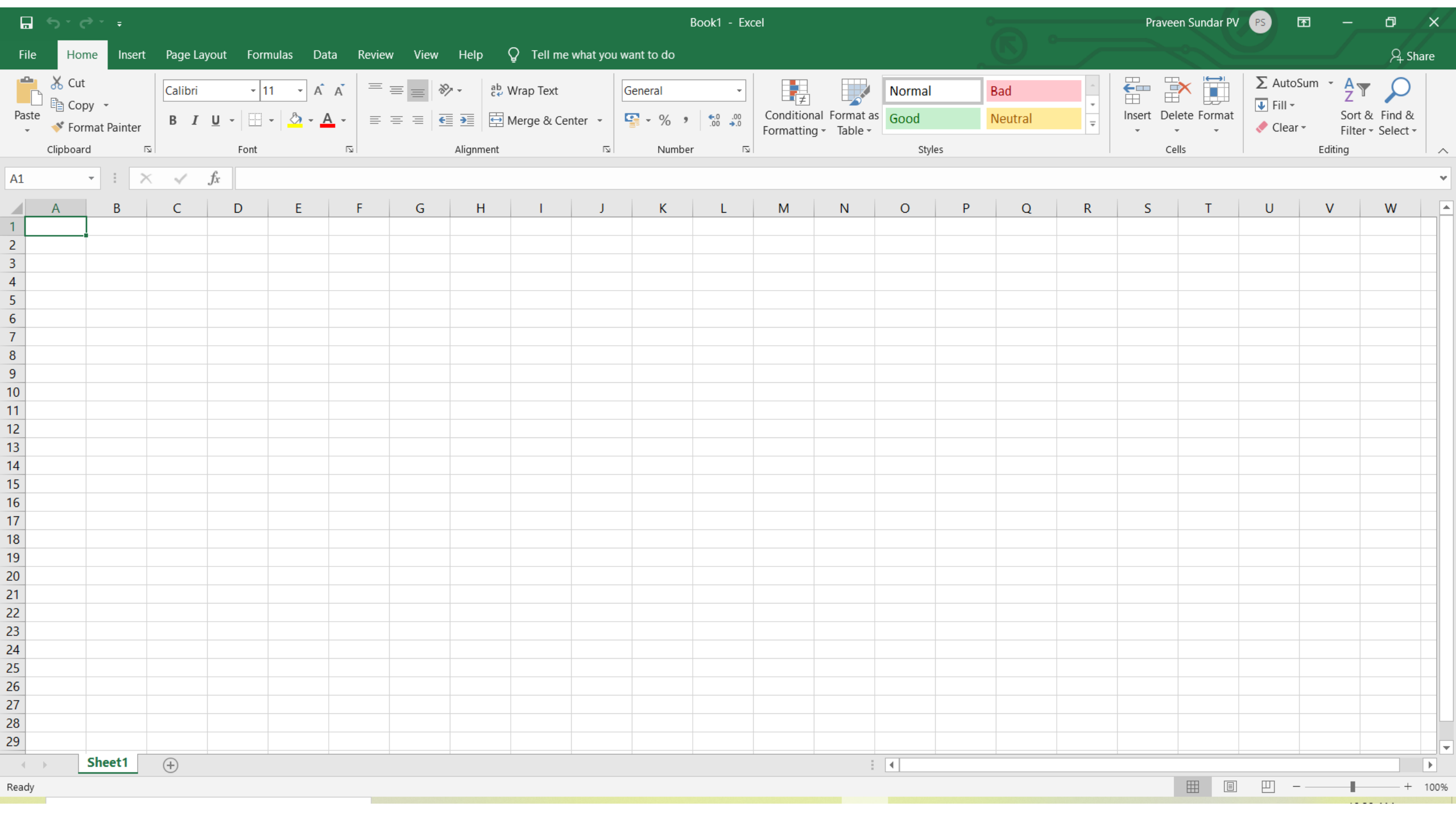
- It is the electronic counter part of a paper ledger sheet which consists of a grid of columns and rows.
- The total number of rows in excel is 65,536 and min is 256.
- The row is identified by alphabets like A, B,C etc. The column is identified by numbers or digits.
- It provides various facilities like:
  - Inserting charts
  - Creating graphs
  - Analyzing situations
  - Help in decision-making

Features of Excel or Spreadsheet

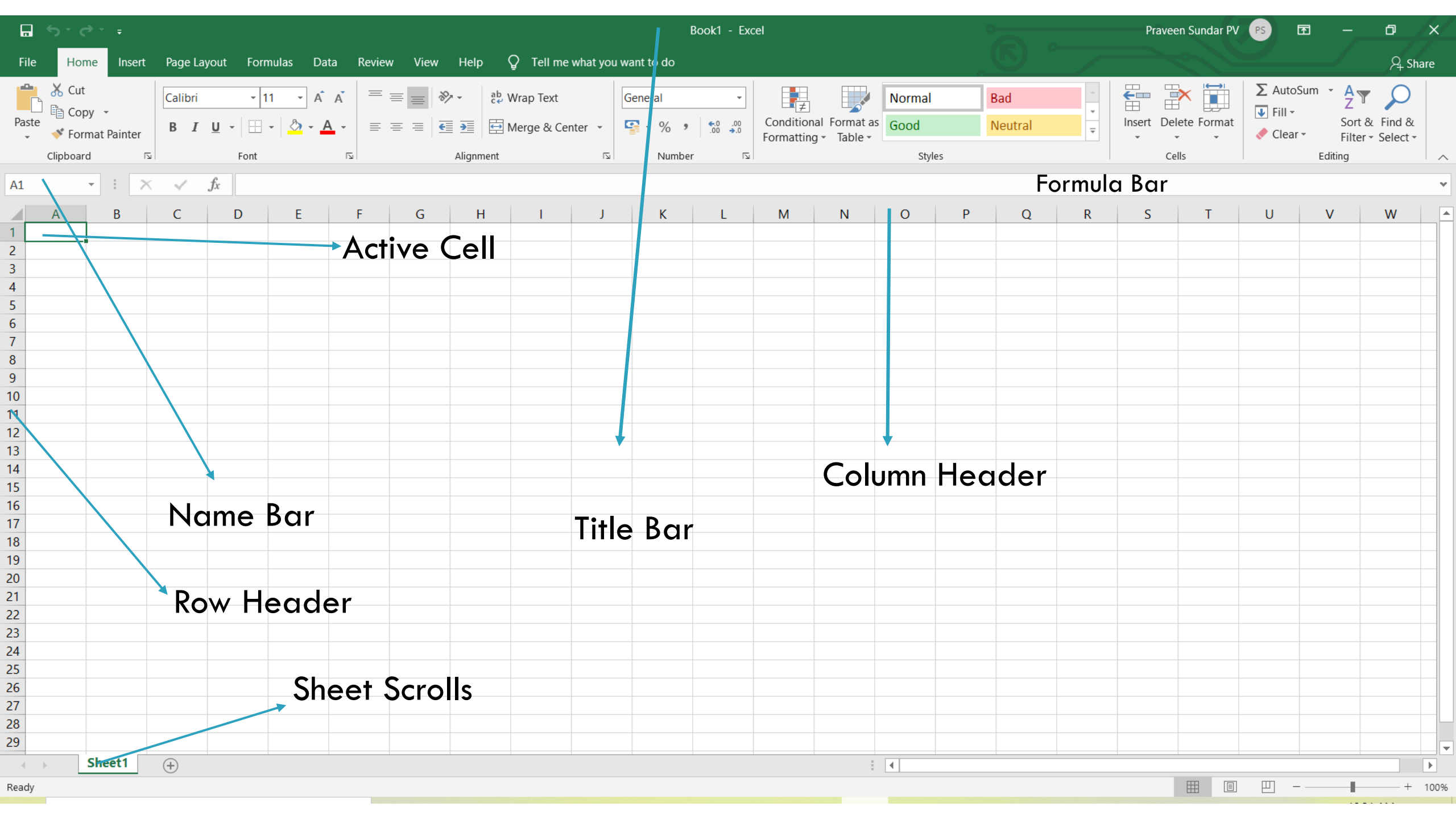
- Special mathematical, trigonometric, financial and statistical functions are available. All complicated calculations can be performed vary easily using these functions.
- The result of a calculations can be accurate.
- Data can also be viewed in the form of graphs.
- The information stored in a worksheet can be transferred to other software program.
- The entire worksheet or any part, it can be printed in desired format.
- The worksheet is saved can be retrieved and modified later as when required.

Starting Excel

- Click on the start button on the Taskbar.
- To begin Microsoft Excel , goto Start→ All Programs→Microsoft Office → Microsoft Excel. (or)
- Select Windows Key + R to obtain Run Command, there type Excel and click Ok to start Microsoft Excel.
- The following excel window displayed on the screen.


Book1 - Excel
Praveen Sundar PV
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Help
Tell me what you want to do
Share
Cut
Copy
Format Painter
Paste
Clipboard
Calibri
11
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Normal
Bad
Good
Neutral
Styles
Insert
Delete
Format
Cells
AutoSum
Fill
Clear
Sort & Filter
Find & Select
Editing
A1
Sheet1
Ready
100%

- Creating a Workbook
- Creating a workbook: Menu option
- Creating a workbook: Toolbar option.
- Opening an existing workbook
- Saving workbook
- Closing a workbook
- Components of an Excel Windows


Book1 - Excel
Praveen Sundar PV
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Help
Tell me what you want to do
Share
Paste
Cut
Copy
Format Painter
Clipboard
Calibri
11
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Normal
Bad
Good
Neutral
Styles
Insert
Delete
Format
Cells
AutoSum
Fill
Clear
Sort & Filter
Find & Select
Editing
A1
Formula Bar
Active Cell
Name Bar
Title Bar
Column Header
Row Header
Sheet Scrolls
Sheet1
Ready
100%

- Working with Worksheet
  - Entering the Data (Text, Numeric, Logical, Formulas)
  - Editing the Cell content.
  - Working with rows and Columns
    - Adjusting Row Height and Column Width
    - Inserting Rows and Columns
    - Deleting Rows and Columns
    - Moving Rows and Columns
    - Copying Rows and Columns
- Printing in Excel
- Hiding Columns

- Organizing Worksheets
  - Inserting Worksheets
  - Moving Worksheets
  - Copying Worksheets
  - Deleting Worksheets
  - Renaming Worksheets
- Charts in Excel

Charts in Excel

- Excel provides you different types of charts that suit your purpose. Based on the type of data, you can create a chart. You can also change the chart type later.
- Excel offers the following major chart types –
  - Column Chart
  - Line Chart
  - Pie Chart
  - Doughnut Chart
  - Bar Chart
  - Area Chart
  - XY (Scatter) Chart
  - Bubble Chart
  - Stock Chart
  - Surface Chart
  - Radar Chart
  - Combo Chart

- **Column Chart:** A Column Chart typically displays the categories along the horizontal (category) axis and values along the vertical (value) axis. To create a column chart, arrange the data in columns or rows on the worksheet.
- **Line Chart :** Line charts can show continuous data over time on an evenly scaled Axis. Therefore, they are ideal for showing trends in data at equal intervals, such as months, quarters or years.
- In a Line chart –
  - Category data is distributed evenly along the horizontal axis.
  - Value data is distributed evenly along the vertical axis.

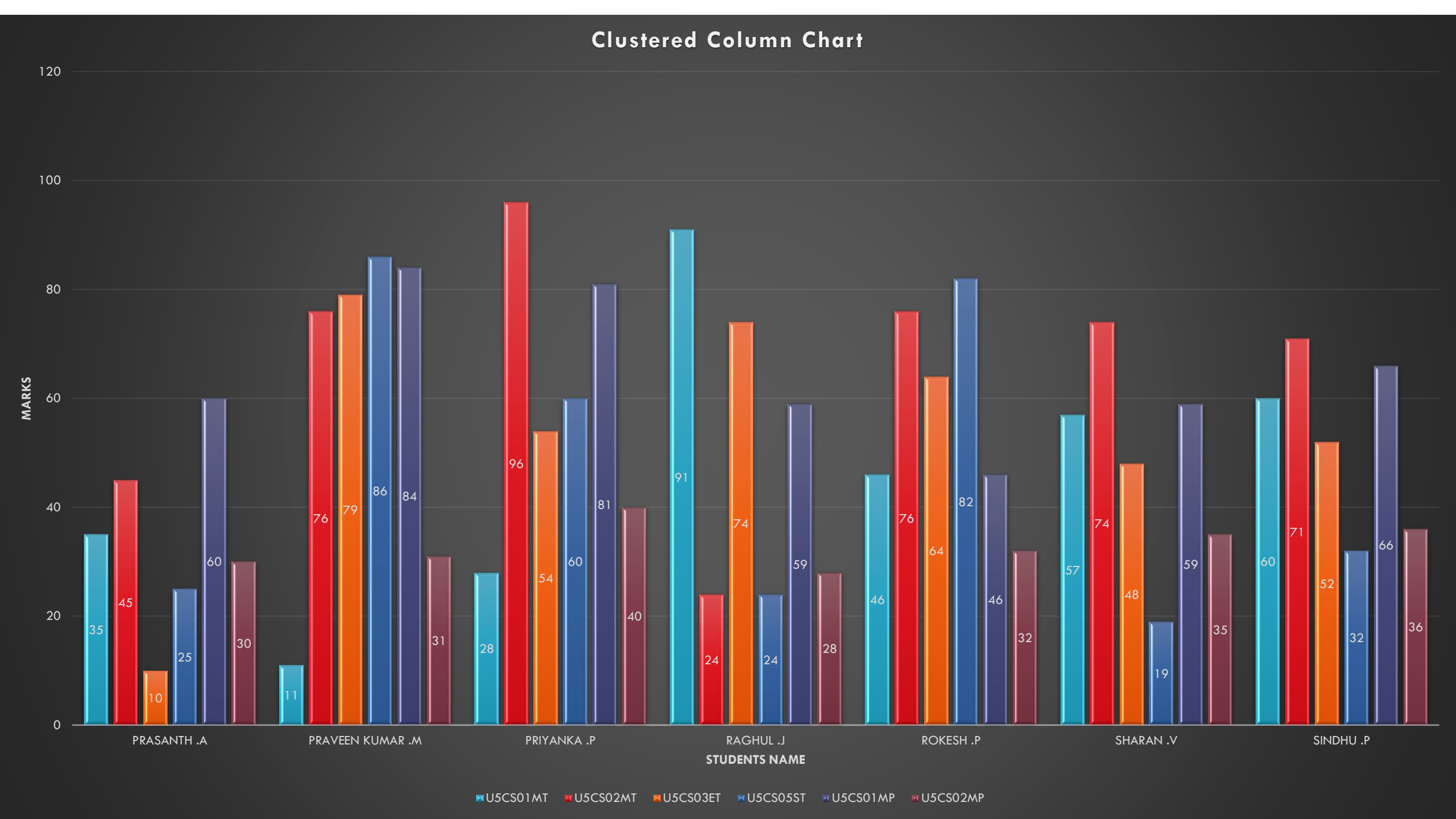
- **Pie Chart :**Pie charts show the size of items in one data series, proportional to the sum of the items. The data points in a pie chart are shown as a percentage of the whole pie. To create a Pie Chart, arrange the data in one column or row on the worksheet.
- **Doughnut Chart:** A Doughnut chart shows the relationship of parts to a whole. It is similar to a Pie Chart with the only difference that a Doughnut Chart can contain more than one data series, whereas, a Pie Chart can contain only one data series. A Doughnut Chart contains rings and each ring representing one data series. To create a Doughnut Chart, arrange the data in columns or rows on a worksheet.
- **Bar Chart :** Bar Charts illustrate comparisons among individual items. In a Bar Chart, the categories are organized along the vertical axis and the values are organized along the horizontal axis. To create a Bar Chart, arrange the data in columns or rows on the Worksheet.

- **Area Chart:** Area Charts can be used to plot the change over time and draw attention to the total value across a trend. By showing the sum of the plotted values, an area chart also shows the relationship of parts to a whole. To create an Area Chart, arrange the data in columns or rows on the worksheet.
- **XY (Scatter) Chart**
- XY (Scatter) charts are typically used for showing and comparing numeric values, like scientific, statistical, and engineering data.
- A Scatter chart has two Value Axes –
  - Horizontal (x) Value Axis
  - Vertical (y) Value Axis
- It combines x and y values into single data points and displays them in irregular intervals, or clusters. To create a Scatter chart, arrange the data in columns and rows on the worksheet.
- Place the x values in one row or column, and then enter the corresponding y values in the adjacent rows or columns.

- **Bubble Chart :** A Bubble chart is like a Scatter chart with an additional third column to specify the size of the bubbles it shows to represent the data points in the data series.
- **Stock Chart:** As the name implies, Stock charts can show fluctuations in stock prices. However, a Stock chart can also be used to show fluctuations in other data, such as daily rainfall or annual temperatures.
- **Surface Chart:** A Surface chart is useful when you want to find the optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.
- **Radar Chart:** Radar charts compare the aggregate values of several data series. To create a Radar chart, arrange the data in columns or rows on the worksheet.
- **Combo Chart:** Combo charts combine two or more chart types to make the data easy to understand, especially when the data is widely varied. It is shown with a secondary axis and is even easier to read. To create a Combo chart, arrange the data in columns and rows on the worksheet.

Consider the following Data,

STUDENT NAME	U5CS01MT	U5CS02MT	U5CS03ET	U5CS05ST	U5CS01MP	U5CS02MP
PRASANTH .A	35	45	10	25	60	30
PRAVEEN KUMAR .M	11	76	79	86	84	31
PRIYANKA .P	28	96	54	60	81	40
RAGHUL .J	91	24	74	24	59	28
ROKESH .P	46	76	64	82	46	32
SHARAN .V	57	74	48	19	59	35
SINDHU .P	60	71	52	32	66	36

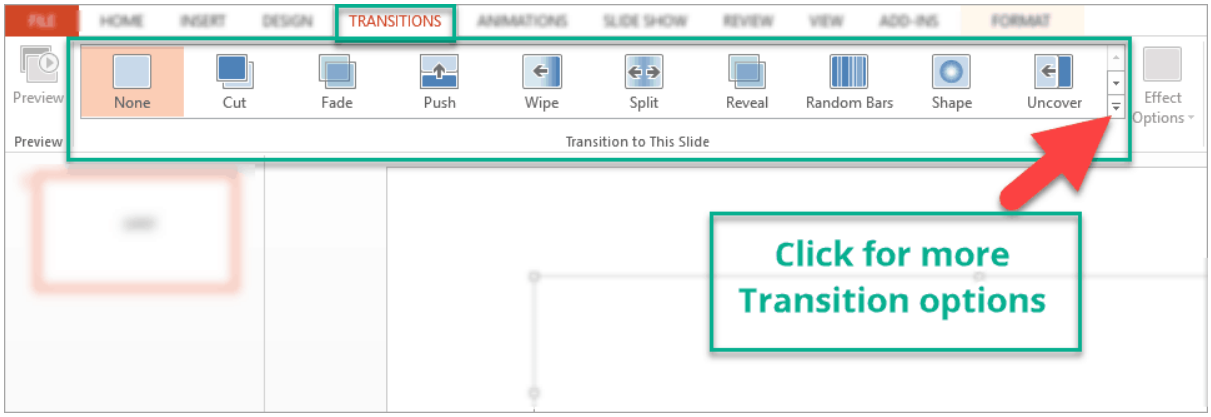

Clustered Column Chart
120
100
80
60
40
20
0
MARKS
35
45
10
25
60
30
11
76
79
86
84
31
28
96
54
60
81
40
91
24
74
24
59
28
46
76
64
82
46
32
57
74
48
19
59
35
60
71
52
32
66
36
PRASANTH .A
PRAVEEN KUMAR .M
PRIYANKA .P
RAGHUL .J
ROKESH .P
SHARAN .V
SINDHU .P
STUDENTS NAME
U5CS01MT
U5CS02MT
U5CS03ET
U5CS05ST
U5CS01MP
U5CS02MP


Thank you

Animations are visual effects for the objects in our PowerPoint presentation. Animations bring objects like text, images, or charts on or off your slide. Microsoft calls these entrances and exits. An entrance is an animation that brings something onto the slide. An exit moves an object off the slide. Use an animation to make an object enter or exit your slide (or even move it between spots on a slide.). There are generally two types of animations you can use to make your presentation come alive. These are:

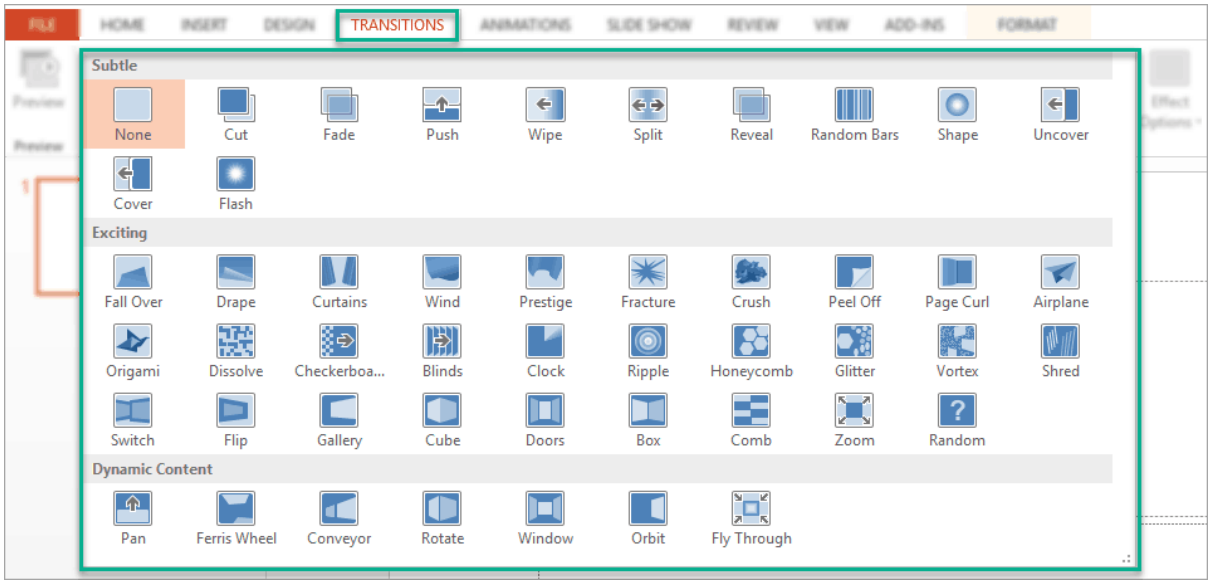
Transitions

The first type of animation is called *transition animation*; these are animations added in between slides. When we transition from slide 1 to slide 2, we can add an animation in between the slides. we can view the different transition options by going to the **Transitions pane** on the PowerPoint ribbon.



(Caption: The Transitions pane *in PowerPoint)*

The default view shows 10 transitions, but if we click on the little , then we will see many more options like below:



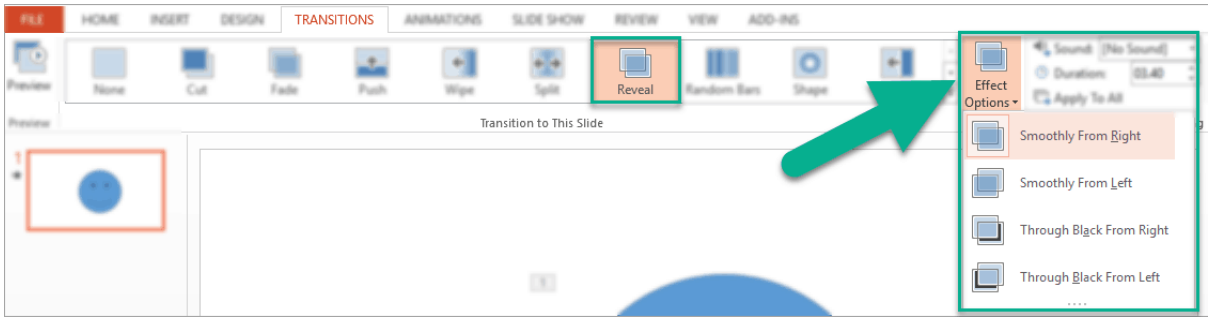
(Caption: More Transition options in PowerPoint – choose from Subtle, Exciting and Dynamic Content transition animations)

Transition animations have additional effect options. we will notice this when you click on the transition we want to use. The **Effect Options** button won't be grayed out, and we can select additional settings.

For example, I selected **'Reveal'** as my transition animation. Available effect options would be:

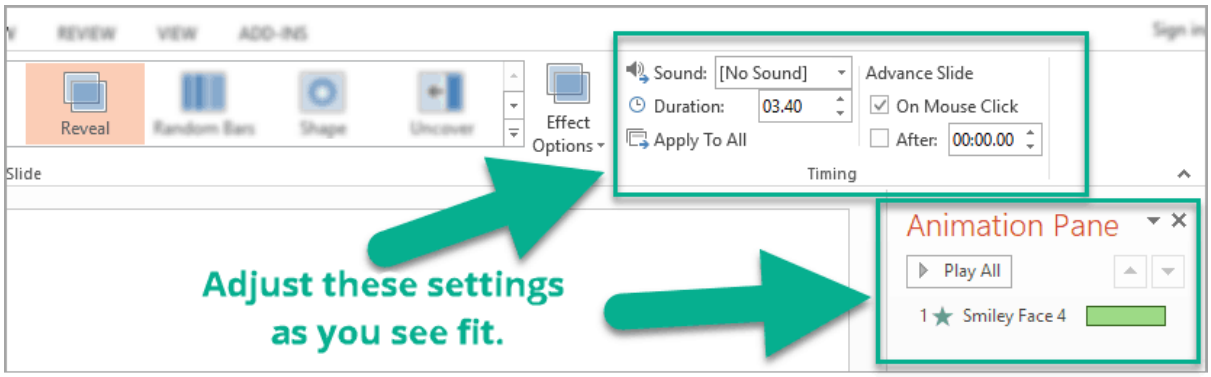
- *Smoothly from right*
- *Smoothly from left*
- *Through black from right*
- *Through black from left*

Here's a screenshot of what it looks like:



(Caption: Effect Options are available for some transition animations in PowerPoint)

we can also adjust the timing and duration of each transition as well as set how we want the slides to advance so that the transition can take place.

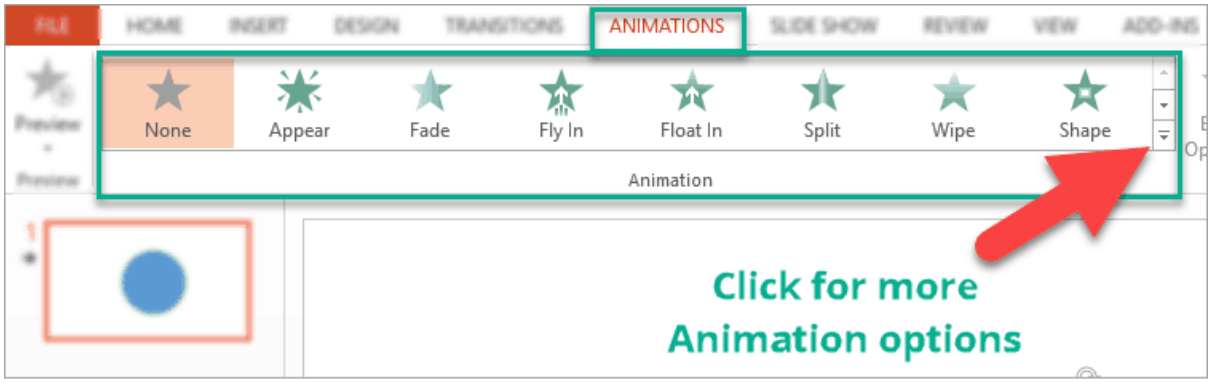


(Caption: More settings can be adjusted in the Timing section as well as the Animation Pane)

Feel free to play around with the transition animations and effect options that work best with our presentation.

Animations

The second type of animations bring the objects or elements within our slide to life. If we want to animate text, an image, shape, graph or chart, this is the type of animation that we select. First to **click on the object we want to animate**, then **click on the Animations tab**.

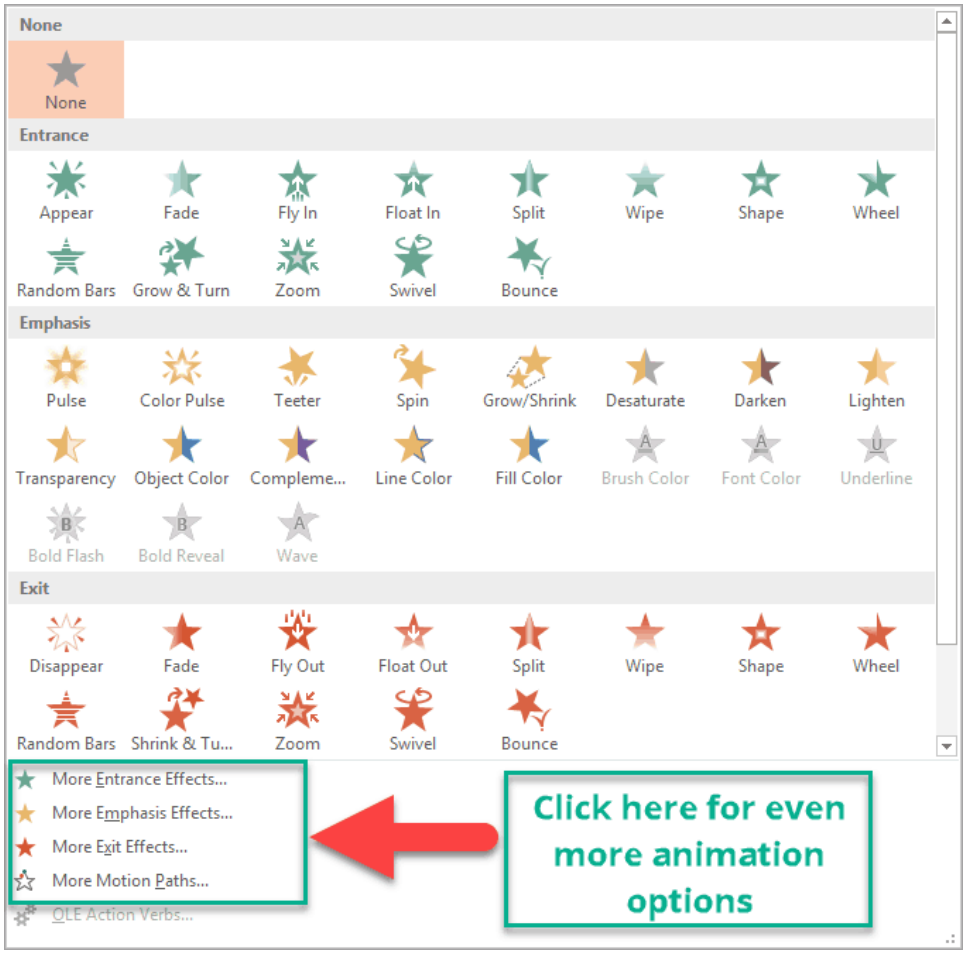


(Caption: The Animations pane in PowerPoint)

The default view shows 8 animations, but if we click on the little, then we will see many more options like below:

We can choose from the following types of animations:

- **Entrance animations.** The icons for this type of animation are **colored green**. If we use this type of animation for an object, that object will **enter the slide** according to our timing preferences.
- **Exit animations.** The icons for this type of animation are **colored red**. The object we have added this animation to will **exit the slide**.
- **Emphasis animations.** The icons for this kind of animation are **colored yellow**. The object won't enter or exit the slide (unless we have added that particular animation to the same object) but will emphasize and draw attention to that object.
- **Motion path animations.** This type of animation will allow us to **move an object from one spot to another.** we can specify or draw the path we want the object to take.

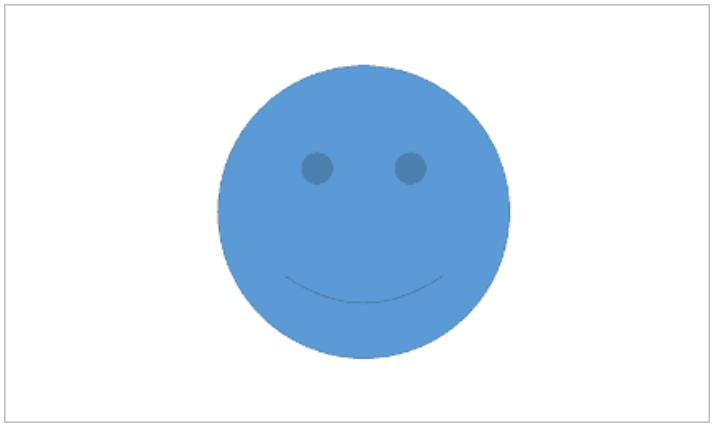


(Caption: More Animation options in PowerPoint – choose from Entrance, Exit, Emphasis and Motion Paths animations)

How To Add Animations to PowerPoint In 2 Simple Steps

To add entrance animations to any object in PowerPoint, here's what we need to do:

1. Click on the object we want to animate. In this example, we will use a blue smiley face.



(Caption: The blue smiley face we will be animating for this tutorial)

2. Select the animation we want to use. For this example, we used the **entrance animation** – **fade** animation. We set the duration to 2.75 seconds. You will notice in the screenshot below that the fade animation has no effect options (the button is greyed out).

(Caption: The different options available for Fade animation in PowerPoint)

Here's what those numbers in the screenshot mean:

1 – We chose the Fade animation.

2 – There are no Effect Options for Fade Animation (the button is grayed out and not clickable)

3 – we can adjust settings via the Advanced Animation, Timing, and Animation Pane sections

4 – The number (1) refers to the fact that we've added 1 animation to our object (this is the Fade animation).

5 – We can click on the Preview button to preview the animation.

Computer Networks

- ✓ A Computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data, and applications.
- ✓ A network consists of two or more computers that are linked in order to share resources (such as printers and CDs), exchange files, or allow electronic communications.
- ✓ The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams.
- ✓ A computer network can be categorized by their size. A computer network is mainly of four types:
    - PAN(Personal Area Network)
    - LAN(Local Area Network)
    - MAN(Metropolitan Area Network)
    - WAN(Wide Area Network)
- ✓ **PAN(Personal Area Network)**
    - Personal Area Network is a network arranged within an individual person, typically within a range of 10 meters.
    - Personal Area Network is used for connecting the computer devices of personal use is known as Personal Area Network.
    - Personal Area Network covers an area of 30 feet.
    - Personal computer devices that are used to develop the personal area network are the laptop, mobile phones, media player and play stations.
- ✓ **LAN(Local Area Network)**
    - Local Area Network is a group of computers connected to each other in a small area such as Home, building, office.
    - LAN is used for connecting two or more personal computers through a communication medium such as twisted pair, coaxial cable, etc.
    - It is less costly as it is built with inexpensive hardware such as hubs, network adapters, and ethernet cables.
    - The data is transferred at an extremely faster rate in Local Area Network.
    - Local Area Network provides higher security.
- ✓ **MAN(Metropolitan Area Network)**
    - A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network.
    - Government agencies use MAN to connect to the citizens and private industries.
    - In MAN, various LANs are connected to each other through a telephone exchange line.
    - It has a higher range than Local Area Network (LAN).
    - Cable Television network is the best example for MAN.
- ✓ **WAN(Wide Area Network)**
    - A Wide Area Network is a network that extends over a large geographical area such as states or countries.
    - A Wide Area Network is quite bigger network than the LAN.

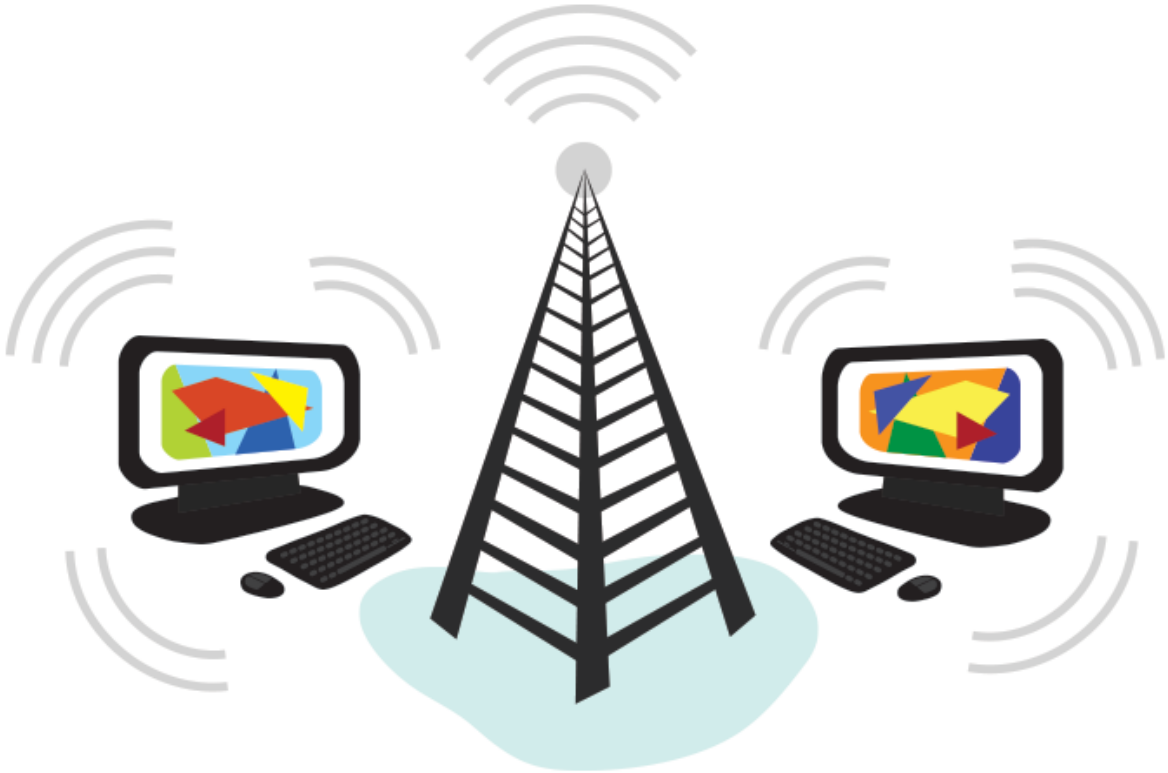
- A Wide Area Network is not limited to a single location, but it spans over a large geographical area through a telephone line, fibre optic cable or satellite links.
- The internet is one of the biggest WAN in the world.
- A Wide Area Network is widely used in the field of Business, government, and education.

✓ Internet

Internet is a network of network that connect computers all over the world. Network is an interconnection of systems to share data and information. Internet is a collection of government, academic, commercial, individual and other sites.

With the Internet, it's possible to access almost any information, communicate with anyone else in the world, and do much more.

You can do all of this by connecting a computer to the Internet, which is also called **going online.** When someone says a computer is online, it's just another way of saying it's connected to the Internet.



What is the Web?

The **World Wide Web**—usually called the **Web** for short—is a collection of different **websites** you can access through the Internet. A **website** is made up of related text, images, and other resources. Websites can resemble other forms of media—like newspaper articles or television programs—or they can be interactive in a way that's unique to computers.

The purpose of a website can be almost anything: a news platform, an advertisement, an online library, a forum for sharing images, or an educational site like us!

Once you are connected to the Internet, you can access and view websites using a type of application called a **web browser**.

A web browser (commonly referred to as a browser) is a software application for accessing information on the World Wide Web.

When a user requests a web page from a particular website, the web browser retrieves the necessary content from a web server and then displays the page on the user's device.

Note: A web browser is not the same thing as a search engine, though the two are often confused. For a user, a search engine is just a website that provides links to other websites. However, to connect to a website's server and display its web pages, a user must have a web browser installed.

Some of the Frequently used Browsers are

- Google Chrome
- Mozilla Firefox
- Internet Explorer
- Microsoft Edge
- Opera

- Netscape navigator
- Safari

Functions of Browser

The purpose of a web browser is to fetch information resources from the Web and display them on a user's device.

This process begins when the user inputs a Uniform Resource Locator (URL), such as https://www.apcas.in/, into the browser.

Virtually all URLs on the Web start with either http: or https: which means the browser will retrieve them with the Hypertext Transfer Protocol (HTTP).

In the case of https: the communication between the browser and the web server is encrypted for the purposes of security and privacy.

Once a web page has been retrieved, the browser's rendering engine displays it on the user's device. This includes image and video formats supported by the browser.

Web pages usually contain hyperlinks to other pages and resources. Each link contains a URL, and when it is clicked or tapped, the browser navigates to the new resource. Thus, the process of bringing content to the user begins again.

Most browsers use an internal cache of web page resources to improve loading times for subsequent visits to the same page. The cache can store many items, such as large images, so they do not need to be downloaded from the server again. Cached items are usually only stored for as long as the web server stipulates in its HTTP response messages.

✓ **Internet Services**

- **E-mail:** This service has been available since the early days of the ARPANET and its enormous popular. Email enables people to send messages as well as files to one or more people.
- **Mailing Lists:** enables groups of people to conduct group conversations by email.
- **News:** Usenet Newsgroups are specialized forums in which users with common interest can exchange messages. It enables online group discussions to occur, using a system of news server to store messages of 10,000.
- **Remote login:** Users on the internet can log into any other machine on the internet on which they have account.
- **File Transfer:** Users can copy files from one machine on the internet to another.
- **Online Chat-** Provides a way for real time online chatting to occur, where participants read each other messages.

- **Voice and Video Conferencing:** Two or more people to hear and see each other, with the help of camera fixed over these and share other applications.
- **Internet Telephony (VoIP):** Allows the internet users to talk across internet to any PC equipped to receive the call.
- **Browser:** Contains the basic software that can retrieve, view and send information over the internet.
- **Download:** To copy data from a remote computer to the local computer.
- Upload: To send data from local computer to remote computer.

✓ **Email Basics**

- Email is a service which allows us to send the message in electronic mode over the internet. It offers an efficient, inexpensive and real time mean of distributing information among people.
- Each user of email is assigned a unique name for his email account. This name is known as E-mail address. Different users can send and receive messages according to the e-mail address.
- E-mail is generally of the form username@domainname. For example, apcasgbn19@gmail.com is an e-mail address where apcasgbn19 is username and gmail.com is domain name.
- The username and the domain name are separated by @ (at) symbol.
- E-mail addresses are not case sensitive.
- Spaces are not allowed in e-mail address.
- Components of E-mail Message
- E-mail message comprises of different components: E-mail Header, Greeting, Text, and Signature.
- **E-mail Header:** The first five lines of an E-mail message is called E-mail header.
- The header part comprises of following fields:
  - **From**: The From field indicates the sender's address i.e. who sent the e-mail.
  - **Date:** The Date field indicates the date when the e-mail was sent.
  - **To:** The To field indicates the recipient's address i.e. to whom the e-mail is sent.
  - **Subject:** The Subject field indicates the purpose of e-mail. It should be precise and to the point.
  - **CC:** CC stands for Carbon copy. It includes those recipient addresses whom we want to keep informed but not exactly the intended recipient.
  - **BCC:** BCC stands for Black Carbon Copy. It is used when we do not want one or more of th e recipients to know that someone else was copied on the message.
  - **Greeting:** Greeting is the opening of the actual message.
  - **Text:** It represents the actual content of the message.
  - **Signature:** This is the final part of an e-mail message. It includes Name of Sender, Address, and Contact Number.

        - **Attachment:** Ability to attach file(s) along with the message is one of the most useful features of email. The attachment may be a word document, PowerPoint presentation, audio/video files, or images. The maximum size allowed is 25 MB.

✓ **Advantages of Email**

- **Productivity tools:** Email is usually packaged with a calendar, address book, instant messaging, and more for convenience and productivity.
- **Access to web services:** If you want to sign up for an account like Facebook or order products from services like Amazon, you will need an email address so you can be safely identified and contacted.
- **Easy mail management:** Email service providers have tools that allow you to file, label, prioritize, find, group, and filter your emails for easy management. You can even easily control spam, or junk email.
- **Privacy:** Your email is delivered to your own personal and private account with a password required to access and view emails.
- **Communication with multiple people:** You can send an email to multiple people at once, giving you the option to include as few as or as many people as you want in a conversation.
- **Accessible anywhere at any time:** You don't have to be at home to get your mail. You can access it from any computer or mobile device that has an Internet connection.
- **Reliable:** Many of the mail systems notify the sender if e-mail message was undeliverable.
- **Speed:** E-mail is very fast. However, the speed also depends upon the underlying network.
- **Inexpensive:** The cost of sending e-mail is very low.
- **Printable:** It is easy to obtain a hardcopy of an e-mail. Also an electronic copy of an e-mail can also be saved for records.
- **Global:** E-mail can be sent and received by a person sitting across the globe.
- **Generality:** It is also possible to send graphics, programs and sounds with an e-mail.

✓ **Disadvantages**

- Apart from several benefits of E-mail, there also exists some disadvantages as discussed below:
    - Forgery
    - Overload
    - Misdirection
    - Junk
    - No response

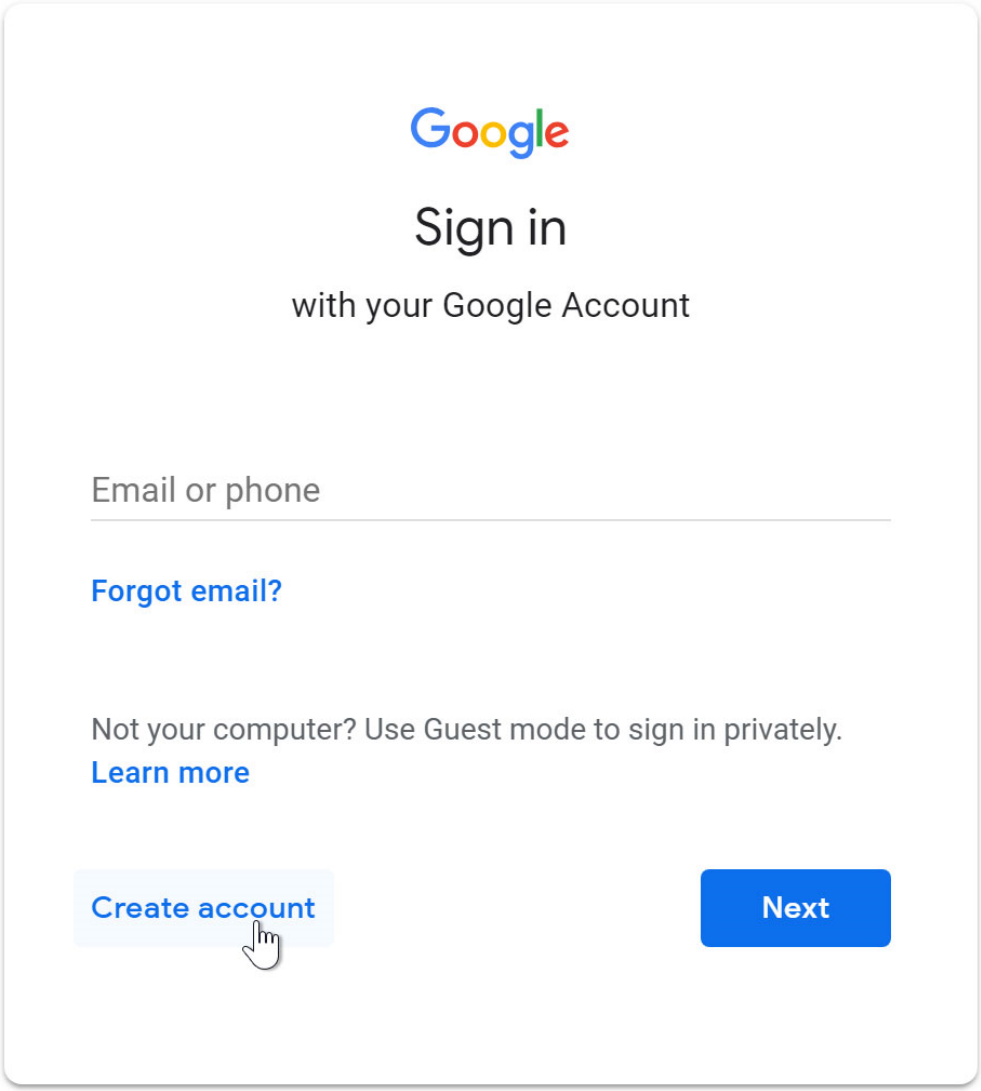
Creating a new email account

To create a **Gmail** address, you'll first need to create a **Google account**. Gmail will redirect you to the Google account sign-up page. You'll need to provide some basic information like your **name**, **birth date**, **gender**, and **location**. You will also need to

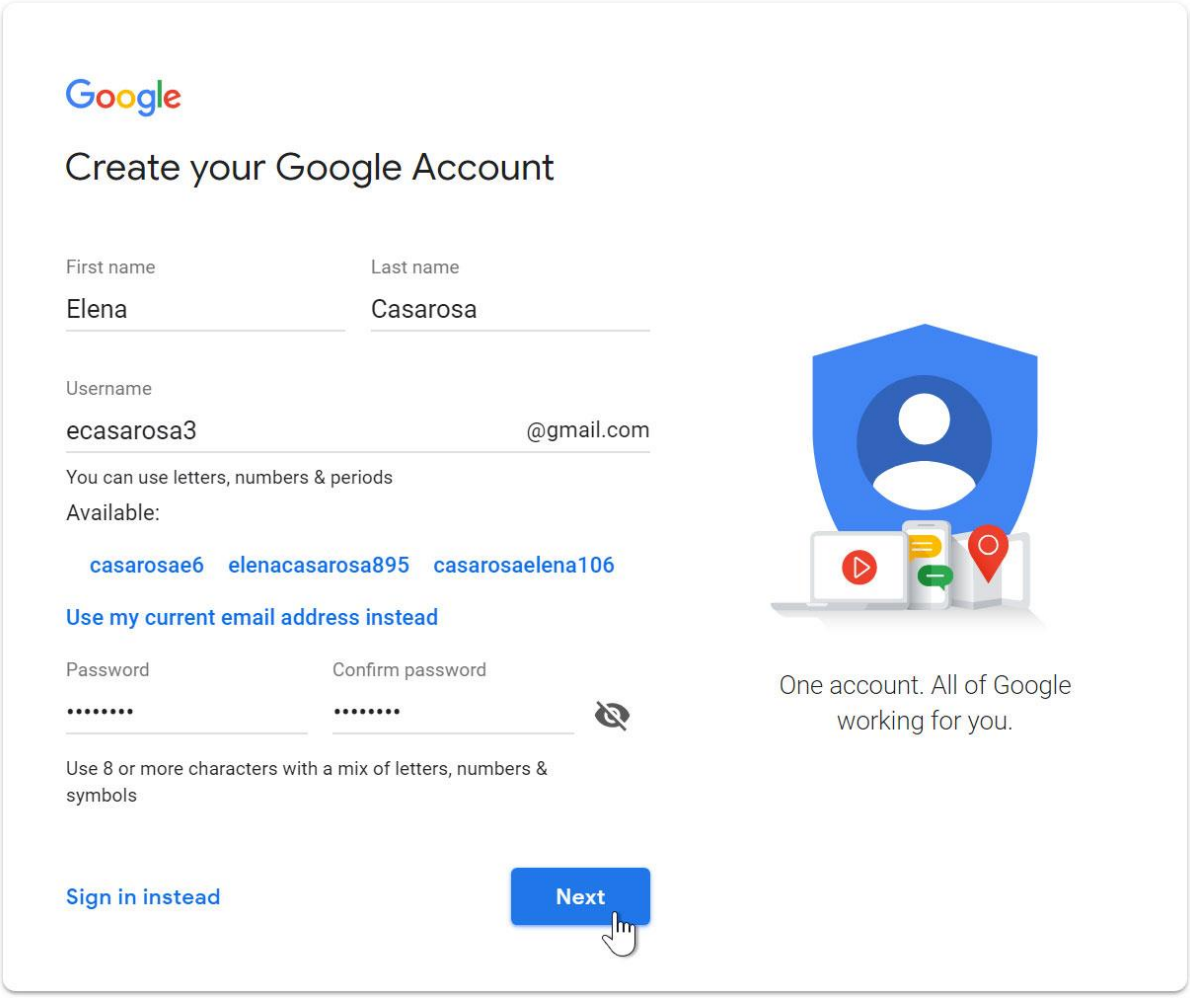
choose a **name** for your new Gmail address. Once you create an account, you'll be able to start adding **contacts** and adjusting your **mail settings**.

To create an account:

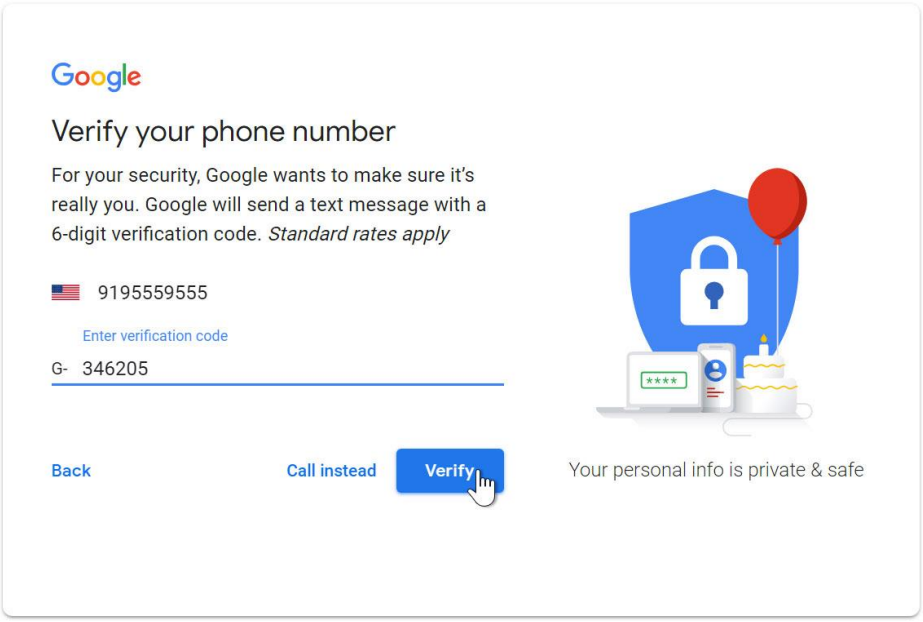
1. Go to www.gmail.com.
2. Click **Create account.**



3. The **sign-up** form will appear. Follow the directions by entering the required information.



4. Next, enter your **phone number** to verify your account. Google uses a two-step verification process for your security.
5. You will receive a text message from Google with a **verification code**. **Enter the code** to complete the account verification.



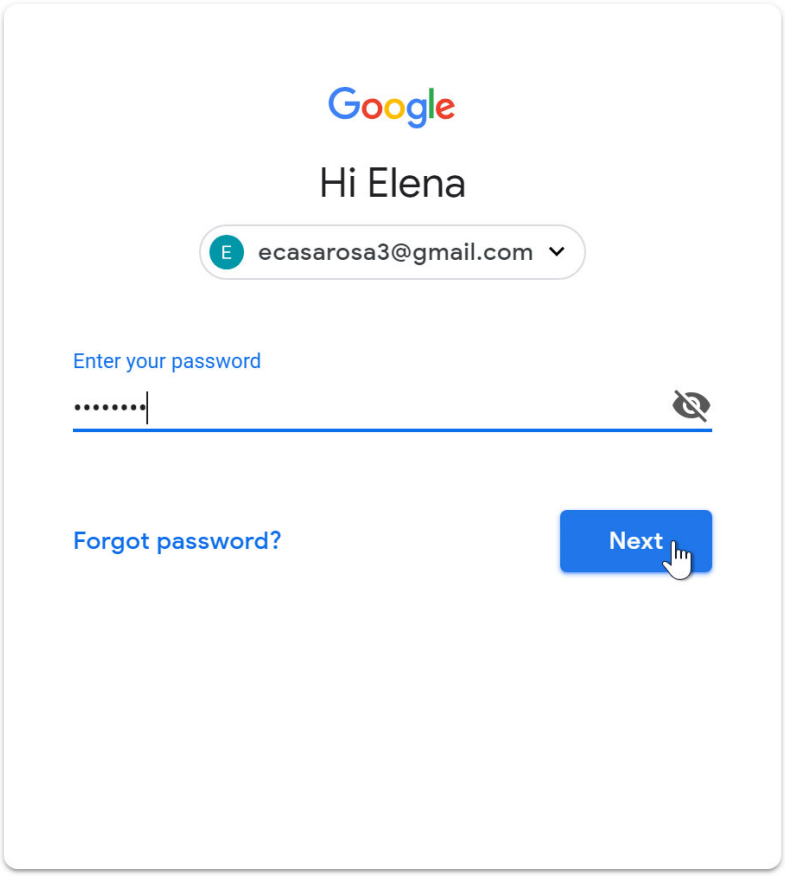
6. Next, you will see a form to enter some of your personal information, like your name and birthday.
7. Review Google's Terms of Service and Privacy Policy, then click **I agree**.
8. Your account will be created.

Signing in to your account

When you first create your account, you will be automatically signed in. Most of the time, however, you'll need to **sign in** to your account and **sign out** when you're done with it. Signing out is especially important if you're using a shared computer (for example, at a **library** or **office**) because it prevents others from viewing your emails.

To sign in:

1. Go to www.gmail.com.
2. Type your **user name** (your email address) and **password**, then click **Next**.



To sign out:

In the top-right corner of the page, locate the circle that has your first initial (if you've already selected an avatar image, it will show the image instead). To sign out, click the circle and select **Sign out**.

Sending email

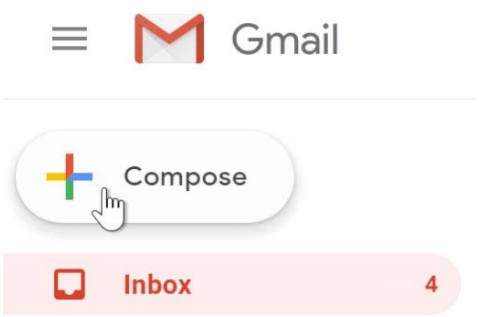
When you write an email, you'll be using the **compose window**. This is where you'll add the **email address of the recipient(s)**, the **subject**, and the **body** of the email, which is the message itself. You'll also be able to add various types of **text formatting**, as well as one or more **attachments**. If you want, you can even create a **signature** that will be added to the end of every email you send.

The compose window

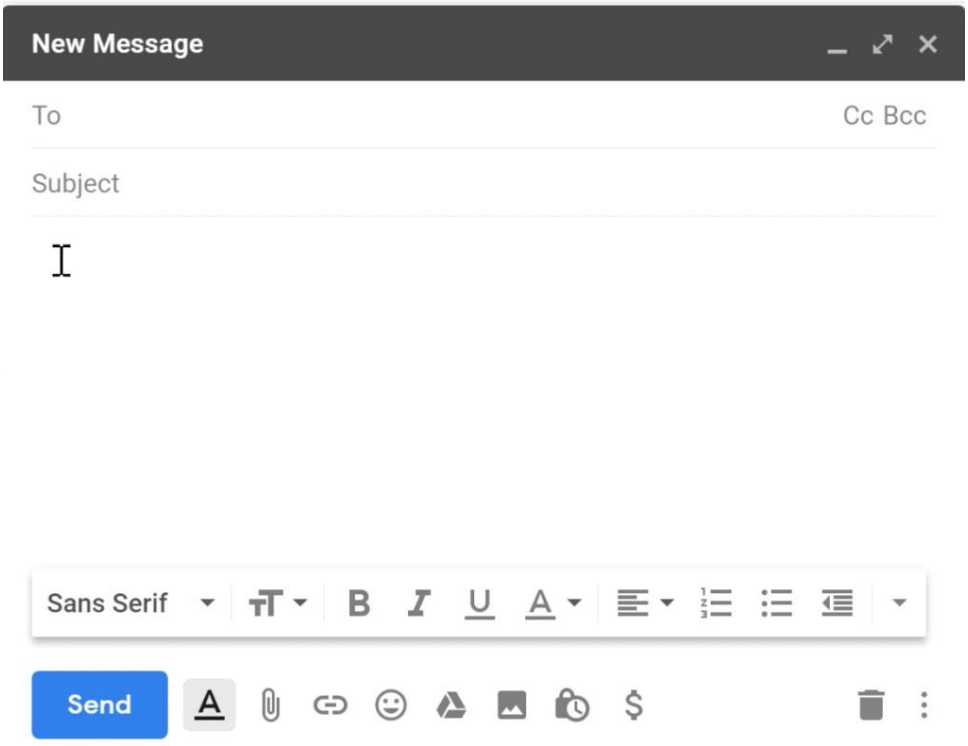
Click the buttons in the interactive below to learn about the different parts of the compose window.

To send an email:

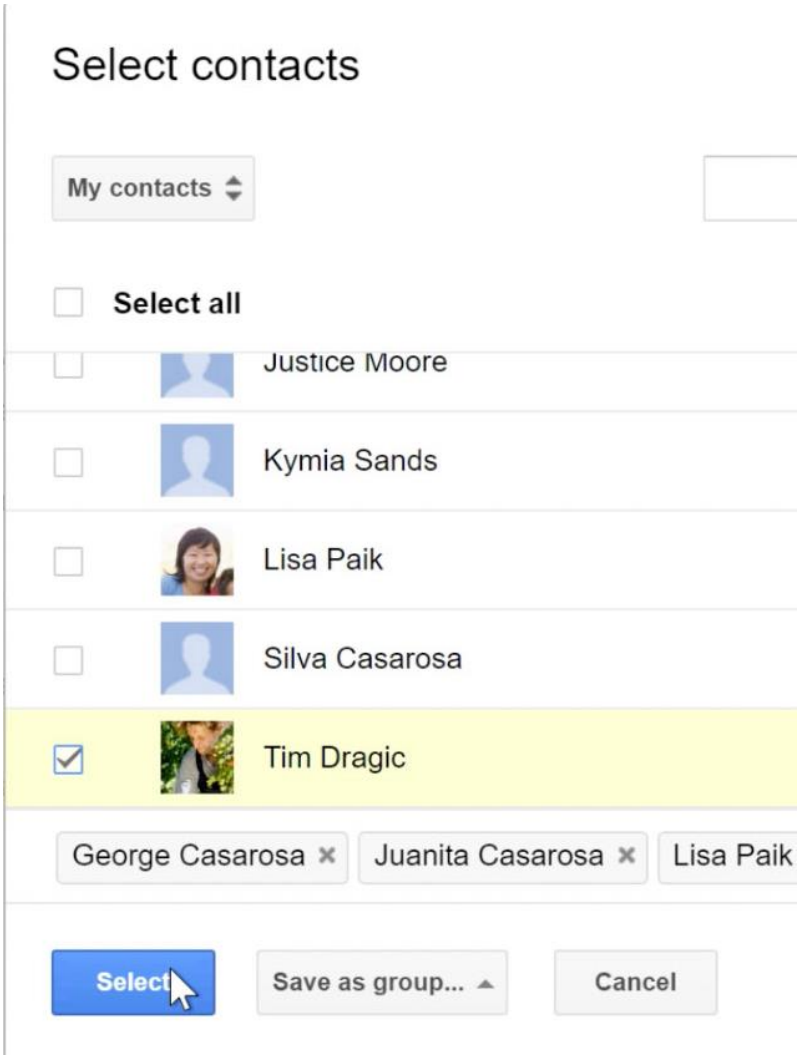
1. In the **left menu pane**, click the **Compose** button.



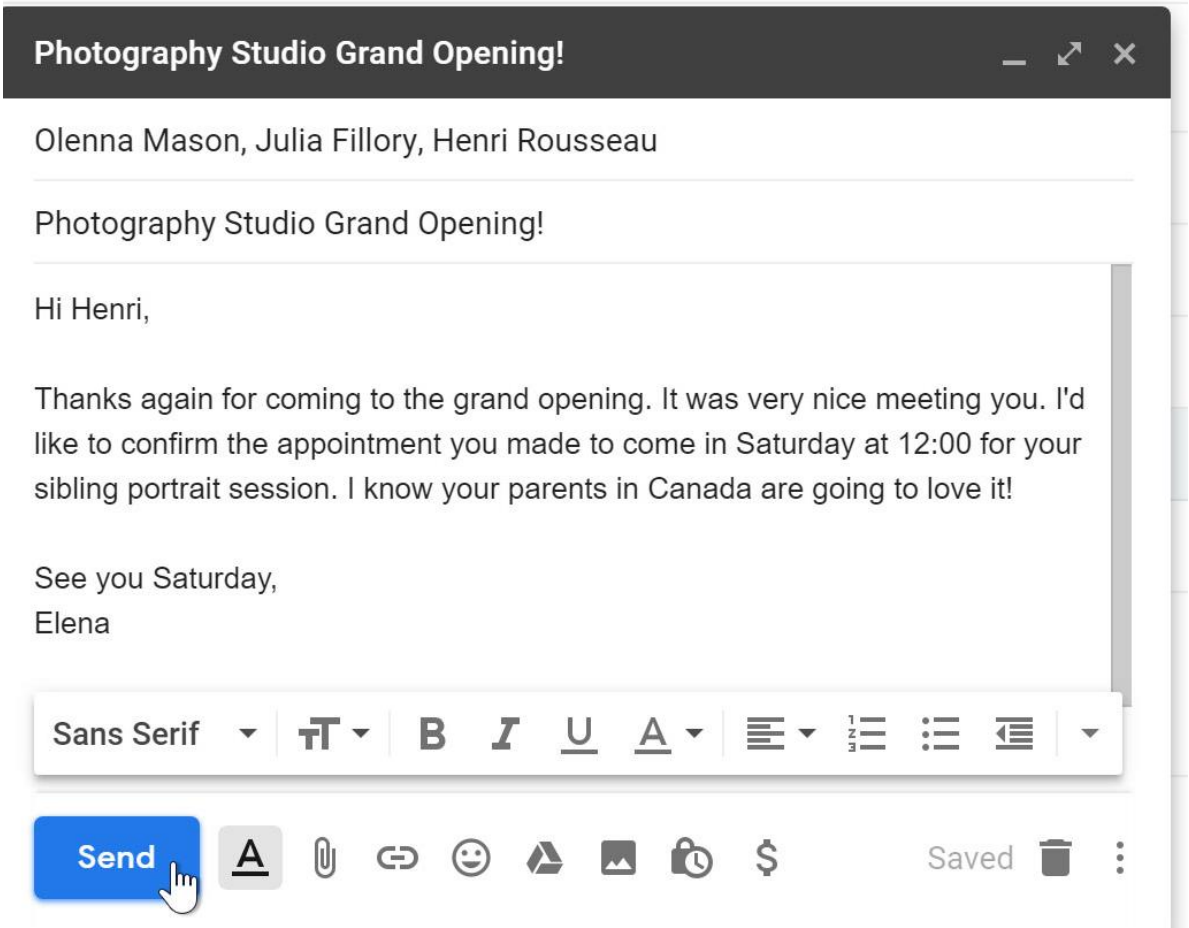
2. The **compose window** will appear in the lower-right corner of the page.



3. You'll need to add one or more **recipients** to the **To: field**. You can do this by typing one or more **email addresses**, separated by commas, or you can click **To** to select recipients from your **contacts**, then click **select**.



4. Type a **subject** for the message.
5. In the **body** field, type your message. When you're done, click **Send**.



If the person you are emailing is already one of your contacts, you can start typing that person's **first name**, **last name**, or **email address**, and Gmail will display the contact below the **To: field**. You can then press the **Enter** key to add the person to the **To: field**.

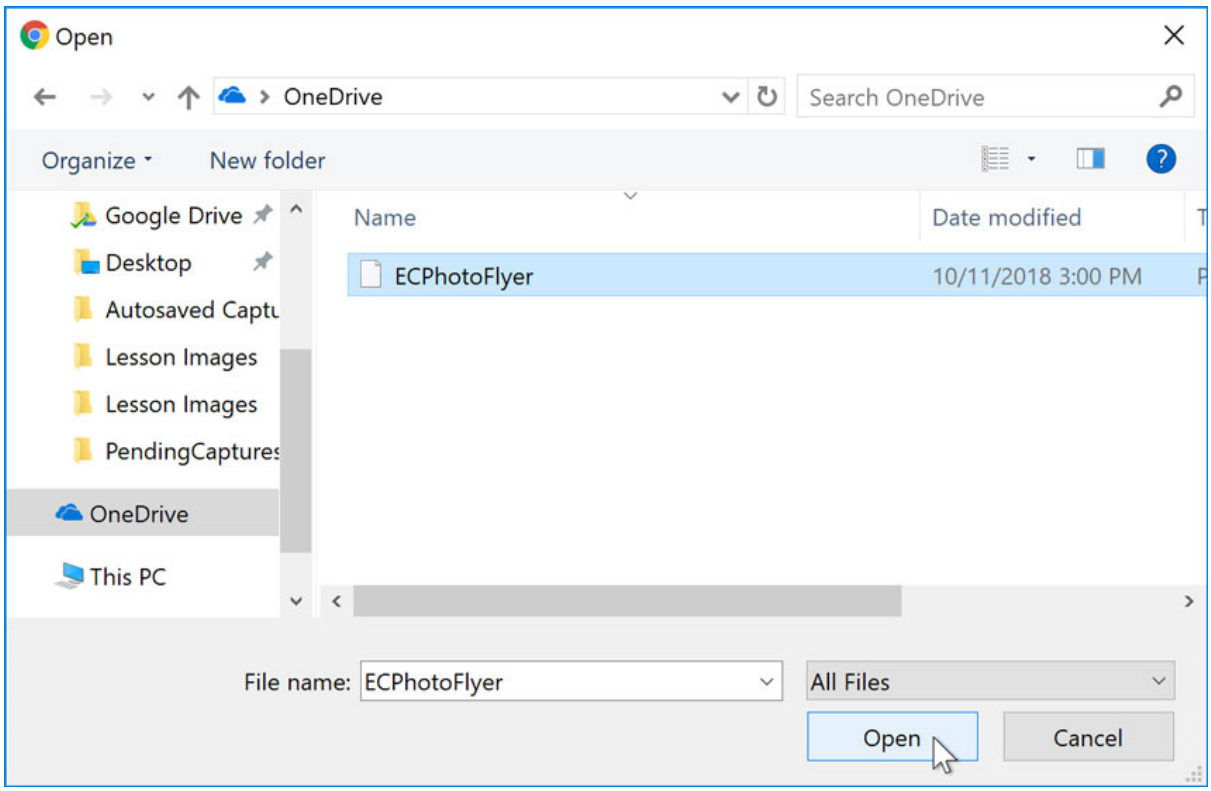
Adding attachments

An **attachment** is simply a **file** (like an image or document) that is sent along with your email. For example, if you are applying for a job, you might send your **resume** as an attachment, with the body of the email being the **cover letter**. It's a good idea to include a **message** in the body of your email explaining what the attachment is, especially if the recipient isn't expecting an attachment.

Remember to attach your file **before** you click **Send**. Forgetting to attach a file is a surprisingly common mistake.

To add an attachment:

1. While composing an email, click the **paper clip icon** at the bottom of the compose window.
2. A **file upload dialog box** will appear. Choose the file you want to attach, then click **Open**.



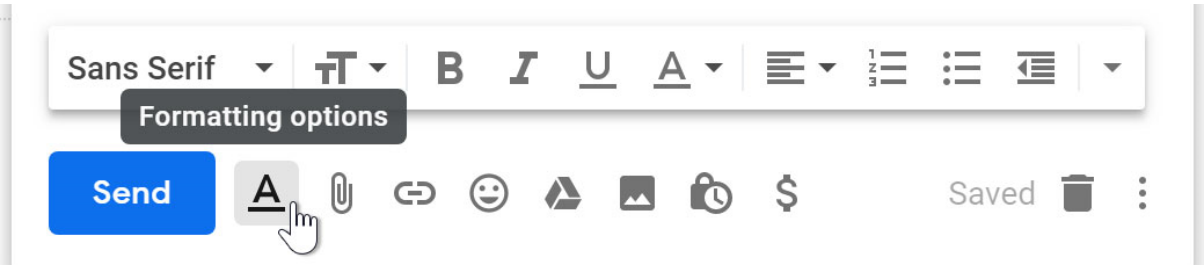
3. The attachment will begin to upload. Most attachments will upload within a few seconds, but larger ones can take longer.
4. When you're ready to send your email, click **Send**.

You can click **Send** before the attachment finishes uploading. It will continue to upload, and Gmail will automatically send the email once it's done.

Email formatting

Gmail allows you to add various types of **formatting** to your text.

Click the **formatting button** at the bottom of the compose window to see different formatting options.



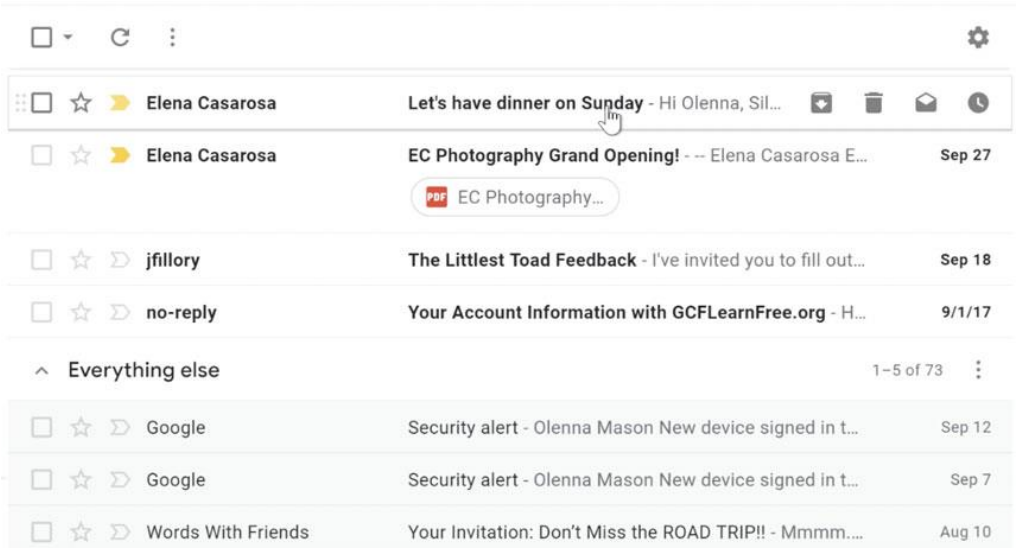
Click the buttons in the interactive below to learn about different formatting options in Gmail.

Reading email

By default, any email we receive will go to our **inbox**. You'll be able to tell which emails are **unread** because they'll be **bold**. You can also see the name of the **sender**, the **subject** of the email, and the first few words of the **email body**. This means even before you select an email, you can tell quite a few things about it.

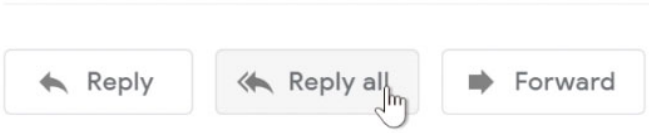
To read an email:

1. From your **inbox**, click the email you want to read.

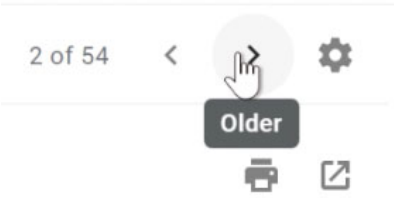


2. The email will open in the same window.

- You can **Reply**, **Reply to all**, or **Forward** the email to someone else.



- You can click **Newer** or **Older** on the right side of the window to view the next email (or previous one).



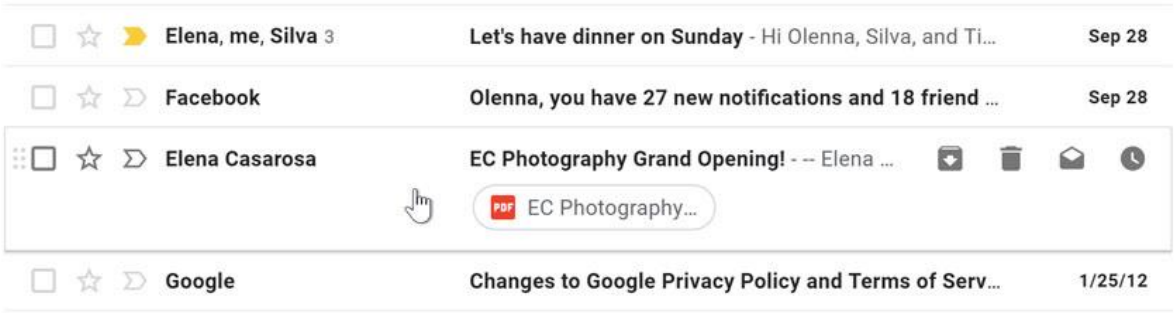
- You can go **Back to Inbox**.

Opening attachments

Sometimes you'll receive emails that contain **attachments**. Generally, you will need to **download** an attachment to view it. However, many common file types, like **Word documents** and **images**, can be viewed within a browser window. If the attachment is an image, you'll also see a smaller copy of the image—called a **thumbnail**—inside the body of the email. You can tell which emails contain attachments because they will have a **paper clip** icon to the right of the **subject**.

To open an attachment:

1. Open the **email message** that contains the attachment.



2. Click the **Download icon** to save the attachment to your computer. If your computer asks whether you want to **Open** or **Save** it, choose **Save**. You can then locate the file on your computer and double-click it to open it.

You should generally only open an attachment if it's from a trusted source. Some attachments can contain **viruses**, especially **.exe** files. If you don't recognize the sender—or if you don't know why someone is sending you the attachment—it's safest not to open it. For more information, read our lesson on avoiding spam and phishing from our Internet Safety tutorial.

Replying to emails

Most of the time, you will be **replying** to an email someone else sends you instead of composing a new message. When you **reply**, the recipient's email address will automatically appear in the **To:** field, so you won't need to worry about choosing the recipient.

Sometimes you'll receive emails where you're not the only recipient, and you'll need to decide whether you want to **reply just to the person who sent the message** or **reply to all** (the sender and all recipients). For example, if you're collaborating with a group of people via email, you'll probably want to use the **Reply to all** option so everyone gets the message. However, if you want to send a more private message to the sender, you'll need to select the **Reply** option so the message stays between the two of you.

To reply to an email message:

1. While viewing the message, click **Reply** at the bottom of the message. If the message was sent to multiple recipients, you will also have the option to **Reply to all**. You can also click the **Reply arrow** to respond to the message.
2. You may want to double-check the **To:** and **Cc:** fields to make sure you're sending your message to the correct people. If you are **replying to all recipients**, the additional recipients will appear in the **Cc:** field.
3. Type your message in the **Body** field, then click **Send**.

To see the text of the original email while you're replying, click the gray button in the lower-left corner of the window, right above the **Send** button.

Forwarding emails

You can also choose to **forward** an email. This basically works the same as **replying**, but it's used to send the email to someone who wasn't one of the original recipients. Just like a reply, the original message will appear as a **quote**. It's usually a good idea to include a brief message of your own to explain why you're forwarding the email.

To forward an email message:

1. While viewing the message, click **Forward** at the bottom of the message. You can also select **Forward** from the More drop-down menu next to the Reply arrow.
2. Type the recipient's email address in the **To: field**, or click **To** to choose a recipient from your contacts. If the person is in your contacts, you can start typing his or her name and that contact's email address should appear.
3. Type your message in the **Body** field, then click **Send**.

Search Engines

A search engine is a software program that helps people find the information they are looking for online using keywords or phrases.

Search engines are able to return results quickly—even with millions of websites online—by scanning the Internet continuously and indexing every page they find.

When a user enters a query into a search engine, a Search Engine Results Page (SERP) is returned, ranking the found pages in order of their relevance. How this ranking is done differs across search engines.

Search engines often change their algorithms (the programs that rank the results) to improve user experience. They aim to understand how users search and give them the best answer to their query. This means giving priority to the highest quality and most relevant pages.

How do search engines work?

There are three key steps to how most search engines work:

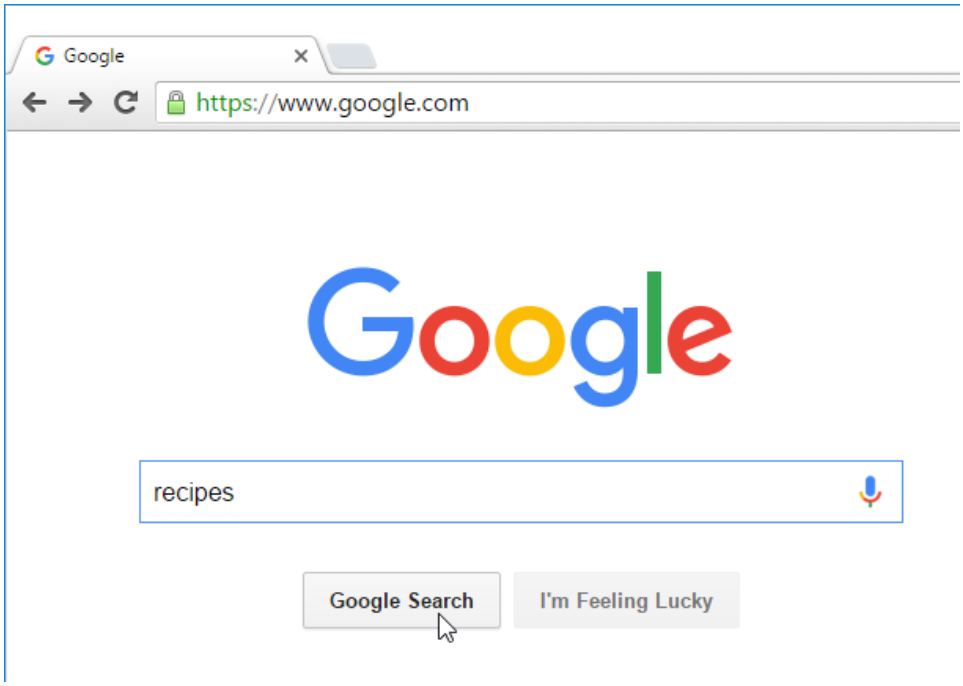
- **Crawling** - search engines use programs, called spiders, bots or crawlers, to scour the internet. They may do this every few days, so it is possible for content to be out-of-date until they crawl your website again.
- **Indexing** - the search engine will try to understand and categorise the content on a web page through 'keywords'. Following SEO best practice will help the search engine understand your content so you can rank for the right search queries.
- **Ranking** - search results are ranked based on a number of factors. These may include keyword density, speed and links. The search engine's aim is to provide the user with the most relevant result.

Although most search engines will provide tips on how to improve your page ranking, the exact algorithms used are well guarded and change frequently to avoid misuse. But by following search engine optimisation (SEO) best practice you can ensure that:

Search engines can easily crawl your website. You can also prompt them to crawl new content. Your content is indexed for the right keywords so it can appear for relevant searches. Your content can rank highly on the SERP.

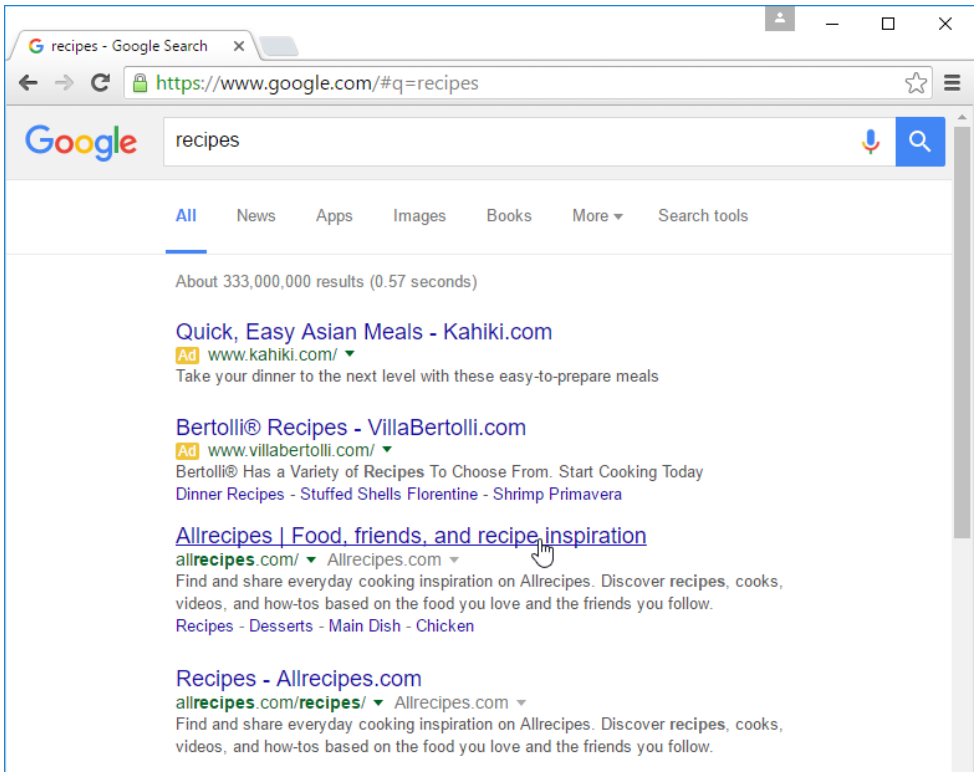
How to search the Web

There are many different search engines we can use, but some of the most popular include **Google**, Yahoo!, and Bing. To perform a search, we need to navigate to a search engine in our web browser, type one or more **keywords**—also known as **search terms**—then press **Enter** on your keyboard. In this example, we'll search for **recipes**.

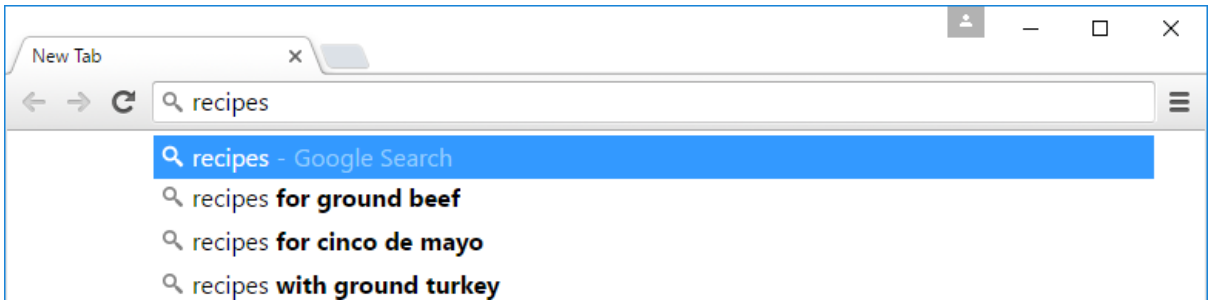


After we run a search, we got a list of **relevant websites** that match our search terms. These are commonly known as **search results**. If we got a result that looks interesting

and match our interest, then we can click a link to open it. If the site doesn't have what we need, then we can simply return to the results page to look for more options.



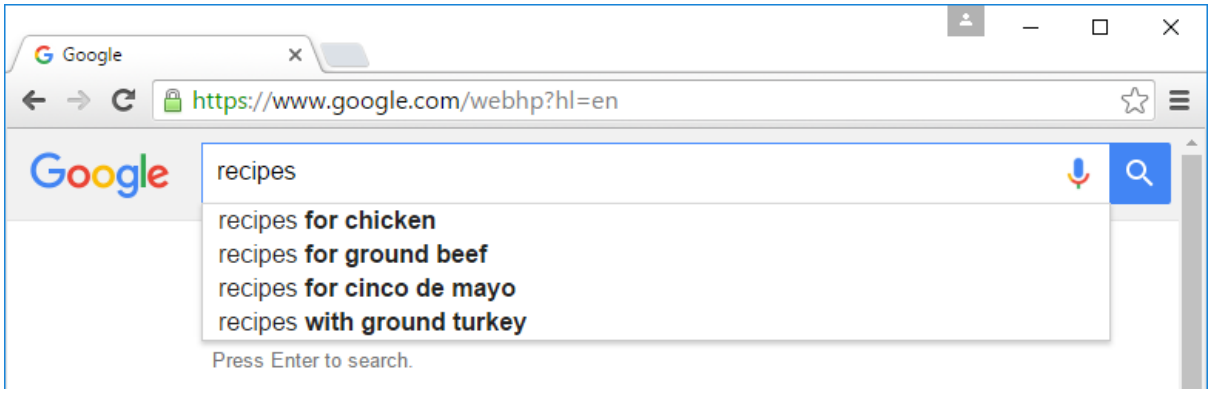
Most browsers also allow us to perform a web search directly from our **address bar**, although some have a separate **search bar** next to the address bar. Simply type our search terms and then press **Enter** to run the search.



Search suggestions

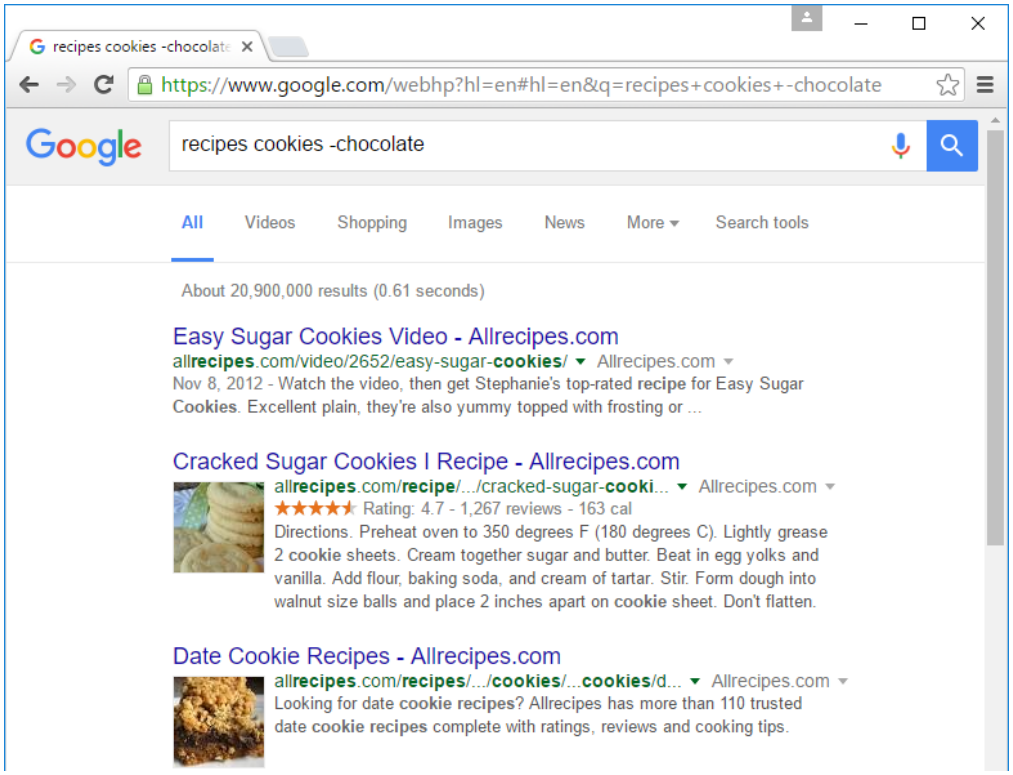
If we don't find what we are looking for on the first try, don't worry! Search engines are good at finding things online, but they're not perfect. We will often need to **try different search terms** to find what we are looking for.

If we are having trouble thinking of new search terms, then we can use **search suggestions** instead. These will usually appear as you're typing, and they're a great way to find new keywords we might not have tried otherwise. To use a search suggestion, we can click it with our mouse, or select it with the arrow keys on our keyboard.

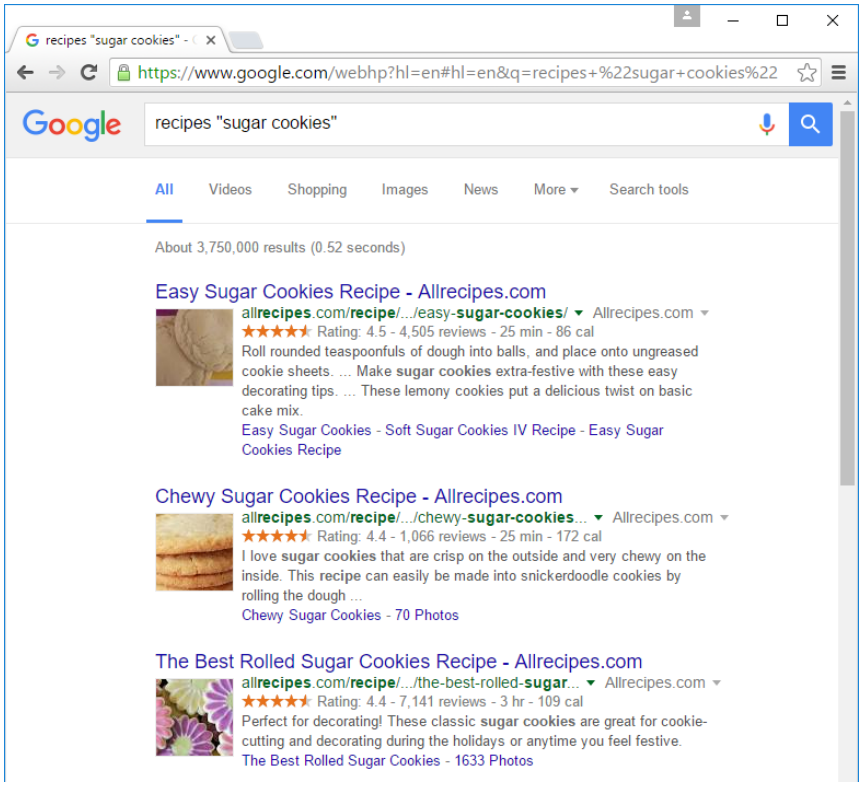


Refining our search

If we are still having trouble finding exactly what we need, then we can use some special characters to help refine our search. For example, if we want to **exclude a word** from a search, we can type a **hyphen** (**-**) at the beginning of a word. Suppose, we wanted to find cookie recipes that don't include chocolate, then we could search for **recipes cookies -chocolate**.



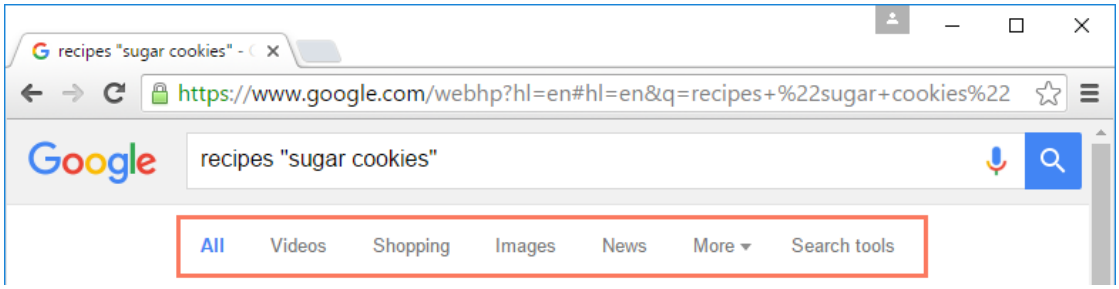
we can also search for **exact words** or **phrases** to narrow down our results even more. All we need to do is place **quotation marks** (" ") around the desired search terms. For example, if we want to search for **recipes "sugar cookies"**, our search results will only include recipes for sugar cookies, instead of any cookies that happen to use sugar as an ingredient.



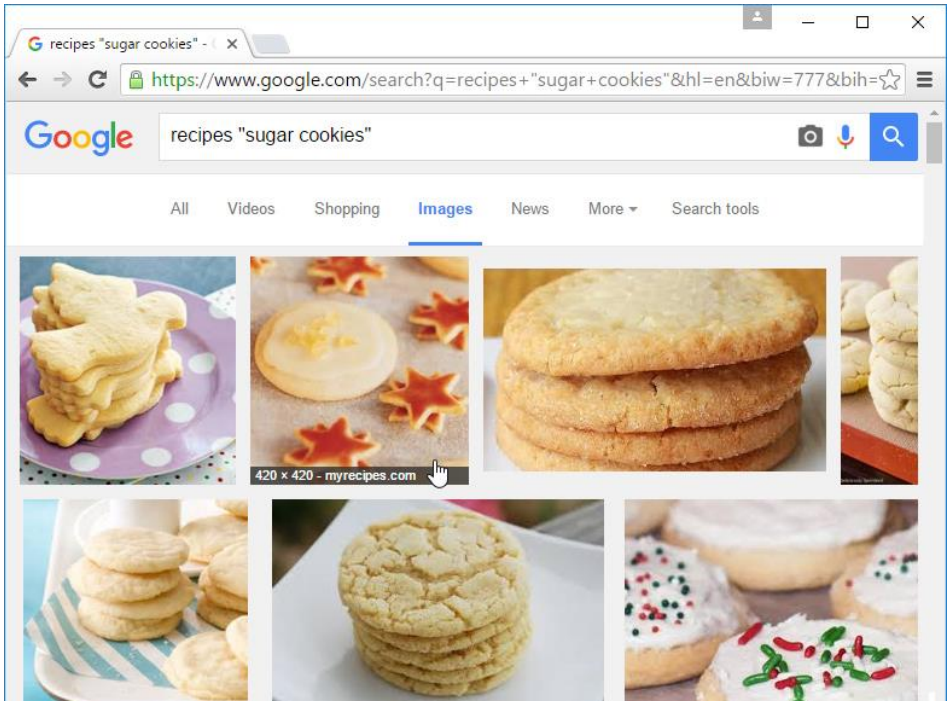
These techniques may come in handy in certain cases, but we probably won't need to use them with most searches. Search engines can usually figure out what we are looking for without these extra characters. We recommend trying a few different **search suggestions** before using this method.

Content-specific searches

There may be times when we are looking for something more specific, like a **news article**, **picture**, or **video**. Most search engines have **links** at the top of the page that allow you to perform these unique searches.



In the example below, we've used the same search terms to look for **images** instead of websites. If we saw an image what we like, then we can click to visit the website it originally came from.



we can use the extra **search tools** to narrow down your results even more. These tools will change based on the type of content what we are looking for, but in this example we can filter our images by **size**, **color**, **image type**, and more. So if we wanted to find cookies with pink frosting, then search for images that are mostly pink.