

# **COMPUTER FUNDAMENTAL & OFFICE AUTOMATION**

**BCA 102**

**SELF LEARNING MATERIAL**



**DIRECTORATE  
OF DISTANCE EDUCATION**

**SWAMI VIVEKANAND SUBHARTI UNIVERSITY**

**MEERUT – 250 005,**

**UTTAR PRADESH (INDIA)**

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Study Material Assessment Committee, as per the SVSU ordinance No. VI (2)

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**Published by:** Gayatri Sales

**Typeset at:** Micron Computers

**Printed at:** Gayatri Sales, Meerut.

## **COMPUTER FUNDAMENTAL & OFFICE AUTOMATION**

### **UNIT-I**

#### **Introduction to Computers**

Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers. Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive) I/O Devices (Scanners, Plotters, LCD, Plasma Display) Number Systems Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication

### **UNIT-II**

#### **Algorithm and Flowcharts**

Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples

Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples.

### **UNIT-III**

#### **Operating System and Services in O.S.**

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### **UNIT-IV**

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# **UNIT-I**

## **Introduction to Computers**

### **Introduction:-**

#### **What is a Computer?**

A Computer is a group of electronic devices used to process data. In the 1950s, computers were massive, special-purpose machines that only huge institutions such as governments and universities could afford. Primarily, these early computers performed complex numerical tasks, such as calculating the precise orbit of Mars or planning the trajectories of missiles or processing statistics for the Bureau of the census. Although computers were certainly useful for tasks like these, it soon became apparent that they could also be helpful in an ordinary business environment.

In the 1960s, modern computers began to revolutionize the business world. IBM introduced its System/360 mainframe computer in April 1964 and ultimately sold over 33,000 of these machines. As a result of the commercial success of its System/360, IBM became the standard against which other computer manufacturers and their systems would be measured for years to come.

In the 1970s, Digital Equipment Corporation (DEC) took two more giant steps toward bringing computers into mainstream use with the introduction of its PDP-11 and VAX computers. These models came in many sizes to meet different needs and budgets. Since then, computers continue to shrink in size while providing more power for less money. Today, the most common type of computer you will see is called a personal or PC, because it is designed to be used by just one person at a time. Despite its small size the modern personal computer is more powerful than any of the room-sized machines of the 1960s.

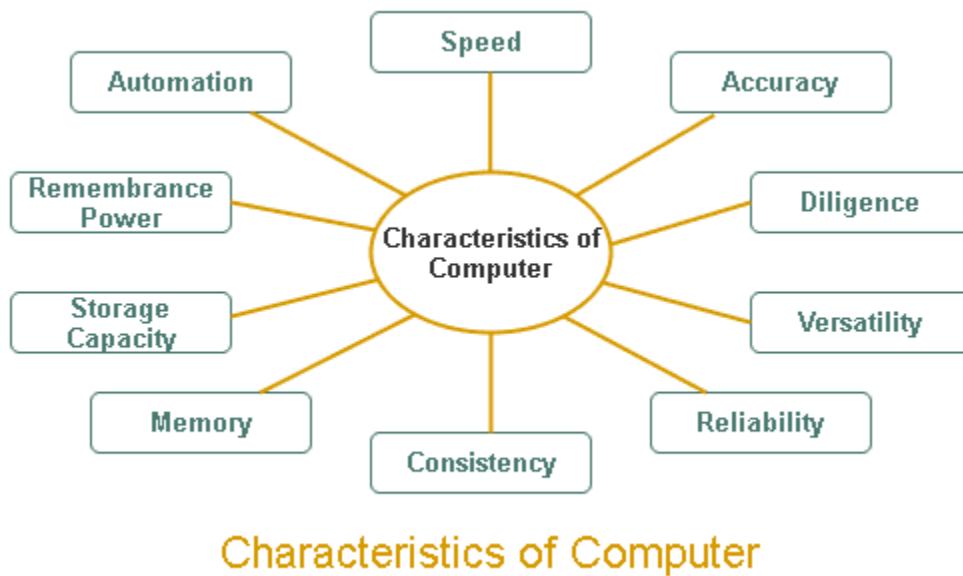
## **Fundamentals of Computers**

A system can be defined as a set of components that work together to accomplish one or more common goals. A Computer is nothing but a system accepting input from a user, process the same, and giving the output in the required format. In other words a computer is a machine , which can be programmed to compute. The characteristics of a computer are:

- Response to a specific set of commands called as Instructions.
- Execution of a prerecorded list of instructions called Program

## **Characteristics of Computers**

There are various features or characteristics of the computer system depending on their size, capacity, and specifications. But, the major characteristics of the computer can be classified into Speed, Accuracy, Diligence, Versatility, Reliability, Consistency, Memory, Storage Capacity, Remembrance Power, and Automation.



### **Limitations of Computer:**

Some limitations of the computer system are given below:

- The computer itself cannot function. It needs a set of instructions to perform or process any task.
- Computers cannot think or feel like humans. They can only work according to the instructions given.
- Unlike humans, computers do not learn from experiences.
- Power is required to operate the computer and unexpected problems or errors can occur in the event of a breakdown of the system.

### **Block diagram of computer**

The Computer system consists of mainly three types that are central processing unit (CPU), Input Devices, and Output Devices. The Central processing unit (CPU) again consists of ALU (Arithmetic Logic Unit) and Control Unit.

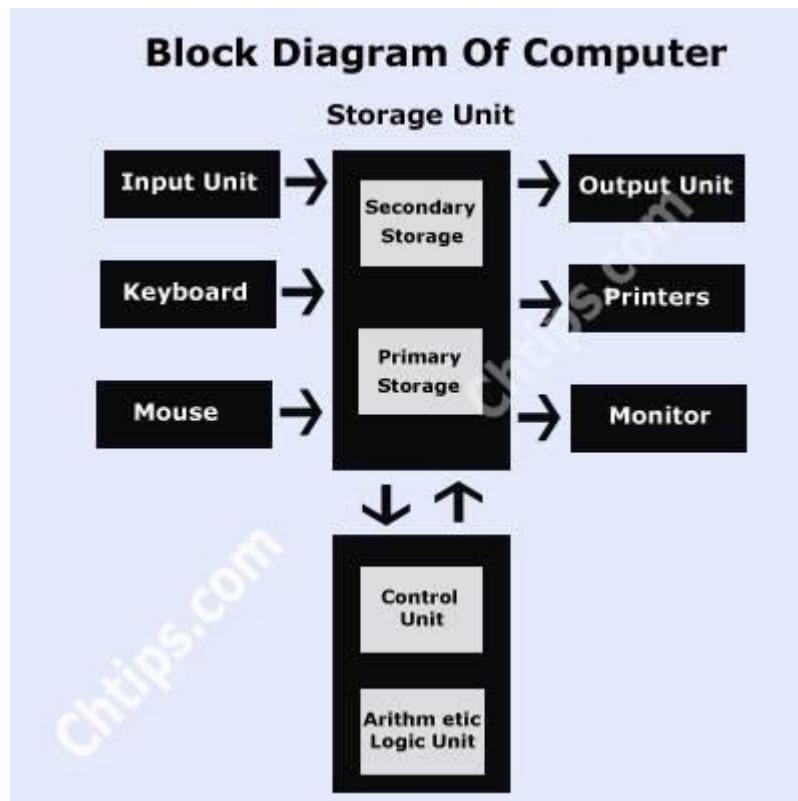
The set of instruction is presented to the computer in the form of raw data which is entered through input devices such as keyboard or mouse.

Later this set of instructions is processed with the help of CPU [Central Processing Unit], and the computer system produces an output with the help of output devices like printers and monitors.

A large amount of data is stored in the computer memory with the help of primary and secondary storage devices temporarily and permanently. This is called as storage devices

The CPU is the heart | Brain of a computer because without the necessary action taken by the CPU the user cannot get the desired output. The Central Processing Unit [CPU] is responsible for processing all the Instruction which is given to the computer system.

Below **Block Diagram of Computer and Its Components** are mentioned for better understanding



The Basic components & parts of computer system are given below ::

Input Devices

Output Devices

CPU (Central Processing Unit)

Storage Unit

ALU(Arithmetic Logic Unit)

Control Unit

### **Types of computers and features**

There are two basic categories of computers: Special purpose and General Purpose. Special purpose computers are designed to perform a specific task such as keeping time in a digital watch or programming a video cassette recorder. In the case of General purpose computers they are adapted to perform any number of functions or tasks. Computers based on their size, cost and performance can be further classified into four types

1. Super Computers
2. Main Frames
3. Mini Computers
4. Micro Computers

### **Super Computers**

Supercomputers are the most powerful computers made. They are built to process huge amounts of data. For example, scientists build models of complex processes and simulate the processes on a supercomputer. One such process is nuclear fission. As a fissionable material approaches a critical mass, the researchers want to know exactly what will happen during every nanosecond of a nuclear chain reaction. A supercomputer can model the actions and reactions of literally millions of atoms as they interact.

Because computer technology changes so quickly the advanced capabilities of a supercomputer today may become the standard features of a PC a few years from now, and next year's supercomputer will be vastly more powerful than today's.

## Main Frames

The largest type of computer in common use is the mainframe. Mainframe computers are used where many people in a large organization need frequent access to the same information, which is usually organized into one or more huge databases. For example, consider the Texas Department of Public Safety, where people get their drivers' licenses. This state agency maintains offices in every major city in Texas, each of which has many employees who work at computer terminals. A terminal is a keyboard and screen wired to the mainframe. It does not have its own CPU or storage; it is just an input/output (I/O) device that functions as a window into a computer located somewhere else. The terminals at the Public Safety offices are all connected to a common database on a mainframe in the state capital. A mainframe computer controls the database that handles the input and output needs of all the terminals connected to it. Each user has continuous access to the driving records and administrative information for every licensed driver and vehicle in the state literally, millions of records. On smaller systems, handling this volume of user access to a central database would be difficult and more time consuming.

No one really knows where the term mainframe originated. Early IBM documents explicitly define the term frame as a integral part of a computer: "the housing,... hardware support structures,... and all the parts and components therein." It may be that when computers of all sizes and shapes began to appear in computer environments, the big computer was referred to as the main frame, as in the main computer, and that eventually the term was shortened to one word, mainframe.

Note :- The main difference between a super computer and a mainframe is that a super computer channels all its power into executing a few programs as fast as possible whereas a mainframe uses its power to execute many programs concurrently.

## **Micro Computers**

Microcomputers are the smallest type of computers available and are popularly known as personal computers. Personal computers are small relatively inexpensive computers that are designed for individual users. In terms of cost, they can range anywhere from a few hundred dollars to over few thousand dollars. Personal computers are designed for word processing, accounting, desktop publishing and database management applications. Personal computers first appeared in the late stage of 1970. One of the first and most popular computers was Apple 2, which was first introduced in 1977 by Apple Computer. During the late 1970s and early 1980s different new models and different operating systems started appearing daily. Then in 1981, International Business Machine (IBM) entered in the fray with the first personal computer called IBM PC. It became an overnight success and was the people's choice for personal computer. One of the few companies, which survive IBM's onslaught, is Apple Computer.

Today the world of personal computers is divided between Macintosh and Personal Computers. The principal characteristics of PC's are that they are single-user systems. But they can be linked together to form a network. In terms of power there is a great variation. At the high-end, the distinction between personal computers and workstations has faded where high-end models of Macintosh and Personal Computer offer the same computing power and graphics capability.

## **Mini Computers**

When Digital Equipment Corporation (DEC) began shipping its PDP series computers in the early 1960s, the press dubbed these machines minicomputers because of their small size compared to other computers of the day. Much to DEC's chagrin, the name stuck. The best way to explain the capabilities of a minicomputer is to say that they lie somewhere between those of mainframes and those of personal computers. Like mainframes, minicomputers can handle a great deal more input and output than personal computers can. Although some minis are designed for a single user, many can handle dozens or even hundreds of terminals.

A company that needs the power of a mainframe but cannot afford such a large machine may find that a minicomputer suits its needs nicely. The major minicomputer manufacturers include DEC, Date General, IBM, and Hewlett-Packard.

### **Types of Programming Languages**

(Machine Languages, Assembly Languages, High Level Languages)

**Computer programming language**, any of various languages for expressing a set of detailed instructions for a digital computer. Such instructions can be executed directly when they are in the computer manufacturer-specific numerical form known as machine language, after a simple substitution process when expressed in a corresponding assembly language, or after translation from some “higher-level” language. Although there are many computer languages, relatively few are widely used.

Machine and assembly languages are “low-level,” requiring a programmer to manage explicitly all of a computer’s idiosyncratic features of data storage and operation. In contrast, high-level languages shield a programmer from worrying about such considerations and provide a notation that is more easily written and read by programmers.

### **Machine and assembly languages**

A machine language consists of the numeric codes for the operations that a particular computer can execute directly. The codes are strings of 0s and 1s, or binary digits (“bits”), which are frequently converted both from and to hexadecimal (base 16) for human viewing and modification. Machine language instructions typically use some bits to represent operations, such as addition, and some to represent operands, or perhaps the location of the next instruction. Machine language is difficult to read and write, since it does not resemble conventional mathematical notation or human language, and its codes vary from computer to computer.

Assembly language is one level above machine language. It uses short mnemonic codes for instructions and allows the programmer to introduce names for blocks of memory that hold data. One might thus write “add pay, total” instead of “0110101100101000” for an instruction that adds two numbers.

Assembly language is designed to be easily translated into machine language. Although blocks of data may be referred to by name instead of by their machine addresses, assembly language does not provide more sophisticated means of organizing complex information. Like machine language, assembly language requires detailed knowledge of internal computer architecture. It is useful when such details are important, as in

programming a computer to interact with peripheral devices (printers, scanners, storage devices, and so forth).

## **Algorithmic languages**

Algorithmic languages are designed to express mathematical or symbolic computations. They can express algebraic operations in notation similar to mathematics and allow the use of subprograms that package commonly used operations for reuse. They were the first high-level languages.

### **FORTRAN**

The first important algorithmic language was FORTRAN (*formula translation*), designed in 1957 by an IBM team led by John Backus. It was intended for scientific computations with real numbers and collections of them organized as one- or multidimensional arrays. Its control structures included conditional IF statements, repetitive loops (so-called DO loops), and a GOTO statement that allowed nonsequential execution of program code. FORTRAN made it convenient to have subprograms for common mathematical operations, and built libraries of them.

FORTRAN was also designed to translate into efficient machine language. It was immediately successful and continues to evolve.

### **ALGOL**

ALGOL (*algorithmic language*) was designed by a committee of American and European computer scientists during 1958–60 for publishing algorithms, as well as for doing computations. Like LISP (described in the next section), ALGOL had recursive subprograms—procedures that could invoke themselves to solve a problem by reducing it to a smaller problem of the same kind. ALGOL introduced block structure, in which a program is composed of blocks that might contain both data and instructions and have the same structure as an entire program. Block structure became a powerful tool for building large programs out of small components.

ALGOL contributed a notation for describing the structure of a programming language, Backus–Naur Form, which in some variation became the standard tool for stating the syntax (grammar) of programming languages. ALGOL was widely used in Europe, and for many years it remained the language in which computer algorithms were published. Many important languages, such as Pascal and Ada (both described later), are its descendants.

### **LISP**

LISP (*list processing*) was developed about 1960 by John McCarthy at the Massachusetts Institute of Technology (MIT) and was founded on the mathematical theory of recursive functions (in which a function appears in its own definition). A LISP program is a function applied to data, rather than being a sequence of procedural steps as in FORTRAN and ALGOL. LISP uses a very simple notation in which operations and their operands are given in a parenthesized list. For example,  $(+ a (* b c))$  stands for  $a + b * c$ . Although this appears awkward, the notation works well for computers. LISP also uses the list structure to represent data, and, because programs and data use the same structure, it is easy for a LISP program to operate on other programs as data.

LISP became a common language for artificial intelligence (AI) programming, partly owing to the confluence of LISP and AI work at MIT and partly because AI programs capable of “learning” could be written in LISP as self-modifying programs. LISP has evolved through numerous dialects, such as Scheme and Common LISP.

## C

The C programming language was developed in 1972 by Dennis Ritchie and Brian Kernighan at the AT&T Corporation for programming computer operating systems. Its capacity to structure data and programs through the composition of smaller units is comparable to that of ALGOL. It uses a compact notation and provides the programmer with the ability to operate with the addresses of data as well as with their values. This ability is important in systems programming, and C shares with assembly language the power to exploit all the features of a computer’s internal architecture. C, along with its descendant C++, remains one of the most common languages.

## **Business-oriented languages**

### **COBOL**

COBOL (common business oriented language) has been heavily used by businesses since its inception in 1959. A committee of computer manufacturers and users and U.S. government organizations established CODASYL (Committee on Data Systems and Languages) to develop and oversee the language standard in order to ensure its portability across diverse systems.

COBOL uses an English-like notation—novel when introduced. Business computations organize and manipulate large quantities of data, and COBOL introduced the record data structure for such tasks. A record clusters heterogeneous data—such as a name, an ID number, an age, and an address—into a single unit. This contrasts with scientific languages, in which homogeneous arrays of numbers are common. Records are an important example of “chunking” data into a single object, and they appear in nearly all modern languages.

## **SQL**

SQL (structured query language) is a language for specifying the organization of databases (collections of records). Databases organized with SQL are called relational, because SQL provides the ability to query a database for information that falls in a given relation. For example, a query might be “find all records with both last name Smith and city New York.” Commercial database programs commonly use an SQL-like language for their queries.

## **Education-oriented languages**

### **BASIC**

BASIC (beginner's all-purpose symbolic instruction code) was designed at Dartmouth College in the mid-1960s by John Kemeny and Thomas Kurtz. It was intended to be easy to learn by novices, particularly non-computer science majors, and to run well on a time-sharing computer with many users. It had simple data structures and notation and it was interpreted: a BASIC program was translated line-by-line and executed as it was translated, which made it easy to locate programming errors.

Its small size and simplicity also made BASIC a popular language for early personal computers. Its recent forms have adopted many of the data and control structures of other contemporary languages, which makes it more powerful but less convenient for beginners.

### **Pascal**

About 1970 Niklaus Wirth of Switzerland designed Pascal to teach structured programming, which emphasized the orderly use of conditional and loop control structures without GOTO statements. Although Pascal resembled ALGOL in notation, it provided the ability to define data types with which to organize complex information, a feature beyond the capabilities of ALGOL as well as FORTRAN and COBOL. User-defined data types allowed the programmer to introduce names for complex data, which the language translator could then check for correct usage before running a program.

During the late 1970s and '80s, Pascal was one of the most widely used languages for programming instruction. It was available on nearly all computers, and, because of its familiarity, clarity, and security, it was used for production software as well as for education.

## **Logo**

Logo originated in the late 1960s as a simplified LISP dialect for education; Seymour Papert and others used it at MIT to teach mathematical thinking to schoolchildren. It had a more conventional syntax than LISP and featured “turtle graphics,” a simple method for generating computer graphics. (The name came from an early project to program a turtlelike robot.) Turtle graphics used body-centred instructions, in which an object was moved around a screen by commands, such as “left 90” and “forward,” that specified actions relative to the current position and orientation of the object rather than in terms of a fixed framework. Together with recursive routines, this technique made it easy to program intricate and attractive patterns.

## Hypertalk

Hypertalk was designed as “programming for the rest of us” by Bill Atkinson for Apple’s Macintosh. Using a simple English-like syntax, Hypertalk enabled anyone to combine text, graphics, and audio quickly into “linked stacks” that could be navigated by clicking with a mouse on standard buttons supplied by the program. Hypertalk was particularly popular among educators in the 1980s and early ’90s for classroom multimedia presentations. Although Hypertalk had many features of object-oriented languages (described in the next section), Apple did not develop it for other computer platforms and let it languish; as Apple’s market share declined in the 1990s, a new cross-platform way of displaying multimedia left Hypertalk all but obsolete (see the section World Wide Web display languages).

## Object-oriented languages

Object-oriented languages help to manage complexity in large programs. Objects package data and the operations on them so that only the operations are publicly accessible and internal details of the data structures are hidden. This information hiding made large-scale programming easier by allowing a programmer to think about each part of the program in isolation. In addition, objects may be derived from more general ones, “inheriting” their capabilities. Such an object hierarchy made it possible to define specialized objects without repeating all that is in the more general ones.

Object-oriented programming began with the Simula language (1967), which added information hiding to ALGOL. Another influential object-oriented language was Smalltalk (1980), in which a program was a set of objects that interacted by sending messages to one another.

## C++

The C++ language, developed by Bjarne Stroustrup at AT&T in the mid-1980s, extended C by adding objects to it while preserving the efficiency of C programs. It has been one of the most important languages for both education and industrial

programming. Large parts of many operating systems were written in C++. C++, along with Java, has become popular for developing commercial software packages that incorporate multiple interrelated applications. C++ is considered one of the fastest languages and is very close to low-level languages, thus allowing complete control over memory allocation and management. This very feature and its many other capabilities also make it one of the most difficult languages to learn and handle on a large scale.

## C#

C# (pronounced C sharp like the musical note) was developed by Anders Hejlsberg at Microsoft in 2000. C# has a syntax similar to that of C and C++ and is often used for developing games and applications for the Microsoft Windows operating system.

## Ada

Ada was named for Augusta Ada King, countess of Lovelace, who was an assistant to the 19th-century English inventor Charles Babbage, and is sometimes called the first computer programmer. Ada, the language, was developed in the early 1980s for the U.S. Department of Defense for large-scale programming. It combined Pascal-like notation with the ability to package operations and data into independent modules. Its first form, Ada 83, was not fully object-oriented, but the subsequent Ada 95 provided objects and the ability to construct hierarchies of them. While no longer mandated for use in work for the Department of Defense, Ada remains an effective language for engineering large programs.

## Data Organization

Choosing one well-conceived system of data organization can help keeping on track with your data if there are multiple versions of data sets or changes in data sets. This holds especially in larger teams. To begin with your data organization, you have to define the structure of your research data. Most important structure types are shown below:

- **Flat rectangular files** or tabular data is a classical and still often used data structure which can be read by all statistical and spreadsheet programs.
  - A common way to structure rectangular files is the wide format (table **A** in the image above): columns represent different variables, while lines represent different observations (e.g. subjects). However, problems in wide format arise when data is hierarchically structured, e.g. in designs with repeated measures (see table **B** in the image above). If the number of measurement occasions differs between observations, many cells will be left empty by design.
  - One solution can be to use the long format for the data set (see table **C** in the image above). In long format every line depicts one observational unit (e.g. one

measurement occasion for a specific person) and a variable characterizes the measurement occasion (e.g. day 1, pre-test etc.). This format permits the representation of hierarchical data in a classical rectangular file. Files in long format will contain some redundancies, because features of the higher order observation units are repeated in every line (e.g. time-invariant variables like subject's gender or year of birth). As functions within statistical packages usually work with one of these formats only, transformations between wide-format and long-format are a frequent task and corresponding functions exist (e.g. the reshape function and the reshape2 package in R).

- **Hierarchical files** can be employed to avoid redundancies, that occur, when using rectangular files (see table E in the image above). XML files fulfill this requirement and allow to save data and metadata in one single file. However, despite these advantages XML-files are not commonly used in psychology and statistical software often requires tabular data as input.
- **Relational data bases** organize data of different hierarchical levels in separate rectangular tables while the different tables are connected through defined associations. Individual tables can be statistically analyzed or linked to form new tables. Relational databases can depict complex associations in an elegant way but they need more administration and knowledge of database languages (e.g SQL).

## Organization of Research Data

As there are neither best practices nor naming conventions that explicitly refer to psychological research data, we recommend the guidance developed in the Project TIER: Teaching Integrity in Empirical Research as a starting point for folder and file organization in empirical research projects.

Furthermore, the general guidance on designing naming conventions of Boston University Libraries (n.d.) may be helpful:

- The file naming you choose should be used consistently throughout your files (always include the same information, in the same order)

Consider how, from a future point of view, your files should be organized, e.g. project\_instrument\_location\_date\_time\_version.

- You should always include dates in your file names so that changes can be retraced; use format YYYY-MM-DD.
- Avoid the following symbols in your file names: “/ \ : \* ? ” < > [ ] & \$. They have specific meanings in some computer operating systems and thus, may result in misreadings or even deletion of the file.
- Don't use spaces to separate terms, instead use underscores (\_).
- Try to name folders in a descriptive way, so that it is clear what it contains, and keep the names short (15-20 characters max.)
- Also try to keep file names short and descriptive (<25 characters)
- If you do not use an automatic versioning software, include version numbers at the end of the file name (e.g. v01, v02,..) and change it every time the file is saved (also, refer to the knowledge base's section on versioning). This is especially important if there are several people working together on the files, so that changes can be tracked.

- For your final version, use the word FINAL instead of a version number. This is especially useful and important if you share your files!
- File names should only contain one period before the file extension, e.g. project\_name\_date.doc NOT project.name.date.doc OR project\_name\_date..doc)
- If you already named many of your files, you can rename them quickly by using a file renaming application such as Bulk Rename Utility (Windows), ReNamer (Mac OS X) or PSRenamer (Mac OS X, Windows, Unix, Linux), and Zamzar (convert files online).

The DataWiz web application assists you in organizing your research data by offering a predefined structure and documentation scheme for your research project.

## Further Resources

- SQL is a programming language that is specialized on managing data in relational database management systems.
- XML is an interoperable human- and machine-readable markup language and is widely used in research data management due to its simplicity and generic usability.

## Drives

Computer folks often throw around words, terms and acronyms assuming everyone else knows what they mean. I recently learned that's a bad assumption, though, as a customer discussing backing up files to an external hard drive remarked, "You know, I don't think I really know what a hard drive is. What is a computer 'drive,' anyway?"

Wow, good question. In a nutshell, a computer "drive," also called a "disk drive," is a device that stores digital information from your computer, sort of like keeping beans in a jar. Beans can be added to or removed from the jar as desired, just as the zeroes and ones (0 and 1) that comprise digital information can be added to or removed from a computer disk drive as the computer user so chooses.

All computer information is made up of various combinations of two numbers: zeroes and ones. Those numbers are the "digital" components of the language that computers speak. When discussing computer "files," and the need for you to "back up" your files, we are talking about large groups of zeros and ones that have been created when you type a manuscript, take a photograph with a digital camera or send a text message from your phone. That picture of the kids at Thanksgiving dinner is, in its basic form, nothing

more than a big batch of numbers called a “file.” Computers have the ability to take that group of numbers and turn it into an image on a screen.

Computer drives are designed to allow us to store our files and retrieve them when needed. They were originally called “disk” drives because the files were recorded on round things called “disks.” “Floppy” disks kept the information on a very thin, round piece of spinning material about the thickness of a piece of paper, and were about 3-1/2, 5-1/4 or 8 inches in diameter. Housed inside a plastic or paper sheath, they were used in floppy disk drives. Very few people continue to use floppy disk drives.

“Hard” disks use round platters made of very stiff material, usually aluminum, glass and/or ceramic. As with floppy disks, hard disks are coated with a layer of magnetic material that allows information to be stored, similar to the magnetic tape used in tape recorders. Hard disks, and the electronic circuits that make them work, are mounted inside rigid housings, and the entire assembly is called a hard disk drive, or, simply, “hard drive.” Hard drives can be mounted inside computers, or inside enclosures that allow them to be easily moved from one location to another. Drives like this are called “external” or “portable” hard drives.

Music CDs (Compact Disks) and DVDs (Digital Video Disks) are called “optical” disks because, rather than using magnetic technology to store information, they use optical technology in the form of lasers. A powerful but very small laser beam scans the spinning disk to read and/or record the zeros and ones that comprise the stored information. If someone mentions an “optical” drive, they are talking about a drive that uses CDs, DVDs or Blu-ray disks. Sometimes these drives, if they are capable of recording CDs or DVDs, are called “burners” because, when recording a CD or DVD, the laser beam actually “burns” spots on a layer of dye embedded in the disk, which the drive and computer can detect and interpret as zeroes and ones.

“Flash” drives, sometimes called jump drives, thumb drives and USB drives, are also used to store digital files, but use “solid-state” memory technology, rather than moving parts like motors and spinning disks. “Solid-state drives” (SSDs) use the same method,

storing their information on digital integrated circuits (sometimes called “chips”) containing millions or billions of microscopic transistors, which act as switches. These switches, whether in an “on” or “off” state, are what store and process the zeroes and ones used by all computers.

Why are disk drives called “drives?” As near as I can tell, in electrical engineering, a drive is an electronic device used to provide power to a motor. That’s the best reason I’ve been able to come up with, so I hope it will do.

Dave Moore has been performing computer consulting, repairs, security and networking in Oklahoma since 1984. He also teaches computer safety workshops for public and private organizations.

## Files

A file is a container in a computer system for storing information. Files used in computers are similar in features to that of paper documents used in library and office files. There are different types of files such as text files, data files, directory files, binary and graphic files, and these different types of files store different types of information. In a computer operating system, files can be stored on optical drives, hard drives or other types of storage devices.

In most operating systems, a file must have a unique name within a given file directory. However, while creating a filename, certain characters are considered illegal, and hence cannot be used. A filename is comprised of a name with a suffix, which is also known as a file extension. The file extension is two to four characters following the period in the complete filename. The file extension helps in identifying the type of file, file format and the attributes associated with the file.

Most modern computer systems provide security or protection measures against file corruption or damage. The data contained in the files could range from system-generated information to user-specified information. File management is done with the help of operating systems, third-party tools or done manually at times with the help of the user.

The basic operations that can be performed on a file are:

- Creation of a new file
- Modification of data or file attributes

- Reading of data from the file
- Opening the file in order to make the contents available to other programs
- Writing data to the file
- Closing or terminating a file operation

In order to read or modify data in a file, specific software associated with the file extension is needed.

## **Directories**

One of the most common pitfalls in building/publishing webpages is a lack of understanding of directory structure. Without this basic foundation, many people are lost when it comes to correcting link problems in their website. When you're creating a website, it's important that you understand WHERE your files are located WITHOUT the common shortcuts. When the website is published for everyone to view, those shortcuts won't be there and they don't work within a web page link to begin with. In order for the links to work properly, the server needs to know where they are truly located. If it can't find them, it will return a broken link. This is a common reason for broken image links. A basic understanding of the information here may help.

## **Files**

Hopefully, you know that most of what you create on your computer is stored as "files." Files can take on many formats and attributes but in our case, we'll be looking at webpages and related files. Almost all files have what is known as a "file extension." A file extension is the last part of a file name and follows a ". " The purpose of the file extension is to define the type of file.

Mostly with web publishing, you'll be dealing with webpage (html) files and images. The most common file extensions in web publishing are listed below. Note, I've only included those extensions supported by UWG servers.

- Web pages
- .html Basic HTML
- .htm Basic HTML
- .php Hypertext Pre-processor

- Images
- .jpg JPEG Image - Best for photography used on the web
- .gif Graphic Interchange Format - Best for images with text and simple color like cartoons. Also supports transparency and animation.

## Directory Basics

It may be easier to explain directory structure with an analogy. So think of your computer as a large file room, filled with file cabinets. Each file cabinet contains folders and files. This is the basic premise of directories. Directories are very similar to file cabinets. They can hold subdirectories and files.

Location, location, location

Just like you have a physical address for your residence, each directory and file has a "path" which indicates its location within your hard drive. Whenever you link to a file, you'll need to let the browser know where the file is located. This can be accomplished by an "absolute" or "relative" link.

## Absolute and Relative Links

Absolute Links are like full addresses. These links are best used for external links such as other websites. For example, "<http://www.westga.edu/departments/index.php>" is a full web page address. With an absolute link, it doesn't matter where the file that contains the link is located because the browser is provided with the full address.

Relative Links are paths which are "relative" to the file linking to it. In other words, if your index.html page links to another page in the same directory you only have to type "nameOfOtherPage.html" for the href="" attribute. The browser will begin with the path of the index.html page to determine the path of the image. Most web editing software will use relative links when you insert a hyperlink in your document. Because you do not

have to repeat the domain name in each link, they are easier and quicker to type. If your links aren't working, here are some clues to help you with relative links.

## **Types of Memory**

(Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices

(FD, CD, HD, Pen drive):-

Memory is the computer's electronic scratchpad. Programs are loaded into and run from memory. Data used by the program is also loaded into memory for fast access. The most common type of memory is called random access memory or RAM. As a result the term memory is commonly used to mean RAM.

Perhaps the most important thing to remember about RAM is that it is volatile, so it needs a constant supply of power. When you turn off a computer, everything in RAM disappears. As you will soon learn this is why you frequently have to save everything you are working on to a storage device.

One of the most important factors affecting the speed and power of a computer is the amount of RAM it has. Generally, the more it can do. The most RAM a computer has, the more it can do. The most common measurement unit for describing a computer's memory is the byte the amount of memory it takes to store a single character. When people talk about memory, the numbers are often so large that it is useful to use a shorthand term to describe the values

- Kilobyte (KB) 1024 bytes
- Megabyte (MB)  1024 kilobytes
- Gigabyte (GB) 1024 megabytes

Today's Personal computers commonly have from 8 to 32 million bytes of memory or 8 to 32 MB.

Data processing systems often require access to a large amount of memory for which main memory is not enough. Memory can be classified into 2 types namely

- Primary
- Secondary

Programs and data are stored in the memory unit of the CPU during processing. Memory consists of a number of storage locations. A unique number called address identifies each storage location. During processing, data may be stored in any location. Primary storage or main memory is of two types.

- Random Access Memory (RAM)

- Read Only Memory (ROM)

There are certain essential functions that the computer must perform when it is switched on. For example, connections have to be established within the various components of the computer and its peripherals. A series of programs or micro programs are required to perform these low-level functions. These programs are hardwired onto the Read Only Memory (ROM) chips at the time of manufacture.

ROM is non-volatile that is when the computer is switched off, the data on these chips is not lost. When the machine is switched on, the memory, which is available to you, is called as Random Access Memory. The data can be read from and written to any location within RAM by specifying the relevant address. New data can be written onto any location, however, remember that any existing data at this location is overwritten.

Unlike ROM, RAM is volatile. When the power goes off, the data is lost. It is necessary to store the data that is important onto a secondary storage device.

## **Units of Storage**

It is possible for a computer to function with just processing, memory input and output devices. To be really useful however it also needs a place to keep program, files and related data when it is not using them. The purpose of storage is to hold data.

It is helpful to think of storage as an electronic file cabinet and to think of RAM as an electronic worktable. When you need to work with a program or a set of data, the computer locates them in the file cabinet and puts a copy on the table. After you have finished working with the program or data, you put the new version into the file cabinet. There are three major distinctions between storage and memory:

1. There is more room in storage than in memory, just as there is, more room in a file cabinet than there is on a tabletop.
2. Storage retains its contents when the computer is turned off, whereas the programs or the data you put into memory disappear when you shut down the computer.
3. Storage is much cheaper than memory.

The most common storage medium is the magnetic disk. A disk is a round, flat object that spins around its center. Read/write heads which are similar to the heads of a tape recorder or VCR float above and below the disk near its surface.

The device that holds a disk is called a disk drive. Some disks are built into the drive and are not meant to be removed and other kinds of drives allow you to remove and replace disks. Most personal computers have a non removable hard disk. In addition, there are usually one or two diskette drives which allow you to use removable diskettes.

Typically a hard disk can store far more data than a diskette can , so the hard disk serves as the computer's primary filing cabinet. Diskettes are used to load new programs or data onto the hard disk to trade data with other users, and to make backup copies of the data on the hard disk. Because you can remove diskettes from a computer they are encased in a plastic or vinyl cover to protect them from fingerprints and dust.

The first diskettes, commonly used in the late 1970s were 8-inch diskettes. Because the vinyl cover was very thin, the diskette was flimsy or floppy. Hence came the name of floppy disk. Next came the 5.25 inch diskettes that were common in the early PCs. Finally the 3.5 inch diskette with its hard plastic shell appeared.

Other types of storage devices include CD –ROM drives, tape drives, optical drives removable hard drives and many others. The CD-ROM drive is the most common type after the hard and diskette drives, Compact disks or CDs are type of optical storage device identical to audio CDs, that can store about 650MB or about 450 times as much information as a diskette. The type used in computers is called a CD-ROM, which stands for compact disk read only memory. The name implies that you cannot record over an audio CD.

Having looked at various ways of storing data and also devices that store it, let us look at the way the computer stores this data. The computer being an electronic device runs on electricity. It recognizes the flow of electricity in states of "on" or "off". It in turn corresponds to the binary number system that has a base of two. Thus instead of 0-9, only the digits 0 and 1 are used.

Each alphanumeric character is now represented in a storage location as a combination of binary digits (0s and 1s) or bits to form a byte. A byte typically stores 8 bits. The higher units are called megabytes, gigabytes, terabytes, and petabytes.

8 bits	= 1 Byte
1024 bytes	= 1 Kilo Byte(KB)
1024 KB	= 1 Mega Byte(MB)
1024 MB	= 1 Giga Byte(GB)
1024 GB	= 1 Tera Byte (TB)

## **I/O Devices (Scanners, Plotters, LCD, Plasma Display:-**

### **Input Devices:-**

The set of instructions or information is provided to the computer system or PC with the help of input devices such as (keyboard, mouse, scanners, etc). The instruction or data presented to the computer system is converted into binary form then it is supplied to a computer system for further processing .

The Input Unit performs transferring the data from outside the world into the system and later this data is processed and the system produces instruction through output unit

such as Printer, monitors, etc.

The Input devices enter the data from outside the world into the primary storage devices. The input devices are a means of communication with the outside world and our computer system.

- Input Devices accepts or receives the data or instruction from outside the world such as input devices like keyboard and mouse
- It converts the data or instruction or information into machine readable form for further processing.
- Later it supplies the decipherable information to PC for additionally handling
- They act like a connection between outside the world and our own computer system
- Keyboard and mouse are the prime examples of input devices.
- When the procedure is finished we get or receive desire result using output devices such as printer's and monitor's.

### **Output Devices:-**

Output devices of computer produce or generate results with the help of devices or gadgets such as a printer, monitor, etc primarily these instruction or data provided to a computer system is in binary code so to produce or generate the desired output the system has to convert this data into human-readable form, to do so it has to first present the data or instruction to a computer system for further processing or handling. With the help and assistance of output devices, the system is linked or connected with outside world.

**For Example,** The data or instruction such as Graphics, images or text is inserted in the computer system with the help of input devices as the data received from the input devices is in binary code, therefore, the data has to be primarily converted into human-readable form after processing user get the required or desired data or set of information.

The prime examples of Output devices are Printer, Monitor, Projectors etc

- The output devices receives all the data or instruction in binary code.
- The output devices converts the binary codes into human readable or intelligible form for better understanding and better functionality.
- They produces the changed or converted result to the user .which is effectively comprehensible by humans for proper and accurate understanding.
- They acts as a connection or link between outside world and computer system or our own PC framework.
- Printers, monitors and projector's are the prime examples of output devices.

## **Number Systems Introduction to Binary:-**

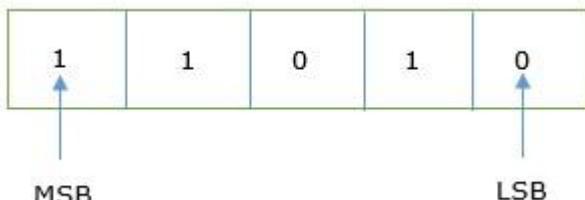
### **Binary Number System:-**

The easiest way to vary instructions through electric signals is two-state system – on and off. On is represented as 1 and off as 0, though 0 is not actually no signal but signal at a lower voltage. The number system having just these two digits – 0 and 1 – is called binary number system.

Each binary digit is also called a bit. Binary number system is also positional value system, where each digit has a value expressed in powers of 2, as displayed here.

$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
-------	-------	-------	-------	-------	-------

In any binary number, the rightmost digit is called least significant bit (LSB) and leftmost digit is called most significant bit (MSB).



And decimal equivalent of this number is sum of product of each digit with its positional value.

$$\begin{aligned}11010_2 &= 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 \\&= 16 + 8 + 0 + 2 + 0 \\&= 26_{10}\end{aligned}$$

Computer memory is measured in terms of how many bits it can store. Here is a chart for memory capacity conversion.

- 1 byte (B) = 8 bits
- 1 Kilobytes (KB) = 1024 bytes
- 1 Megabyte (MB) = 1024 KB
- 1 Gigabyte (GB) = 1024 MB
- 1 Terabyte (TB) = 1024 GB
- 1 Exabyte (EB) = 1024 PB
- 1 Zettabyte = 1024 EB
- 1 Yottabyte (YB) = 1024 ZB

## **Octal Number System**

Octal number system has eight digits – 0, 1, 2, 3, 4, 5, 6 and 7. Octal number system is also a positional value system with where each digit has its value expressed in powers of 8, as shown here –

$8^5$	$8^4$	$8^3$	$8^2$	$8^1$	$8^0$
-------	-------	-------	-------	-------	-------

Decimal equivalent of any octal number is sum of product of each digit with its positional value.

$$\begin{aligned} 726_8 &= 7 \times 8^2 + 2 \times 8^1 + 6 \times 8^0 \\ &= 448 + 16 + 6 \\ &= 470_{10} \end{aligned}$$

### Hexadecimal Number System

Octal number system has 16 symbols – 0 to 9 and A to F where A is equal to 10, B is equal to 11 and so on till F. Hexadecimal number system is also a positional value system with where each digit has its value expressed in powers of 16, as shown here –

$16^5$	$16^4$	$16^3$	$16^2$	$16^1$	$16^0$
--------	--------	--------	--------	--------	--------

Decimal equivalent of any hexadecimal number is sum of product of each digit with its positional value.

$$\begin{aligned} 27FB_{16} &= 2 \times 16^3 + 7 \times 16^2 + 15 \times 16^1 + 10 \times 16^0 \\ &= 8192 + 1792 + 240 + 10 \\ &= 10234_{10} \end{aligned}$$

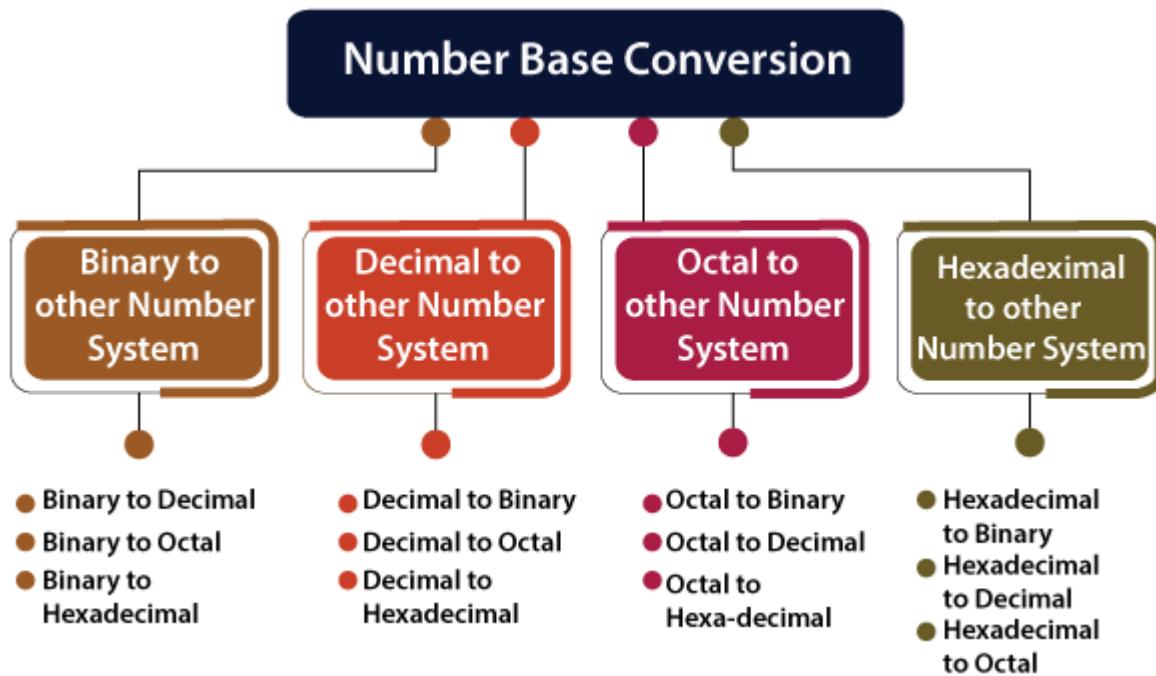
### Conversion:-

In our previous section, we learned different types of number systems such as binary, decimal, octal, and hexadecimal. In this part of the tutorial, we will learn how we can change a number from one number system to another number system.

As, we have four types of number systems so each one can be converted into the remaining three systems. There are the following conversions possible in Number System

1. Binary to other Number Systems.
2. Decimal to other Number Systems.

3. Octal to other Number Systems.
4. Hexadecimal to other Number Systems.



### Binary to other Number Systems

There are three conversions possible for binary number, i.e., binary to decimal, binary to octal, and binary to hexadecimal. The conversion process of a binary number to decimal differs from the remaining others. Let's take a detailed discussion on Binary Number System conversion.

#### Binary to Decimal Conversion

The process of converting binary to decimal is quite simple. The process starts from multiplying the bits of binary number with its corresponding positional weights. And lastly, we add all those products.

#### Simple Addition

Binary addition is one of the binary operations. To recall, the term “Binary Operation” represents the basic operations of mathematics that are performed on two operands. Basic arithmetic operations like addition, subtraction, multiplication, and division, play an important role in mathematics. In this lesson, all the concepts about binary addition are explained, which includes:

- Definition
- Rules

- Method
- table
- Examples
- Using 1's complement

### What is Binary Addition

The binary addition operation works similarly to the base 10 decimal system, except that it is a base 2 system. The binary system consists of only two digits, 1 and 0. Most of the functionalities of the computer system use the binary number system. The binary code uses the digits 1's and 0's to make certain processes turn off or on. The process of the addition operation is very familiar to the decimal system by adjusting to the base 2.

Before attempting the binary addition process, we should have complete knowledge of how the place works in the binary number system. Because most of the modern digital computers and electronic circuits perform the binary operation by representing each bit as a voltage signal. The bit 0 represents the “OFF” state, and the bit 1 represents the “ON” state.

### Rules of Binary Addition

Binary addition is much easier than the decimal addition when you remember the following tricks or rules. Using these rules, any binary number can be easily added. The four rules of binary addition are:

- $0 + 0 = 0$
- $0 + 1 = 1$
- $1 + 0 = 1$
- $1 + 1 = 10$

### Subtraction

Subtraction is an arithmetic operation that represents the operation of removing objects from a collection. The result of a subtraction is called a difference. Subtraction is signified by the minus sign,  $-$ . For example, in the adjacent picture, there are  $5 - 2$  apples—meaning 5 apples with 2 taken away, resulting in a total of 3 apples. Therefore, the difference of 5 and 2 is 3, that is,  $5 - 2 = 3$ . While primarily associated with natural numbers in arithmetic, subtraction can also represent removing or decreasing physical and abstract quantities using different kinds of objects including negative numbers, fractions, irrational numbers, vectors, decimals, functions, and matrices.

Subtraction follows several important patterns. It is anticommutative, meaning that changing the order changes the sign of the answer. It is also not associative, meaning that when one subtracts more than two numbers, the order in which subtraction is performed matters. Because 0 is the additive identity, subtraction of it does not change

a number. Subtraction also obeys predictable rules concerning related operations, such as addition and multiplication. All of these rules can be proven, starting with the subtraction of integers and generalizing up through the real numbers and beyond. General binary operations that follow these patterns are studied in abstract algebra.

Performing subtraction on natural numbers is one of the simplest numerical tasks. Subtraction of very small numbers is accessible to young children. In primary education for instance, students are taught to subtract numbers in the decimal system, starting with single digits and progressively tackling more difficult problems.

In advanced algebra and in computer algebra, an expression involving subtraction like  $A - B$  is generally treated as a shorthand notation for the addition  $A + (-B)$ . Thus,  $A - B$  contains two terms, namely  $A$  and  $-B$ . This allows an easier use of associativity and commutativity.

## Multiplication

A **multiplication algorithm** is an **algorithm** (or method) to **multiply** two numbers. Depending on the size of the numbers, different algorithms are used. Efficient multiplication algorithms have existed since the advent of the decimal system.

### Grid method

The grid method (or box method) is an introductory method for multiple-digit multiplication that is often taught to pupils at primary school or elementary school. It has been a standard part of the national primary school mathematics curriculum in England and Wales since the late 1990s.<sup>[1]</sup>

Both factors are broken up ("partitioned") into their hundreds, tens and units parts, and the products of the parts are then calculated explicitly in a relatively simple multiplication-only stage, before these contributions are then totalled to give the final answer in a separate addition stage.

The calculation  $34 \times 13$ , for example, could be computed using the grid:

/	30	4
10	300	40
3	90	12

followed by addition to obtain 442, either in a single sum (see right), or through forming the row-by-row totals  $(300 + 40) + (90 + 12) = 340 + 102 = 442$ .

This calculation approach (though not necessarily with the explicit grid arrangement) is also known as the partial products algorithm. Its essence is the calculation of the simple multiplications separately, with all addition being left to the final gathering-up stage.

The grid method can in principle be applied to factors of any size, although the number of sub-products becomes cumbersome as the number of digits increases. Nevertheless, it is seen as a usefully explicit method to introduce the idea of multiple-digit

multiplications; and, in an age when most multiplication calculations are done using a calculator or a spreadsheet, it may in practice be the only multiplication algorithm that some students will ever need.

### **Long multiplication**

If a positional numeral system is used, a natural way of multiplying numbers is taught in schools as long multiplication, sometimes called grade-school multiplication, sometimes called Standard Algorithm: multiply the multiplicand by each digit of the multiplier and then add up all the properly shifted results. It requires memorization of the multiplication table for single digits.

This is the usual algorithm for multiplying larger numbers by hand in base 10. Computers initially used a very similar shift and add algorithm in base 2, but modern processors have optimized circuitry for fast multiplications using more efficient algorithms, at the price of a more complex hardware realization. A person doing long multiplication on paper will write down all the products and then add them together; an abacus-user will sum the products as soon as each one is computed.

## UNIT-II

# Algorithm and Flowcharts

### **Algorithm**

#### **Definition:-**

An algorithm is set of instructions for solving a problem or accomplishing a task. One common example of an algorithm is a recipe, which consists of specific instructions for preparing a dish/meal. Every computerized device uses algorithms to perform its functions.

- An algorithm is set of instructions for solving a problem or accomplishing a task. Every computerized device uses algorithms to perform its functions.
- Algo trading, also known as automated trading or black-box trading, uses a computer program to buy or sell securities at a pace not possible for humans. Since prices of stocks, bonds, and commodities appear in various formats online and in trading data, the process by which an algorithm digests scores of financial data becomes easy.
- Computer algorithms make life easier by trimming the time it takes to manually do things. In the world of automation, algorithms allow workers to be more proficient and focused. Algorithms make slow processes more proficient. In many cases, especially in automation, algos save companies money.

### **How an Algorithm Works**

Financial companies use algorithms in areas such as loan pricing, stock trading, asset-liability management, and many automated functions. For example, algorithmic trading, known as "algo" trading, is used for deciding the timing, pricing, and quantity of stock orders. Algo trading, also known as automated trading or black-box trading, uses a computer program to buy or sell securities at a pace not possible for humans.

Since prices of stocks, bonds, and commodities appear in various formats online and in trading data, the process by which an algorithm digests scores of financial data becomes easy. The user of the program simply sets the parameters and gets the desired output when securities meet the trader's criteria.

Computer algorithms make life easier by trimming the time it takes to manually do things. In the world of automation, algorithms allow workers to be more proficient and focused. Algorithms make slow processes more proficient. In many cases, especially in automation, algos save companies money.

## **Types of Algos**

Several types of trading algorithms help investors decide whether to buy or sell. A mean reversion algorithm examines short-term prices over the long-term average price, and if a stock goes much higher than the average, a trader may sell it for a quick profit. Seasonality refers to the practice of traders buying and selling securities based on the time of year when markets typically rise or fall. A sentiment analysis algorithm gauges news about a stock price that could lead to higher volume for a trading period.

## **Algorithm Example**

The following is an example of an algorithm for trading. A trader creates instructions within his automated account to sell 100 shares of a stock if the 50-day moving average goes below the 200-day moving average.

Contrarily, the trader could create instructions to buy 100 shares if the 50-day moving average of a stock rises above the 200-day moving average. Sophisticated algorithms consider hundreds of criteria before buying or selling securities. Computers quickly synthesize the automated account's instructions to produce the desired results. Without computers, complex trading would be time-consuming and likely impossible.

## **Algorithms in Computer Science**

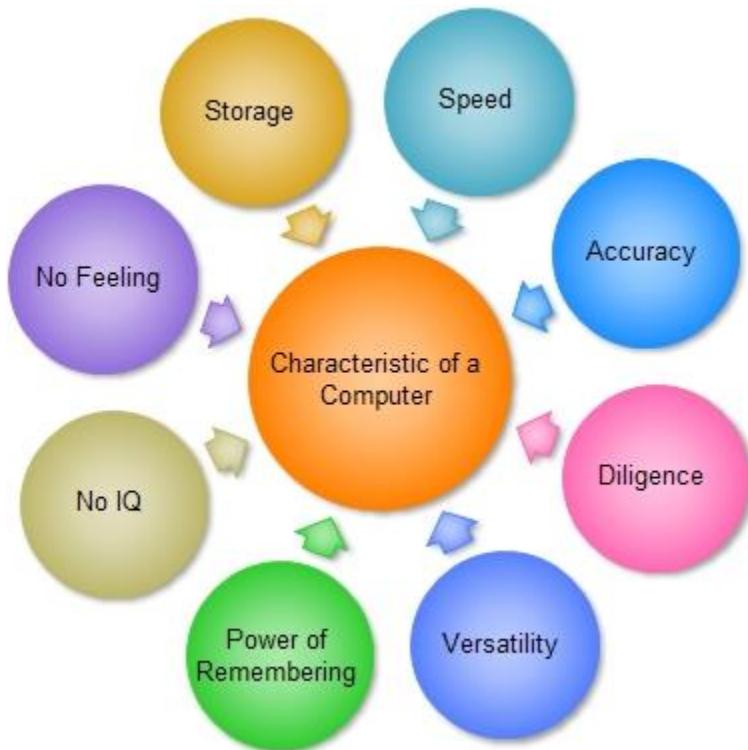
In computer science, a programmer must employ five basic parts of an algorithm to create a successful program.

First, he/she describes the problem in mathematical terms before creating the formulas and processes that create results. Next, the programmer inputs the outcome parameters, and then he/she executes the program repeatedly to test its accuracy. The conclusion of the algorithm is the result given after the parameters go through the set of instructions in the program.

For financial algorithms, the more complex the program, the more data the software can use to make accurate assessments to buy or sell securities. Programmers test complex algorithms thoroughly to ensure the programs are without errors. Many algorithms can be used for one problem; however, there are some that simplify the process better than others.

## Characteristics

Basic characteristics about computer are:



**1. Speed:** – As you know computer can work very fast. It takes only few seconds for calculations that we take hours to complete. You will be surprised to know that computer can perform millions (1,000,000) of instructions and even more per second.

Therefore, we determine the speed of computer in terms of microsecond (10<sup>-6</sup> part of a second) or nanosecond (10 to the power -9 part of a second). From this you can imagine how fast your computer performs work.

**2. Accuracy:** – The degree of accuracy of computer is very high and every calculation is performed with the same accuracy. The accuracy level is 7. determined on the basis of design of computer. The errors in computer are due to human and inaccurate data.

**3. Diligence:** – A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without creating any error. If millions of calculations are to be performed, a computer will perform every calculation with the same accuracy. Due to this capability it overpowers human being in routine type of work.

**4. Versatility:** – It means the capacity to perform completely different type of work. You may use your computer to prepare payroll slips. Next moment you may use it for inventory management or to prepare electric bills.

**5. Power of Remembering:** – Computer has the power of storing any amount of information or data. Any information can be stored and recalled as long as you require it, for any numbers of years. It depends entirely upon you how much data you want to store in a computer and when to lose or retrieve these data.

**6. No IQ:** – Computer is a dumb machine and it cannot do any work without instruction from the user. It performs the instructions at tremendous speed and with accuracy. It is up to you to decide what you want to do and in what sequence. So a computer cannot take its own decision as you can.

**7. No Feeling:** – It does not have feelings or emotion, taste, knowledge and experience. Thus it does not get tired even after long hours of work. It does not distinguish between users.

**8. Storage:** – The Computer has an in-built memory where it can store a large amount of data. You can also store data in secondary storage devices such as floppies, which can be kept outside your computer and can be carried to other computers.

### **Advantages and disadvantages**

The invention of the computer is considered to be one of the greatest inventions of all time. The modern computer has changed our daily life to some extent. A computer is an integral part of human beings and we can not imagine our lives without the use of a computer.

As there are two sides of the coins there are advantages and disadvantages of computer system in points which we are going to discuss in detail.

We will focus on each and every topic briefly. The computer has reached to every section of human society, from schools to hospitals business organizations, institutions everywhere we cannot imagine our daily life without the use of computers.

The impact of computers on humans is beyond imagination, people use a computer for selling and purchasing goods, online studies (E-Learning ) for searching virtually anything on the web, playing games, watching movies, downloading software's, for business promotions, railways, and airplanes tickets, etc almost everything can be done with the help of computer and the output can be obtained with just a few clicks.

Their uses and study of computers are mandatory for students because of its worldwide use and acceptance.

The computers have made a vital impact on education, students can learn online, and get the required skills and knowledge just sitting at home, the computers have made the distance virtually zero.

Students are getting a higher education, certificates, and degrees from the reputed institutes before they just dreamed of it computer has made their dreams into reality.

They even had made a significant impact in business, now businessman prefers to use a computer to a huge extent they have made their business life so peaceful that now they can perform multitasking, with almost 100% accuracy, **The advantages of computer** in research has made the scientist to solve complex to complex problems with ease before would take longs hours or even months to solve.

**As there are 2 sides of coins there are Advantages and Disadvantages of computers ::**

- Speed
- Accuracy
- Stores Huge Amount of Data
- Online Trading
- Online Education | Distance Learning
- Research
- Forecasting Weather, and Predicting Earthquakes ,Volcano Eruptions
- Produce Employment
- Internet
- In Business

### **Speed**

The speed of computer has made a vital impact on human society before some decades computer were just used for the purpose of some numerical calculations, but nowadays computers are used in virtually every single part of human life.

The modern computer is not just a calculating device anymore with their speed and accuracy it can perform multiple tasks, operations, and complex numerical problems within fractions of second. They can perform about Trillions of instruction per second.

People can play songs, perform their documentation work, surf the internet, check emails, search for your requirements on the internet with great speed and accuracy.

The speed is considered as the biggest advantage of computers because it can perform all operations with an incredible speed which can reduce the amount of time spend when working manually.

**For Example :** It can calculate the salaries of Employees within a fraction of seconds before it would take long hours when done manually by people.

### **Accuracy**

Not only speed but a computer can work with almost 100% accuracy. This is also one of

its advantages, as it can perform complex numerical calculations not only with speed but with unbelievable accuracy..

Imagine you have given a task to calculate the gross salary of ten thousand employees with reduction as per the rules and regulations of the organization. That's not a simple task to calculate the given salaries manually, you are bound to make mistakes and even a small mistake can harm you badly economically.

And now here comes the magic of computers it can perform all the hard work of calculating the salaries of the employees and deduction as per the requirements. You can derive the results at your fingertips within a fraction of seconds when given correct and proper input, with great speed and incredible accuracy.

Hence the big organizations with hundreds of employees working for them use computer-generated bills and payslips. Even in the Government sector, all the manual calculations had been shifted to computers.

### **Stores Huge Amount of Data**

Data storing capabilities of computers these days are “HUGE” as compared to previous years. They can save or store any volume of data or instruction given to them permanently.

Users can recall the data or instructions or information given to them anytime & any place.

The Storing capability of computer is measured in MB (Mega-Bytes), GB (Giga-Bytes), TB (Tera-Bytes) Railways use modern computer for storing their passenger details, route of trains and even their employee's details. India has a population of around 125 cr people, 93% of them have received their aadhaar card issued by the Government of India.

### **Online Trading**

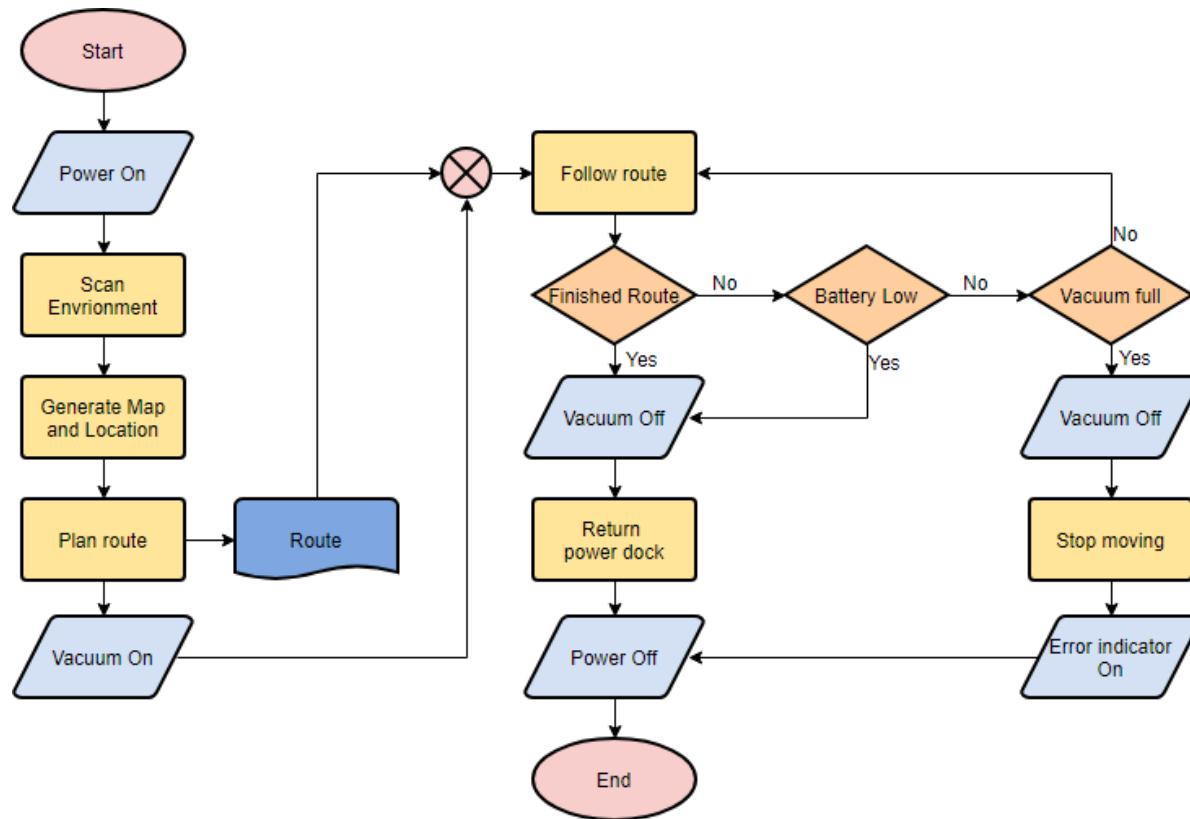
People tend to use computer and internet while purchasing and selling their goods, according to a recent survey more than 50% of people across the world will use computers for their online trading.

Online trading is very simple and time saving, you have a variety of products to choose with the best prices, many websites offer their users a heavy discount. People are more inclined toward online shopping and trading these days due to their simplicity in use.

### **Examples Flowchart:**

## Definition

A flowchart is simply a graphical representation of steps. It shows steps in sequential order and is widely used in presenting the flow of algorithms, workflow or processes. Typically, a flowchart shows the steps as boxes of various kinds, and their order by connecting them with arrows.



## What is a Flowchart?

A flowchart is a graphical representations of steps. It was originated from computer science as a tool for representing algorithms and programming logic but had extended to use in all other kinds of processes. Nowadays, flowcharts play an extremely important role in displaying information and assisting reasoning. They help us visualize complex processes, or make explicit the structure of problems and tasks. A flowchart can also be used to define a process or project to be implemented.

## **Define symbols of flowchart**

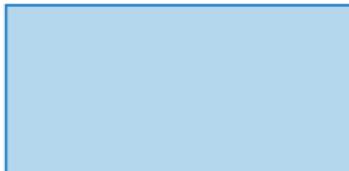
Different flowchart shapes have different conventional meanings. The meanings of some of the more common shapes are as follows:

### **Terminator**

The terminator symbol represents the starting or ending point of the system.



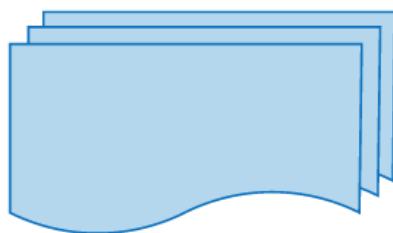
**Start/End Symbol**



**Action or Process Symbol**



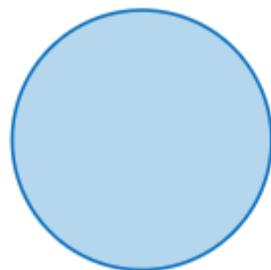
**Document Symbol**



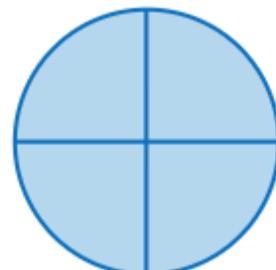
**Multiple Documents Symbol**



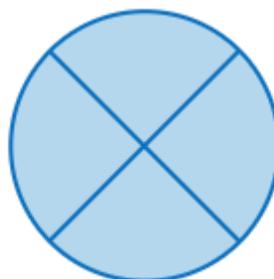
**Preparation Symbol**



**Connector Symbol**



**Or Symbol**



**Summoning Junction Symbol**

## **Advantages and disadvantages**

A flowchart is actually a graphical representation of a computer program in relation to its sequence of functions. Which will help the programmer to draw out the basic build block and working mechanism of the program or the system?

In the flowchart, we generally use geometric symbols like a rectangle, oval shapes and arrows to define the relationships. In simple terms, it will explain the start and end of the program.

### **Advantages of Flowchart**

1. It is a convenient method of communication.
2. It indicates very clearly just what is being done, where a program has logical complexities.
3. A key to correct programming.
4. It is an important tool for planning and designing a new system.
5. It clearly indicates the role-played at each level.
6. It saves the inconveniences in future and serves the purpose of documentation for a system.
7. It provides an overview of the system and also demonstrates the relationship between various steps.
8. Facilitates troubleshooting.
9. It promotes logical accuracy.
10. It makes sure that no logical path is left incomplete without any action being taken.

### **Disadvantages of Flowchart**

1. The flowchart is a waste of time and slows down the process of software development.
2. The flowchart is quite costly to produce and difficult to use and manage.
3. Flowcharts are not meant for man to computer communication.
4. Sometimes the Complex logic of the program logic is quite complicated to draw out on by using different defined shapes. In that case, flowchart becomes

complex and clumsy. This will become a pain for the user, resulting in a waste of time and money trying to correct the problem

5. If you need to modify or alternate the process then it will be very hard to do in the flowchart. Because either you will have to erase the end of the flowchart or start.

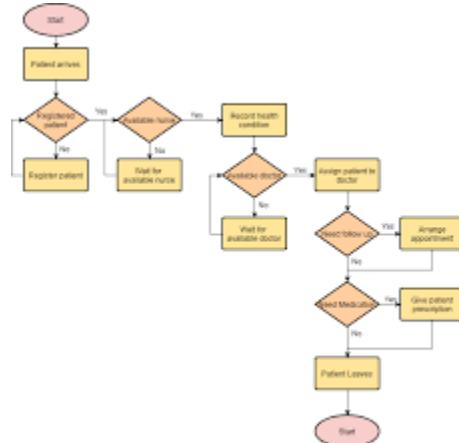
## Flowchart Advantages

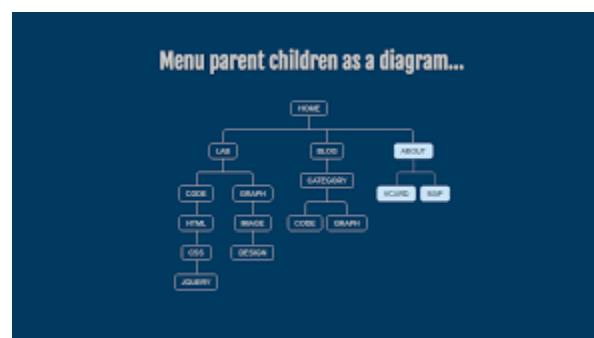
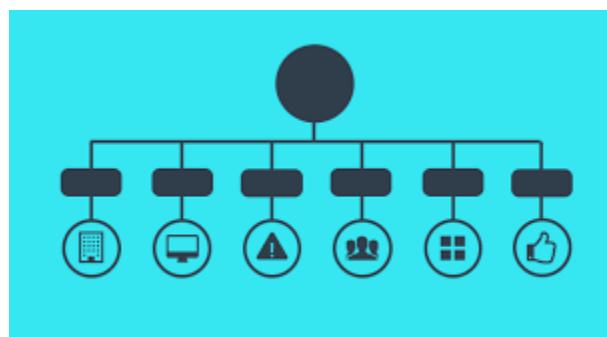
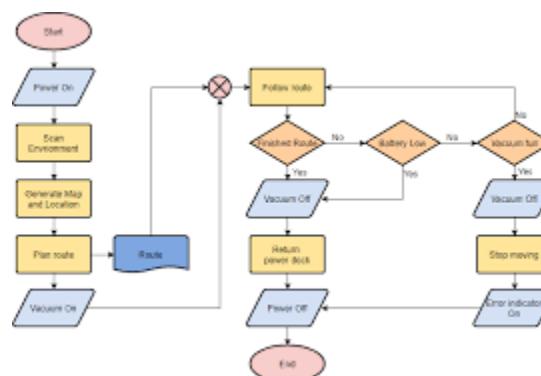
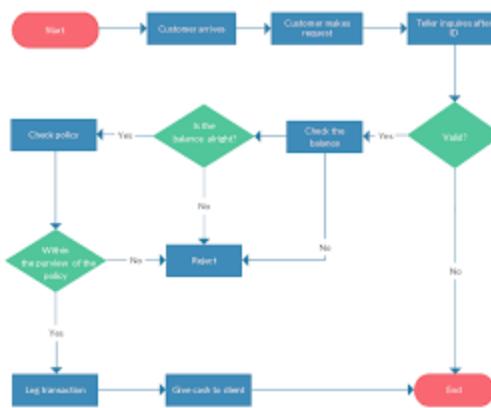
- Flowcharts are easier to understand compare to Algorithms and Pseudo code.
- It helps us to understand Logic of given problem.
- It is very easy to draw flowchart in any word processing software like MS Word.
- Using only very few symbol, complex problem can be represented in flowchart.
- Software like RAPTOR can be used to check correctness of flowchart drawn in computers.
- Flowcharts are one of the good way of documenting programs.
- It helps us in debugging process.

## Flowchart Disadvantages

- Manual tracing is needed to check correctness of flowchart drawn on paper.
- Simple modification in problem logic may leads to complete redraw of flowchart.
- Showing many branches and looping in flowchart is difficult.
- In case of complex program/algorithm, flowchart becomes very complex and clumsy.
- Modification of flowchart is sometimes time consuming.

## Examples





## **UNIT-III**

# **Operating System and Services in O.S.**

### **Dos – History**

MS-DOS (shorthand for Microsoft Disk Operating System) is a single tasking, single user, non-graphical command line operating system. Originally developed for use with IBM's earliest line of personal home computers, MS-DOS is one of the most successful operating systems of its kind. As an operating system, DOS is simple, compact, and remarkably robust; especially considering its age. While it may have been surpassed by the newer, and more user friendly, graphical user interface (GUI) operating systems, MS-DOS remains in widespread use by businesses and independent programmers throughout the world.

### **A History of MS-DOS**

The origins of MS-DOS can be traced back to two earlier operating systems, CP/M and QDOS. CP/M (AKA Control Program for Microcomputers) was created in the mid 1970s by Gary Kildall of Digital Research. CP/M was an 8-bit operating system, and was one of the first to be widely used in the emerging line of commercial microcomputers. In 1980, Tom Paterson of Seattle Computer Products developed QDOS (Quick and Dirty Operating System) for Intel's new 16-bit 8086 central processing unit(CPU). QDOS was largely based on CP/M, and it is here that Microsoft entered the picture.

In 1981 Microsoft purchased QDOS from Seattle Computer Products, renaming it MS-DOS 1.0 and offering it to IBM for use in their new personal computers. In a prescient move, Gates retained the licensing for MS-DOS and it would become the most important factor in Microsoft's move from a simple vendor of computer programming languages to a giant in the computer software industry. The success of MS-DOS directly paralleled the growing popularity of the personal home computer, and remained Microsoft's most significant source of income even after the firm began to introduce its own GUI in the form of MS-Windows.

### **The Evolution of an Operating System**

In many ways MS-DOS laid the groundwork for Microsoft's ongoing success, and over the years it remained a focus for research and development. From 1981 through to 1997 it would undergo several revisions and enhancements, resulting in a number of different iterations. Each new version of MS-DOS built upon its predecessor, evolving to meet the demands of lay-users and professional programmers alike.

The earliest revisions of MS-DOS addressed the need for larger hard disk drives, with support for multiple directories, networks, and foreign and extended characters. Later iterations would bring support for multiple HDD partitions, disk compression and fragmentation, enhanced memory management, and improvements in the operating system's text editing functions. The final versions, MS-DOS 7.0 and 7.1, were revised for close integration with Microsoft's newest operating system Windows 95. MS-DOS 7 eliminated a number of redundant utilities which were included in the Windows 95 OS, and brought in support for long filenames and the FAT32 file system.

Microsoft no longer uses MS-DOS in any of its iterations in their primary operating systems, though both Windows 2000 and Windows XP do contain an emulation layer which allows for the running of MS-DOS programs, thereby providing backward compatibility with legacy-styled software.

### **Clones and Imitations**

Over the years the success of MS-DOS has inspired a number of imitators, and many so-called 'clones' of the operating system have been launched by independent software developers and computer enthusiasts. Some of the more notable imitators include DR-DOS, OpenDOS, and FreeDOS. Many of the systems were developed and released as a direct response to Microsoft's announcement that they were halting further development of MS-DOS and would no longer be supporting the system with regular updates and revisions.

The most successful of these clones has been FreeDOS. Developed by Jim Hall in 1994, FreeDOS is lean and robust and offers some improvements over its parent operating system. It can run on legacy hardware and embedded systems, and includes several additions to the command structure not found in MS-DOS itself.

### **The Future of MS-DOS**

While the last iteration of MS-DOS was released in 1997, the operating system itself still forms a large part of the modern computing landscape. Many businesses and independent programmers still rely on DOS for many embedded applications. DOS survives, in no small part, because it is a highly compact and efficient operating system that performs well with a minimum of required maintenance. With the ongoing advances in hardware (specifically larger memories and faster CPUs) MS-DOS and its clones still have much to offer. Moreover, developments by hobbyists and independent programmers like Jim Hall are introducing new and improved utilities and applications to the system despite Microsoft's own disinterest.

## Online Tutorials

MS-DOS has a fairly long history, and as such there is plenty of reference material available to anyone interested in learning more about the operating system and its many applications. Online tutorials offer a good starting point, and can provide insight into the development of DOS and its value and use as an operating system.

- An Inside Look at MS-DOS: from the Paterson Technology website, this article presents an overview of the fundamentals of MS-DOS. The website itself also offers a history of MS-DOS, its developmental roots, and a selection of archived manuals. There is also a short bio of Tim Paterson, the creator of QDOS and Paterson Technology's owner and managing director.
- MS-DOS Literacy — an Introduction to MS-DOS: from Silicon Mountain and Aames Production comes a video tutorial aimed at the early PC home market. Published in 1992, this tutorial looks more than a little dated. However, the fundamentals are presented in an easy to understand and interactive manner that makes this a surprisingly effective learning tool, particularly for the novice.
- Learning MS-DOS Basics — a Tutorial (PDF): This document was prepared by the staff at the University of North Carolina Wilmington, and it offers a comprehensive introduction to basic MS-DOS commands. This easy to understand tutorial covers command prompts, managing directories, managing files, and formatting floppy disks.
- Using DOS Commands with MS-DOS 6.22: Que Publishing provides this extensive guide to using DOS, specifically the 6.22 iteration. Topics include "Understanding the Elements of DOS Commands," "Issuing DOS Commands," and "Troubleshooting Program Files." Best suited to someone with a basic working knowledge of MS-DOS.

## Books

Many books have been written on the subject of MS-DOS and its various iterations. Some have been aimed at the mass market, acting as basic instruction manuals for first time programmers. Others have been more technical in their approach, appealing mostly to the professional programmer and the more experienced computer enthusiast.

- DOS for Dummies by Dan Gookin: one of the more popular books on MS-DOS and one of the most successful of the "Dummies" franchise. This book is specifically targeted to a mass audience, and as such is mostly suitable for beginners. There is also a follow-up, More DOS for Dummies, which goes into a bit more detail than the original.
- Running MS-DOS, the 20th Anniversary Edition by Van Wolverton: the original Running MS-DOS became a best seller, and this anniversary edition expands upon earlier editions with updated material. Special emphasis is given to MS-DOS 6.22 (the latest iteration upon time of publication). The book is informative and easy to understand, making it suitable for both beginners and experienced programmers.
- Using MS-DOS 6.22 (3rd Edition) by Jim Cooper: this is one of the most extensive guides to MS-DOS, and also one of the most highly regarded. The 3rd edition brings things up to date, with an emphasis on the latest iteration (6.22 at time of publication) of

- the DOS operating system. Cooper covers all aspects of MS-DOS, including its history and development. Ideal for experienced programmers and serious hobbyists.
- DOS: The Complete Reference (4th Edition) by Kris Jamsa: this book is not so much an introduction to DOS as it is a reference guide for those with some working knowledge of the operating system. The work itself is forthright and easy to understand, but is perhaps best suited to readers with some experience of DOS who need to refresh their skills.
  - Advanced MS-DOS Programming: The Microsoft Guide for Assembly Language and C Programmers by Ray Duncan: this book targeted the professional programmer circa 1988. More than a 'how-to' guide, this is an in-depth look at MS-DOS as a programming environment, including best uses and applications. Not for the novice or inexperienced hobbyist.

## **Summary**

Technically, MS-DOS has been retired and Microsoft has made it clear their will be no more iterations or updates to the operating system. But MS-DOS still has a place in the computing landscape, even beyond its attraction to hobbyists and niche programmers. MS-DOS continues to be used around the world, and is responsible for many of the embedded applications that we all take for granted. MS-DOS may not be the vital operating system that it once was, but it still has merit and deserves the attention of serious programmers.

MS-DOS (Microsoft Disk Operating System) is a single-user, single-tasking computer operating system that uses a command line interface. In spite of its very small size and relative simplicity, it is one of the most successful operating systems that has been developed to date.

## **A Quick and Dirty History**

When IBM launched its revolutionary personal computer, the IBM PC, in August 1981, it came complete with a 16-bit operating system from Microsoft, MS-DOS 1.0. This was Microsoft's first operating system, and it also became the first widely used operating system for the IBM PC and its clones.

MS-DOS 1.0 was actually a renamed version of QDOS (Quick and Dirty Operating System), which Microsoft bought from a Seattle company, appropriately named Seattle Computer Products, in July 1981. QDOS had been developed as a clone of the CP/M eight-bit operating system in order to provide compatibility with the popular business applications of the day such as WordStar and dBase. CP/M (Control Program for Microcomputers) was written by Gary Kildall of Digital Research several years earlier and had become the first operating system for microcomputers in general use.

QDOS was written by Tim Paterson, a Seattle Computer Products employee, for the new Intel 16-bit 8086 CPU (central processing unit), and the first version was shipped in August, 1980. Although it was completed in a mere six weeks, QDOS was sufficiently different from CP/M to be considered legal. Paterson was later hired by Microsoft.

Microsoft initially kept the IBM deal a secret from Seattle Computer Products. And in what was to become another extremely fortuitous move, Bill Gates, the not uncontroversial co-founder of Microsoft, persuaded IBM to let his company retain marketing rights for the operating system separately from the IBM PC project. Microsoft renamed it PC-DOS (the IBM version) and MS-DOS (the Microsoft version). The two versions were initially nearly identical, but they eventually diverged.

The acronym DOS was not new even then. It had originally been used by IBM in the 1960s in the name of an operating system (i.e., DOS/360) for its System/360 computer. At that time the use of disks for storing the operating system and data was considered cutting edge technology.

Until its acquisition of QDOS, Microsoft had been mainly a vendor of computer programming languages. Gates and co-founder Paul Allen had written Microsoft BASIC and were selling it on disks and tape mostly to PC hobbyists.

MS-DOS soared in popularity with the surge in the PC market. Revenue from its sales fueled Microsoft's phenomenal growth, and MS-DOS was the key to company's rapid emergence as the dominant firm in the software industry. This product continued to be the largest single contributor to Microsoft's income well after it had become more famous for Windows.

Subsequent versions of MS-DOS featured improved performance and additional functions, not a few of which were copied from other operating systems. For example, version 1.25, released in 1982, added support for double-sided disks, thereby eliminating the need to manually turn the disks over to access the reverse side.

Version 2.0, released the next year, added support for directories, for IBM's then huge 10MB hard disk drive (HDD) and for 360KB, 5.25-inch floppy disks. This was followed by version 2.11 later in the same year, which added support for foreign and extended characters.

Version 3.0, launched in 1984, added support for 1.2MB floppy disks and 32MB HDDs. This was soon followed by version 3.1, which added support for networks.

Additions and improvements in subsequent versions included support for multiple HDD partitions, for disk compression and for larger partitions as well as an improved disk-checking utility, enhanced memory management, a disk defragmenter and an improved text editor.

The final major version was 7.0, which was released in 1995 as part of Microsoft Windows 95. It featured close integration with that operating system, including support for long filenames and the removal of numerous utilities, some of which were on the Windows 95 CDROM. It was revised in 1997 with version 7.1, which added support for the FAT32 filesystem on HDDs.

Although many of the features were copied from UNIX, MS-DOS was never able to come anywhere close to UNIX in terms of performance or features. For example, MS-DOS never became a serious multi-user or multitasking operating system (both of which were core features of UNIX right from the start) in spite of attempts to retrofit these capabilities. Multitasking is the ability for a computer to run two or more programs simultaneously.

## **The Rise of the GUI**

The introduction of the Apple Macintosh in 1984 brought about a surge of interest in GUIs (graphical user interfaces), and it soon became apparent that they would eventually replace command line interfaces such as that used by MS-DOS. Although many MS-DOS application programs created their own primitive GUIs, this approach required duplication of programming effort, and the lack of a consistent GUI among programs made it more difficult for users to learn new programs.

It took Microsoft years until it was able to offer a fairly high quality GUI of its own, with the introduction of Windows 95 in 1995 (or arguably with Windows 3.0 in 1990). Microsoft had also begun work on a joint project with IBM called OS/2, which was originally a protected-mode version of MS-DOS with a GUI, but Microsoft soon abandoned the project in order to devote more resources to the development of Windows NT, a completely new operating system that was independent of MS-DOS.

Protected mode and real mode are the two modes of operation supported by the Intel x86 architecture. The former enables 32-bit memory addressing, thereby permitting use of the extended memory that cannot be easily accessed from real mode. This makes it possible to assign separate memory areas to the operating system kernel (i.e., the core of the operating system) and to each process (i.e., program or task), thus resulting in much more stable multitasking than can be attained with real mode.

Early versions of Microsoft Windows ran under MS-DOS, whereas later versions were launched under MS-DOS but were then extended by going into protected mode. Windows NT and its successors, Windows 2000 and XP, do not use MS-DOS; however, they contain an emulation layer on which MS-DOS programs can be operated, mainly for backward compatibility with legacy (i.e., old) software.

## DOS Commands

MS-DOS has a relatively small number of commands, and an even smaller number of commonly used ones. Moreover, these commands are generally inflexible because, in contrast to Linux and other Unix-like operating systems, they are designed to accommodate few options or arguments (i.e., values that can be passed to the commands).

Some of the most common commands are as follows (corresponding commands on Unix-like operating systems are shown in parenthesis):

CD - changes the current directory (cd)  
COPY - copies a file (cp)  
DEL - deletes a file (rm)  
DIR - lists directory contents (ls)  
EDIT - starts an editor to create or edit plain text files (vi, vim, ed, joe)  
FORMAT - formats a disk to accept DOS files (mformat)  
HELP - displays information about a command (man, info)  
MKDIR - creates a new directory (mkdir)  
RD - removes a directory (rmdir)  
REN - renames a file (mv)  
TYPE - displays contents of a file on the screen (more, cat)

## Comparison between MS-DOS and Linux

MS-DOS and Linux have much in common, primarily because MS-DOS copied many ideas from UNIX. However, there are some very fundamental differences, including:

- (1) Linux is a full-fledged multiuser, multitasking operating system, whereas MS-DOS is a single-user, single-tasking operating system.
- (2) MS-DOS does not have built-in security concepts such as file-ownership and permissions, which are fundamental to Linux.
- (3) Linux has an inverted tree-like filesystem in which all directories and files branch from a single directory, i.e., the root directory, and its subdirectories. MS-DOS can have multiple, independent root directories, such as A:, C:, D:, etc.
- (4) Linux uses forward slashes "/" to separate directories, whereas MS-DOS uses backslashes "\\" for the same purpose.
- (5) Linux filenames can contain up to 255 characters. MS-DOS filenames are limited to an eight characters plus a three-character extension and have restrictions on allowable characters. Also, filenames are case-sensitive in Linux, whereas they are not in MS-DOS.

(6) Linux has a vastly richer command set than does MS-DOS, with a much greater number of commands and individual commands having greater power, flexibility and ease of use. Commands are case-sensitive in Linux, but they are not in MS-DOS.

(7) Although Linux and MS-DOS both have pipes and input/output redirection, the MS-DOS pipes use a completely different -- and inferior -- implementation.

(8) MS-DOS is not sufficiently flexible and efficient to serve as a base for a high quality, general-purpose GUI (and thus it had to be abandoned by Microsoft). In sharp contrast, Linux is an excellent base for a GUI (and it is used as a base for the X Window System, which is extremely configurable and whose already excellent performance continues to improve).

## **MS-DOS Clones and Emulators**

The great success of MS-DOS led to the development of several similar operating systems, including DR-DOS, FreeDOS, OpenDOS and PC-DOS. The most promising of these clones is FreeDOS, which is claimed to be the only free operating system that is fully compatible with MS-DOS.

Development of FreeDOS was begun in 1994 by Jim Hall, then a physics student at the University of Wisconsin-River Falls. His motivation was Microsoft's announcement that it would stop supporting MS-DOS because of its impending replacement by Windows 95.

Like MS-DOS, FreeDOS is lean and robust, and it can run on old hardware and in embedded systems. A major improvement as compared with MS-DOS is the addition of options to the commands. Moreover, FreeDOS is released under the GPL (although some software in the distribution is covered by other licenses), thus making it ideal for bundling a version of DOS into products without having to pay royalties.

Because Linux was originally developed on PCs and at a time when MS-DOS was the dominant PC operating system, a variety of tools were developed to help developers and users bridge the gap between the two operating systems. Among them is dosemu, a DOS emulator which is included with Red Hat and other distributions and on which it is possible to run DOS programs. Emulators are also available for running DOS on other Unix-like operating systems, even on non-x86 processors.

mtools is a collection of utilities that make it easy to access an MS-DOS floppy disk from Linux by merely inserting it into the floppy disk drive and without having to use any mounting commands (which can be tricky for inexperienced users). Included in mtools are more than 20 commands, all of which are identical to their MS-DOS counterparts except that the letter m is added to the start of each of their names and forward slashes are used instead of backslashes. For example, the MS-DOS command type a:\file1.txt to display the contents of a file named file1.txt that is located on a floppy disk would become mtype a:/file1.txt.

## **Outlook For the Future**

Although it is widely believed that MS-DOS is an antiquated and useless operating system with few features and capabilities, this is far from correct. In fact, although not generally publicized, MS-DOS is still used today by numerous businesses and individuals around the world. A good analogy is the ancient programming language COBOL (introduced in 1960!), which is still in widespread use and, amazingly, accounts for roughly half of all the computer code still in existence. Both MS-DOS and COBOL have survived for so long because they are robust, relatively simple and continue to get the job done with a minimum of maintenance.

In many cases, it was not MS-DOS itself that was the limiting factor in system performance; rather, it was the hardware, including small memories, slow CPUs and slow video cards. The capabilities of MS-DOS have, in fact, continued to increase even after Microsoft Windows became widespread. This is a result of continuing advances in the hardware and the introduction of new or improved utilities and applications. DOS as a whole is also being strengthened by the improvements that are being made to the MS-DOS clones, particularly FreeDOS.

DOS will be around for many years into the future not only because of the continued existence of legacy applications but also because of the development of new applications. The main area of growth will most likely be simple embedded applications, for which DOS is eminently well suited because of its extremely small size, very reliable operation and zero cost (in the case of FreeDOS).

DOS is so tiny, in fact, that it can fit on a single floppy disk and still leave sufficient room on the same disk for an embedded program and data files. Although there are many alternatives for embedded systems, including embedded Linux and Microsoft Windows CE, DOS can be the best choice if space is severely limited. Moreover, in contrast to FreeDOS, Windows CE has the disadvantages of not being free and having various licensing issues with which to contend.

## **Files and Directories**

An understanding of files and directories is a necessity if you regularly use computers today. You must become familiar with the techniques of creating, removing, and copying files and directories for your preferred operating system. This brief tutorial will cover the Windows 95/NT family of operating systems.

This primer is also intended for those switching to the Windows OS from another OS. If this is the case, you can skip the first few paragraphs and jump here.

## **Introduction**

### **What is a File?**

Every document that you have saved on your hard drive is called a file. Whenever you write a paper in a word processor and save it, you have just created a file. Similarly, every Excel spreadsheet is a file. So is every Access database. So is every JPEG or GIF image. So is every MP3 music song. If you create a web page and call it ‘my\_resume.html’, then you have just created a new file which must be stored on your hard drive, a floppy disk, or some other storage device on your computer.

### **What is a Folder?**

Think of your disk drives as large filing cabinets. However, think of them as large filing cabinets that have no drawers and none of those manila folders inside. Instead, whenever you have a paper or document you wish to file away, you just toss it directly into your large cabinet. After a few hundred documents have been tossed haphazardly inside the this cabinet, you would of course discover that finding any one document inside that large pile of papers is time-consuming and difficult. Instead, what most of us do is to label a series of manila folders and then place them inside our file cabinet. You might keep a folder dedicated to academic transcripts, another for tax papers, another for old poetry you’ve written, and another to hold the warranties that came with your new PC.

The same thing applies to your hard drive. In Windows, a folder (also called a directory) is analogous to the yellow folders people use in filing cabinets. You might create a folder on your drive called “school\_essays”, and another called “scanned\_photos”, and perhaps another called “215\_homework”. Over time you will come to accumulate a number of different folders, but you will be glad you did since finding and organizing your documents will be significantly easier.

In fact, you will notice that there are already a large number of directories that have been created for you. When a new program is installed on your machine, it will usually create one or more new folders in which to store the relevant files.

## **Windows Explorer**

So let's begin by examining the ways in which we can directly access files and directories in Windows. The two most common way for doing so is via 'My Computer', represented by a or similar icon. However, I highly recommend using Windows' Explorer. Explorer gives you much more efficient control over your files and directories. In fact, I'd recommend placing a shortcut directly on your desktop. (It is possible that one is already there).

### **Create a shortcut for Explorer on the desktop**

1. Right-click on an empty part of the desktop. (Right-click = click the right mouse button).
2. Choose "New", then "Shortcut"
3. Type "explorer.exe"
4. Windows will prompt you for a "friendly" name. Type "Windows Explorer" or something similar.

Now when you double-click (click twice rapidly) on the Explorer icon, you will see something similar (but not identical) to the following:

Now as is often the case, much confusion arises from the plethora of options available. With Explorer, there are several different views you can choose. If your Explorer looks significantly different from mine, do the following:

### **Change views in Explorer**

1. With Explorer open, click on "Tools", then "Folder Options"
2. Look for the option that says something to the effect of "Use Windows Classic Folders" and check it.

Later on you may choose to use one of the other views, but in my opinion, the standard ("classic") view is the most efficient one.

What are all those + signs next to the folders?

It is common to have folders inside of folders. By clicking on the + sign, you can see the folders contained within the current folder. For example, you may create a folder called 'School Papers'. Inside that folder you may have a few other folders containing documents pertaining to each course. (For example, 'Chemistry', 'English', 'Biology'). Notice the + next to the 'English' folder. This tells you that that folder contains other folders.

## **PROPERTIES OF FILES AND DIRECTORIES**

On this page, we will look at the following features and concepts related to files and directories:

- Files and directories
- Naming practices
- Paths
- File types
- Data size units
- Managing file and folder views

### **FILES AND DIRECTORIES**

A file refers to data stored on a hard drive or other storage media as a separate entity. For example, you would usually save a thesis or a slide presentation or a photograph as a file. Files typically have the following characteristics:

- A file always has a name.
- A file always takes up storage space.
- A file is always saved in a certain format: a body of text is saved in one of the many text file formats, a photo in one of the many image file formats, etc.
- A file contains information on when it was created and when it was last modified.
- Files usually have access rights, especially if they are online.

Files are saved on the user's own computer or in a remote location.

A directory or folder is a place where files or other directories are saved.

### **NAME**

Think carefully about how you name your files. Use descriptive file names so that even years later you will be able to recognize the contents of the file by its name. Avoid abbreviations and, instead, use whole words. For example, a file name like "Cultural encounters" is better than "Cult".

The naming conventions for files and directories vary by operating system: in Windows, for example, the dot in the file name is usually followed by a file extension consisting of one or several characters that indicate the file type. In Linux, on the other hand, no extension is necessary.

Depending on the system, it may not be possible to use certain special characters (: > / \* ? " > |) in the file name. In addition, using a space or Scandinavian umlauts (å, ä, ö) may sometimes cause problems, especially over the Internet. If you have trouble posting files online, try removing special characters from the name.

In Linux, the use of UPPER CASE and lower case letters in file names makes a difference; e.g. Ray.txt is different from ray.txt. In Windows, upper and lower case letters can be used more freely.

## PATHS

A string of text that shows the location of a file or directory is called a **Path**. The path to a single file on the hard drive of your home computer (in Windows) can be e.g.:

```
C:\Users\rkeskiva\Studies\Study diary.docx
```

structure of the path depends on the operating system; you can read more about the path structure in, say, Linux in the additional reading section.

## FILE TYPES

A file can contain different kinds of material: text, video and so forth. When the contents of a file are saved in a certain generally known format, it is called a file type. Photographs, for example, are often stored as JPEG image files, and word processing documents as DOCX or RTF document files.

In Windows, the file type is evident from the file extension (usually consisting of three letters) that follows the dot in the file name. The file extension indicates the format in which the data in the file has been stored.

## FILE SIZE AND UNITS OF MEASUREMENT

Understanding file sizes is very useful. Too big a file sent as e-mail may completely fill the recipient's mailbox or it may cause your message not to leave at all. Similarly, you may not be able to save several large files on a USB flash drive if you don't know how to estimate the total amount of space they need.

Data is saved in **binary** form, i.e. as numbers consisting of ones and zeros. The smallest data storage unit – the **bit (b)** – can receive the value 1 or 0. When several bits are combined in a row, they form a **byte (B)**. A byte may look like this, for example: "01011001". If you type the word "data" on your computer, it consists of four bytes (each letter usually consists of one byte).

The storage capacity is specified as the maximum number of bytes that the storage media can hold. The storage capacity is often so large that it is described as follows:

<b>Unit</b>	<b>Abbreviation</b>	<b>Size in bits or bytes</b>
byte	B (Byte)	1 byte = 1 character = 8-bit string
kilobyte	kB	1024 bytes
megabyte	MB	1024 kilobytes
gigabyte	GB	1024 megabytes
terabyte	TB	1024 gigabytes

The size of a file depends very much on the file type. A document of one page that only contains text may be as small as 3 kB, while a photograph may be 3 MB or much larger (the image size depends on the format the image is saved in). A whole movie can easily take several gigabytes of storage space.

## **CREATION AND MODIFICATION DATES**

When the file window is set to display all of the details of the files, you will often see the Date Modified for each file.

## **MANAGING FILE AND FOLDER VIEWS**

You can change the folder view in order to see the file and folder details in your preferred format (e.g. as thumbnails or with the dates visible). In Windows 10, you can change the view by clicking the buttons at the bottom right of the window (see the image below).

The same options can be accessed via the View menu, which can be displayed by pressing the Alt key on the keyboard.

You can sort files and folders by clicking the headings above the list. For example, to sort files by their date of modification, click the Date Modified heading (see the image above). You can reverse the order of the files by clicking the heading again.

## **Internal and External Commands**

### **Most Commonly Used Internal and External DOS Commands**

#### **DOS Commands**

DOS Commands are instructions to perform tasks on files and directories very useful to Windows users. DOS commands are case insensitive. And as you already know, file is the area where we store group of information or data, and collection of group of files is called a directory.

In MS-DOS the file name follow 8dot3 format and is divided into two parts – primary name and secondary name. Primary name is up to 8 characters long and secondary name is up to 4 characters with dot. For example, in the file-name Logo.jpg, Logo is the primary name and .jpg is the secondary name. Secondary names are fixed for particular type of file, meaning for system files the secondary name is designated as .sys, for text files it is .txt and so on. To name a file or directory special characters like < > , . / \* ? | & Space are not allowed. Here is the list of some of the important types of files with their default secondary names:

Text file	.txt
Command file	.com
System file	.sys
Programme file	.prg
Database file	.dbm
Library file	.lib
Batch file	.bat
Executable file	.exe

DOS Commands are divided into 2 types:

#### **1. Internal Commands**

These are for performing basic operations on files and directories and they do not need any external file support.

#### **2. External Commands**

These external commands are for performing advanced tasks and they do need some external file support as they are not stored in COMMAND.COM

There are also Batch commands or Batch files which are text files that contain a list of internal and/or external commands which are executed in sequence when the batch file is executed. AUTOEXEC.BAT gets executed automatically on booting.

In MS-DOS, keyboard shortcuts involving handy ones like Functional keys, arrows, pipe character (" | "), asterisk (\*), ?, [] and ESC are of great help for recalling to searching to clearing command line etc., Here are few of them:

- UP ( $\uparrow$ ) and DOWN ( $\downarrow$ ) arrows recall previously entered commands.
- ESC clears the present command line. It abandons the currently construct command and the next prompt appears.
- F1 or  $\rightarrow$  retypes one character at a time from the last command entry from the current cursor position.
- F2 retypes all characters from the last command entry up to the one identical to your next keystroke. It asks you to enter char to copy up to and retypes the last command up to that char.
- F3 retypes all remaining characters from the last command entry.
- F4 stores all characters beginning at the first match with your next keystroke and ending with the last command entry.
- F5 or F8 keys give all the previously typed commands.
- F6 places a special end-of-file code at the end of the currently open file. Sometimes referred to as Ctrl+z or ^z.
- F7 key displays command history and ALT+F7/ESC hides it.
- F9 is used to select a command by number. Just enter the command number and it fetches the command line for you.
- Pipe character (" | ") combines several series of commands or programs inter-dependent.
- Name enclosed within [] indicate a sub-directory.
- Asterisk (\*) is used to represent zero or more any characters.
- ? is used to present zero or single character.

MS-DOS commands perform tasks like:

- Manage files and directories
- Maintain Disks
- Configure Hardware and Networking
- Optimize the use of memory
- Customize MS-DOS

Most Commonly Used Internal DOS Commands

## 1. DATE

This command is used to display the system current date setting and prompt you to enter a new date. The syntax is: DATE [/T | date]

```
C:\>date  
The current date is: Tue 03/29/2011  
Enter the new date: (mm-dd-yy)  
  
C:\>date/t  
Tue 03/29/2011  
  
C:\>
```

1. If you type DATE without parameters then it displays current date and prompts to enter new date. We should give new date in mm-dd-yy format. If you want to keep the same date just Press ENTER. DATE command with /T switch tells the command to just output the current system date, without prompting for a new date.

## 2. TIME

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

The syntax is: TIME [/T | time]

```
C:\>time  
The current time is: 13:41:53.99  
Enter the new time:  
  
C:\>time/t  
01:42 PM  
  
C:\>
```

Same as DATE command, typing TIME with no parameters displays the current time and a prompt for a new one. Press ENTER to keep the same time. TIME

command used with /T switch tells the command to just output the current system time, without prompting for a new time.

## 1. COPY CON

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

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

## 2. TYPE

This command is used to display the contents of a text file or files. The syntax is: TYPE [drive:][path]filename

Now, lets try to display the contents of the file named filename we've created earlier using COPY CON command.

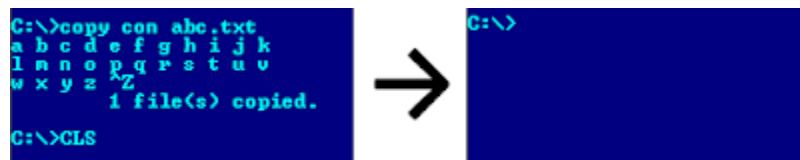
```
C:\>copy con filename
-----
COPY CON Command is used to
create a file in the existing
directory, so here we're creating
a file named filename in C drive.

To save and exit type F6, which I'm
gonna do now ^Z
    1 file(s) copied.

C:\>
```

## 3. CLS

It is used to clear the screen. Syntax is CLS



```
C:\>copy con abc.txt
a b c d e f g h i j k
l m n o p q r s t u v
w x y z ^Z
    1 file(s) copied.

C:\>CLS
```

## 4. REN

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

Syntax is: REN [drive:] [path] filename1 filename2.

Here, filename1 is source file for which you wanted to change the name, and filename2 will obviously becomes your new file name. Also note that you cannot specify a new drive or path for your destination file.

## 5. DIR

This command displays a list of files and subdirectories in a directory. Syntax is: DIR [drive:] [path] [filename]

[/A[[:]attributes]] [/B] [/C] [/D] [/L] [/N] [/O[[:]sortorder]] [/P] [/Q]  
 [/S] [/T[[:]timefield]] [/W] [/X] [/4]

Here,

[drive:][path][filename]	Specifies drive, directory, and/or files to list.
/A:attributes	Displays files with specified attributes. The possible attributes are as follow: D → Directories, R → Read-only files, H → Hidden files, A → Files ready for archiving, S → System files, – Prefix meaning not
/B	display in bare format with no heading information or summary
/C	Using this attribute with dir by default displays the thousand separator in file sizes. To disable display or separator use /-C
/D	Displays file list sorted by column.
/L	Uses lowercase in listing file names and sub-directories.
/N	Display in new long list format where filenames are on the far right.
/O:sortorder	Displays list by files in sorted order. The sortorder attributes are as follow: N → By name (alphabetic), S → By size (smallest first), E → By extension (alphabetic), D → By date/time (oldest first), G → Group directories first, – Prefix to reverse order
/P	Display page wise pausing after each screenful of information and prompts to press any key to continue.
/Q	Displays the owner of a file or files.
/S	Displays files in specified directory and all subdirectories. Bear caution in using this in your root directory as you may end up in overflowing information. To stop the screen overflow at any point hit Pause-Break key.
T:timefield	This sorts and displays the list based on time field specified. C for Creation, A for Last Access, W for Last Written
/W	Displays list width wise or wide list format.
/X	This is used to display the short names generated for non-8dot3 file names.

1. Note that switches may be different in the DIRCMD environment variable, in which case just override present switches by prefixing any switch with – (hyphen), for example instead of using /P use -P

## 2. PATH

This command displays the path that how we have come to the present position or sets a search path for executable files.

Its Syntax is PATH [[drive:]path[;...][;%PATH%]]

Typing PATH without any parameters displays the current path under current directory. Typing PATH ; clears all search-path settings and direct cmd.exe to search only in the current directory. And including %PATH% in the new path setting causes the old path to be appended to the new setting.

## 3. VER

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

## 4. VOL

It displays the disk volume label and serial number, if they exist for the drive specified. If no drive is specified it displays for the active drive.

Syntax is VOL [drive:]

```
C:\>vol
  Volume in drive C has no label.
  Volume Serial Number is EC21-77CD

C:\>vol e:
  Volume in drive E is New Volume
  Volume Serial Number is 60B4-4F09

C:\>
```

## 5. DEL/ERASE

Used to delete one or more files.

Syntax is DEL [/P] [/F] [/S] [/Q] [/A[[:.]attributes]] names

Here,

tr>

names	Specifies a list of one or more files or directories. Wildcards * and ? may be used to delete multiple files. * indicates group of unknown characters whereas using wildcard ? in file-names is for single unknown character. And using this command if a directory is specified, all files within the directory will be deleted.
-------	---

/P	Prompts for (Y)es/(N)o confirmation before deleting each file. 
/F	Used to force delete read-only files.
/S	Delete specified files from all subdirectories. If Command Extensions are enabled DEL and ERASE change while using /S switch such that it shows you only the files that are deleted, not the ones it could not find.
/Q	Delete in quite mode and do not ask if ok to delete on global wildcard
/A:attributes	Delete files based on specified attribute. The attributes are: R for Read-only files, S for System files, H for Hidden files, A for files ready for archiving and – Prefix meaning not.

## 6. COPY

This command is useful in copying one or more files to another file or location.

Syntax is COPY [/D] [/V] [/N] [/Y | /-Y] [/Z] [/A | /B] source [/A | /B] [+ source [/A | /B] [+ ...]] [destination [/A | /B]]

The different switches that can be used with this command as follow along with their use.

source	It specifies the file or files to be copied.
/A	Indicates an ASCII text file.
/B	This switch indicates a binary file.
/D	This allows the destination file to be created with decryption.
destination	This specifies the directory and/or filename for the new file or files.
/V	Helps to verify new files to be written correctly.

/N	Specifying this switch uses short filename, if available, when copying a file with a non-8dot3 file name.
/Y	If destination file already exists, this switch suppresses prompting to confirm you want to overwrite it and does it asap.
/-Y	Contrary to above switch, this causes prompting to confirm you want to overwrite an existing destination file.
/Z	Copies networked files in restartable mode.

For appending multiple files for source use wildcard or file1+file2+file3 format and make sure to specify a single file for destination.

## 6. MD, CD and RD

- MD (or MKDIR) command stand for make directory and it is used to create a directory. Syntax is MD [drive:]path
- CD (or CHDIR) stands for create or change directory and it allows to display the name of or change the current directory or rather we can say come out of a directory. Syntax is CD [/D] [drive:][path]
  - Typing CD drive: displays the current directory in the specified drive. This CD (or CHDIR) command does not treat spaces as delimiters due to which it allows to CD into a subdirectory name that contains a space without surrounding the name with quotes.

For example:

CHDIR program filesmozilla firefox

is the same as:

CHDIR “program filesmozilla firefox”

→ If you type CD without any parameters it displays current drive and directory. CD.. specifies that you want to change to the higher directory in the current path. Whereas, using CD you can directly change to parent/root directory from any location in the current drive.

→ Using /D switch changes current drive in addition to current directory for a drive.

```
C:\>CD /D e:\sftw
E:\sftw>
```

- RD (or RMDIR) command removes or deletes a directory. There are two conditions to remove any directory – (1) Directory to be removed should be empty. and (2) We should be outside the directory we are commanding to delete.

Syntax is RD [/S] [/Q] [drive:]path

Here, using the switch /S removes a directory tree meaning it removes all directories and files in the specified directory in addition to the directory itself. And using /Q is the quiet mode that doesn't ask for ok approval to remove a directory tree.

## 7. PROMPT

This changes the cmd.exe command prompt. By default the prompt is always set to the name of current drive followed by > sign.

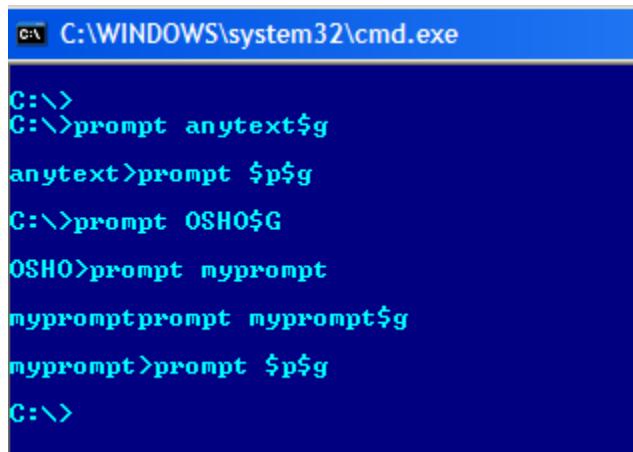
Customize the Prompt

To customize the prompt to display any text of your choice, use the syntax prompt anytext and this will change the prompt to new command prompt anytext.  
Prompt with Options (or Special Codes)

You can use prompt with options. To let the prompt display the current working directory use prompt \$p\$g

\$p in the above signifies the current drive and path.

\$g signifies the greater than sign >



The screenshot shows a Windows Command Prompt window with the title bar "C:\WINDOWS\system32\cmd.exe". The window contains the following text:

```
C:\>
C:\>prompt anytext$g
anytext>prompt $p$g
C:\>prompt OSHO$G
OSHO>prompt myprompt
myprompt>prompt myprompt$g
myprompt>prompt $p$g
C:\>
```

The other options used with prompt command are as follows.

Any combination of these can be used with prompt command.

\$A & (Ampersand)

\$B | (pipe character)

\$C ( (Left parenthesis)

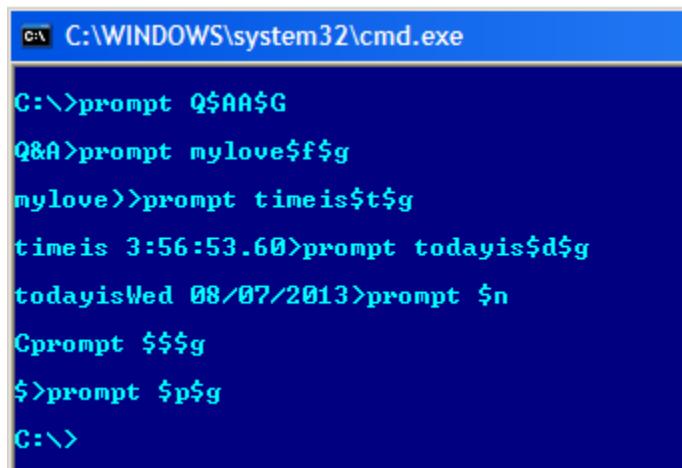
\$D Current date

\$E Escape code (ASCII code 27)

\$F ) (Right parenthesis)

\$H Backspace (erases previous character)

\$L < (less-than sign) \$N Current drive \$Q = (equal sign) \$T Current time \$V  
Windows XP version number \$\_ Carriage return and linefeed \$\$ \$ (dollar sign)



The screenshot shows a Windows Command Prompt window titled 'C:\WINDOWS\system32\cmd.exe'. The command line is C:\>. The output shows several prompt sequences:

```
C:\>prompt Q$AA$G
Q&A>prompt mylove$f$g
mylove>>prompt timeis$t$g
timeis 3:56:53.60>prompt todayis$d$g
todayisWed 08/07/2013>prompt $n
Cprompt $$$g
$>prompt $p$g
C:\>
```

## Most Commonly Used External DOS Commands

### 1. EDIT

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

Syntax is EDIT [/B] [/H] [/R] [/S] [filename(s)]

Using switch /B you can force the edit in monochrome mode. /H displays the maximum number of lines possible for your system hardware. Whereas using /R and /S one can load files in read-only mode and force the use of short filenames respectively. [filename(s)] is used to specify file(s) to go edit. You can use wildcards (\*) and (?) to specify multiple files.

### 2. XCOPY

This command is used to copy files and directory trees from one disk to another disk.

Syntax is XCOPY source [destination] [/A | /M] [/D[:date]] [/P] [/S  
[/E]] [/V] [/W] [/C] [/I] [/Q] [/F] [/L] [/G] [/H] [/R] [/T] [/U] [/K] [/N] [/O  
] [/X] [/Y] [/Y] [/Z] [/EXCLUDE:file1[+file2][+file3]...]

### 3. LABEL

It is used to create, change, or delete the volume label of a disk.

Syntax is LABEL [drive:] [label]

LABEL [/MP] [volume] [label]

Here, [drive:] is for specifying the drive letter of a drive to be labelled and [label] specifies the label of the volume disk. [/MP] is used to specify that the volume should be created as a mount point and [volume] is used to specify volume name, usually mentioned after drive letter followed by colon and then giving volume name required.

#### **4. DISKCOPY**

This command copies the contents of one floppy from the source drive to a formatted or un-formatted floppy disk in the destination drive. This command copies the data from particular position on the source disk to exactly the same position on the destination disk. Syntax Diskcopy A: B:  
copies contents of A: to B: drive. This command can be used with /V switch which verifies that the disk is copied correctly.

#### **5. CHKDSK**

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

Syntax is **CHKDSK [volume path] [/F] [/V] [/R] [/X] [/I] [/C] [/L[:size]]**  
[volume path] is where you specify the drive letter followed by a colon and volume name to be checked. using /F switch allows you to fix errors on the disk. /V display full path and/or cleanup message if any. /R is used in tandem with /F and used to locate bad sectors and recover readable information. If you wanted to perform a less vigorous check of index entries on the disk then the right option is to use /I or /C rather than /R as they skip checking of cycles on the volume and helps in reducing the amount of time required to run chkdsk. Using /X forces the volume to dismount first before checking is performed. /L:size is all about specifying the log file size in kilobytes.

#### **6. TREE**

This command is very useful to view the list of directories and subdirectories present on the disk in graphical form. If you wanted to include files also with directories and subdirectories, then you'll have to give the command line as tree/f which presents the tree view of all the content on your disk. Here is the syntax for this command with allowed switches:

**TREE [drive:path] [/F] [/A]**

In case you wanted use ASCII instead of extended characters, then go ahead include /A in the command line.

## **7. DELTREE**

This command is used to remove a directory along with its contents.  
Syntax is deltree [drive:path]

here, [drive:path] specifies the directory name to be deleted. All the subdirectories and files in this directory will be deleted without prompt and there's no getting back. So, keep caution while using this command.

## **8. DOSKEY**

This command is generally used to edits command lines and recalls commands.  
Syntax is DOSKEY [/REINSTALL] [/HISTORY] [text]

Here, /REINSTALL installs new copy of doskey, /HISTORY is used to display all previously given commands stored in memory. And [text] specifies the commands you want to record.

## **9. FIND**

This command searches for a specific text string in a file or files. Syntax is FIND [/V] [/C] [/N] [/I] [/OFF] "string" [[drive:][path]filename[ ...]]  
The basic essential elements in the command line for find are – the string enclosed in " " and [[drive:][path]filename(s)]. String specifies the text string to find in the file and [[drive:][path]filename(s)] specifies the file or files where the text string search is to be done. If a path is not specified, FIND searches the text typed at the prompt or piped from another command. When you append /OFF in the command line, it searches and finds even those files with offline attribute set. Apart from searching the text string, this command is useful in:

- Displaying all lines not containing the specified string @ /V
- Displaying only the number count of lines containing the text string @ /C
- Displaying line numbers with the displayed lines @ /N

## **10. SORT**

This command is used to arrange the data of a file in alphabetical order (A-Z, 0-9) or reverse alphabetical order.

Syntax is SORT [/R] [[drive1:][path1]filename1] [/T [drive2:][path2]] [/O [drive3:][path3]filename3]

/R in command line reverses the sort order; that is, the data of the specified file sorts Z to A, then 9 to 0. [drive1:][path1]filename1 specifies the file to be sorted. /T [drive2:][path2] is used in cases of data overflow in main memory and it specifies the path of the directory to hold the sort's working storage. And

/O [drive3:][path3]filename3 specifies the file where the sorted input is to be stored.

## 11. FORMAT

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

FORMAT with /S switch

When the disk is formatted with /s option, the disk can be used as a booting disk. C:>DOS>Format A: /s

The above command copies the OS files MSDOS.SYS, IO.SYS and COMMAND.COM which are required for booting the machine from your system startup drive to the newly formatted disk. The disk can then be used for booting.  
FORMAT with /U switch

Here's the command C:DOS>Format A: /U

This command specifies an Unconditional Format which destroys all existing data and prevents you from later unformatting the disk.

FORMAT with /Q switch

This can be used only with the previously formatted disk. This deletes FAT, Root directory and data of disk but doesn't scan for the bad errors. This is generally used for Quick formatting.

Warning As Format command deletes all existing data, use this command with extreme caution. Any disk formatted (except with /U switch) may be later unformatted using the UNFORMAT command.

## 12. BACKUP

The Backup command backs up one or more files from one disk to another. You can backup files onto either a hard disk or on a floppy disk. Syntax is  
BACKUP Source Destination

Here source specifies the location of files to be backed up and destination drive specifies the drive on which you want to store the backup files. The backed-up files are stored in backup.nnn and control.nnn files where nnn represents the backup disk number.

### **Backup with Switches**

- The /S switch can be used to backup the contents of all files in the source including the contents of sub-directories.
- The /N switch can be used to backup only those files that have changed since the last backup.
- Backup command with /D:mm-dd-yyyy switch will backup files that have changed since the date specified.

## **13. RESTORE**

The RESTORE command restores files that were backed up by using BACKUP command. Syntax: RESTORE drive1 drive2:path

Here drive1 specifies the drive on which backup files are stored.

drive2:path specifies the path to which those backup files will be restored.

► Using backup command with /S switch is used to restore all backup files to their original directories and sub-directories.

### **Batch Files**

A batch file is a text file containing a series of commands that the operating system will carry out for you, one at a time. A batch file is a batches (bundles or packages) of DOS commands into a single file. MS-DOS batch files consist of the normal operating system commands (e.g. DIR, DEL, COPY and MKDIR) together with some extra commands such as IF, FOR, GOTO, SHIFT and PAUSE that provide conditional control of execution and enable PARAMETERS to be passed so that the same batch file can be used in many different contexts. Under UNIX, batch files are called SHELL SCRIPTS, and are written in a c-like scripting language.

A batch file, such as WP.BAT, ends with the letters .BAT. When the user types in the name of a batch file and presses Enter at the DOS prompt, the commands in that batch file are performed one at a time-with no additional instructions from the user. For example, if the user typed WP and pressed Enter, WordPerfect (a popular word processing program) would start.

Batch files are great when you use a given set of commands repeatedly-instead of activating each command separately every time you want to carry out that set of commands, you can accomplish the same thing in one step.

A user can create a batch file to perform any routine task. For example, a batch file could be created to prepare a disk for use (a process called formatting). Because the commands are in a batch file, the user doesn't have to type them herself, or even remember what they are-all the user would have to do is type the name of this batch file to format a disk.

## **The most important batch file is the AUTOEXEC BAT.**

This file contains commands that are performed automatically each time the PC is turned on or restarted. Typical AUTOEXEC BAT commands include those which change the system prompt, display the current date and time, and set the directories in which DOS looks for files.

Batch files were very important before Windows came along, when everyone had to deal with DOS (the PC's operating system). DOS required the user to type everything in-which made each task tedious and easy to make mistakes. Batch files eliminated mistakes because the user no longer typed in the command, just the name of the batch file. With Windows, there is little typing involved in issuing commands.

Instead, the user selects commands from a list called a menu, or he selects an icon that represents the command he wants performed. Automation is still desirable in Windows, but instead of saving a list of typed commands, the user records his actions and saves them in a macro. A macro is like a batch file; when it's activated, the actions recorded in the macro are carried out.

### **Batch processing:**

The grouping together of several processing jobs to be executed one after another by a computer, without any user interaction. This is achieved by placing a list of the commands to start the required jobs into a BATCH FILE that can be executed as if it were a single program: hence batch processing is most often used in operating systems that have a COMMAND LINE user interface. Indeed, batch processing was the normal mode of working in the early days of mainframe computers, but modern personal computer applications typically require frequent user interaction, making them unsuitable for batch execution.

Running a batch file is one example of batch processing, but there are plenty of others. When you select several documents from the same application and print them all in one step (if the application allows you to do that), you are "batch printing," which is a form of batch processing. Or let's say that you want to send a whole group of files to someone else via your modem-if your communications software permits batch processing, you can choose all the files you want to send, and have the software send them off in a batch while you go to the kitchen for a snack. Batch processing is a good feature to have in most applications.

### **What is Batch Processing Operating System?**

To avoid the problems of early systems the batch processing systems were introduced. The problem of early systems was more setup time. So the problem of more set up time was reduced by processing the jobs in batches, known as batch processing system. In this approach similar jobs were submitted to the CPU for processing and were run together.

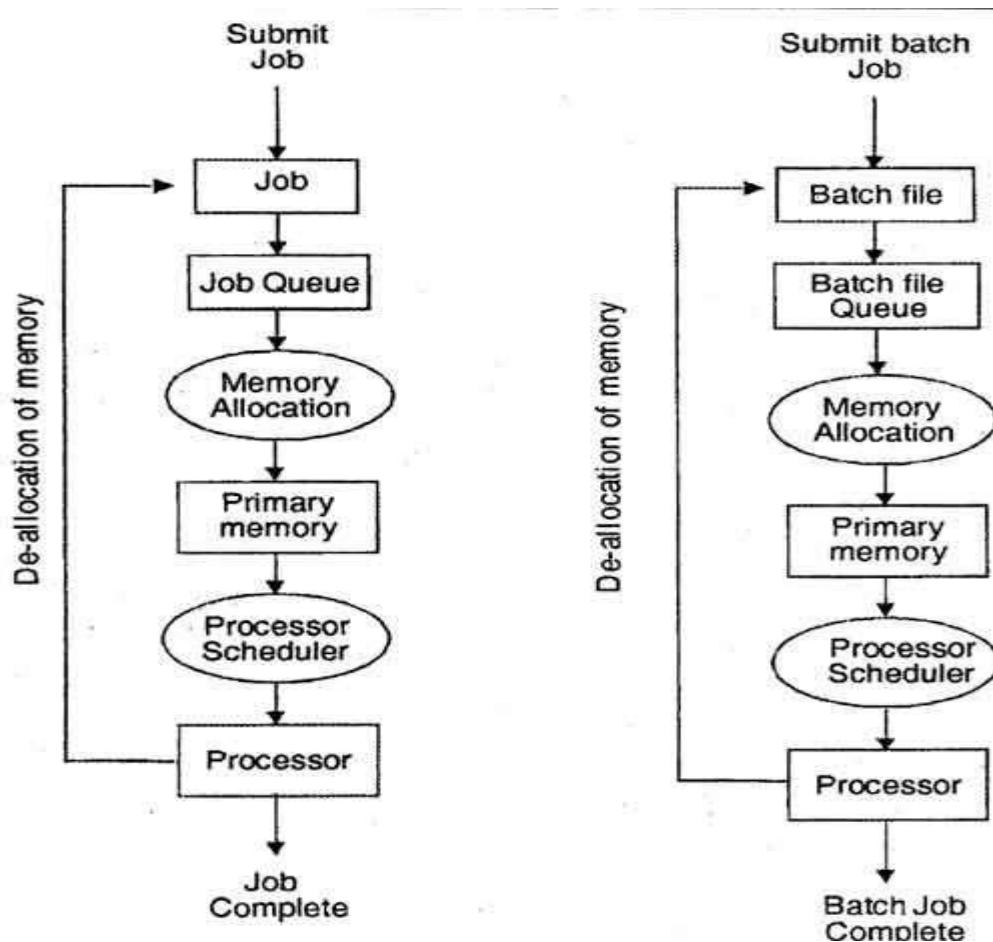
The main function of a batch processing system is to automatically keep executing the jobs in a batch. This is the important task of a batch processing system i.e. performed by the 'Batch Monitor' resided in the low end of main memory.

This technique was possible due to the invention of hard-disk drives and card readers. Now the jobs could be stored on the disk to create the pool of jobs for its execution as a batch. First the pooled jobs are read and executed by the batch monitor, and then these jobs are grouped; placing the identical jobs (jobs with the similar needs) in the same batch. So, in the batch processing system, the batched jobs were executed automatically one after another saving its time by performing the activities (like loading of compiler) only for once. It resulted in improved system utilization due to reduced turn around time.

In the early job processing systems, the jobs were placed in a job queue and the memory allocate or managed the primary memory space, when space was available in the main memory, a job was selected from the job queue and was loaded into memory.

Once the job loaded into primary memory, it competes for the processor. When the processor became available, the processor scheduler selects job that was loaded in the memory and execute it.

In batch strategy is implemented to provide a batch file processing. So in this approach files of the similar batch are processed to speed up the task.



## **Batch File Processing**

In batch processing the user were supposed to prepare a program as a deck of punched cards. The header cards in the deck were the “job control” cards which would indicate that which compiler was to be used (like FORTRAN, COBOL compilers etc). The deck of cards would be handed in to an operator who would collect such jobs from various users. Then the submitted jobs were ‘grouped as FORTRAN jobs, COBOL jobs etc. In addition, these jobs were classified as ‘long jobs’ that required more processing time or short jobs which required a short processing time. Each set of jobs was considered as a batch and the processing would be done for a batch. For instance, there maybe a batch of short FORTRAN jobs. The output for each job would be separated and turned over to users in a collection area. So in this approach, files of the similar batch were processed to speed up the task.

In this environment there was no interactivity and the users had no direct control. In this system, only one job could engage the processor at a time and if there was any input/ output operation the processor had to sit idle till the completion of I/O job. So it resulted to the under utilization of CPU time.

In batch processing system, earlier; the jobs were scheduled in the order of their arrival i.e. First Come First Served (FCFS). Even though this scheduling method was easy and simple to implement but unfair for the situations where long jobs are queued ahead of the short jobs. To overcome this problem, another scheduling method named as ‘Shortest Job First’ was used. As memory management is concerned, the main memory was partitioned into two fixed partitions. The lower end of this partition was assigned to the resident portion of the OS i.e. named as Batch Monitor. Whereas, the other partition (higher end) was assigned to the user programs.

Though, it was an improved technique in reducing the system setup time but still there were some limitations with this technique like as under-utilization of CPU time, non-interactivity of user with the running jobs etc. In batch processing system, the jobs of a batch were executed one after another. But while these jobs were performing I/O operations; meantime the CPU was sitting idle resulting to low degree of resource utilization.

## **Types of O.S.**

Following are some of the most widely used types of Operating system.

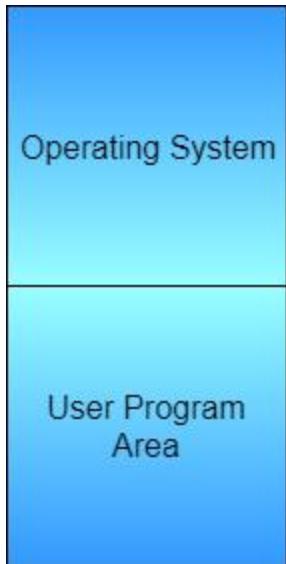
1. Simple Batch System
2. Multiprogramming Batch System
3. Multiprocessor System
4. Desktop System
5. Distributed Operating System
6. Clustered System
7. Realtime Operating System
8. Handheld System

### **Simple Batch Systems**

- In this type of system, there is no direct interaction between user and the computer.
- The user has to submit a job (written on cards or tape) to a computer operator.
- Then computer operator places a batch of several jobs on an input device.
- Jobs are batched together by type of languages and requirement.
- Then a special program, the monitor, manages the execution of each program in the batch.
- The monitor is always in the main memory and available for execution.

### **Advantages of Simple Batch Systems**

1. No interaction between user and computer.
2. No mechanism to prioritise the processes.

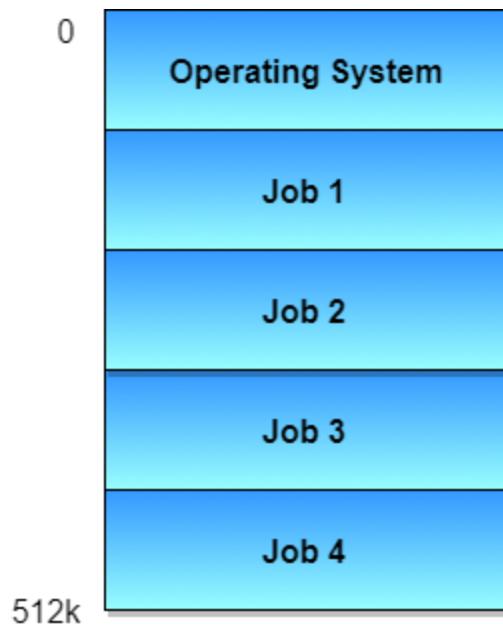


## Multiprogramming Batch Systems

- In this the operating system picks up and begins to execute one of the jobs from memory.
- Once this job needs an I/O operation operating system switches to another job (CPU and OS always busy).
- Jobs in the memory are always less than the number of jobs on disk(Job Pool).
- If several jobs are ready to run at the same time, then the system chooses which one to run through the process of CPU Scheduling.
- In Non-multiprogrammed system, there are moments when CPU sits idle and does not do any work.
- In Multiprogramming system, CPU will never be idle and keeps on processing.

Time Sharing Systems are very similar to Multiprogramming batch systems. In fact time sharing systems are an extension of multiprogramming systems.

In Time sharing systems the prime focus is on minimizing the response time, while in multiprogramming the prime focus is to maximize the CPU usage.



## Multiprocessor Systems

A Multiprocessor system consists of several processors that share a common physical memory. Multiprocessor system provides higher computing power and speed. In multiprocessor system all processors operate under single operating system. Multiplicity of the processors and how they do act together are transparent to the others.

## Advantages of Multiprocessor Systems

1. Enhanced performance
2. Execution of several tasks by different processors concurrently, increases the system's throughput without speeding up the execution of a single task.
3. If possible, system divides task into many subtasks and then these subtasks can be executed in parallel in different processors. Thereby speeding up the execution of single tasks.

## Desktop Systems

Earlier, CPUs and PCs lacked the features needed to protect an operating system from user programs. PC operating systems therefore were neither multiuser nor multitasking. However, the goals of these operating systems have changed with time; instead of

maximizing CPU and peripheral utilization, the systems opt for maximizing user convenience and responsiveness. These systems are called Desktop Systems and include PCs running Microsoft Windows and the Apple Macintosh. Operating systems for these computers have benefited in several ways from the development of operating systems for mainframes.

Microcomputers were immediately able to adopt some of the technology developed for larger operating systems. On the other hand, the hardware costs for microcomputers are sufficiently low that individuals have sole use of the computer, and CPU utilization is no longer a prime concern. Thus, some of the design decisions made in operating systems for mainframes may not be appropriate for smaller systems.

## **Distributed Operating System**

The motivation behind developing distributed operating systems is the availability of powerful and inexpensive microprocessors and advances in communication technology.

These advancements in technology have made it possible to design and develop distributed systems comprising of many computers that are interconnected by communication networks. The main benefit of distributed systems is its low price/performance ratio.

### **Advantages Distributed Operating System**

1. As there are multiple systems involved, user at one site can utilize the resources of systems at other sites for resource-intensive tasks.
2. Fast processing.
3. Less load on the Host Machine.

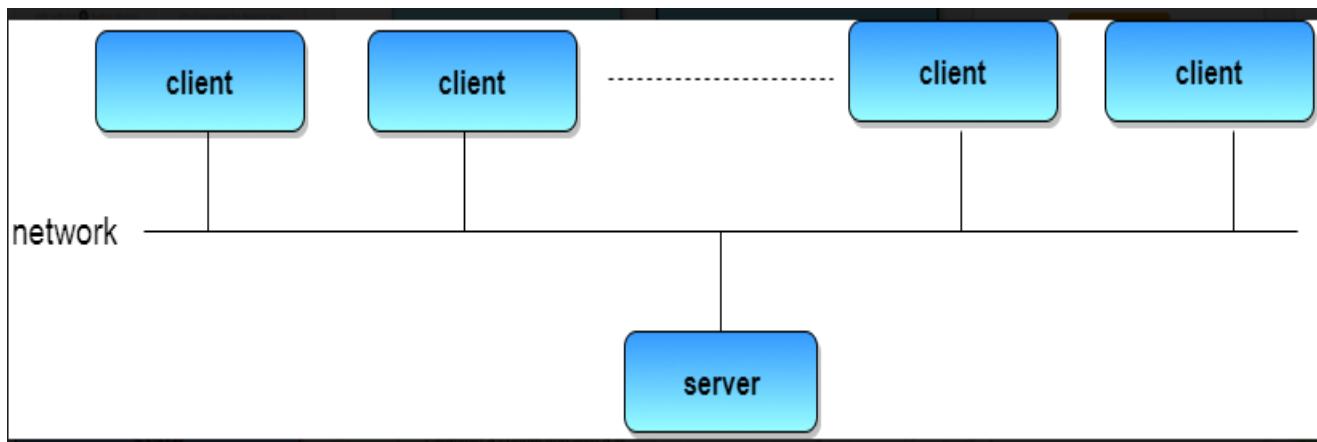
### **Types of Distributed Operating Systems**

Following are the two types of distributed operating systems used:

1. Client-Server Systems
2. Peer-to-Peer Systems

## **Client-Server Systems**

Centralized systems today act as server systems to satisfy requests generated by client systems. The general structure of a client-server system is depicted in the figure below:



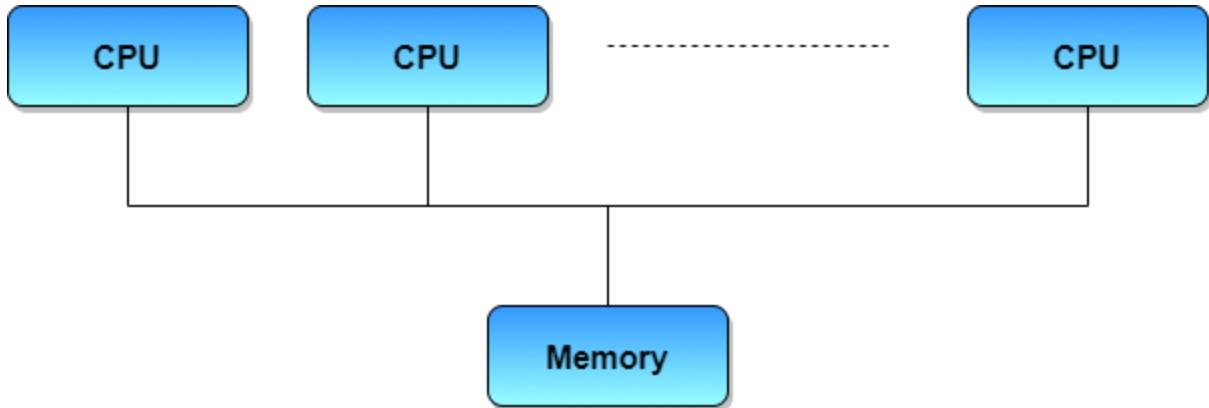
Server Systems can be broadly categorized as: Compute Servers and File Servers.

- Compute Server systems, provide an interface to which clients can send requests to perform an action, in response to which they execute the action and send back results to the client.
- File Server systems, provide a file-system interface where clients can create, update, read, and delete files.

## **Peer-to-Peer Systems**

The growth of computer networks - especially the Internet and World Wide Web (WWW) – has had a profound influence on the recent development of operating systems. When PCs were introduced in the 1970s, they were designed for personal use and were generally considered standalone computers. With the beginning of widespread public use of the Internet in the 1990s for electronic mail and FTP, many PCs became connected to computer networks.

In contrast to the Tightly Coupled systems, the computer networks used in these applications consist of a collection of processors that do not share memory or a clock. Instead, each processor has its own local memory. The processors communicate with one another through various communication lines, such as high-speed buses or telephone lines. These systems are usually referred to as loosely coupled systems (or distributed systems). The general structure of a client-server system is depicted in the figure below:



## Clustered Systems

- Like parallel systems, clustered systems gather together multiple CPUs to accomplish computational work.
- Clustered systems differ from parallel systems, however, in that they are composed of two or more individual systems coupled together.
- The definition of the term clustered is not concrete; the general accepted definition is that clustered computers share storage and are closely linked via LAN networking.
- Clustering is usually performed to provide high availability.
- A layer of cluster software runs on the cluster nodes. Each node can monitor one or more of the others. If the monitored machine fails, the monitoring machine can take ownership of its storage, and restart the application(s) that were running on the failed machine. The failed machine can remain down, but the users and clients of the application would only see a brief interruption of service.
- Asymmetric Clustering - In this, one machine is in hot standby mode while the other is running the applications. The hot standby host (machine) does nothing but monitor the active server. If that server fails, the hot standby host becomes the active server.

- Symmetric Clustering - In this, two or more hosts are running applications, and they are monitoring each other. This mode is obviously more efficient, as it uses all of the available hardware.
- Parallel Clustering - Parallel clusters allow multiple hosts to access the same data on the shared storage. Because most operating systems lack support for this simultaneous data access by multiple hosts, parallel clusters are usually accomplished by special versions of software and special releases of applications.

Clustered technology is rapidly changing. Clustered system's usage and its features should expand greatly as Storage Area Networks(SANs). SANs allow easy attachment of multiple hosts to multiple storage units. Current clusters are usually limited to two or four hosts due to the complexity of connecting the hosts to shared storage.

## **Real Time Operating System**

It is defined as an operating system known to give maximum time for each of the critical operations that it performs, like OS calls and interrupt handling.

The Real-Time Operating system which guarantees the maximum time for critical operations and complete them on time are referred to as Hard Real-Time Operating Systems.

While the real-time operating systems that can only guarantee a maximum of the time, i.e. the critical task will get priority over other tasks, but no assurance of completing it in a defined time. These systems are referred to as Soft Real-Time Operating Systems.

## **Handheld Systems**

Handheld systems include Personal Digital Assistants(PDAs), such as Palm-Pilots or Cellular Telephones with connectivity to a network such as the Internet. They are usually of limited size due to which most handheld devices have a small amount of memory, include slow processors, and feature small display screens.

- Many handheld devices have between 512 KB and 8 MB of memory. As a result, the operating system and applications must manage memory efficiently. This includes returning all allocated memory back to the memory manager once the memory is no longer being used.

- Currently, many handheld devices do not use virtual memory techniques, thus forcing program developers to work within the confines of limited physical memory.
- Processors for most handheld devices often run at a fraction of the speed of a processor in a PC. Faster processors require more power. To include a faster processor in a handheld device would require a larger battery that would have to be replaced more frequently.
- The last issue confronting program designers for handheld devices is the small display screens typically available. One approach for displaying the content in web pages is web clipping, where only a small subset of a web page is delivered and displayed on the handheld device.

Some handheld devices may use wireless technology such as BlueTooth, allowing remote access to e-mail and web browsing. Cellular telephones with connectivity to the Internet fall into this category. Their use continues to expand as network connections become more available and other options such as cameras and MP3 players, expand their utility.

### **What is a Process?**

A process is a program in execution. Process is not as same as program code but a lot more than it. A process is an 'active' entity as opposed to program which is considered to be a 'passive' entity. Attributes held by process include hardware state, memory, CPU etc.

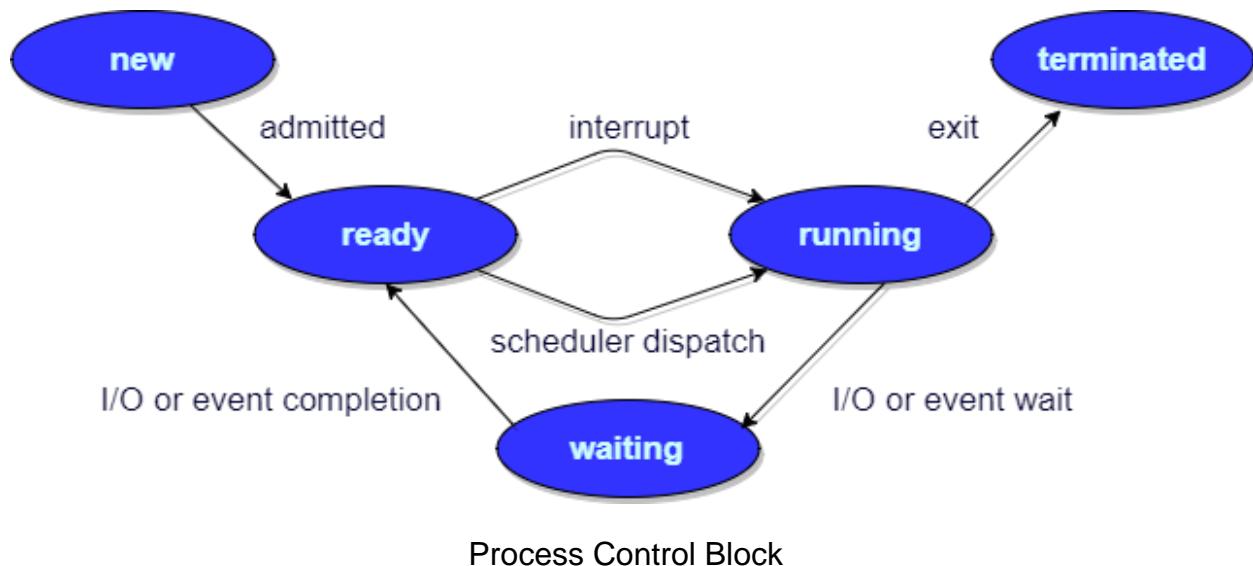
Process memory is divided into four sections for efficient working :

- The Text section is made up of the compiled program code, read in from non-volatile storage when the program is launched.
- The Data section is made up the global and static variables, allocated and initialized prior to executing the main.
- The Heap is used for the dynamic memory allocation, and is managed via calls to new, delete, malloc, free, etc.
- The Stack is used for local variables. Space on the stack is reserved for local variables when they are declared.

## Different Process States

Processes in the operating system can be in any of the following states:

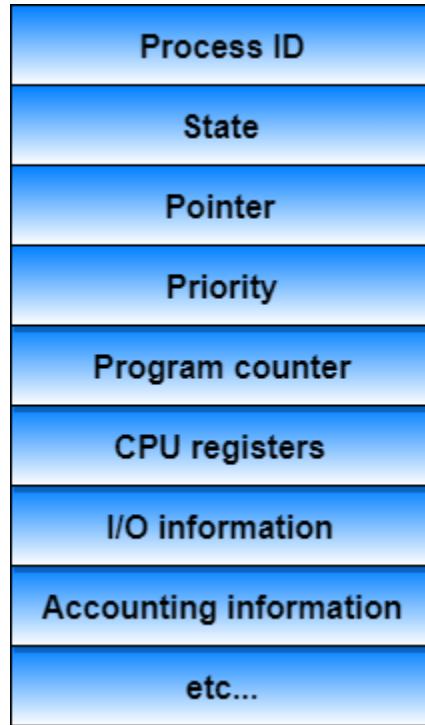
- NEW- The process is being created.
- READY- The process is waiting to be assigned to a processor.
- RUNNING- Instructions are being executed.
- WAITING- The process is waiting for some event to occur(such as an I/O completion or reception of a signal).
- TERMINATED- The process has finished execution.



There is a Process Control Block for each process, enclosing all the information about the process. It is a data structure, which contains the following:

- Process State: It can be running, waiting etc.
- Process ID and the parent process ID.
- CPU registers and Program Counter. Program Counter holds the address of the next instruction to be executed for that process.
- CPU Scheduling information: Such as priority information and pointers to scheduling queues.

- Memory Management information: For example, page tables or segment tables.
- Accounting information: The User and kernel CPU time consumed, account numbers, limits, etc.
- I/O Status information: Devices allocated, open file tables, etc.
- 



## **What is Process Scheduling?**

The act of determining which process is in the ready state, and should be moved to the running state is known as Process Scheduling.

The prime aim of the process scheduling system is to keep the CPU busy all the time and to deliver minimum response time for all programs. For achieving this, the scheduler must apply appropriate rules for swapping processes IN and OUT of CPU.

Scheduling falls into one of the two general categories:

- Non Pre-emptive Scheduling: When the currently executing process gives up the CPU voluntarily.

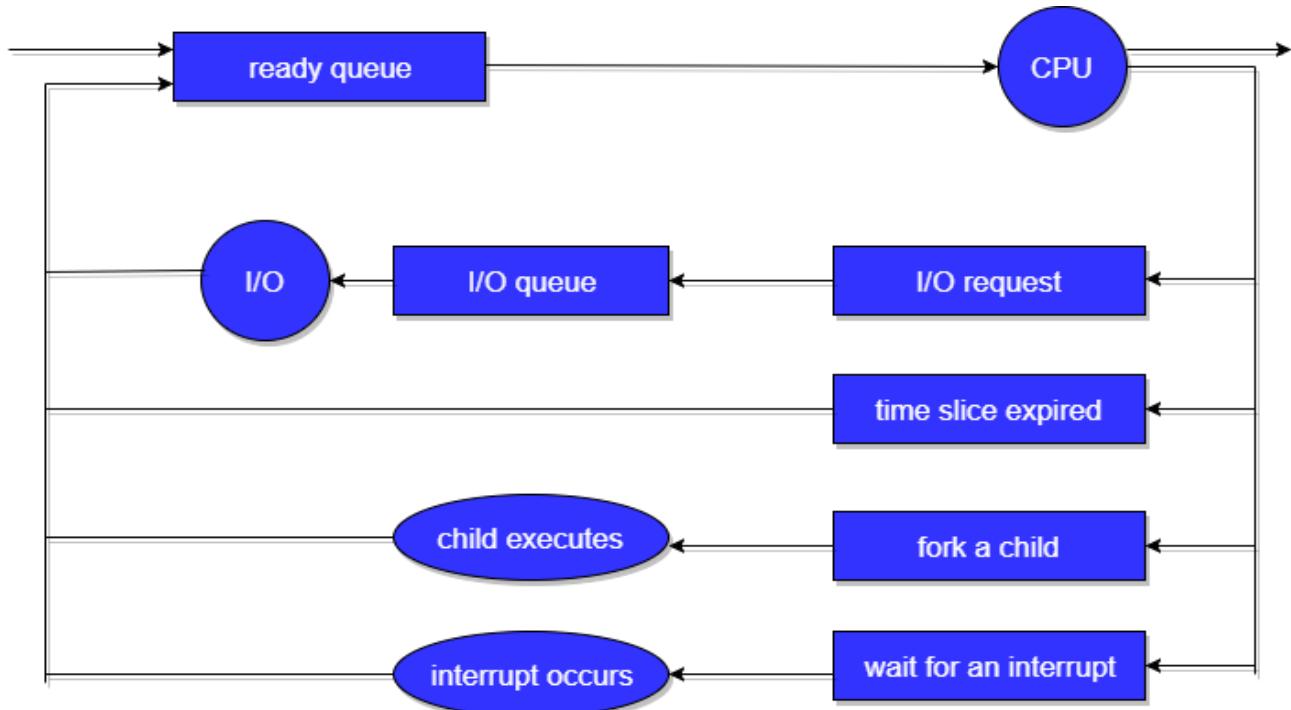
- Pre-emptive Scheduling: When the operating system decides to favour another process, pre-empting the currently executing process.

## What are Scheduling Queues?

- All processes, upon entering into the system, are stored in the Job Queue.
- Processes in the Ready state are placed in the Ready Queue.
- Processes waiting for a device to become available are placed in Device Queues. There are unique device queues available for each I/O device.

A new process is initially put in the Ready queue. It waits in the ready queue until it is selected for execution(or dispatched). Once the process is assigned to the CPU and is executing, one of the following several events can occur:

- The process could issue an I/O request, and then be placed in the I/O queue.
- The process could create a new subprocess and wait for its termination.
- The process could be removed forcibly from the CPU, as a result of an interrupt, and be put back in the ready queue.



In the first two cases, the process eventually switches from the waiting state to the ready state, and is then put back in the ready queue. A process continues this cycle until it terminates, at which time it is removed from all queues and has its PCB and resources deallocated.

## **Types of Schedulers**

There are three types of schedulers available:

1. Long Term Scheduler
2. Short Term Scheduler
3. Medium Term Scheduler

Let's discuss about all the different types of Schedulers in detail:

### **Long Term Scheduler**

Long term scheduler runs less frequently. Long Term Schedulers decide which program must get into the job queue. From the job queue, the Job Processor, selects processes and loads them into the memory for execution. Primary aim of the Job Scheduler is to maintain a good degree of Multiprogramming. An optimal degree of Multiprogramming means the average rate of process creation is equal to the average departure rate of processes from the execution memory.

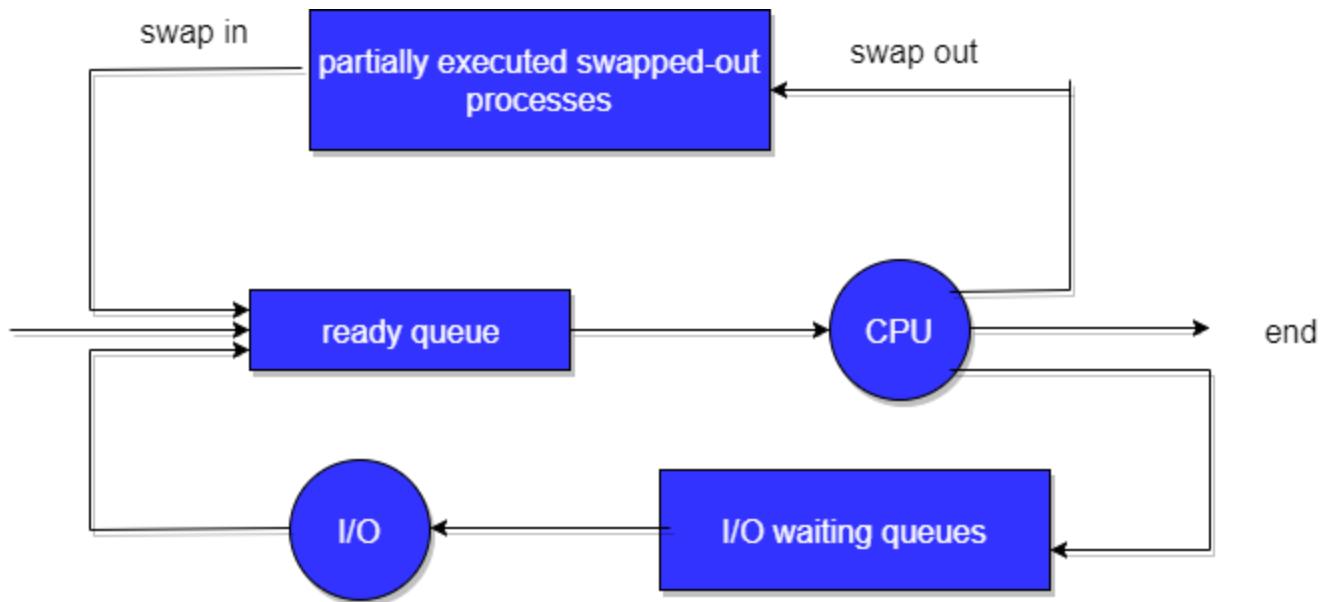
### **Short Term Scheduler**

This is also known as CPU Scheduler and runs very frequently. The primary aim of this scheduler is to enhance CPU performance and increase process execution rate.

### **Medium Term Scheduler**

This scheduler removes the processes from memory (and from active contention for the CPU), and thus reduces the degree of multiprogramming. At some later time, the process can be reintroduced into memory and its execution can be continued where it left off. This scheme is called swapping. The process is swapped out, and is later swapped in, by the medium term scheduler.

Swapping may be necessary to improve the process mix, or because a change in memory requirements has overcommitted available memory, requiring memory to be freed up. This complete process is described in the below diagram:



**Addition of Medium-term scheduling to the queueing diagram.**

### What is Context Switch?

1. Switching the CPU to another process requires saving the state of the old process and loading the saved state for the new process. This task is known as a Context Switch.
2. The context of a process is represented in the Process Control Block(PCB) of a process; it includes the value of the CPU registers, the process state and memory-management information. When a context switch occurs, the Kernel saves the context of the old process in its PCB and loads the saved context of the new process scheduled to run.
3. Context switch time is pure overhead, because the system does no useful work while switching. Its speed varies from machine to machine, depending on the memory speed, the number of registers that must be copied, and the existence of special instructions(such as a single instruction to load or store all registers). Typical speeds range from 1 to 1000 microseconds.
4. Context Switching has become such a performance bottleneck that programmers are using new structures(threads) to avoid it whenever and wherever possible.

## Operations on Process

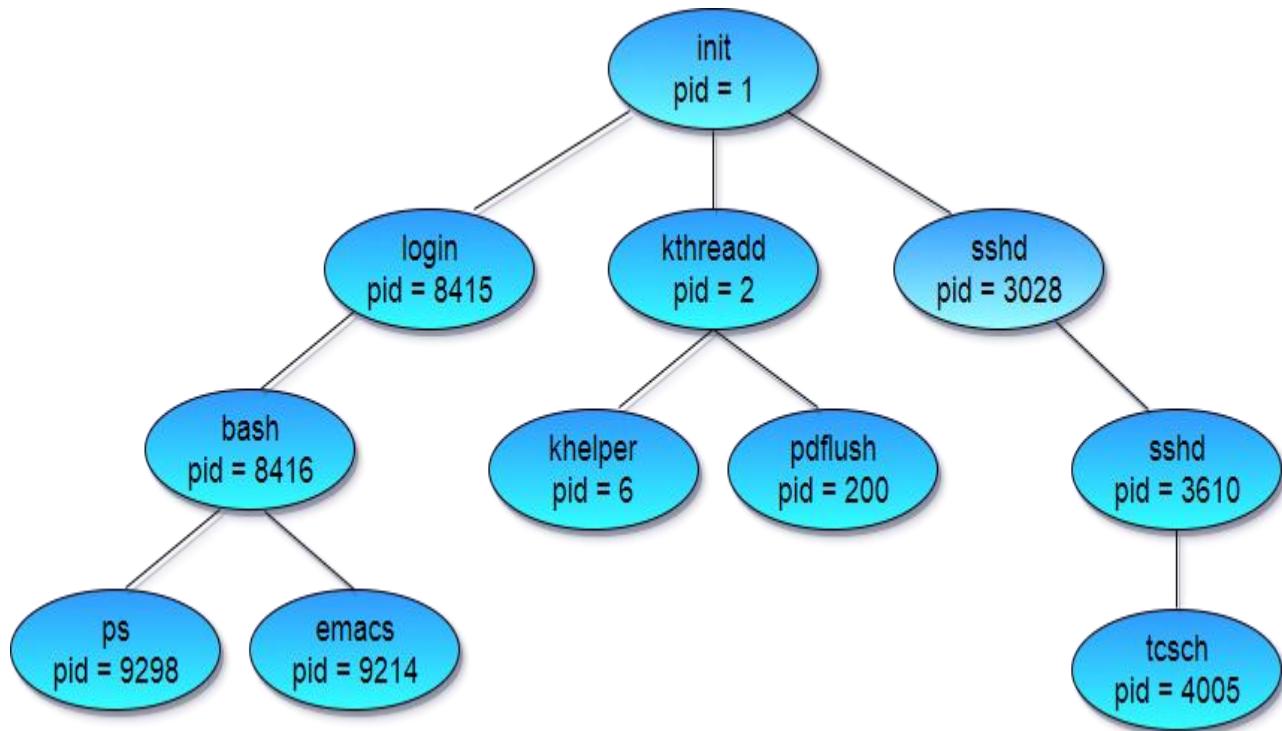
Below we have discussed the two major operation Process Creation and Process Termination.

### Process Creation

Through appropriate system calls, such as fork or spawn, processes may create other processes. The process which creates other process, is termed the **parent** of the other process, while the created sub-process is termed its **child**.

Each process is given an integer identifier, termed as process identifier, or PID. The parent PID (PPID) is also stored for each process.

On a typical UNIX systems the process scheduler is termed as sched, and is given PID 0. The first thing done by it at system start-up time is to launch init, which gives that process PID 1. Further Init launches all the system daemons and user logins, and becomes the ultimate parent of all other processes.



A child process may receive some amount of shared resources with its parent depending on system implementation. To prevent runaway children from consuming all of a certain system resource, child processes may or may not be limited to a subset of the resources originally allocated to the parent.

There are two options for the parent process after creating the child :

- Wait for the child process to terminate before proceeding. Parent process makes a `wait()` system call, for either a specific child process or for any particular child process, which causes the parent process to block until the `wait()` returns. UNIX shells normally wait for their children to complete before issuing a new prompt.
- Run concurrently with the child, continuing to process without waiting. When a UNIX shell runs a process as a background task, this is the operation seen. It is also possible for the parent to run for a while, and then wait for the child later, which might occur in a sort of a parallel processing operation.

There are also two possibilities in terms of the address space of the new process:

1. The child process is a duplicate of the parent process.
2. The child process has a program loaded into it.

To illustrate these different implementations, let us consider the UNIX operating system. In UNIX, each process is identified by its process identifier, which is a unique integer. A new process is created by the `fork` system call. The new process consists of a copy of the address space of the original process. This mechanism allows the parent process to communicate easily with its child process. Both processes (the parent and the child) continue execution at the instruction after the `fork` system call, with one difference: The return code for the `fork` system call is zero for the new(child) process, whereas the(non zero) process identifier of the child is returned to the parent.

Typically, the `execvp` system call is used after the `fork` system call by one of the two processes to replace the process memory space with a new program. The `execvp` system call loads a binary file into memory - destroying the memory image of the program containing the `execvp` system call – and starts its execution. In this manner the two processes are able to communicate, and then to go their separate ways.

Below is a C program to illustrate forking a separate process using UNIX(made using Ubuntu):

```
#include<stdio.h>

void main(int argc, char *argv[])
{
    int pid;

    /* Fork another process */
    pid = fork();

    if(pid < 0)
    {
        //Error occurred
        fprintf(stderr, "Fork Failed");
        exit(-1);
    }
    else if (pid == 0)
    {
        //Child process
        execlp("/bin/ls","ls",NULL);
    }
    else
    {
        //Parent process
        //Parent will wait for the child to complete
        wait(NULL);
        printf("Child complete");
    }
}
```

```
    exit(0);  
}  
}
```

**GATE Numerical Tip:** If **fork** is called for n times, the number of child processes or new processes created will be:  $2^n - 1$ .

## Process Termination

By making the **exit**(system call), typically returning an int, processes may request their own termination. This int is passed along to the parent if it is doing a **wait()**, and is typically zero on successful completion and some non-zero code in the event of any problem.

Processes may also be terminated by the system for a variety of reasons, including :

- The inability of the system to deliver the necessary system resources.
- In response to a KILL command or other unhandled process interrupts.
- A parent may kill its children if the task assigned to them is no longer needed i.e. if the need of having a child terminates.
- If the parent exits, the system may or may not allow the child to continue without a parent (In UNIX systems, orphaned processes are generally inherited by **init**, which then proceeds to kill them.)

When a process ends, all of its system resources are freed up, open files flushed and closed, etc. The process termination status and execution times are returned to the parent if the parent is waiting for the child to terminate, or eventually returned to **init** if the process already became an orphan.

The processes which are trying to terminate but cannot do so because their parent is not waiting for them are termed zombies. These are eventually inherited by **init** as orphans and killed off.

## What is CPU Scheduling?

CPU scheduling is a process which allows one process to use the CPU while the execution of another process is on hold(in waiting state) due to unavailability of any resource like I/O etc, thereby making full use of CPU. The aim of CPU scheduling is to make the system efficient, fast and fair.

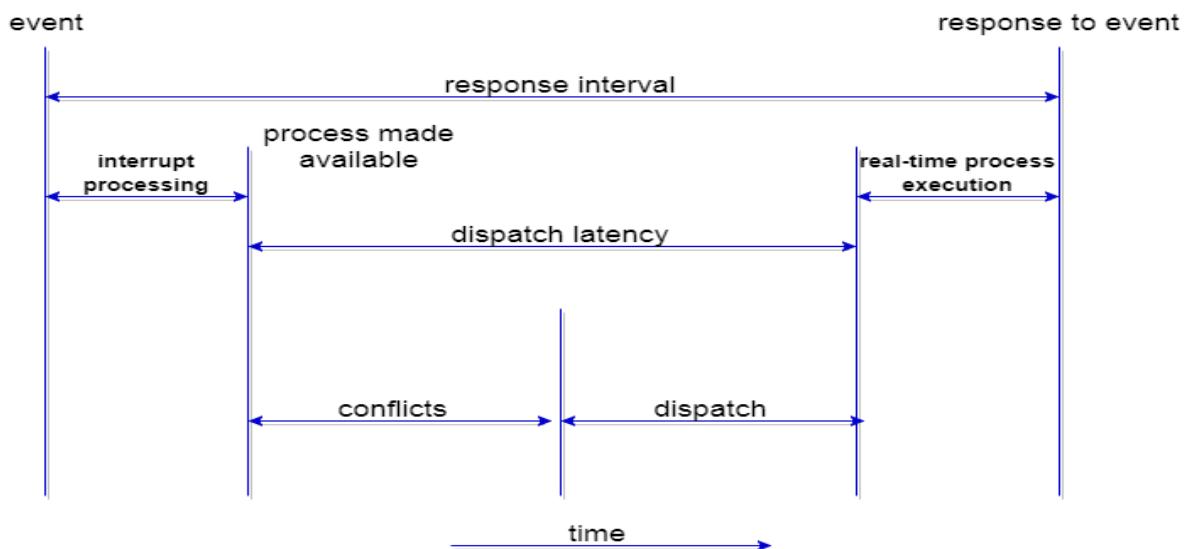
Whenever the CPU becomes idle, the operating system must select one of the processes in the ready queue to be executed. The selection process is carried out by the short-term scheduler (or CPU scheduler). The scheduler selects from among the processes in memory that are ready to execute, and allocates the CPU to one of them.

## CPU Scheduling: Dispatcher

Another component involved in the CPU scheduling function is the Dispatcher. The dispatcher is the module that gives control of the CPU to the process selected by the short-term scheduler. This function involves:

- Switching context
- Switching to user mode
- Jumping to the proper location in the user program to restart that program from where it left last time.

The dispatcher should be as fast as possible, given that it is invoked during every process switch. The time taken by the dispatcher to stop one process and start another process is known as the Dispatch Latency. Dispatch Latency can be explained using the below figure:



## **Types of CPU Scheduling**

CPU scheduling decisions may take place under the following four circumstances:

1. When a process switches from the running state to the waiting state(for I/O request or invocation of wait for the termination of one of the child processes).
2. When a process switches from the running state to the ready state (for example, when an interrupt occurs).
3. When a process switches from the waiting state to the ready state(for example, completion of I/O).
4. When a process terminates.

In circumstances 1 and 4, there is no choice in terms of scheduling. A new process(if one exists in the ready queue) must be selected for execution. There is a choice, however in circumstances 2 and 3.

When Scheduling takes place only under circumstances 1 and 4, we say the scheduling scheme is non-preemptive; otherwise the scheduling scheme is preemptive.

### **Non-Preemptive Scheduling**

Under non-preemptive scheduling, once the CPU has been allocated to a process, the process keeps the CPU until it releases the CPU either by terminating or by switching to the waiting state.

This scheduling method is used by the Microsoft Windows 3.1 and by the Apple Macintosh operating systems.

It is the only method that can be used on certain hardware platforms, because It does not require the special hardware(for example: a timer) needed for preemptive scheduling.

### **Preemptive Scheduling**

In this type of Scheduling, the tasks are usually assigned with priorities. At times it is necessary to run a certain task that has a higher priority before another task although it is running. Therefore, the running task is interrupted for some time and resumed later when the priority task has finished its execution.

## **CPU Scheduling: Scheduling Criteria**

There are many different criterias to check when considering the "best" scheduling algorithm, they are:

### **CPU Utilization**

To make out the best use of CPU and not to waste any CPU cycle, CPU would be working most of the time(Ideally 100% of the time). Considering a real system, CPU usage should range from 40% (lightly loaded) to 90% (heavily loaded.)

### **Throughput**

It is the total number of processes completed per unit time or rather say total amount of work done in a unit of time. This may range from 10/second to 1/hour depending on the specific processes.

### **Turnaround Time**

It is the amount of time taken to execute a particular process, i.e. The interval from time of submission of the process to the time of completion of the process(Wall clock time).

### **Waiting Time**

The sum of the periods spent waiting in the ready queue amount of time a process has been waiting in the ready queue to acquire get control on the CPU.

### **Load Average**

It is the average number of processes residing in the ready queue waiting for their turn to get into the CPU.

### **Response Time**

Amount of time it takes from when a request was submitted until the first response is produced. Remember, it is the time till the first response and not the completion of process execution(final response).

In general CPU utilization and Throughput are maximized and other factors are reduced for proper optimization.

## **Scheduling Algorithms**

To decide which process to execute first and which process to execute last to achieve maximum CPU utilisation, computer scientists have defined some algorithms, they are:

1. First Come First Serve(FCFS) Scheduling
2. Shortest-Job-First(SJF) Scheduling
3. Priority Scheduling

4. Round Robin(RR) Scheduling
5. Multilevel Queue Scheduling
6. Multilevel Feedback Queue Scheduling

We will be discussing all the scheduling algorithms, one by one, in detail in the next tutorials.

### **First Come First Serve Scheduling**

In the "First come first serve" scheduling algorithm, as the name suggests, the process which arrives first, gets executed first, or we can say that the process which requests the CPU first, gets the CPU allocated first.

- First Come First Serve, is just like FIFO(First in First out) Queue data structure, where the data element which is added to the queue first, is the one who leaves the queue first.
- This is used in Batch Systems.
- It's easy to understand and implement programmatically, using a Queue data structure, where a new process enters through the tail of the queue, and the scheduler selects process from the head of the queue.
- A perfect real life example of FCFS scheduling is buying tickets at ticket counter.

### **Calculating Average Waiting Time**

For every scheduling algorithm, Average waiting time is a crucial parameter to judge its performance.

AWT or Average waiting time is the average of the waiting times of the processes in the queue, waiting for the scheduler to pick them for execution.

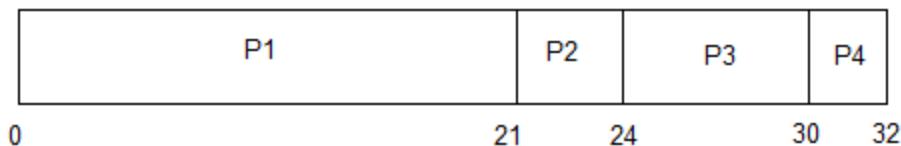
Lower the Average Waiting Time, better the scheduling algorithm.

Consider the processes P1, P2, P3, P4 given in the below table, arrives for execution in the same order, with Arrival Time 0, and given Burst Time, let's find the average waiting time using the FCFS scheduling algorithm.

PROCESS	BURST TIME
P1	21
P2	3
P3	6
P4	2



The average waiting time will be =  $(0 + 21 + 24 + 30)/4 = 18.75 \text{ ms}$



This is the GANTT chart for the above processes

The average waiting time will be 18.75 ms

For the above given processes, first P1 will be provided with the CPU resources,

- Hence, waiting time for P1 will be 0
- P1 requires 21 ms for completion, hence waiting time for P2 will be 21 ms
- Similarly, waiting time for process P3 will be execution time of P1 + execution time for P2, which will be  $(21 + 3)$  ms = 24 ms.
- For process P4 it will be the sum of execution times of P1, P2 and P3.

The GANTT chart above perfectly represents the waiting time for each process.

## Problems with FCFS Scheduling

Below we have a few shortcomings or problems with the FCFS scheduling algorithm:

1. It is Non Pre-emptive algorithm, which means the process priority doesn't matter.

If a process with very least priority is being executed, more like daily routine backup process, which takes more time, and all of a sudden some other high priority process arrives, like interrupt to avoid system crash, the high priority process will have to wait, and hence in this case, the system will crash, just because of improper process scheduling.

2. Not optimal Average Waiting Time.
3. Resources utilization in parallel is not possible, which leads to Convoy Effect, and hence poor resource(CPU, I/O etc) utilization.

## What is Convoy Effect?

Convoy Effect is a situation where many processes, who need to use a resource for short time are blocked by one process holding that resource for a long time.

This essentially leads to poor utilization of resources and hence poor performance.

## Program for FCFS Scheduling

Here we have a simple C++ program for processes with arrival time as 0.

In the program, we will be calculating the Average waiting time and Average turn around time for a given array of Burst times for the list of processes.

```
/* Simple C++ program for implementation  
of FCFS scheduling */  
  
#include<iostream>  
  
using namespace std;
```

```

// function to find the waiting time for all processes

void findWaitingTime(int processes[], int n, int bt[], int wt[])
{
    // waiting time for first process will be 0
    wt[0] = 0;

    // calculating waiting time
    for (int i = 1; i < n ; i++)
    {
        wt[i] = bt[i-1] + wt[i-1];
    }
}

// function to calculate turn around time

void findTurnAroundTime( int processes[], int n, int bt[], int wt[], int tat[])
{
    // calculating turnaround time by adding
    // bt[i] + wt[i]

    for (int i = 0; i < n ; i++)
    {
        tat[i] = bt[i] + wt[i];
    }
}

// function to calculate average time

```

```

void findAverageTime( int processes[], int n, int bt[])
{
    int wt[n], tat[n], total_wt = 0, total_tat = 0;

    // function to find waiting time of all processes
    findWaitingTime(processes, n, bt, wt);

    // function to find turn around time for all processes
    findTurnAroundTime(processes, n, bt, wt, tat);

    // display processes along with all details
    cout << "Processes " << " Burst time " << " Waiting time " << " Turn around time\n";

    // calculate total waiting time and total turn around time
    for (int i = 0; i < n; i++)
    {
        total_wt = total_wt + wt[i];
        total_tat = total_tat + tat[i];
        cout << " " << i+1 << "\t\t" << bt[i] << "\t\t" << wt[i] << "\t\t" << tat[i] << endl;
    }

    cout << "Average waiting time = " << (float)total_wt / (float)n;
    cout << "\nAverage turn around time = " << (float)total_tat / (float)n;
}

// main function

```

```

int main()
{
    // process ids

    int processes[] = { 1, 2, 3, 4};

    int n = sizeof processes / sizeof processes[0];

    // burst time of all processes

    int burst_time[] = {21, 3, 6, 2};

    findAverageTime(processes, n, burst_time);

    return 0;
}

```

Processes Burst time Waiting time Turn around time

1 21 0 21

2 3 21 24

3 6 24 30

4 2 30 32

Average waiting time = 18.75

Average turn around time = 26.75

Here we have simple formulae for calculating various times for given processes:

**Completion Time:** Time taken for the execution to complete, starting from arrival time.

**Turn Around Time:** Time taken to complete after arrival. In simple words, it is the difference between the Completion time and the Arrival time.

**Waiting Time:** Total time the process has to wait before its execution begins. It is the difference between the Turn Around time and the Burst time of the process.

For the program above, we have considered the arrival time to be 0 for all the processes, try to implement a program with variable arrival times.

### **Shortest Job First(SJF) Scheduling**

Shortest Job First scheduling works on the process with the shortest burst time or duration first.

- This is the best approach to minimize waiting time.
- This is used in Batch Systems.
- It is of two types:
  1. Non Pre-emptive
  2. Pre-emptive
- To successfully implement it, the burst time/duration time of the processes should be known to the processor in advance, which is practically not feasible all the time.
- This scheduling algorithm is optimal if all the jobs/processes are available at the same time. (either Arrival time is 0 for all, or Arrival time is same for all)

#### **Non Pre-emptive Shortest Job First**

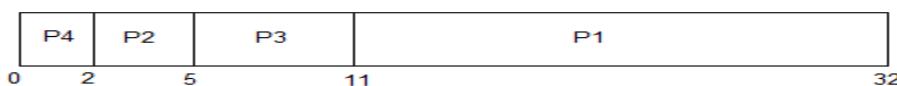
Consider the below processes available in the ready queue for execution, with arrival time as 0 for all and given burst times.

PROCESS	BURST TIME
P1	21
P2	3
P3	6
P4	2



In Shortest Job First Scheduling, the shortest Process is executed first.

Hence the GANTT chart will be following :



Now, the average waiting time will be =  $(0 + 2 + 5 + 11)/4 = 4.5 \text{ ms}$

As you can see in the GANTT chart above, the process P4 will be picked up first as it has the shortest burst time, then P2, followed by P3 and at last P1.

We scheduled the same set of processes using the First come first serve algorithm in the previous tutorial, and got average waiting time to be 18.75 ms, whereas with SJF, the average waiting time comes out 4.5 ms.

### Problem with Non Pre-emptive SJF

If the **arrival time** for processes are different, which means all the processes are not available in the ready queue at time 0, and some jobs arrive after some time, in such situation, sometimes process with short burst time have to wait for the current process's execution to finish, because in Non Pre-emptive SJF, on arrival of a process with short duration, the existing job/process's execution is not halted/stopped to execute the short job first.

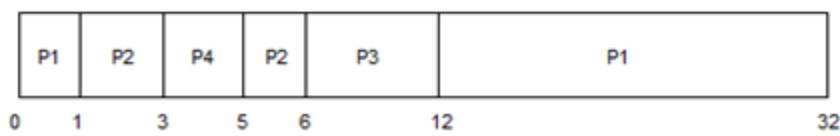
This leads to the problem of **Starvation**, where a shorter process has to wait for a long time until the current longer process gets executed. This happens if shorter jobs keep coming, but this can be solved using the concept of **aging**.

### Pre-emptive Shortest Job First

In Preemptive Shortest Job First Scheduling, jobs are put into ready queue as they arrive, but as a process with **short burst time** arrives, the existing process is preempted or removed from execution, and the shorter job is executed first.

PROCESS	BURST TIME	ARRIVAL TIME
P1	21	0
P2	3	1
P3	6	2
P4	2	3

The GANTT chart for Preemptive Shortest Job First Scheduling will be,



The average waiting time will be,  $((5-3)+(6-2)+(12-1))/4=8.75$

The average waiting time for preemptive shortest job first scheduling is less than both, non preemptive SJF scheduling and FCFS scheduling

As you can see in the GANTT chart above, as P1 arrives first, hence its execution starts immediately, but just after 1 ms, process P2 arrives with a burst time of 3 ms which is less than the burst time of P1, hence the process P1(1 ms done, 20 ms left) is preempted and process P2 is executed.

As P2 is getting executed, after 1 ms, P3 arrives, but it has a burst time greater than that of P2, hence execution of P2 continues. But after another millisecond, P4 arrives with a burst time of 2 ms, as a result P2(2 ms done, 1 ms left) is preempted and P4 is executed.

After the completion of P4, process P2 is picked up and finishes, then P2 will get executed and at last P1.

The Pre-emptive SJF is also known as Shortest Remaining Time First, because at any given point of time, the job with the shortest remaining time is executed first.

### **Program for SJF Scheduling**

In the below program, we consider the arrival time of all the jobs to be 0.

Also, in the program, we will sort all the jobs based on their burst time and then execute them one by one, just like we did in FCFS scheduling program.

```
// c++ program to implement Shortest Job first
```

```
#include<bits/stdc++.h>
```

```
using namespace std;
```

```
struct Process
```

```
{
```

```
    int pid; // process ID
```

```
    int bt; // burst Time
```

```
};
```

```
/*
```

```
    this function is used for sorting all
```

```

processes in increasing order of burst time

*/
bool comparison(Process a, Process b)
{
    return (a.bt < b.bt);
}

// function to find the waiting time for all processes
void findWaitingTime(Process proc[], int n, int wt[])
{
    // waiting time for first process is 0
    wt[0] = 0;

    // calculating waiting time
    for (int i = 1; i < n ; i++)
    {
        wt[i] = proc[i-1].bt + wt[i-1] ;
    }
}

// function to calculate turn around time
void findTurnAroundTime(Process proc[], int n, int wt[], int tat[])
{
    // calculating turnaround time by adding bt[i] + wt[i]
    for (int i = 0; i < n ; i++)
    {

```

```

tat[i] = proc[i].bt + wt[i];

}

}

// function to calculate average time

void findAverageTime(Process proc[], int n)

{

int wt[n], tat[n], total_wt = 0, total_tat = 0;

// function to find waiting time of all processes

findWaitingTime(proc, n, wt);

// function to find turn around time for all processes

findTurnAroundTime(proc, n, wt, tat);

// display processes along with all details

cout << "\nProcesses " << " Burst time "

<< " Waiting time " << " Turn around time\n";

// calculate total waiting time and total turn around time

for (int i = 0; i < n; i++)

{

total_wt = total_wt + wt[i];

total_tat = total_tat + tat[i];

cout << " " << proc[i].pid << "\t\t"

<< proc[i].bt << "\t " << wt[i]

```

```

        << "\t\t " << tat[i] << endl;
    }

    cout << "Average waiting time = "
        << (float)total_wt / (float)n;
    cout << "\nAverage turn around time = "
        << (float)total_tat / (float)n;
}

// main function
int main()
{
    Process proc[] = {{1, 21}, {2, 3}, {3, 6}, {4, 2}};
    int n = sizeof proc / sizeof proc[0];

    // sorting processes by burst time.
    sort(proc, proc + n, comparison);

    cout << "Order in which process gets executed\n";
    for (int i = 0 ; i < n; i++)
    {
        cout << proc[i].pid << " ";
    }

    findAverageTime(proc, n);
}

```

```
    return 0;  
}
```

Order in which process gets executed

4 2 3 1

Processes Burst time Waiting time Turn around time

4 2 0 2

2 3 2 5

3 6 5 11

1 2 1 11 32

Average waiting time = 4.5

Average turn around time = 12.5

Try implementing the program for SJF with variable arrival time for different jobs, yourself.

## Priority CPU Scheduling

In this tutorial we will understand the priority scheduling algorithm, how it works and its advantages and disadvantages.

In the Shortest Job First scheduling algorithm, the priority of a process is generally the inverse of the CPU burst time, i.e. the larger the burst time the lower is the priority of that process.

In case of priority scheduling the priority is not always set as the inverse of the CPU burst time, rather it can be internally or externally set, but yes the scheduling is done on the basis of priority of the process where the process which is most urgent is processed first, followed by the ones with lesser priority in order.

Processes with same priority are executed in FCFS manner.

The priority of process, when internally defined, can be decided based on memory requirements, time limits ,number of open files, ratio of I/O burst to CPU burst etc.

Whereas, external priorities are set based on criteria outside the operating system, like the importance of the process, funds paid for the computer resource use, market factor etc.

## Types of Priority Scheduling Algorithm

Priority scheduling can be of two types:

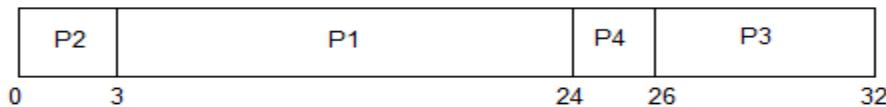
1. **Preemptive Priority Scheduling:** If the new process arrived at the ready queue has a higher priority than the currently running process, the CPU is preempted, which means the processing of the current process is stopped and the incoming new process with higher priority gets the CPU for its execution.
2. **Non-Preemptive Priority Scheduling:** In case of non-preemptive priority scheduling algorithm if a new process arrives with a higher priority than the current running process, the incoming process is put at the head of the ready queue, which means after the execution of the current process it will be processed.

## Example of Priority Scheduling Algorithm

Consider the below table of processes with their respective CPU burst times and the priorities.

PROCESS	BURST TIME	PRIORITY
P1	21	2
P2	3	1
P3	6	4
P4	2	3

The GANTT chart for following processes based on Priority scheduling will be,



The average waiting time will be,  $(0 + 3 + 24 + 26)/4 = 13.25 \text{ ms}$

As you can see in the GANTT chart that the processes are given CPU time just on the basis of the priorities.

### **Problem with Priority Scheduling Algorithm**

In priority scheduling algorithm, the chances of indefinite blocking or starvation.

A process is considered blocked when it is ready to run but has to wait for the CPU as some other process is running currently.

But in case of priority scheduling if new higher priority processes keeps coming in the ready queue then the processes waiting in the ready queue with lower priority may have to wait for long durations before getting the CPU for execution.

In 1973, when the IBM 7904 machine was shut down at MIT, a low-priority process was found which was submitted in 1967 and had not yet been run.

### **Using Aging Technique with Priority Scheduling**

To prevent starvation of any process, we can use the concept of aging where we keep on increasing the priority of low-priority process based on its waiting time.

For example, if we decide the aging factor to be 0.5 for each day of waiting, then if a process with priority 20(which is comparatively low priority) comes in the ready queue. After one day of waiting, its priority is increased to 19.5 and so on.

Doing so, we can ensure that no process will have to wait for indefinite time for getting CPU time for processing.

### **Implementing Priority Scheduling Algorithm in C++**

Implementing priority scheduling algorithm is easy. All we have to do is to sort the processes based on their priority and CPU burst time, and then apply FCFS Algorithm on it.

Here is the C++ code for priority scheduling algorithm:

```
// Implementation of Priority scheduling algorithm
#include<bits/stdc++.h>
using namespace std;

struct Process
{
```

```

    // this is the process ID

    int pid;

    // the CPU burst time

    int bt;

    // priority of the process

    int priority;

};

// sort the processes based on priority

bool sortProcesses(Process a, Process b)

{
    return (a.priority > b.priority);
}

// Function to find the waiting time for all processes

void findWaitingTime(Process proc[], int n,

                     int wt[])

{
    // waiting time for first process is 0

    wt[0] = 0;

    // calculating waiting time

    for (int i = 1; i < n ; i++ )

        wt[i] =  proc[i-1].bt + wt[i-1] ;

}

```

```

// Function to calculate turn around time

void findTurnAroundTime( Process proc[], int n,
                        int wt[], int tat[])
{
    // calculating turnaround time by adding
    // bt[i] + wt[i]

    for (int i = 0; i < n ; i++)
        tat[i] = proc[i].bt + wt[i];

}

//Function to calculate average time

void findavgTime(Process proc[], int n)

{
    int wt[n], tat[n], total_wt = 0, total_tat = 0;

    //Function to find waiting time of all processes
    findWaitingTime(proc, n, wt);

    //Function to find turn around time for all processes
    findTurnAroundTime(proc, n, wt, tat);

    //Display processes along with all details
    cout << "\nProcesses " << " Burst time "
         << " Waiting time " << " Turn around time\n";

    // Calculate total waiting time and total turn
}

```

```

// around time

for (int i=0; i<n; i++)
{
    total_wt = total_wt + wt[i];
    total_tat = total_tat + tat[i];
    cout << " " << proc[i].pid << "\t\t"
        << proc[i].bt << "\t " << wt[i]
        << "\t\t " << tat[i] << endl;
}

cout << "\nAverage waiting time = "
    << (float)total_wt / (float)n;
cout << "\nAverage turn around time = "
    << (float)total_tat / (float)n;
}

void priorityScheduling(Process proc[], int n)
{
    // Sort processes by priority
    sort(proc, proc + n, sortProcesses);

    cout << "Order in which processes gets executed \n";
    for (int i = 0 ; i < n; i++)
        cout << proc[i].pid << " ";

    findavgTime(proc, n);
}

```

```
}
```

```
// Driver code
```

```
int main()
```

```
{
```

```
    Process proc[] = {{1, 10, 2}, {2, 5, 0}, {3, 8, 1}};
```

```
    int n = sizeof proc / sizeof proc[0];
```

```
    priorityScheduling(proc, n);
```

```
    return 0;
```

```
}
```

## **UNIT-IV**

# **Windows Operating Environment**

### **Features of MS – Windows**

Microsoft Windows includes a wide array of features, tools, and applications to help get the most out of Windows and your computer.

To learn more about the features included in Microsoft Windows, click a link below.

- Control Panel
- Cortana
- Desktop
- Device Manager
- Disk Cleanup
- Event Viewer
- File Explorer
- Internet browser
- Microsoft Paint
- Notepad
- Notification area
- Power User Tasks Menu
- Registry Editor
- Settings
- Start and Start menu
- System Information
- Taskbar
- Task Manager
- Windows search box

### **Control Panel**

The Control Panel is a collection of tools to help you configure and manage the resources on your computer. You can change settings for printers, video, audio, mouse, keyboard, date and time, user accounts, installed applications, network connections, power saving options, and more.



In Windows 10, the Control Panel is located in the Start menu, under Windows System.

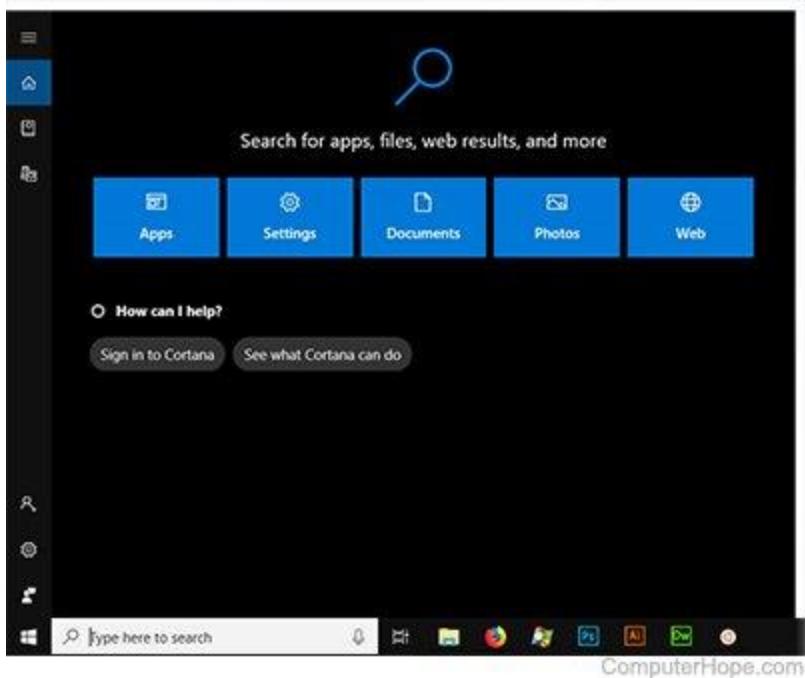
You can also start the Control Panel from the Run box. Press Win+R, type control, and press Enter. Or, you may press the Windows key, type Control Panel, and then press Enter.

Many of the Control Panel settings are also accessible in the Windows 10 *Settings* menu.

## What is the Control Panel?

### Cortana

Cortana is a virtual assistant introduced in Windows 10 that accepts voice commands. Cortana can answer questions, search your computer or Internet, set appointments and reminders, perform online purchases, and more. Cortana has similarities to other voice-activated services, such as Siri, Alexa, or Google Assistant, with the added benefit that it can search the information on your computer.



To access Cortana in Windows 10, press Win+S.

- What is Cortana?
- How to enable voice activation for Cortana.
- How do I turn off Cortana?

## Desktop

The desktop is a fundamental part of the default GUI (graphical user interface) in Windows. It is a space where you can organize applications, folders, and documents, which appear as icons. Your desktop is always in the background, behind any other applications you're running.

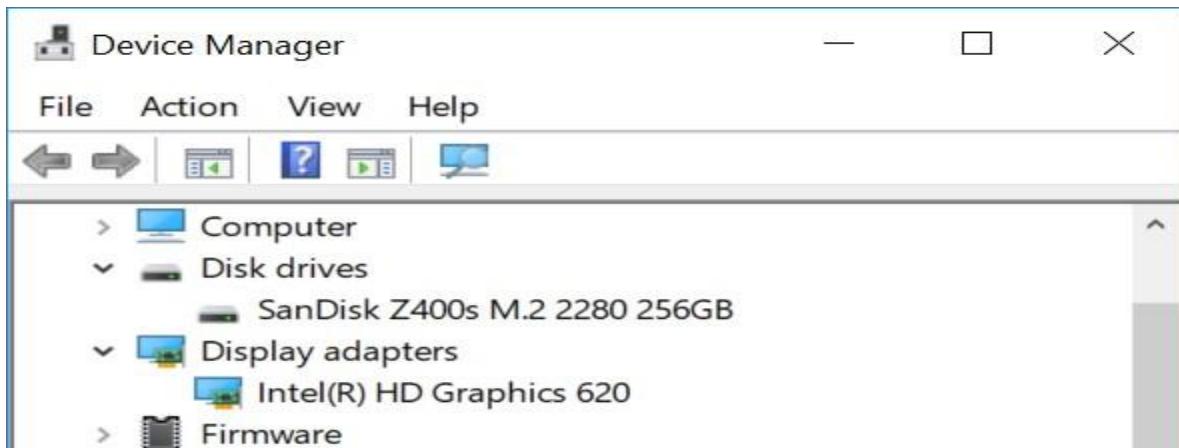
When you power on your computer and log in to Windows, the first thing you see is your desktop background, icons, and the taskbar. From here, you can access the installed programs on your computer from the Start menu, or by double-clicking any application shortcuts you may have on your desktop.



You can access your desktop at any time by pressing Win+D to minimize any running applications.

## Device Manager

The Device Manager lists the hardware devices installed in a computer. It allows users to see what hardware is installed, view and update hardware drivers, and uninstall hardware through the Device Manager.

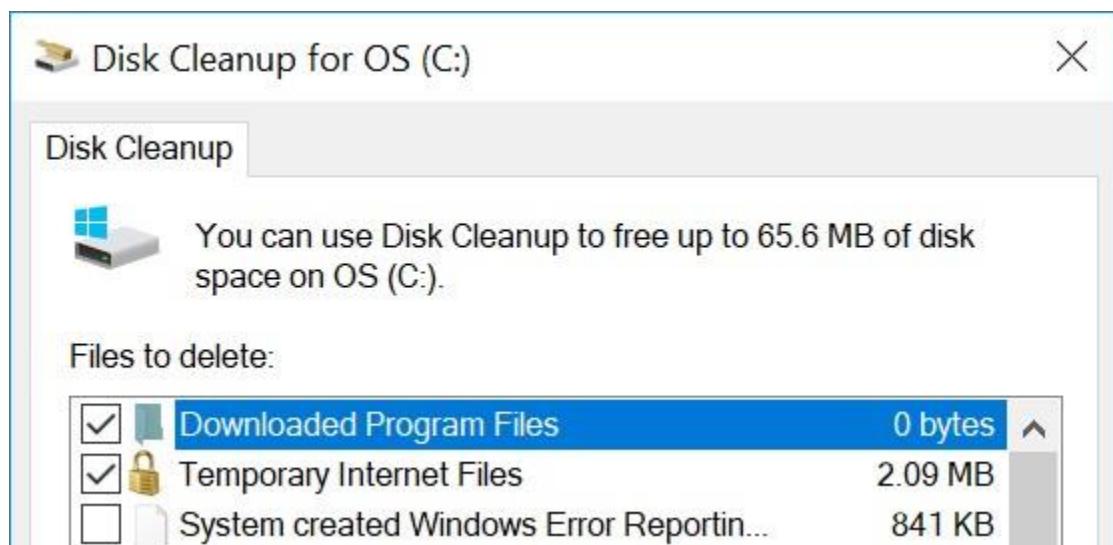


You can open the Device Manager from the Power User Tasks Menu (Win+X, then press M).

- What is the Device Manager?
- Device Manager help index.

## Disk Cleanup

The Disk Cleanup utility helps increase free disk space on your computer by removing temporary or unnecessary files. Running Disk Cleanup helps improve your computer's performance, and create additional space to store your downloads, documents, and programs.



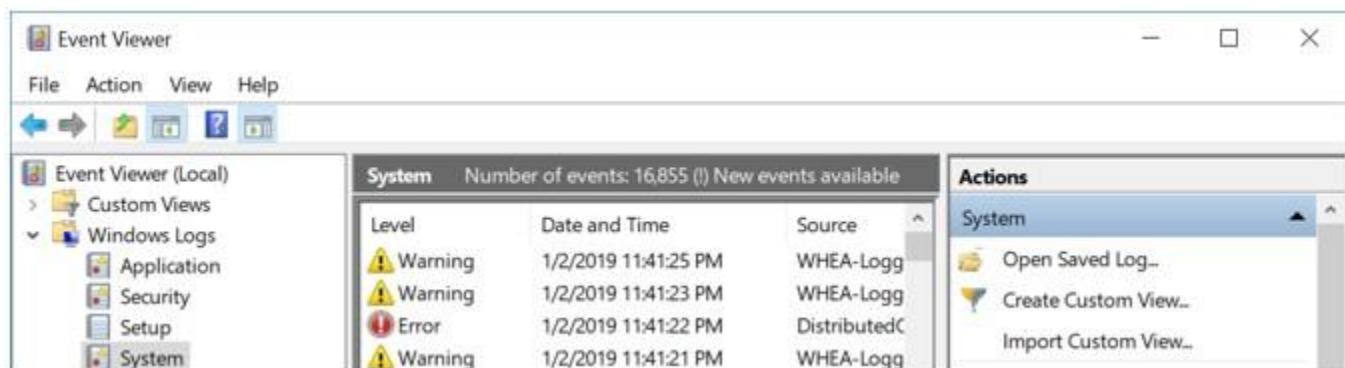
You can access Disk Cleanup from the File Explorer.

1. Press **Win+E** to open an Explorer window.
  2. On the left side of the window, find **This PC** or **My Computer**, and select it by clicking once.
  3. Then, on the right side, right-click any disk drive on your computer (**C:**, for example).
  4. Select **Properties**.
  5. Under the General tab, click **Disk Cleanup**.
- What is Disk Cleanup?
  - My computer is running slow, what steps can I do to fix it?

- How to regain computer hard drive space.

## Event Viewer

The Event Viewer is an administrator tool displays errors and important events that happen on your computer. It helps troubleshoot advanced problems in your Windows system.



Event Viewer can be accessed from the Power User Tasks Menu (press Win+X, then press V).

- What is the Event Viewer?
- How to fix Windows blue screen errors.

## File Explorer

The File Explorer, also called Windows Explorer, provides you with a view of the files and folders on the computer. You can browse the contents of your SSD, hard drive, and attached removable disks. You can search for files and folders, and open, rename, or delete them from the File Explorer.

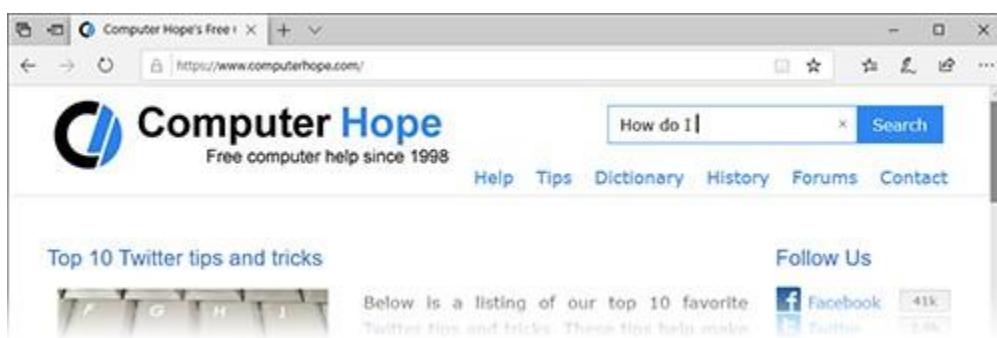


To open a new File Explorer window, press Win+E. You can open more than one Explorer window at the same time, which helps with viewing multiple folders at once, or copying/moving files from one to the other.

- What is File Explorer?
- How to change how files are displayed in Windows Explorer.

## Internet browser

Your Internet browser is one of the most important applications on your computer. You can use it to find information on the Internet, view web pages, shop and buy merchandise, watch movies, play games, and more. Microsoft Edge is the default browser in Windows 10. Internet Explorer is included as the default browser in previous versions of Windows, from Windows 95 to Windows 8.1.

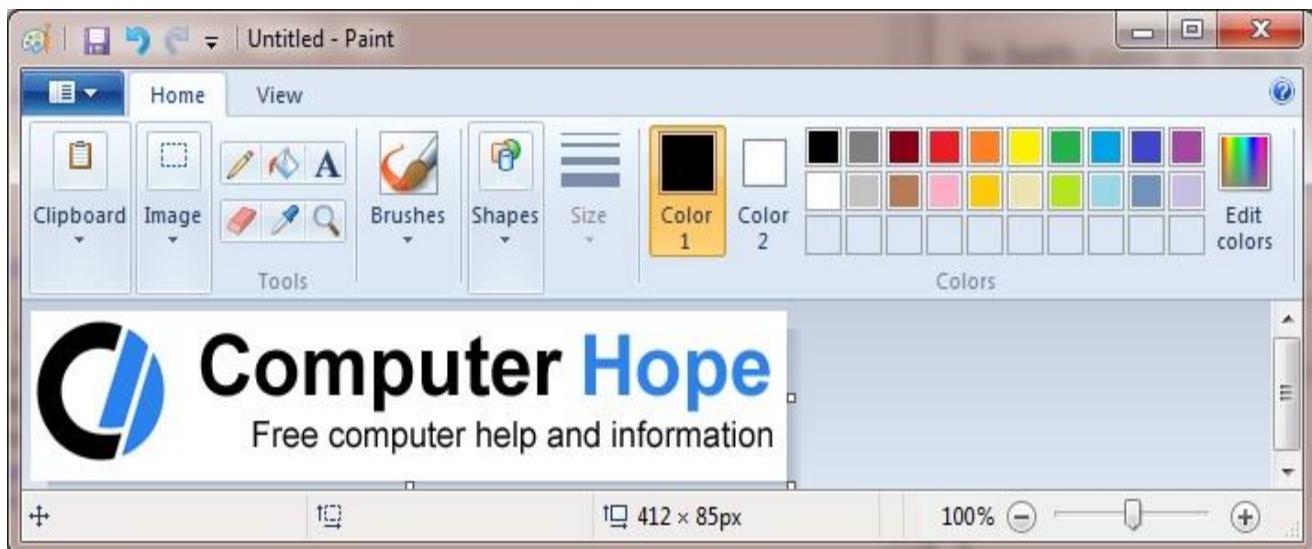


To open a new Edge browser window in Windows 10, open the Start menu and scroll down to Microsoft Edge.

- What is an Internet browser?
- How to find version of installed Internet browser.
- How do I update my browser?
- Can I have more than one Internet browser installed?

## Microsoft Paint

Included in Windows since November 1985, **Microsoft Paint** is a simple image editor that you can use to create, view, and edit digital images. It provides basic functionality to draw and paint pictures, resize and rotate photographs, and save pictures as different file types.



To open Microsoft Paint in all versions of Windows, press the Windows key, type mspaint, and press Enter. It's also available in your Start menu: in Windows 10, it's listed under Windows Accessories, Paint.

- What is Microsoft Paint?
- Microsoft Paint help index.

## Notepad

Notepad is a simple text editor. You can use it to create, view, and edit text files. For instance, you can use Notepad to write a batch file, or a web page written in HTML.

```
computerhope.bat - Notepad
File Edit Format View Help
@echo off
rem Computer Hope
rem Free computer help since 1998
echo ComputerHope.com
pause
cls|
```

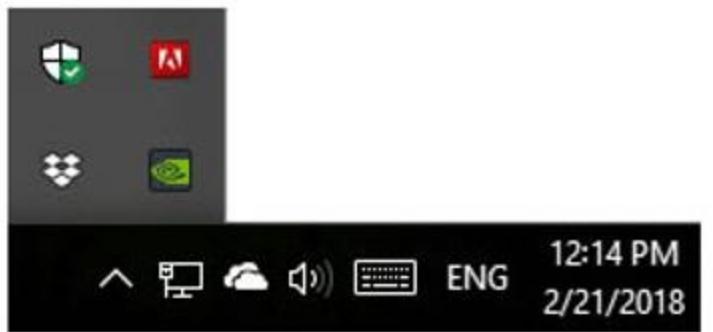
A screenshot of the Notepad application window. The title bar shows the file name "computerhope.bat - Notepad". The menu bar includes File, Edit, Format, View, and Help. The main text area contains a batch script:  
@echo off  
rem Computer Hope  
rem Free computer help since 1998  
echo ComputerHope.com  
pause  
cls|

In Windows 10, Notepad is located in your Start menu under Windows accessories. In all versions of Windows, you can start Notepad from the Run box: press Win+R, type notepad, and press Enter.

- What is Notepad?
- How to create a text file.

## Notification area

The notification area, also known as the system tray, displays the date and time, and shows icons of programs that are started with Windows. It also provides your Internet connection's status and a speaker icon for adjusting sound volume.

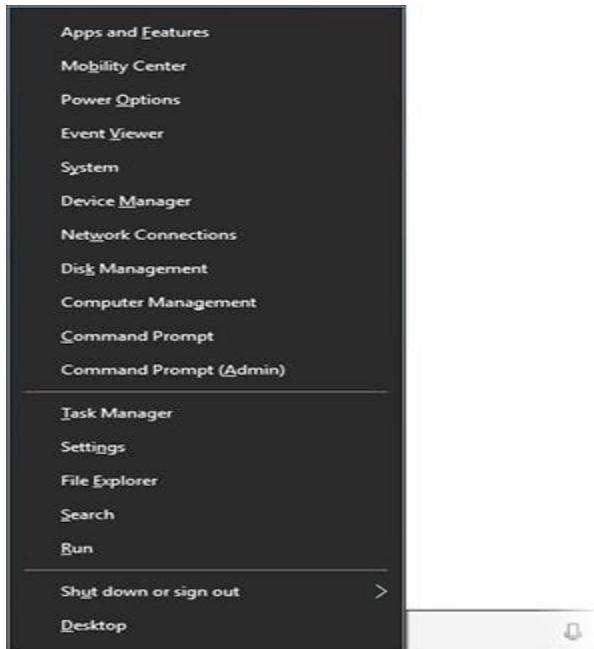


ComputerHope.com

- What is the Notification Area?
- Information about the Windows notification area (systray).

## Power User Tasks Menu

Available in Windows 8 and Windows 10, the Power User Tasks Menu provides quick access to helpful and important Windows utilities. From this menu, you can open the Control Panel, Device Manager, File Explorer, Task Manager, and more.

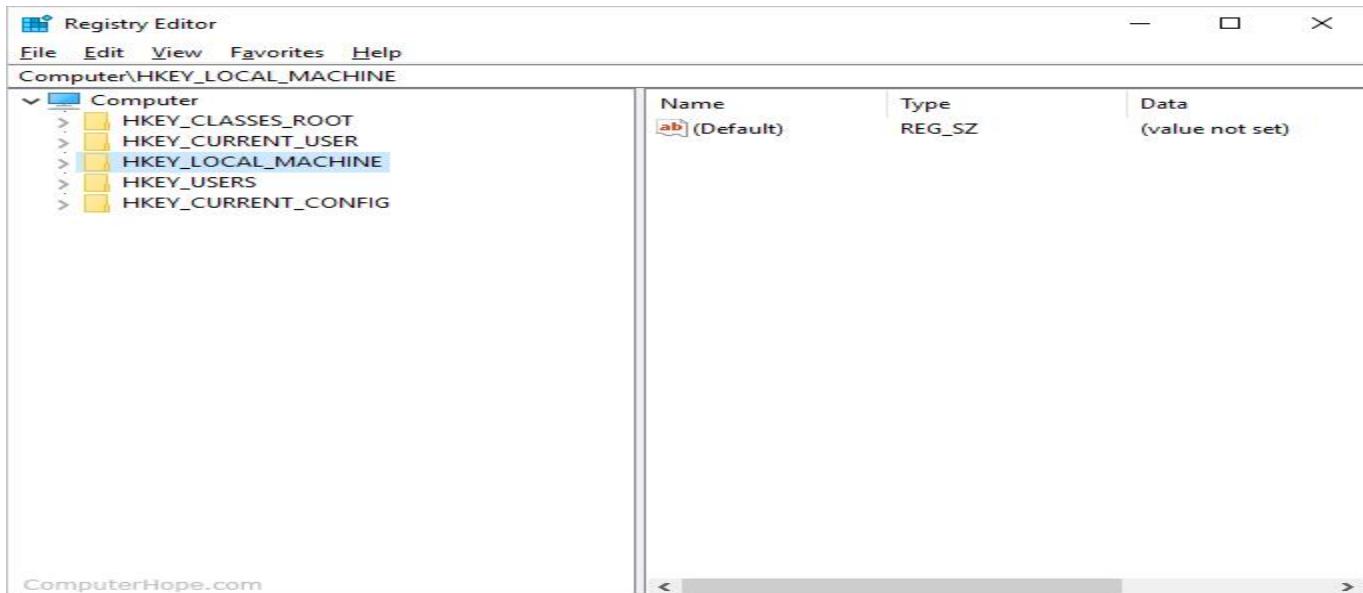


To open the Power User Tasks Menu, press Win+X, or right-click the Start menu icon.

- What is the Power User Tasks Menu?

## Registry Editor

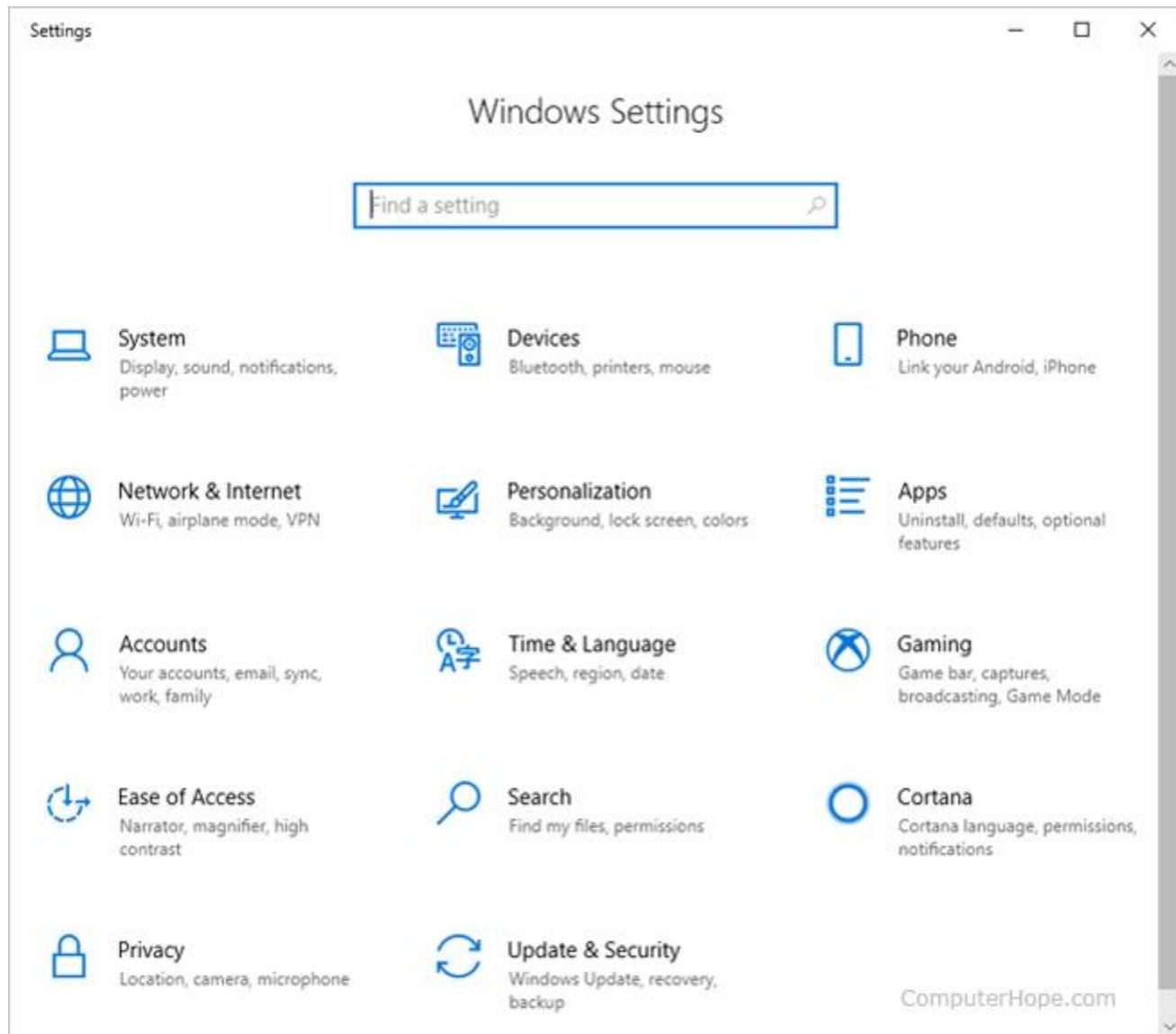
The Registry Editor allows you to view the Windows system registry, and edit registry keys. Computer technicians may use the Registry Editor to fix problems with the Windows operating system or installed software.



In Windows 10, the Registry Editor is located in the Start menu under Windows Administrative Tools. You can also start it by pressing the Windows key, typing regedit, and then pressing Enter.

## Settings

Available in Windows 8 and Windows 10, Settings allows you to change many aspects of Windows. You can change the desktop background, adjust power settings, review options for external devices, and more.

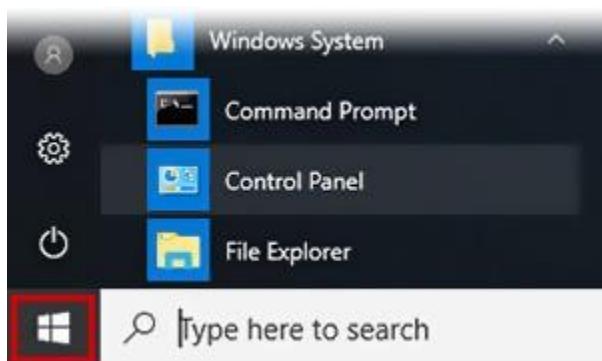


To open Settings in Windows 10, press Win+I. Or, open the Start menu, and click the gear icon (⚙).

- What is Windows Settings?
- How to adjust power, standby, and sleep settings.

## Start and Start menu

The Start menu is a list of applications and utilities installed on your computer. You can open it by pressing Start, on the left side of your taskbar.

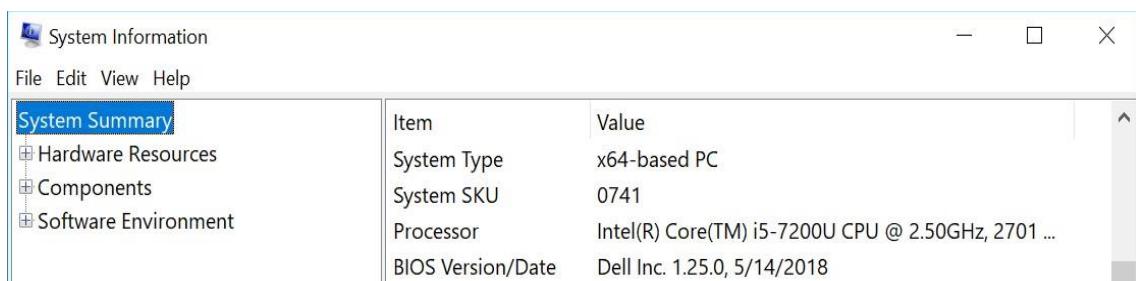


From the keyboard, you can open the Start menu by pressing the Windows key.

- What is the Start button?
- What is the Start menu?
- How do I get the start button back in Windows 8?

## System Information

The System Information utility provides information about the computer, including hardware and Windows details. You can find out details about your computer's hardware, including processor, memory, video card, and sound card. You can also view and configure environment variables, device drivers, services, and more.

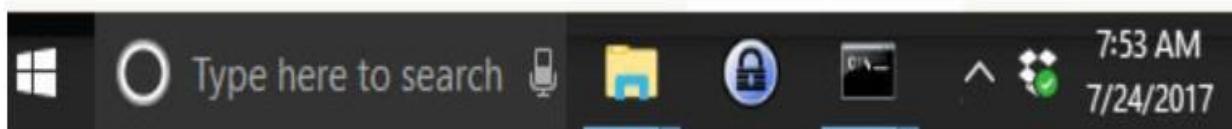


In Windows 10, System Information is located in the Start menu, under Windows Administrative Tools. You can also open it from the Run box: press Win R, type msinfo32, and press Enter.

- What is System Information?
- How to find hardware and other computer specifications.

## Taskbar

The Windows taskbar shows programs that are currently open, and a Quick Launch area that allows quick access to launch specific programs. The notification area is on the right side of the taskbar, showing the date and time, and programs running in the background.



- What is the taskbar?
- How to keep the Windows taskbar hidden.

## Task Manager

The Task Manager gives you an overview of what's running on your computer. You can see how much of your system resources is used by each application (task), sorting by CPU, RAM, and disk I/O usage. If a program is frozen or not responding, you can right-click it in Task Manager and end the task, forcing it to quit.

To open the Task Manager at any time, press Ctrl+Shift+Esc.

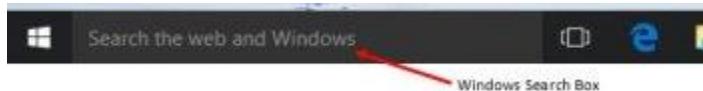
A screenshot of the Windows Task Manager window. The main table displays resource usage for different tasks:

Name	9% CPU	42% Memory	0% Disk	6% Network
<b>Apps (6)</b>				
Adobe Dreamweaver CS6 (32 bit)	0.1%	52.4 MB	0 MB/s	0 Mbps
Adobe Photoshop CS5	0%	115.5 MB	0 MB/s	0 Mbps
FileLocator Lite	0%	19.5 MB	0 MB/s	0 Mbps
Google Chrome (2)	1.5%	141.1 MB	0.1 MB/s	0.1 Mbps
Task Manager	0%	11.9 MB	0 MB/s	0 Mbps
Windows Explorer	0%	37.9 MB	0 MB/s	0 Mbps
<b>Background processes (49)</b>				
AAM Updates Notifier Application	0%	0.2 MB	0 MB/s	0 Mbps
Adobe CS5 Service Manager (32...)	0%	0.3 MB	0 MB/s	0 Mbps
Adobe CS6 Service Manager (32...)	0%	0.3 MB	0 MB/s	0 Mbps

At the bottom left is a "Fewer details" link, and at the bottom right is an "End task" button.

## **Windows search box**

The Windows search box is a convenient way to search for documents, pictures, videos, applications, and more. In Windows 10, the search box is also integrated with Cortana. The feature first appeared in Windows Vista.



The search box is on your taskbar by default. In Windows 10, if you don't see the search box, right-click the taskbar and select Taskbar settings. Make sure Use small taskbar buttons is Off. Then, right-click the taskbar again, and select Cortana, Show search box.

## **Windows**

Windows is a collection of programs known as an *operating system* (OS) that controls a PC (personal computer). First produced by Microsoft in November 1985, it has been frequently updated since, as computer memory has got bigger, as processing chips have got faster and, of course, when the internet was invented. Prior to Windows, PCs were operated by a series of text commands.

### **Windows' key benefits and features**

- Allows the user to interact with the computer (through the keyboard, mouse, microphone, etc.).
- Controls the storage of data (images, files, music).
- Controls hardware attached to the computer such as webcams, scanners and printers.
- Helps to open and close programs (word processors, games, photo editors, etc.), and gives them part of the computer's memory to allow them to work.
- Controls what access to a computer different users have and the computer's security.
- Deals with errors and user instructions, and issues simple error messages.
- Promotes multitasking by allowing the user to do several things on the computer at once – for example, watch a video while writing a letter.

Other operating systems are available, notably the Apple OS X used in Mac computers. In addition, with the increased use of smartphones, notepads and tablets, there are systems aimed directly at mobile devices. However, most people who learn to use computers do so on a system running Windows.

In this topic, we are going to learn about the Introduction to Windows. Microsoft Windows is a multitasking operating system developed by Microsoft Corporation which uses Graphical User Interface to interact with the users. Microsoft was originally named “Traf-O-Data” in 1972, was renamed as “Micro-soft” in November 1975, then “Microsoft” on November 26, 1976. Microsoft entered the marketplace in August 1981 by releasing version 1.0 of the operating system Microsoft DOS (MS-DOS), a 16-bit command-line operating system. Bill Gates and Paul Allen founded Microsoft and windows operating system has been its primary product.

In this Introduction to Windows, we will also clear you about the latest OS release of Windows is “Windows 10” which was launched in the year 2015.

In a nutshell, below is how Microsoft windows evolved over time:

Windows 1.0 – Nov 1985

Windows 2.0 – Dec 1987

Windows 3.0 – May 1990

Windows 95 – Aug 1995

Windows 98 – June 1998

Windows ME – Sep 2000

Windows XP – Oct 2001

Windows Vista – Nov 2006

Windows 7 – July 2009

Windows 8.0 – Oct 2012

Windows 8.1 – Oct 2013

Windows 10 – July 2015

### **Main Components of Windows**

After learning about the Introduction to Windows, we are now going to study about the main components of Windows. The main components of the Windows Operating System are the following:

- Configuration and maintenance
- User interface
- Applications and utilities

- Windows Server components
- File systems
- Core components
- Services
- DirectX
- Networking
- Scripting and command-line
- Kernel
- .NET Framework
- Security
- Deprecated components and apps
- APIs

**Source Link:** [https://en.wikipedia.org/wiki/List\\_of\\_Microsoft\\_Windows\\_components](https://en.wikipedia.org/wiki/List_of_Microsoft_Windows_components)

## **Application**

### **Introduction:**

The term Application refers to Software which is a set of instructions or code written in a program for executing a task or an operation in a Computer. Applications play a vital role in a Computer as it is an end-user program that enables the users to do many things in a system. The application programs are designed and developed to run in a System Software which is an Operating system. An Operating System is system software that enables all the applications programs to run and execute various tasks in a Computer system. The GUI based applications carries out various tasks in a Computer like creating documents, playing games, browsing and many more.

### **Application Software Overview:**

Application software's are the end-user programs designed to enhance the productivity in various fields of work. The applications are used for creating documents, spreadsheets, databases, and publications, doing online research, sending email, designing graphics, running businesses, and also playing games. Application software's are designed to perform a specific task and can be as simple as a calculator application or as complex as a word processing application. The applications are designed with built-in functions and properties so to easily carry out all the operations. One of the most popular and widely used applications is Microsoft word processor where you can do calculations, copy, paste, delete, and add colors and pictures, change the appearance by using its built-in properties. Not only Word processor applications but there are several other productivity programs like Graphical software, Photo studio, Antivirus and many more that are packed as an Application software.

hen installed on a computer that can be used. But there are several applications like Microsoft Office which is a complete suite of programs that includes Excel, Power point, Access etc, Graphic suites like Adobe Creative suite with various applications for creating and editing images, Audio master suite for sound production, Video editing applications, Security software's and most importantly Web-browser which is also application software.

Application Software can be divided into two broad categories are System Software and Applications Software.

- **System Software** is a program designed to manage all the hardware resources and also runs the applications programs in a Computer. It is mainly of two types are the Operating system and utility software that is installed with the Operating system. The Operating system and utility programs are written in such a way to function independently because they are not user oriented. It always runs in the background and executes all the operations in a Computer. But there are some system software's that are used by the end-users like a Device manager which is found on Control panel.

Operating systems like Windows, Mac, Linux, and UNIX are the best examples that manage all the programs in a Computer. Since there are other systems software's that help the OS to perform all the tasks like BIOS (Basic Input/output system) that manages data flow between OS and other attached devices such as keyboard, mouse, hard drives etc. Boot program loads the Operating system to RAM, an Assembler takes basic instructions and converts them to machine language to perform operations and a Device manager controls all the devices attached to Computer. The utility software's like disk derangement, system restore, compilers and debuggers are also installed on the Operating system software.

- **Application Software** is a program or a group of program designed for the end-user to perform a specific task in a Computer. The user directly interacts with the application programs for performing a task in a system. Some of the applications software's are browsers, e-mail clients, word processors, spreadsheet, database programs and many more that has various built-in functions to be used. Furthermore the Applications Software's are also broadly categorized for better productivity. Some of them are:-

**Application suites** are packed with multiple programs with user interfaces, features and functions to interact with the users. Some of them are Microsoft Office, Adobe Creativity suite, Security suite, Gaming apps and many more.

**Enterprise Software** labels the organization requirements and also manages data flow in a huge environment. It may be an automated billing system, e-mail marketing, business intelligence and Content management.

**Enterprise Infrastructure Software** provides the capabilities required to support enterprise software systems. It is mainly used for businesses, society or Organization for network security, surveillance system, transportation, sewage, communication, electricity and water that need high investment for the systems.

**Educational Software** includes all the contents of different subjects that can be **used by a student** or any individuals. There are several websites providing educational software about various topics and vast database makes it an easy to use application.

**Multimedia Software** is used for development of media in our day to day life. There are various audio, video and image editing tools, printing media that can be used to maximize the growth of a business.

**Content Access Software** is used to access the contents in a website for publishing digital contents and entertainment.

**Information Software** is used for addressing the needs of an individual by creating and managing information for individual projects within the department. It may be the word processors, spreadsheets, e-mail or blog clients etc.

### **Conclusion:**

Application software is the lifeline for a user as it creates an interface to communicate with the Computer by using various application programs. Each and Every application program is run by the system software which is the Operating system. You can run loads of applications in your Computer and can perform various tasks from creating documents to playing games. I hope you like this article about the **Computer Application** and its types, if you have any issues kindly write into my mail.

### **Icons**

An icon is a small graphical representation of a program or file. When you double-click an icon, the associated file or program will be opened. For example, if you were to double-click My Computer icon, it would open Windows Explorer. Icons are a component of GUI operating systems, including Apple macOS X and Microsoft Windows. Icons help users quickly identify the type of file represented by the icon. The image is an example of "My Computer" icons in different versions of Microsoft Windows.

### **How to create a desktop icon**

1. Press Windows key+D or navigate to the Windows desktop.
2. Right-click any blank space on the desktop. If you're on a laptop, tap the trackpad with two fingers at the same time.

3. In the drop-down menu that appears, move your mouse cursor over New, then select Shortcut.
4. In the window that appears, select Browse... then navigate to the program, file, or folder which you'd like to create a shortcut, and then click Ok.
5. In the Create Shortcut window, select Next, then Finish.

### **How to create a desktop shortcut to a web page**

1. Press Windows key+D or navigate to the Windows desktop.
2. Right-click any blank space on the desktop. If you're on a laptop, tap the trackpad with two fingers at the same time.
3. In the drop-down menu that appears, move your mouse cursor over New, then select Shortcut.
4. In the window that appears, type the web address, and then click Next.
5. Type a name for the shortcut, and then click Finish.

### **How to arrange desktop icons**

1. Press Windows key+D or navigate to the Windows desktop.
- 2.
3. Right-click any blank space on the desktop. If you're on a laptop, tap the trackpad with two fingers at the same time.
4. In the drop-down menu that appears, select Sort by. You should see another menu appear to the right.
5. Choose how you'd like the icons arranged, either by Name, Size, Item type, or Date modified.

### **How to remove a desktop icon**

To remove a desktop icon, single-click it and press the Delete key.

### **How to remove unused icons from the Windows desktop**

---

You may have many icons on your Windows desktop that came from different sources. Some were placed there after installing Windows, some appear when a program is installed, and others may have been created by you. The method of removing Windows

desktop icons varies based on how they were made. To proceed, identify the type of icon you're trying to remove and follow the steps in the appropriate section.

### **General program icons and shortcuts**

To delete an icon created by saving a file, the installation of a software program, or user-created shortcuts:

1. Right-click the icon you'd like to delete.
2. In the drop-down menu that appears, select **Delete**.

### **Option 2:**

1. Click the icon with your left mouse button once so that it is highlighted.
2. Press the **Delete key** on your keyboard.

### **Built-in Windows utilities**

To remove the icons for Windows utilities, such as My Computer, Recycle Bin, or Control Panel, locate your version of Windows below and follow the steps.

#### **Windows 8 and 10 users**

1. Right-click on a blank part of the Windows desktop.
2. Select Personalize in the pop-up menu.
3. In the left navigation menu, click on Themes.
4. Under Related Settings, click the Desktop icon settings option.
5. Uncheck the box next to the icon(s) you want to remove, click Apply, and then OK.

#### **Microsoft Windows Vista and 7 users**

1. Right-click on a blank part of the Windows desktop.
2. Select Personalize in the pop-up menu.

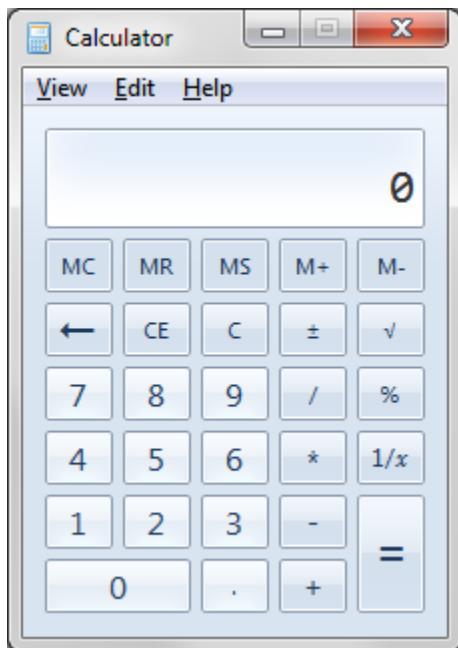
3. In the *Personalize appearance and sounds* window, click the Change desktop icons link on the left side.
4. Uncheck the box next to the icon(s) you want to remove, click Apply, and then OK.

## Windows Accessories

Windows operating system ships with some handy applications known as Windows accessories. Calculator, Notepad, Paint, Explorer, WordPad are some of the most frequently used accessories.

Apart from above mentioned applications, Windows has a few tools for Ease of Access and some System Tools. We'll be briefly talking about them here.

### Calculator



Windows Calculator is a calculating application included in all the versions of Windows. It can be used to perform simple calculation, scientific calculation and Programming calculation.

- Choose Start >> Programs >> Accessories >> Calculator to start Calculator application, or
- Alternately you can open Run dialog box (Start >> Run) dialog box then type **calc** and hit enter.

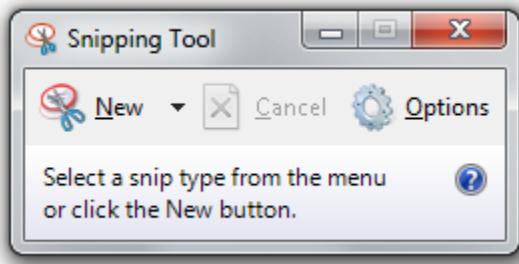
- From View menu choose the required type of calculator – Standard, Scientific, Programmer, Statistical
- Edit >> Copy and Paste commands can be used to input the numbers into calculator or paste the result to other applications

Calculator was first included with Windows 1.0 as a simple arithmetic calculator. In Windows 3.0, a Scientific mode was added, which included exponents and roots, logarithms, factorial-based functions, trigonometry (supports radian, degree and radians angles), base conversions (2, 8, 10, 16), logic operations, Statistic functions such as single variable statistics and linear regression.

In Windows 7, separate Programmer, Statistics, Unit Conversion, Date Calculation, and Worksheets modes were added. Calculator's interface was revamped for the first time since its introduction.

On the right of the main Calculator, one can add a panel with Date Calculation, Unit Conversion, and Worksheets. The included Worksheets allow one to calculate a result of a chosen field based on the values of other fields. Pre-defined templates include calculating a car's fuel economy (mpg and L/100 km), a vehicle lease, and a mortgage. In pre-beta versions of Windows 7, Calculator also provided a Wages template.

## **Snipping Tool**

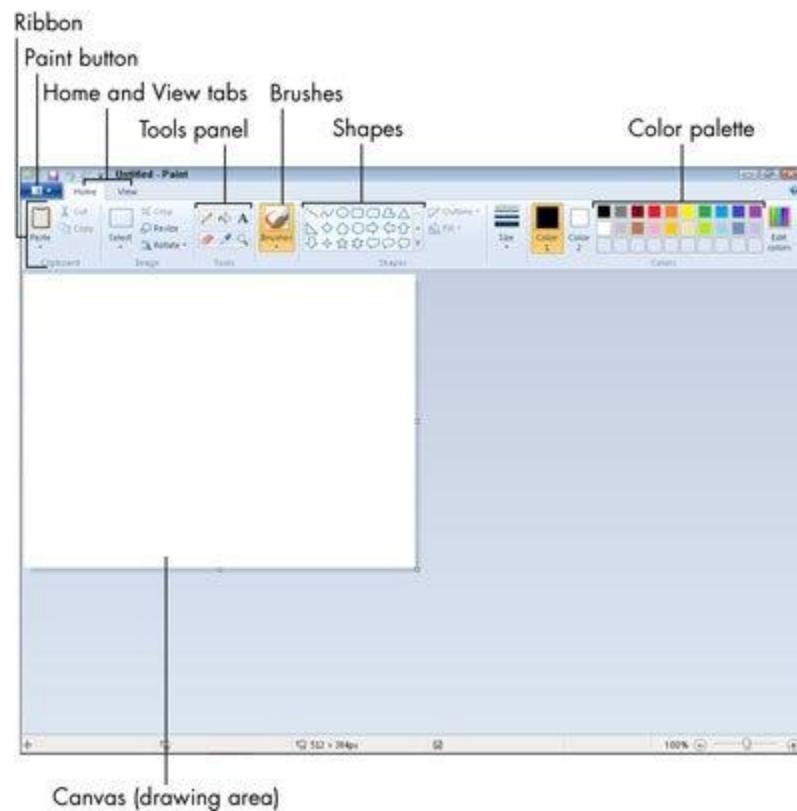


Snipping Tool is another useful of Windows accessories included in Windows 7, Windows Vista, and Experience Pack for Windows XP Tablet PC Edition 2005. It was originally released as a powertoy for the Tablet PC. The program is a screen-capture tool that allows taking screenshots (called snips) of an open window, rectangular areas, a free-form area, or the entire screen. Snips can then be annotated using a mouse or a tablet, saved as an image file (PNG, GIF, or JPEG file) or an HTML page, or e-mailed.

The Snipping Tool captures all or part of the computer display screen as a picture. You can save the picture and attach it to an e-mail or paste the picture into a document. Click the Start button, type snip, and click the Snipping Tool from the search results. The screen fades slightly, and the Snipping Tool toolbar appears.

Snipping tool can be used to PrintScreen, annotate and use in other applications.

## Paint

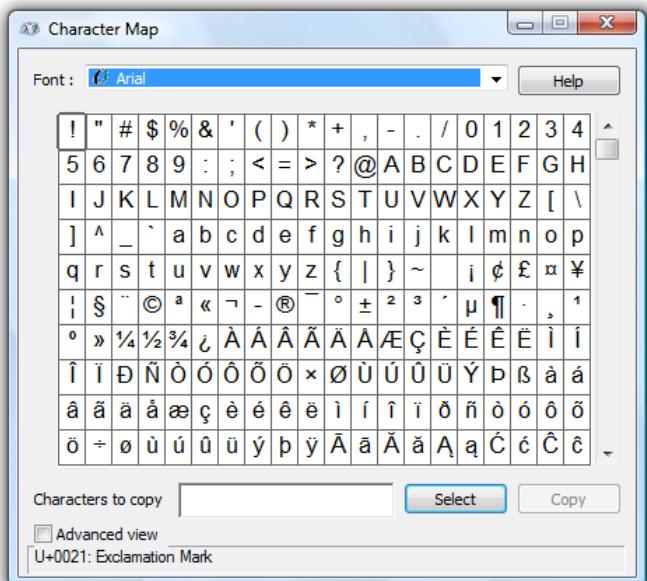


**Image Source: Wikipedia**

Paint (formerly Paintbrush for Windows) is a simple graphics painting program that has been included with all versions of Microsoft Windows. It is often referred to as MS Paint or Microsoft Paint. The program opens and saves files as Windows bitmap (24-bit, 256 color, 16 color, and monochrome) .BMP, JPEG, GIF. Paintbrush supports GIF without animation or transparency. Since Windows 98 Paint supports GIF with transparency. It also supports PNG (without alpha channel), and TIFF (without multiple page support).

The program can be in color mode or two-color black-and-white, but there is no grayscale mode. For its simplicity, it rapidly became one of the most used applications in the early versions of Windows—introducing many to painting on a computer for the first time—and still has strong associations with the immediate usability of the old Windows workspace.

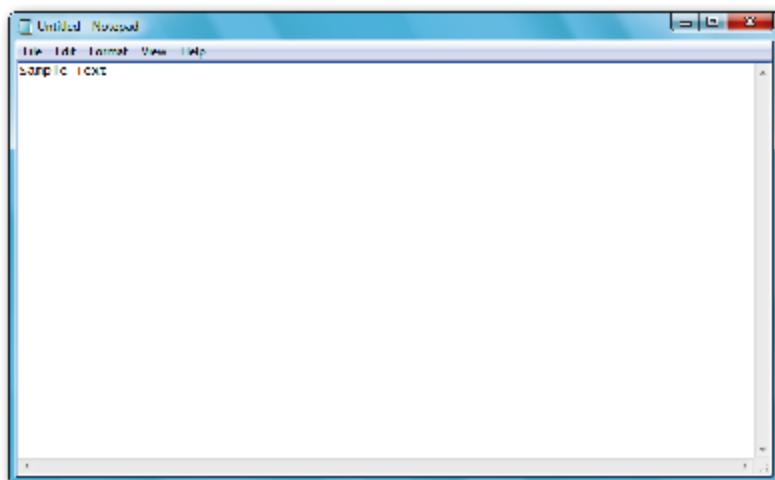
## Character Map



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

The tool is usually useful for entering special characters. It can be opened via the command line or Run Command dialog using the 'charmap' command.

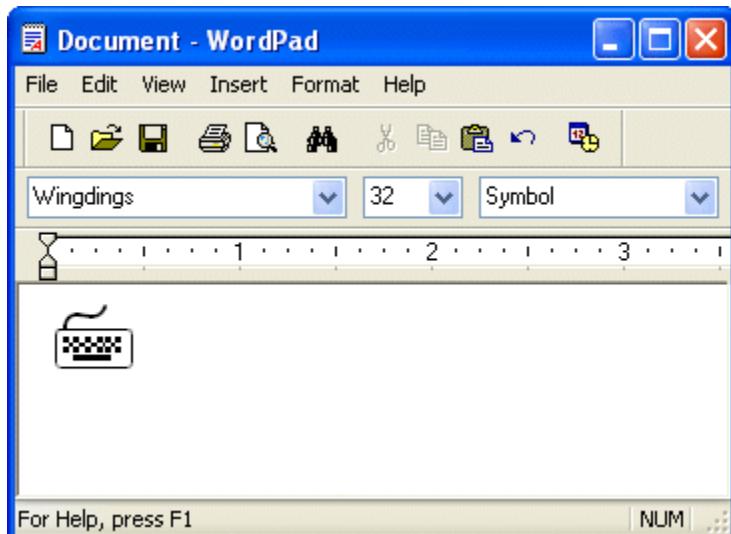
## Notepad



Notepad is a common text-only (plain text) editor. The resulting files—typically saved with the .txt extension—have no format tags or styles, making the program suitable for editing system files that are to be used in a DOS environment.

Notepad supports both left-to-right and right-to-left based languages, and one can alternate between these viewing formats by using the right or left Ctrl+Shift keys to go to right-to-left format or left-to-right format, respectively.

## WordPad



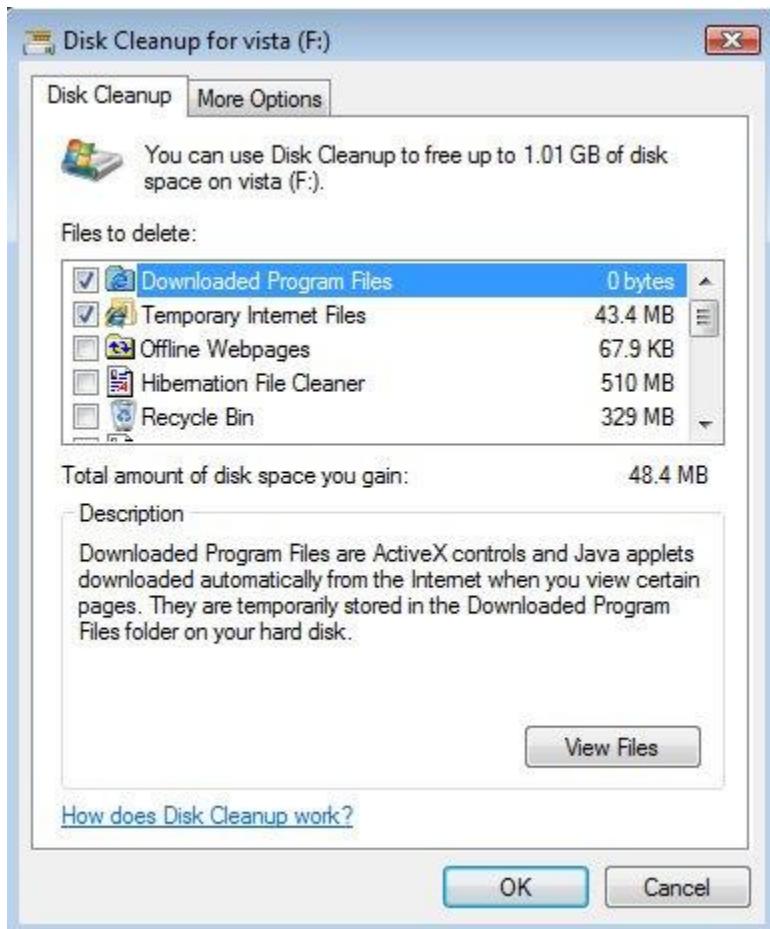
Microsoft WordPad is a free rich text editor included with Microsoft Windows 95 and the later. Earlier to Windows 95 there used to be an application called Write for the same task. Although capable of doing much more than Notepad, WordPad is not as advanced as Microsoft Word.

WordPad can format and print text, but lacks intermediate features such as a spell checker, thesaurus, and support for tables. As such, it is suitable for writing letters or short pieces, but underpowered for work that relies heavily on graphics or typesetting.

## System Tools

For a smooth performance of a system, periodic maintenance is necessary. Tools like Disk Check, Disk Derangement, etc., helps in system maintenance. Windows includes some of the system utilities such as Disk Cleanup, Disk Defragment, System Restore, Control Panel and so on.

## Disk Cleanup



In Windows 7, Vista, and XP, Disk Cleanup frees disk space by cleaning areas that gather unneeded files. Using Disk Cleanup regularly, along with ScanDisk, DEFrag, and up-to-date virus patterns, will help keep your computer running smoothly.

### To run Disk Cleanup:

- From the Start menu, select Programs or All Programs, then Accessories, then System Tools, and then Disk Cleanup.
- Select the drive on which you would like to clear disk space (usually your C: drive), and click OK.
- Select from the four areas that Disk Cleanup will check and clean up:

**Temporary Internet Files:** Files stored on your local drive that allow web pages to load more quickly

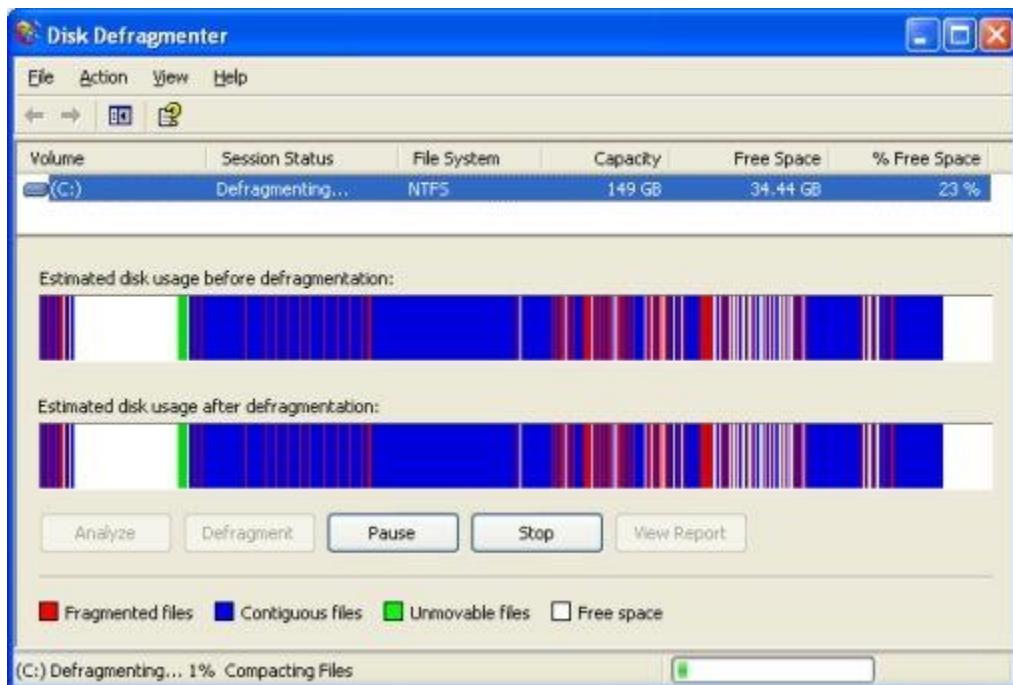
**Downloaded Program Files:** A storage location for programs downloaded when you

visit specific web sites that use ActiveX and Java applets

**Recycle Bin:** Files that have been marked as deleted

**Temporary Files:** Items in the TEMP folder

## Disk Defragmentation

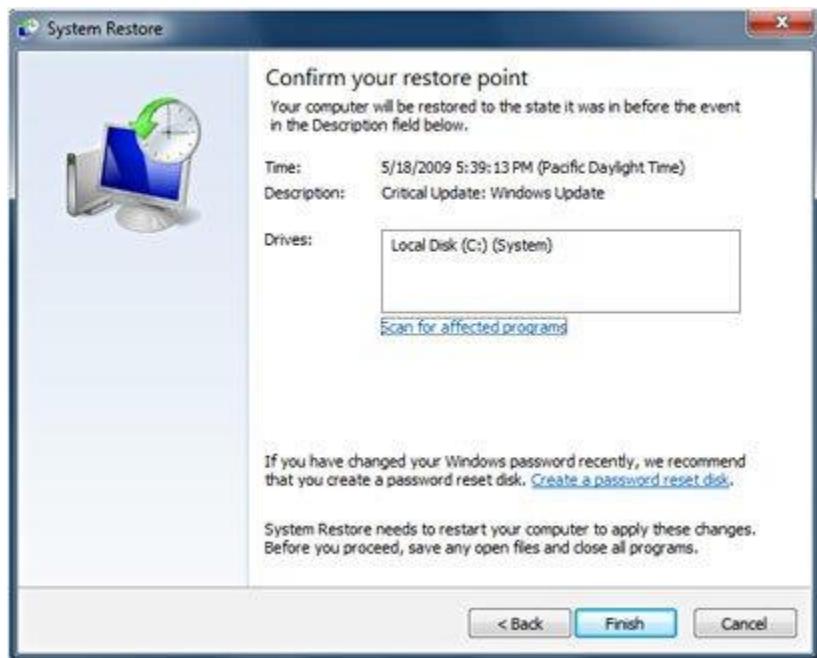


Disk Defragmenter consolidates files so that each is saved in contiguous physical space on the hard drive. When your computer crashes or freezes, the drive becomes fragmented. This means the files may be broken up and stored in different locations in your computer. This causes programs and files to run more slowly.

### To run Disk Defragmenter:

- Close all programs.
- Choose Start menu | All Programs | Accessories | System Tools | Disk Defragmenter.
- Select the drive you want to clean and click OK.
- Click Analyze. This may take several minutes.
- Click Close or Defragment. If the drive needs defragmented and you choose Defragment, this may take several minutes to several hours, depending on the number of files to consolidate.

## System Restore

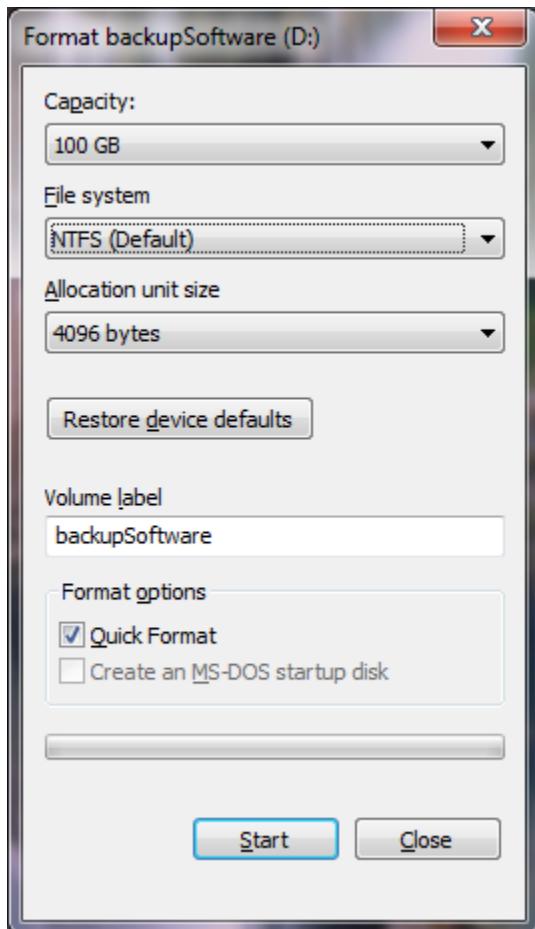


System restore is a feature of Windows that allows you to roll back the system to the same configuration it had at an earlier time. If this feature is turned on (which it is by default) Windows will take periodic snapshots (called restore points) of your installation. It can use the information gathered in these snapshots to restore your system to a previous configuration. It is a good idea to create a restore point before you make major changes to your system, such as before installing new hardware or doing any major updates.

### To run System Restore:

- Go to Start > Programs > Accessories > System Tools > System Restore.
- The System Restore screen will come up.
- Follow the on screen instructions

## Format



There are times when Windows becomes so damaged or so compromised by hackers and Trojan programs that the only thorough solution is to essentially start all over. This is accomplished by formatting your hard drive, which means erasing all of the programs and the data on your machine, and re-installing Windows.

The format creates a new root directory and file system for the disk. It can also check for bad areas on the disk, and it can delete all data on the disk. To be able to use a new disk, you must first use this command to format the disk.

## Control Panel

The **Control Panel** is a part of the Microsoft Windows graphical user interface. It allows users to view and manipulate basic system settings and controls via applets. You can use control panel for the tasks such as adding hardware, adding and removing software, controlling user accounts, and changing accessibility options. Additional applets can be provided by third party software.

In recent versions of Windows, the Control Panel has two views, Classic View and Category View, and it is possible to switch between these through an option that appears on either the left side or top of the window.

The classic view consists of shortcuts to the various control panel applets, usually without any description (other than the name). The categories are seen if the user use "Details" view.

The category view consists of categories, which when clicked on display the control panel applets related to the category. In Windows Vista, the category used applets below the name of the category.

Windows XP provides several accessories, or applications, that you can use to help you in your work. These accessories are not full-featured programs, but they are useful for specific jobs in the Windows environment. Accessories include a calculator, a painting program, a word processor, a text editor, and Internet applications. (Internet applications are discussed in Part 8, "Connecting to the Internet.")

## Tasks

1. Using Calculator
2. Using Command Prompt
3. Using WordPad
4. Typing Text
5. Selecting Text
6. Deleting Text
7. Copying Text
8. Moving Text
9. Formatting Text
10. Using Notepad
11. Using Paint
12. Drawing a Shape with Paint
13. Adding Text to a Drawing
14. Adding Color to a Drawing
15. Erasing Part of a Drawing

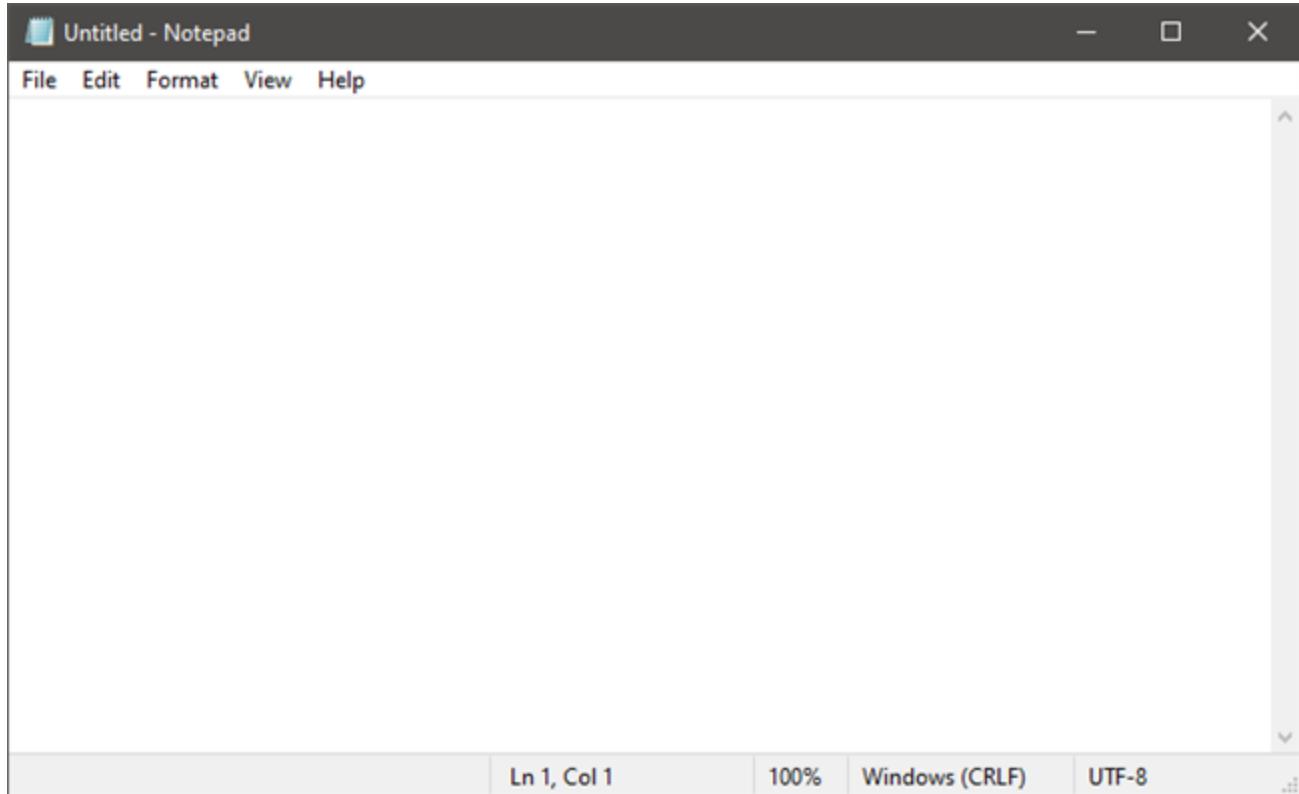
## Notepad

You've probably seen *Notepad* on your Windows computer or device. Did you wonder about what it is and what it does? This is a very old app that has been present in Windows operating systems for decades. Although it keeps mostly the same appearance in all Windows versions, lately, in Windows 10, it has received more attention from Microsoft. In this article, we're going to show you what *Notepad* is and how to use it. If you want to learn about it, read on:

### What is Notepad? What is Notepad used for?

*Notepad* is a basic text editor that's built into Windows. It is excellent for writing relatively short text documents that you want to save as plain text. However, that's not all you can do with it. If you have not used *Notepad* much, or ever, you may be surprised by how easy it is to work with.

*Notepad* looks and works mostly the same in Windows 10 and older versions of Microsoft's operating systems such as Windows 7. The main differences are related to how you open the application in different operating systems, and you can learn more about that in this tutorial: 11 ways to start Notepad in Windows (all versions). When you open *Notepad*, you get to see this no-frills screen:

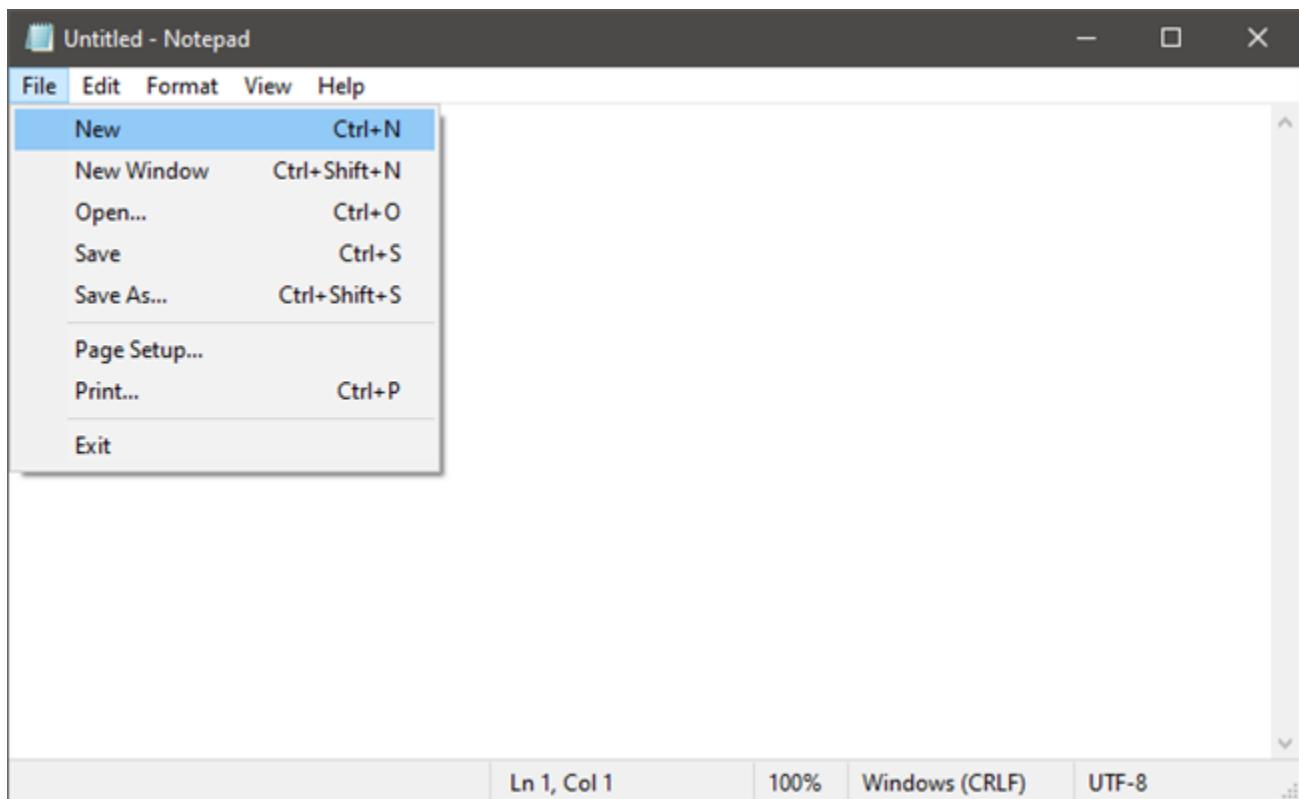


## Notepad in Windows 10

Nothing more is needed, since *Notepad* has a limited set of options. At the top of the window, you should see menus for *File*, *Edit*, *Format*, *View*, and *Help*. Let's take a look at what you can do with *Notepad*. Everything should be reassuringly familiar, but keep in mind that *Notepad* is just a text editor. If you try to paste graphics into it, it does not work.

### 1. Create, open, and save text files with Notepad

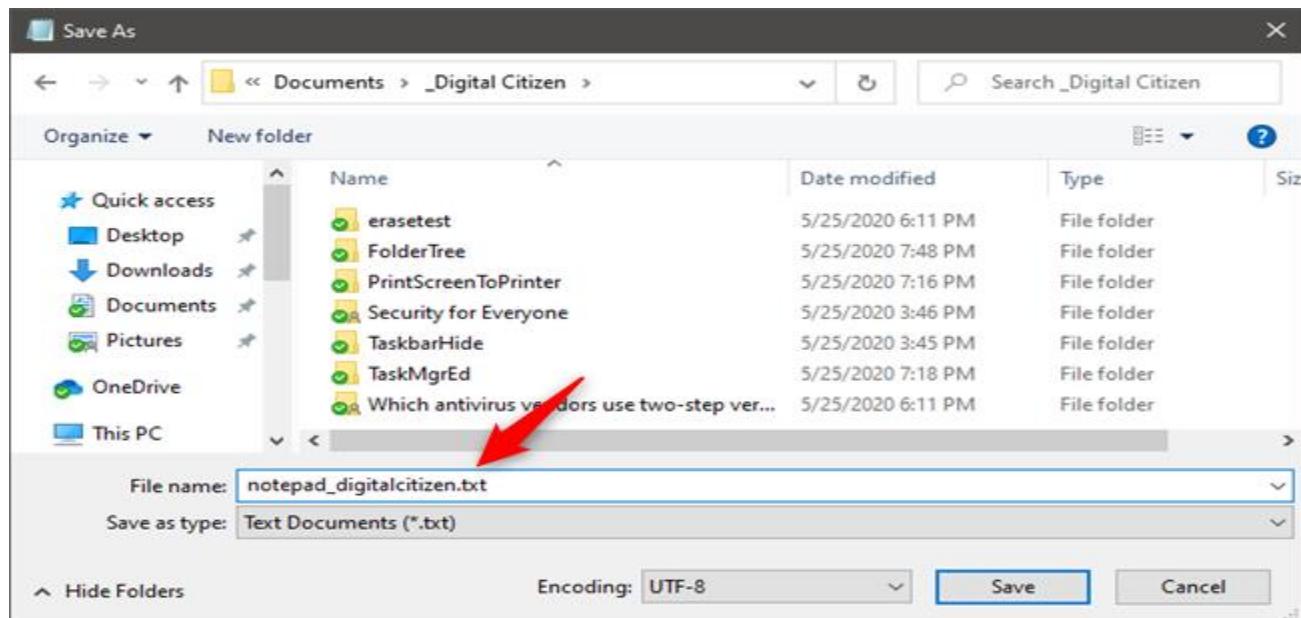
The choices you have in the *File* menu are *New*, *New Windows*, *Open*, *Save*, *Save As*, *Page Setup*, and *Print*. As you can see, many of these commands have keyboard shortcuts as well. You might already be familiar with some of them since they are the same in nearly every Windows application.



#### The File menu from Notepad

Creating and saving text documents in *Notepad* is simple: open *Notepad*, start typing, and then edit and format the text as you see fit. Once you are finished, use the *Save As* command to save your work. The default folder is the OneDrive folder in Windows 10, and the *My Documents* folder in Windows 7. You can change this quite easily: use the *Save As* command, browse to your preferred folder, and click *Open*. *Notepad* will

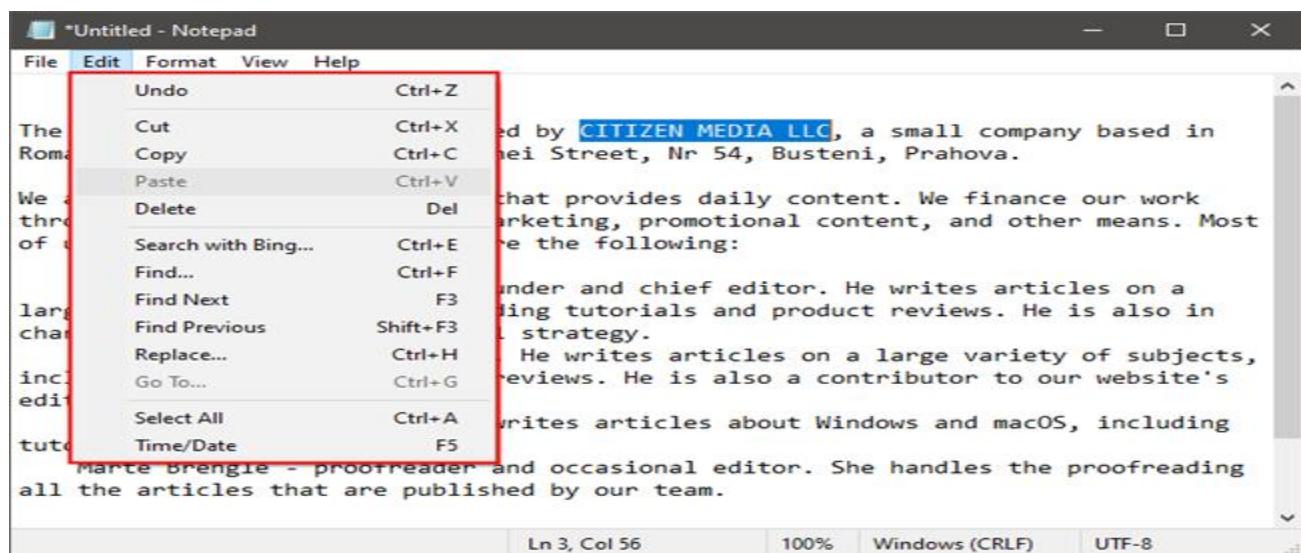
remember your choice. Keep in mind that your files are saved with a `.txt` extension and in plain text.



## Saving a document with Notepad

### 2. Use Notepad to make simple text edits

The *Edit* menu offers a few choices, but again, everything on this menu should be familiar to anyone who has used Windows. All the *Edit* choices have associated keyboard shortcuts. Note that most of the commands are greyed out until there is text selected in the *Notepad* window.

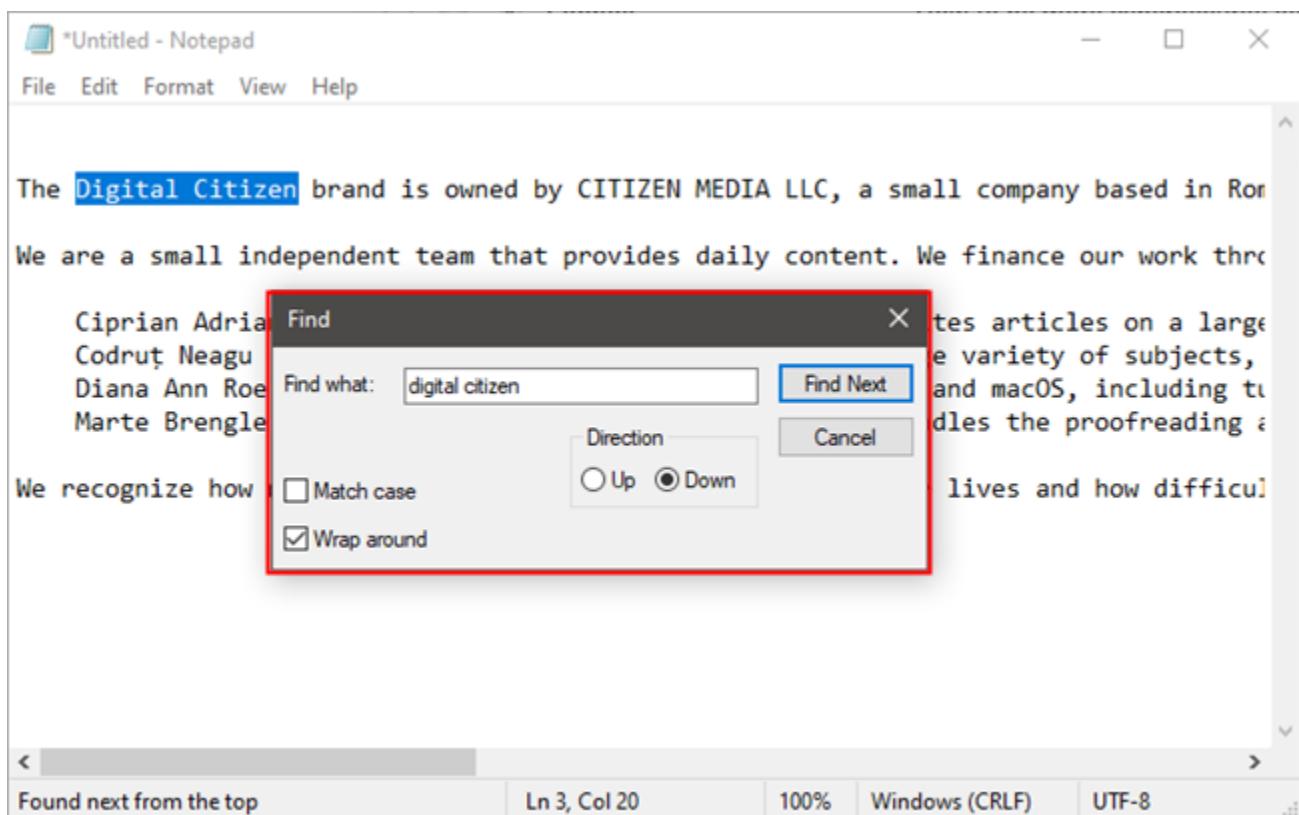


## Notepad's Edit menu

The first item on the *Edit* menu is *Undo/Redo*, which can be useful when you are editing the document. What appears in this place depends on what you have been doing. If you have just used the *Undo* command or pressed *Ctrl + Z*, you should see the *Redo* command at the top of the list (and its keyboard shortcut, *Ctrl + Y*).

### 3. Search and replace text in Notepad documents

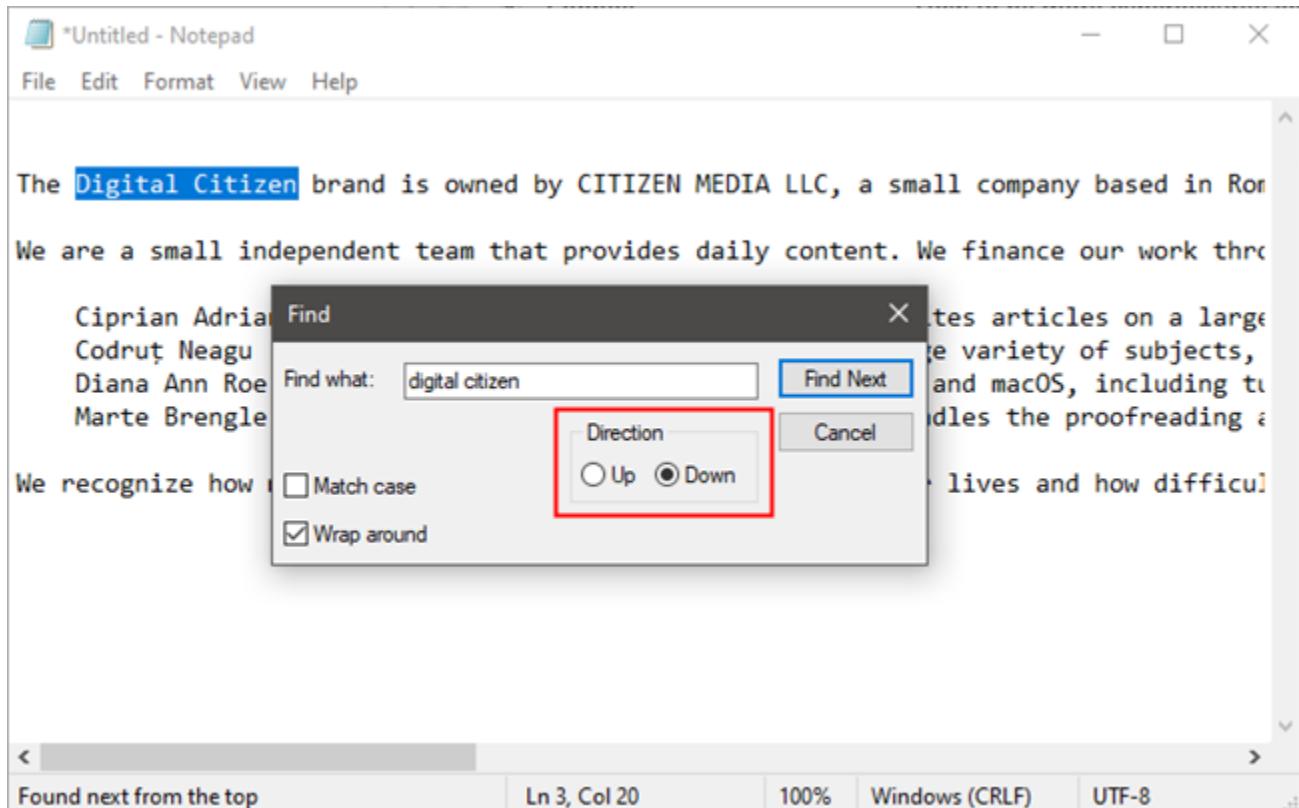
Find, Find Next, and Replace are used to search and replace text in the document, while Go To can be used to navigate through it. To search for or replace a piece of text, select the Find option (keyboard shortcut *Ctrl + F*) or the Replace (*Ctrl + H*) option, depending on what you want. That makes Notepad open a box where you can type the text you're looking for in the “Find what” field. If you want to replace text, the Replace window also gives you a “Replace with” field. Either way, both Find and Replace include the same few search options:



#### Using Notepad to find text in a document

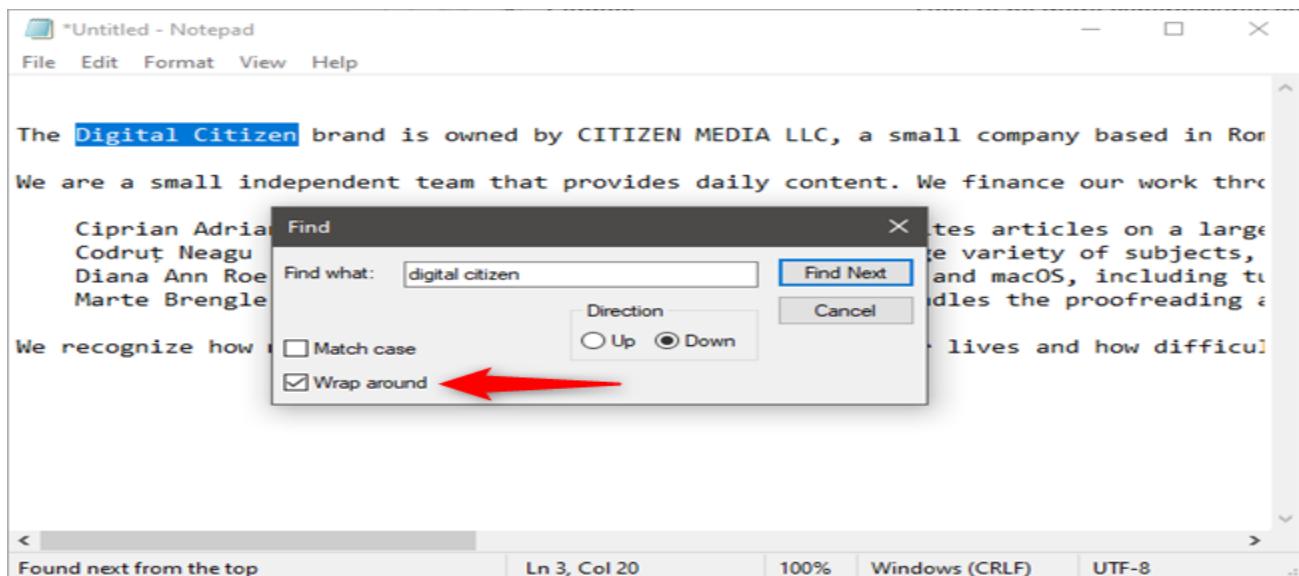
You can decide whether the search should “Match case” the text and choose the Direction to be either Down or Up. Down means that the search is made starting from where your cursor is inside the text document until the end of the

document. Up, on the other hand, performs the search from the cursor's position upwards, up to the beginning of the document. Unfortunately, neither option ensures that a search is done on the entire document unless you've placed the cursor at either the start or the end of the document.



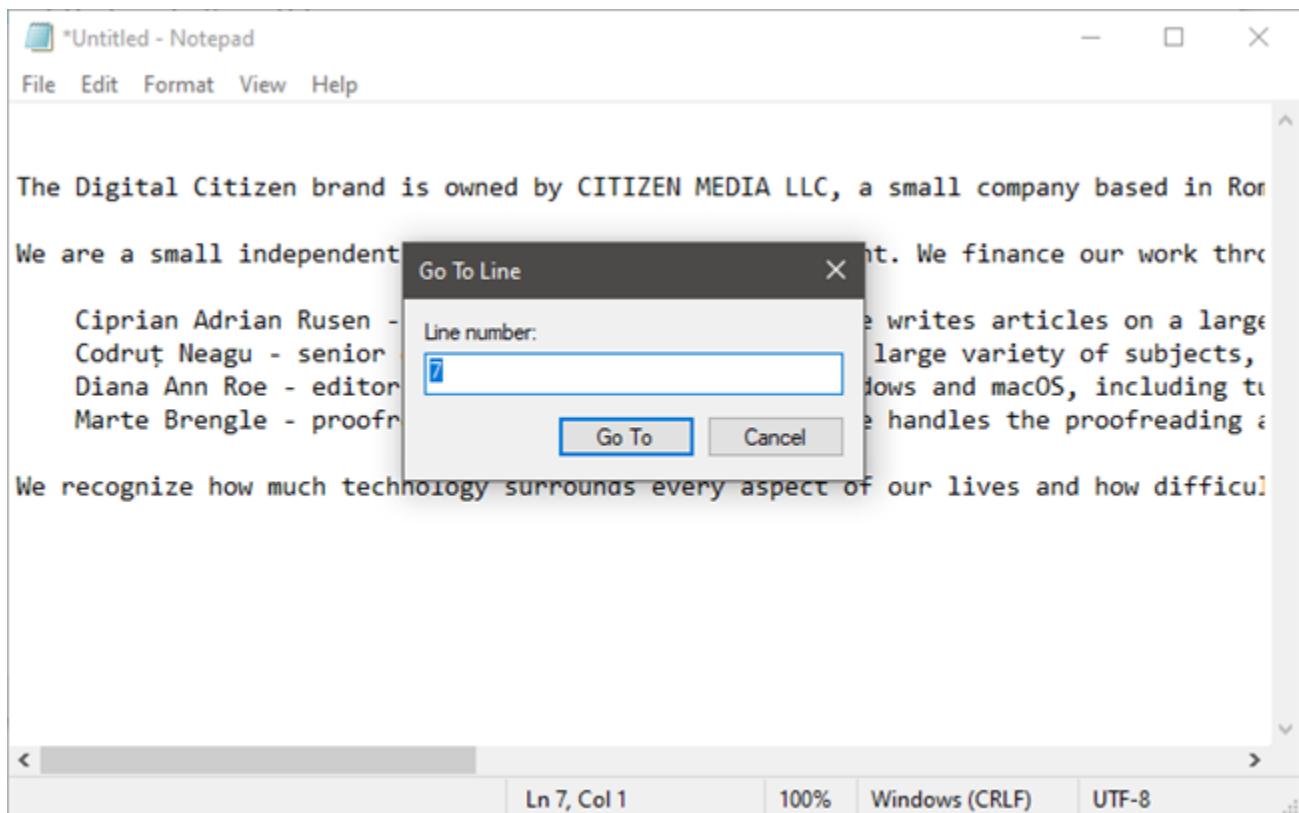
### Choosing the search direction in Notepad

Fortunately, you can ensure that your searches are performed on the entire document, from beginning to the end, by selecting the “Wrap around” setting. When Wrap around is on, Notepad uses your other search options too. However, if the Direction is set to Down, when it reaches the end of the document, Notepad automatically continues the search from the beginning and never stops. Similarly, if you set the Direction to Up, when the search reaches the beginning of the document, Wrap around automatically continues the search from the end of the document.



### The Wrap around setting from Windows 10's Notepad

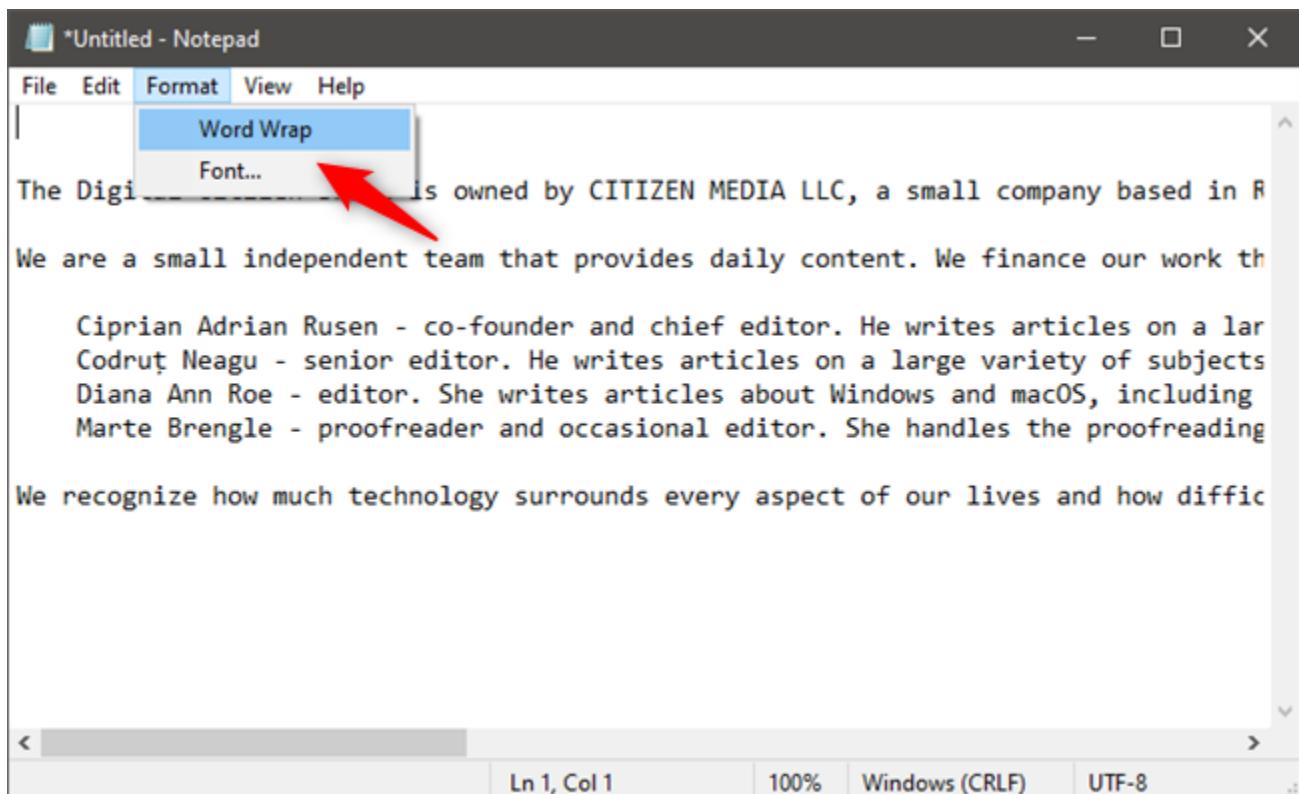
Go To is a less familiar command. You use Go To for jumping to a particular numbered line in the document. Go To only works if Word Wrap is turned off. If Word Wrap is on\*, Go To\* is greyed out.



## The Go To function from Notepad

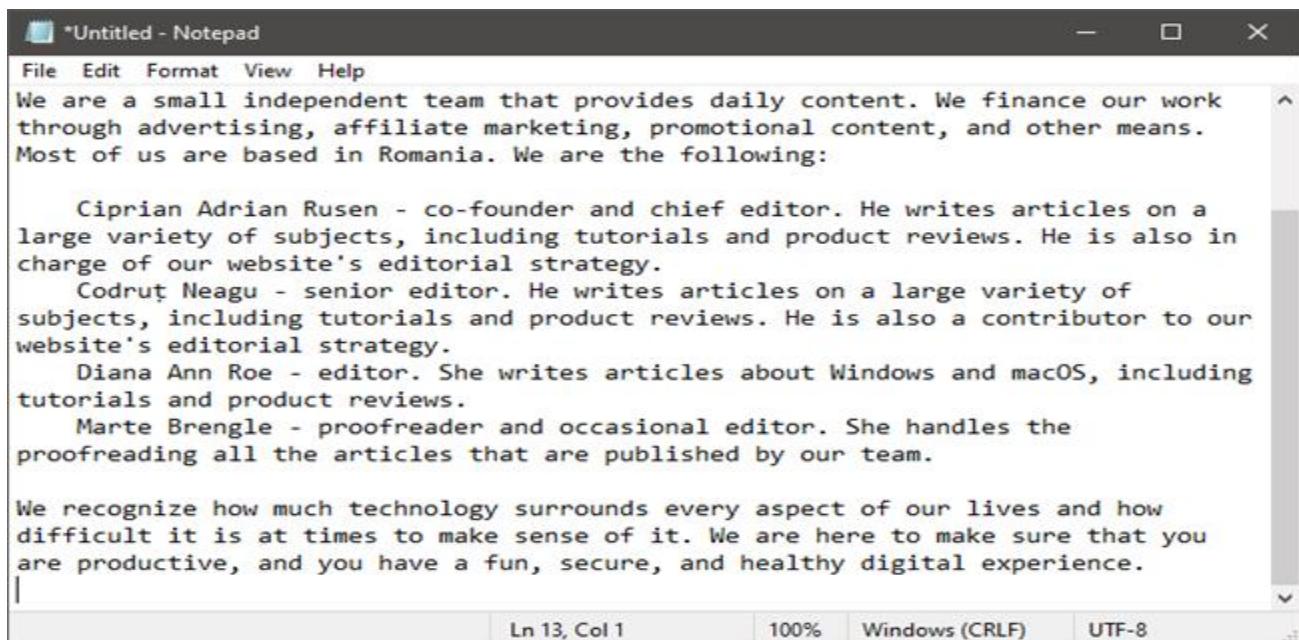
### 4. Turn Word Wrap on or off

The Format menu offers you only two choices: Word Wrap and Font. For some unknown reason, Notepad has always come with Word Wrap turned off. This means everything you type ends up on one long line until you press Enter, which starts another long line.



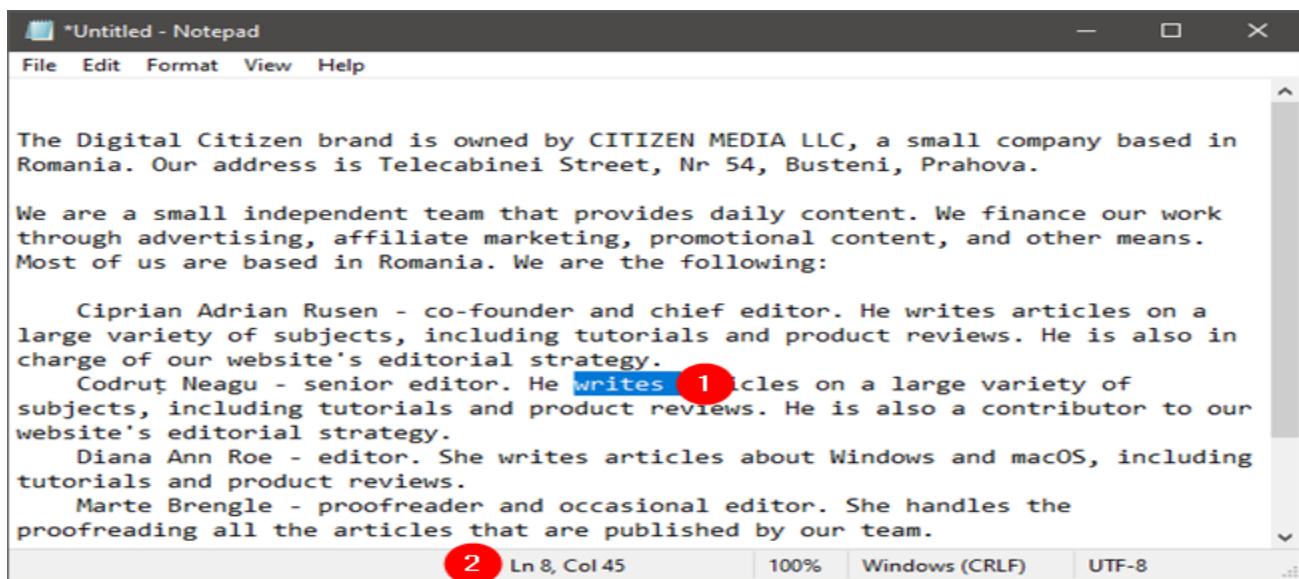
### Word Wrap in Notepad

You have the option of pressing Enter when your typing approaches the right margin of the Notepad window, but that makes the lines some arbitrary length depending on the size of your window. If you would like to see what you are typing without having to scroll all the way to the right, turn Word Wrap on. Then Notepad should behave just like any other word processing program and automatically wrap the text to the next line as you approach the right margin of your window.



## A document in Notepad displayed with Word Wrap

In Windows 7, the Status Bar (which you can enable or disable from the View menu) is also linked with Word Wrap. If Word Wrap is off, you can see a notification on the lower border of your window, showing you where the cursor is currently located in a document that is not word-wrapped. If Word Wrap is on, the lower border is blank. In Windows 10, the Status Bar is on by default and shows line and column numbers regardless of whether you're using Word Wrap or not.

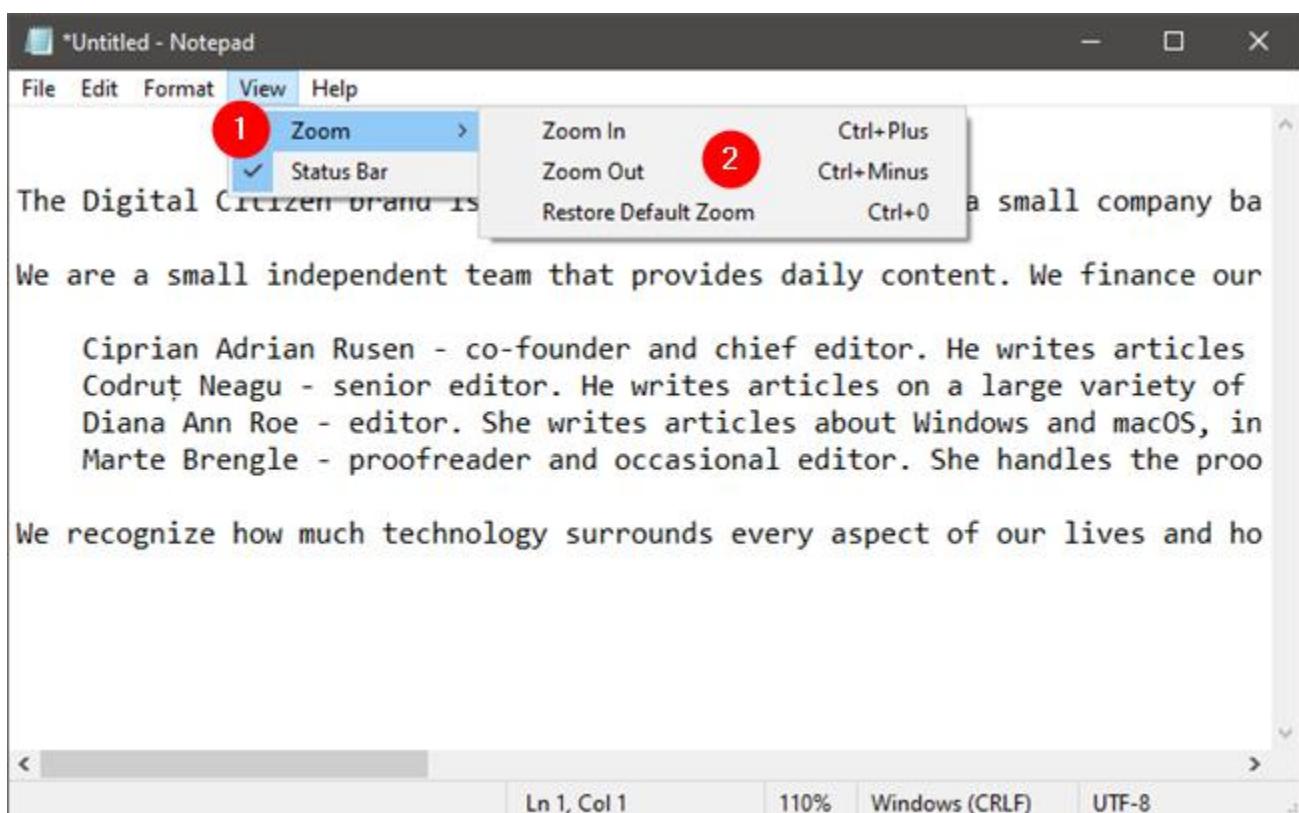


## Line and column numbers are shown in the Status Bar from Notepad

## 5. Zoom in and zoom out in Notepad (only in Windows 10)

If you're using Windows 10 with May 2020 Update or newer, Notepad also has another nifty feature: text zooming. You can use this feature to increase or decrease the size of the text so that it's easier to see on your screen.

To zoom text, open the View menu from the top of the Notepad window, select Zoom, and click or tap on Zoom In or Zoom Out. Repeat the same steps to further increase or decrease the zoom level. To go back to the normal zoom level, select "Restore Default Zoom" from the same menu.



Zoom settings in Notepad for Windows 10

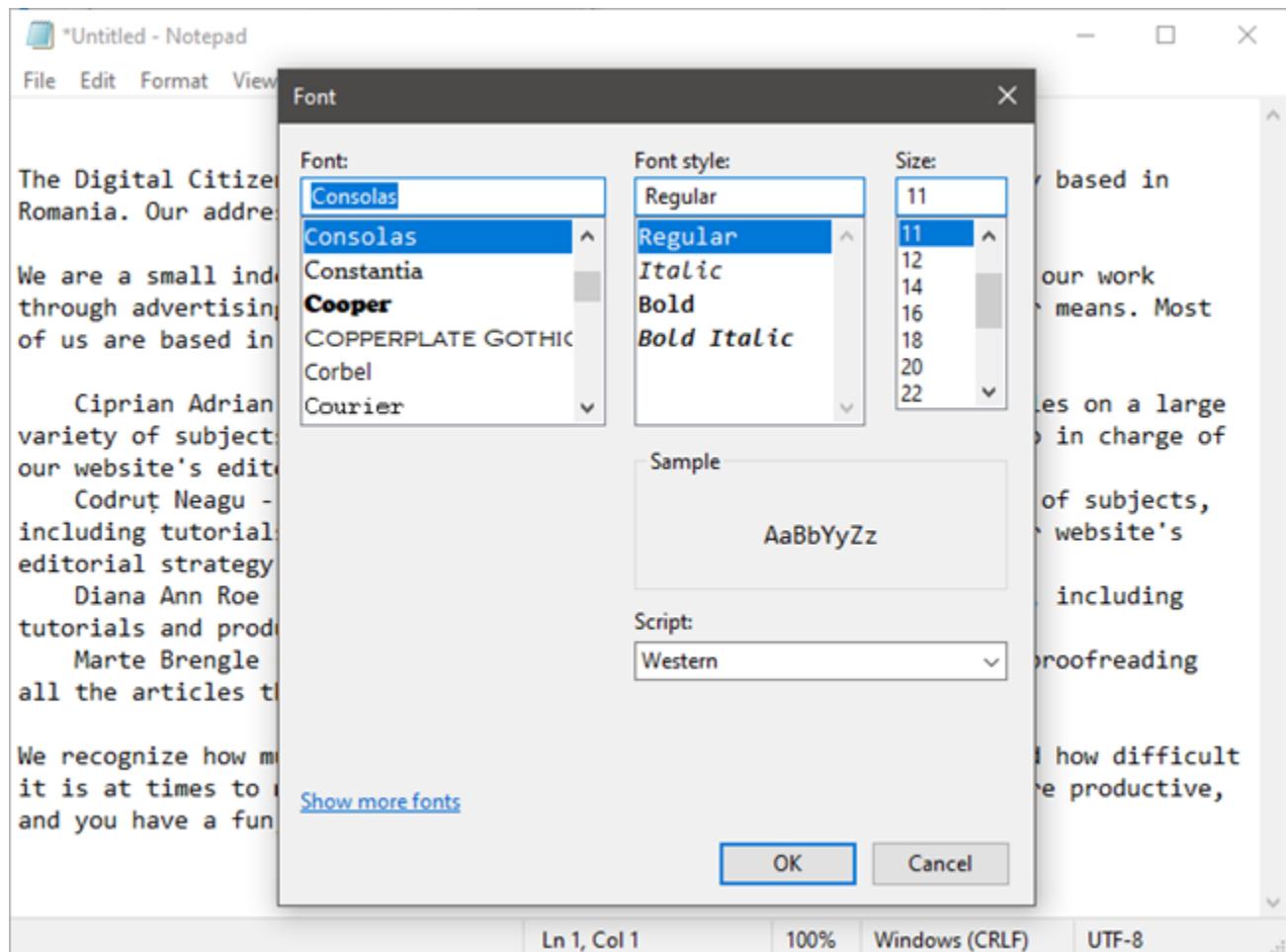
Also, for a faster experience, you might want to remember that you can also use these keyboard shortcuts for adjusting the zoom level in Notepad:

- Zoom In – Ctrl + Plus
- Zoom Out – Ctrl + Minus
- Restore Default Zoom – Ctrl + 0

## 6. Change the font of the text document

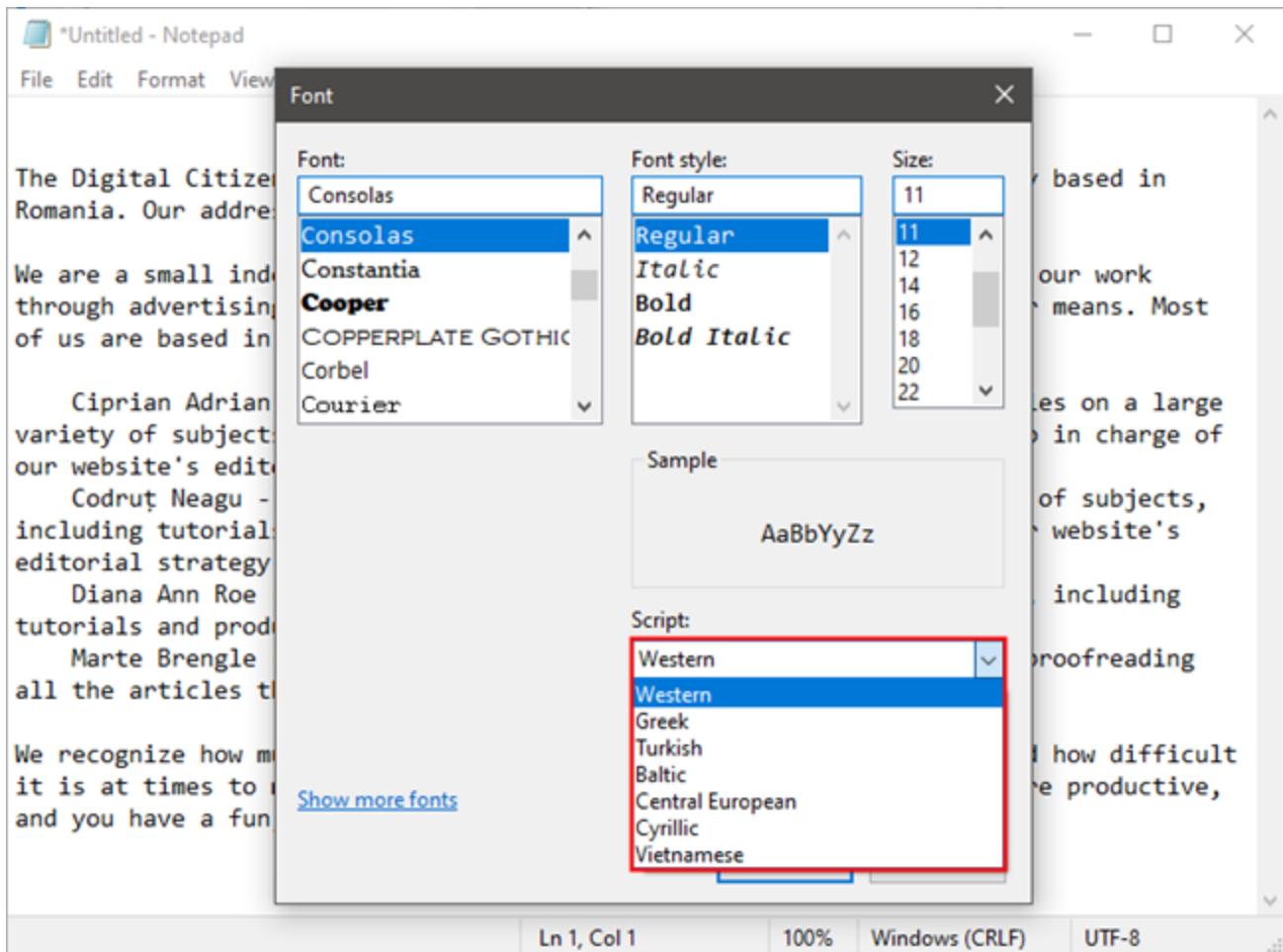
The Font choice is self-explanatory: it offers you a list of all your installed fonts and the option to use bold, italic, and the like. However, unlike the way it works in programs like Microsoft Word, a change of font immediately affects the entire document. You

cannot use one font in one part of the document and another font somewhere else. It is all or nothing.



### Font options in Notepad

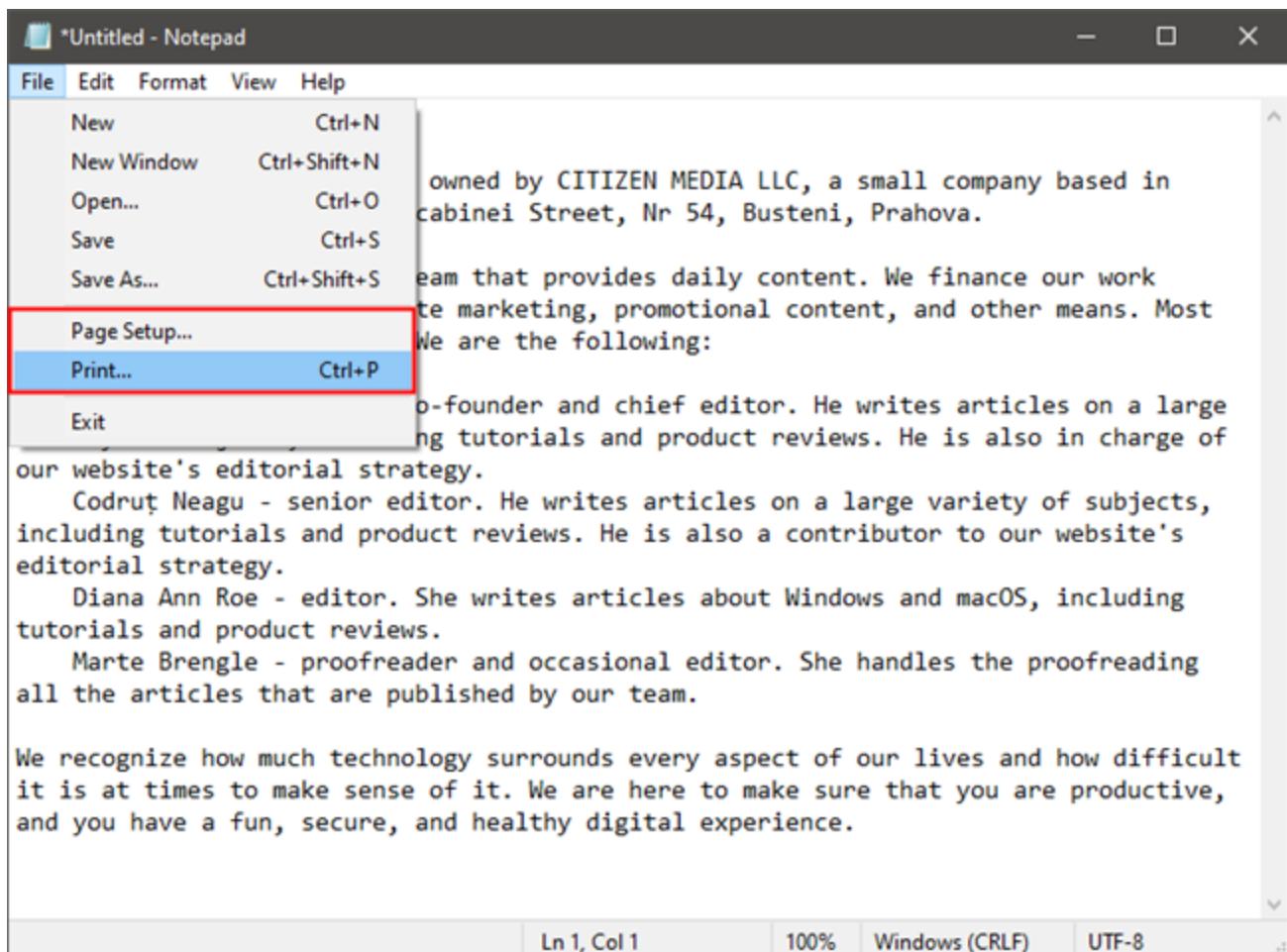
In the Font menu, there is a less familiar option available, the drop-down menu labeled Script. This lets you choose characters that are not available in the standard "Western" style fonts. The choices are Western, Greek, Turkish, Baltic (not available in Windows 7), Central European, Cyrillic, and Vietnamese (not available in Windows 7). Choose a set, and you should see some representative characters above it. The Western set is selected by default, and you need to change it to another one if necessary.



Font Script options in Notepad

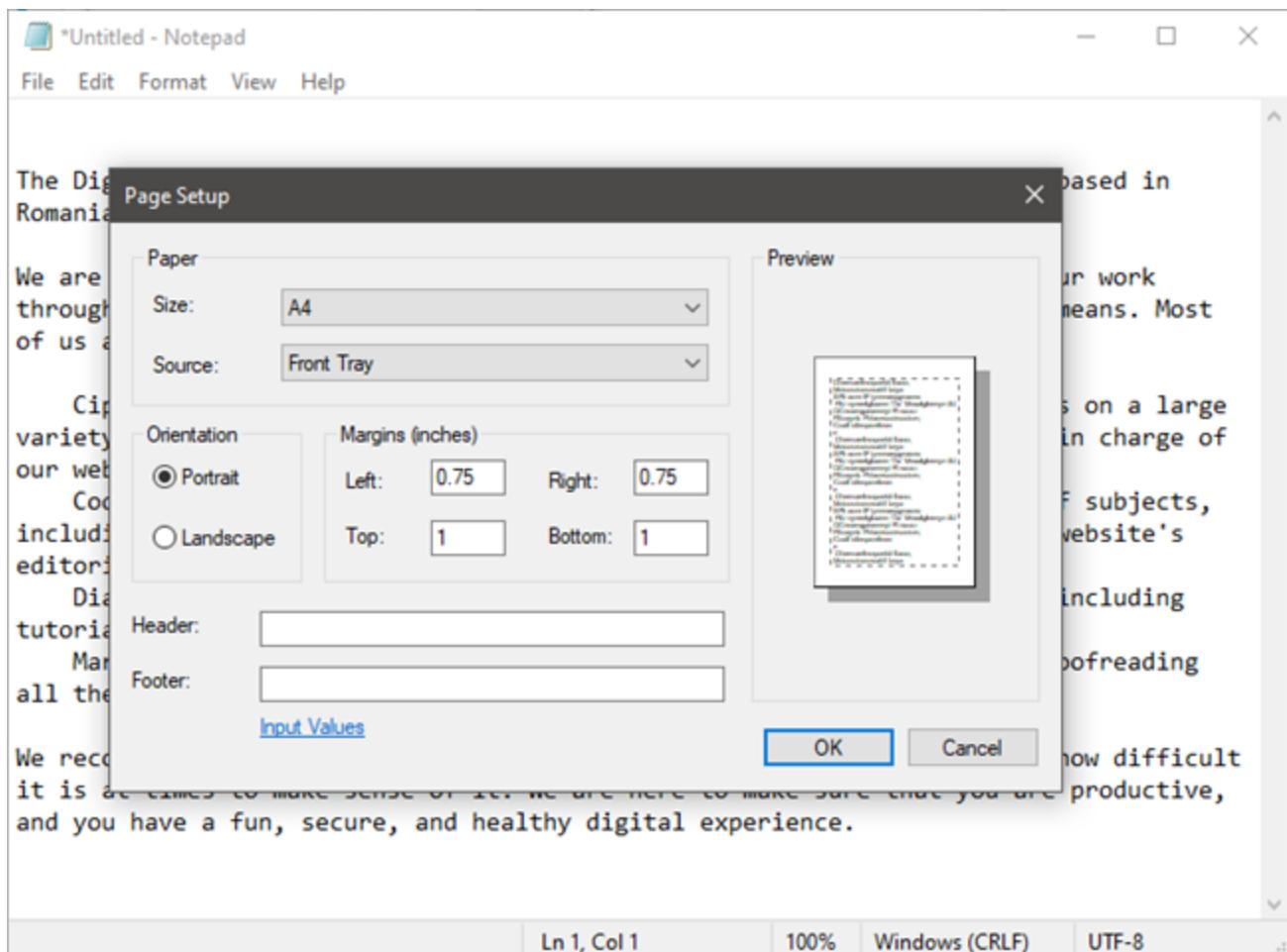
## 7. Print text files with Notepad

If there is nothing else that you want to customize in the document that you're printing, open the File menu, and click or tap Print. If you do want to customize the print, first click or tap on Page Setup in the File menu.



## Page Setup and Print in Notepad

In more sophisticated programs, Page Setup offers a long list of options. In Notepad, though, your choices are simple. You can choose the paper size and where your printer keeps the paper, the page orientation, and whether to have a header and footer (and the text to include in each).

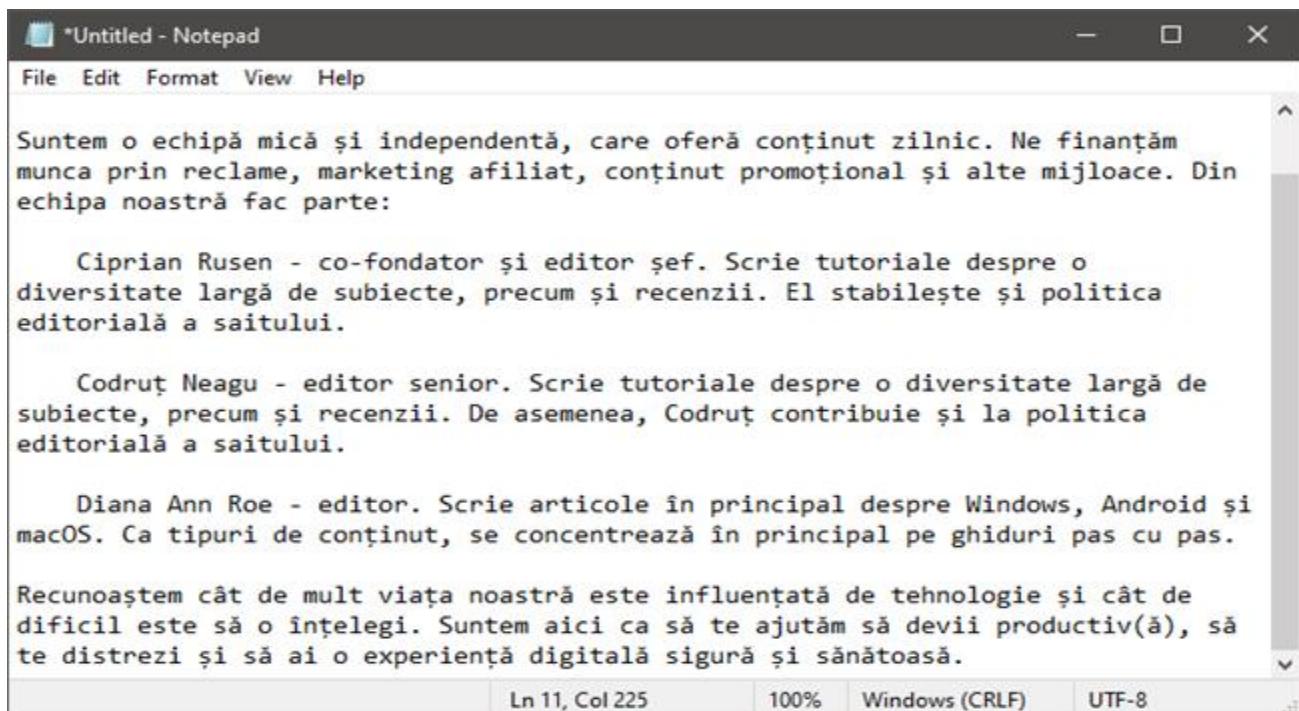


## Page Setup settings available in Notepad

By default, in Windows 10, there's no header or footer printed. In Windows 7, the text in the header is the name of the document and the date it was printed, and the text in the footer is the page number. If you want to customize the header and footer, type the texts you want to use for them. Note that you can also use some codes for printing the current date, time, name of the document, or page numbers. To see all the codes, click or tap on the Input Values link from the Page Setup window, or visit this page: [Changing Header and Footer Commands in Notepad](#).

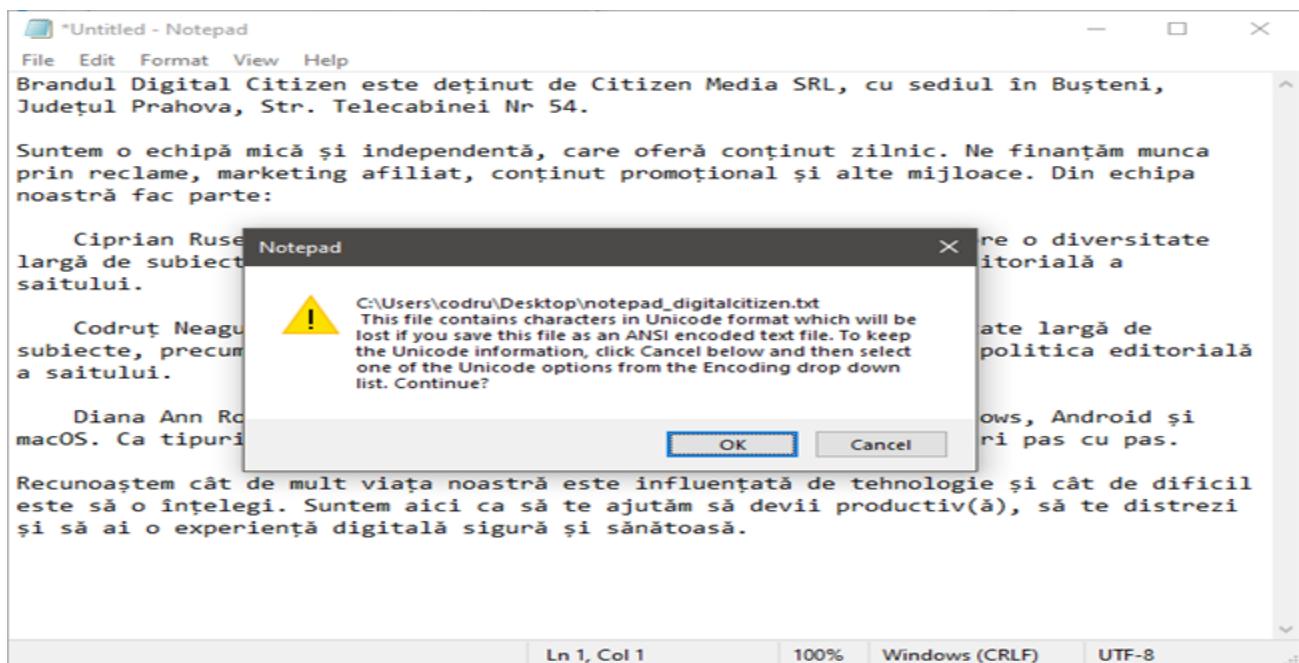
## 8. Save text files using different encodings

You can also use Save As to change the encoding of your file to match a particular character set. Here, a bit of text from our Romanian site [digitalcitizen.ro](http://digitalcitizen.ro) has been cut and pasted into Notepad.



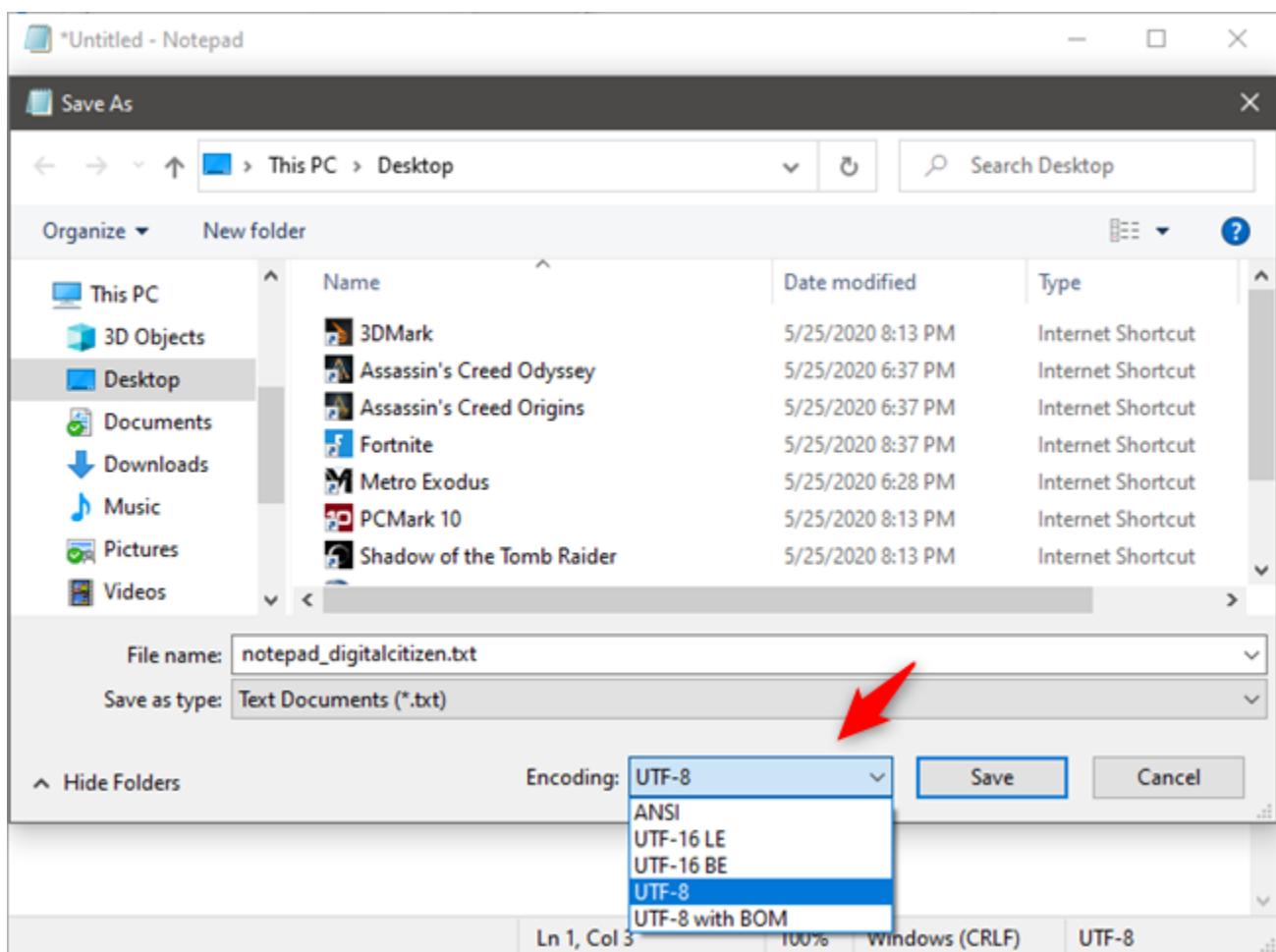
A document with Central European characters, created in Notepad

If you were to try to save this in ANSI encoding, which is the default option in the Notepad from Windows 7 and old versions of Windows 10, you would get a message that if you save it as plain text, all the formatting would be lost.



Saving a document in ANSI encoding can lose characters

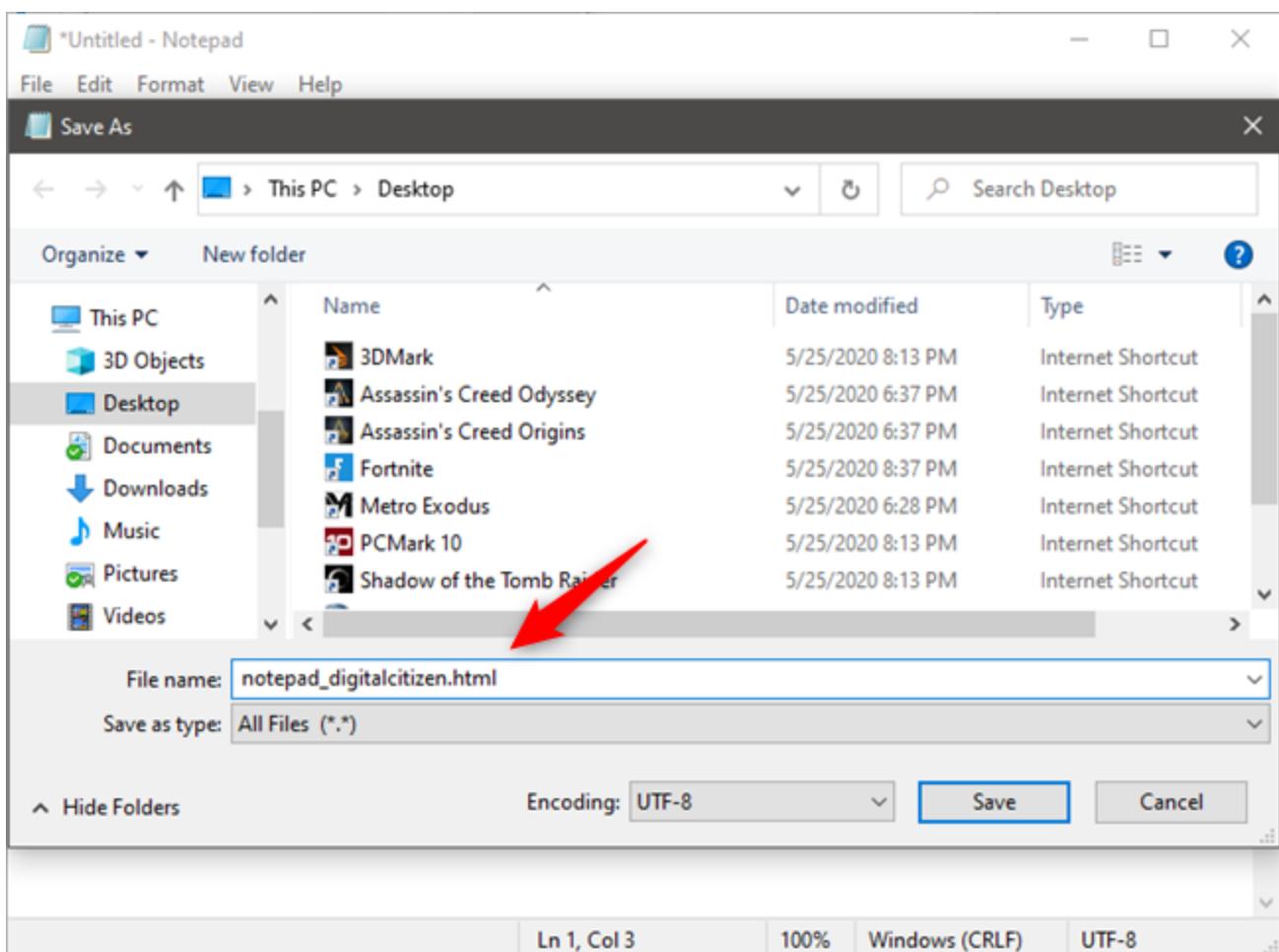
You have to choose the appropriate encoding from the drop-down list. This might take a little experimentation to get right, depending on the types of characters in the file, but starting with Unicode is a good bet. If you are not familiar with encoding, the first section of this tutorial should help explain it: Make Windows correctly display characters from languages other than English (set non-Unicode programs).



Choosing UTF-8 encoding for a document saved with Notepad

## 9. Save documents as HTML files

You can also use Notepad to create HTML files. Make sure that Word Wrap is turned on and type your HTML code the way you would type plain text. When it comes time to save your work, choose Save As, and select All Files from the list of choices. Then save your file with the .htm or .html extension.



Saving a document as an HTML file with Notepad

### Do you use Notepad for (light) text editing?

Notepad has been around for a long time and continues to be a useful desktop app for writing simple text and HTML. Sometimes, that is all you need. If you require more than just the basics, WordPad might be a better choice. It is built into all versions of Windows, too! Do you use Notepad regularly? If you do, please tell us how you find it useful in the comments below.

### Paintbrush

Microsoft Paint (frequently called MS Paint; formerly Paintbrush for Windows) is a simple graphics painting program that comes bundled with all modern versions of Microsoft Windows. Its original copyright dates to 1985.

The program opens and saves files as Windows bitmap (24-bit, 256 color, 16 color, and monochrome, all with the .bmp extension), JPEG, GIF, PNG, and TIFF. Older

versions cannot open or edit PNG files, and can only open GIF, JPEG, and TIFF files with a graphics filter for the specific file type. In addition, newer versions no longer support the PCX format, or some older special formats like RLE. Furthermore, the newer versions do not support the older MSP file format, readable by Paintbrush in Windows 3.x and used with versions of Paint in Windows version 1 and 2.

The program can be in color mode and in monochrome mode (in the sense of having no shades of grey). Thus for shades of grey the color mode is used. Alternatively, in monochrome mode, shades of grey simulated by patterns of black dots, in various densities, can be painted.

However, there is no option to convert real grey to this simulated grey. When loading an image with shades of grey, the program automatically goes into color mode.

### **Tools and functions**

New versions of Microsoft Paint allow the user to pick up to three colors at a time: the primary color (left mouse click), secondary color (right mouse click), and tertiary color (control key + any mouse click). The tertiary color function seems to be present, but deactivated or left undeveloped, in the older versions.

The program comes with the following options in its Tool Box: Free-Form Select, Select, Eraser/Color Eraser, Fill With Color, Pick Color, Magnifier, Pencil, Brush, Airbrush, Text, Line, Curve, Rectangle, Polygon, Ellipse, and Rounded Rectangle. MS Paint does not have the ability to automatically create color gradients.

The "Image" menu offers the following options: Flip/Rotate, Stretch/Skew, Invert Colors, Image Attributes, Clear Image, and Draw Opaque. The "Colors" menu allows the user to Edit Colors (only menu option under Colors). The Edit Colors dialog box shows a 48-color palette and 12 custom color slots that can be edited. Clicking "Define Custom Colors" displays a square version of the color wheel that can select a custom color either with a crosshair cursor (like a "+"), by Hue/Saturation/Luminance, or by Red/Green/Blue values.

The default colors in the Color Box could be described as the following colors: Black, White, Gray, Silver, Maroon, Red, Olive, Yellow, Dark Green, Green, Teal, Cyan, Navy blue, Blue, Purple, Magenta, Old Gold, Lemon Yellow, Slate grey, Kelly green, Dark Carolina blue, Aquamarine, Midnight blue, Periwinkle, Violet-blue, Coral, and Pumpkin orange. A colour palette is also available.

MS Paint also has a few hidden functions not mentioned in the help file: a "stamp mode", "trail mode" and "10x Zoom".

For the stamp mode, the user can select part of the image, hold the control key, and move it to another part of the canvas. This, instead of cutting the piece out, creates a copy of it. The process can be repeated as many times as desired, as long as the control key is held down. The trail mode works exactly the same, but it uses the shift key instead of the control key. 10x Zoom can be accessed by clicking right below the 8x Zoom button (there is a line about 2 pixels high. Click that to obtain 10x Zoom.) It may be a removed feature.

## **Uses**

Despite its simplicity, Microsoft Paint is still widely used, especially for oekaki and pixel artists since both forms of art require minimal resources.

## **Negative implications**

Because of its simplicity and the fact that it has been bundled with every version of Windows to date, Microsoft Paint is usually associated with the concept of a newbie or otherwise inexperienced or clueless user, and images and drawings of poor quality are usually labelled as "made with Paint" in a somewhat derogatory manner. In the past, there have been shareware Windows programs featuring graphics drawn with MS Paint, which were easy to recognize because of their rough outlines and flat coloring with no gradients or color smoothing, typical of Microsoft Paint drawings made in a hurry, since those effects are not automated. Intentionally horrible images are also considered to be Microsoft Paint creations, although the connotation is more lighthearted and humorous.

Despite this, experienced artists (especially pixel and oekaki, as mentioned before) can indeed create high quality images with the program.

## **UNIT-V**

# **Editors and Word Processors**

### **Basic Concepts**

#### **1.1 INTRODUCTION**

A computer is a programmable machine designed to perform arithmetic and logical operations automatically and sequentially on the input given by the user and gives the desired output after processing. Computer components are divided into two major categories namely hardware and software. Hardware is the machine itself and its connected devices such as monitor, keyboard, mouse etc. Software are the set of programs that make use of hardware for performing various functions.

#### **1.2 OBJECTIVES**

After going through this lesson you would be able to:

- familiarise yourself with characteristics of computers
- identify the basic components of a computer
- explain the importance of various units of a computer
- differentiate between system software and application
- software explain the importance of operating system
- get acquainted with open source
- appreciate the need of computer security

#### **1.3 CHARACTERISTICS OF COMPUTERS**

The characteristics of computers that have made them so powerful and universally useful are speed, accuracy, diligence, versatility and storage capacity. Let us discuss them briefly.

##### **Speed**

Computers work at an incredible speed. A powerful computer is capable of performing about 3-4 million simple instructions per second.

## **Accuracy**

In addition to being fast, computers are also accurate. Errors that may occur can almost always be attributed to human error (inaccurate data, poorly designed system or faulty instructions/programs written by the programmer)

## **Diligence**

Unlike human beings, computers are highly consistent. They do not suffer from human traits of boredom and tiredness resulting in lack of concentration. Computers, therefore, are better than human beings in performing voluminous and repetitive jobs.

## **Versatility**

Computers are versatile machines and are capable of performing any task as long as it can be broken down into a series of logical steps. The presence of computers can be seen in almost every sphere – Railway/Air reservation, Banks, Hotels, Weather forecasting and many more.

## **Storage Capacity**

Today's computers can store large volumes of data. A piece of information once recorded (or stored) in the computer, can never be forgotten and can be retrieved almost instantaneously.

### **Examples:**

**MS-Word:-** Sometimes called Winword, MS Word, or Word, Microsoft Word is a word processor published by Microsoft. It is one of the office productivity applications included in the Microsoft Office suite. Originally developed by Charles Simonyi and Richard Brodie, it was first released in 1983.

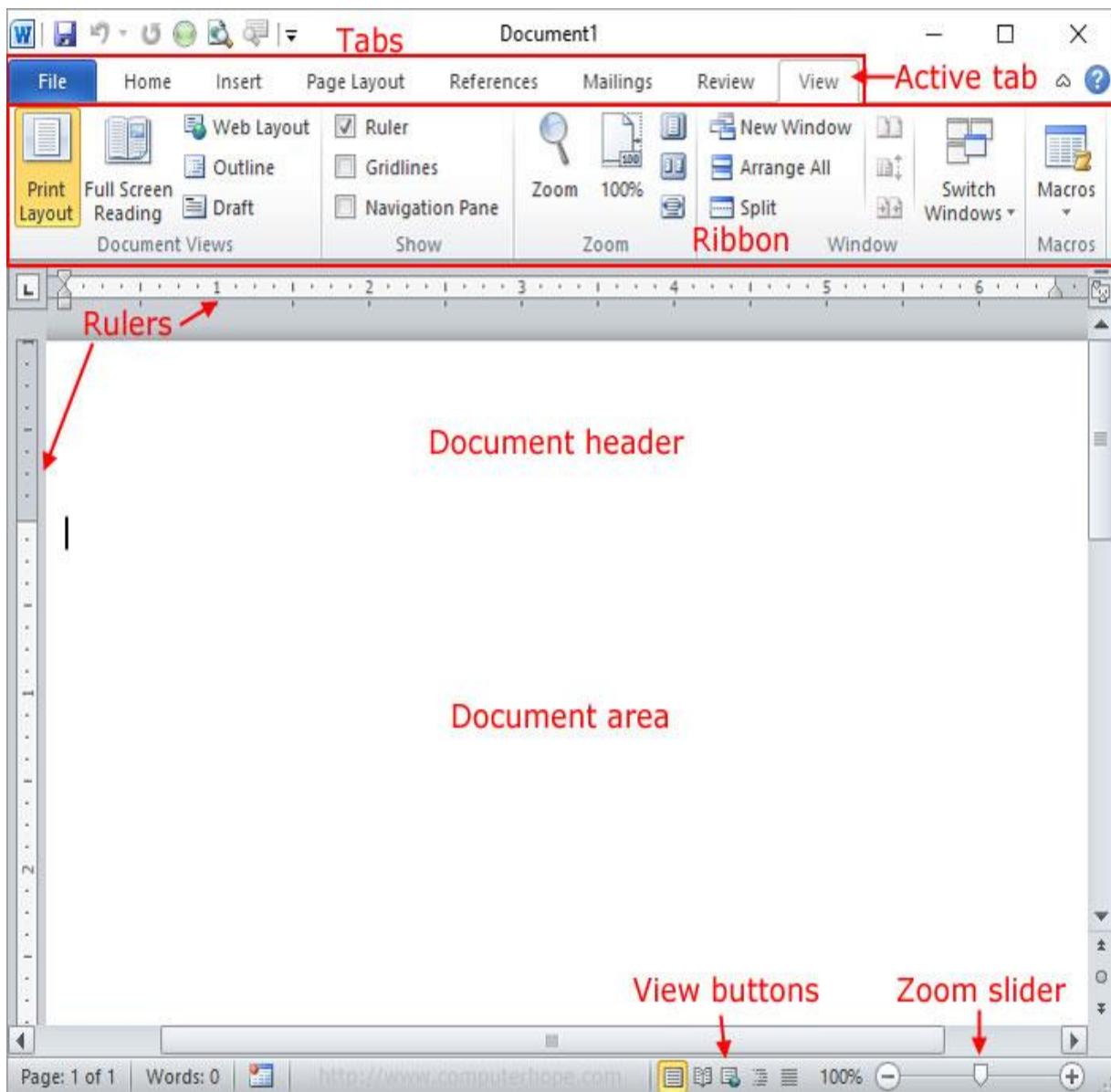
Microsoft Word is available for Microsoft Windows, Apple macOS, Android, and Apple iOS. It can also run on the Linux operating system using WINE.

### **What is Microsoft Word used for?**

Microsoft Word allows you to create professional-quality documents, reports, letters, and résumés. Unlike a plain text editor, Microsoft Word has features including spell check, grammar check, text and font formatting, HTML support, image support, advanced page layout, and more.

### **What does the Microsoft Word editor look like?**

Below is an overview of a Microsoft Word 2010 document.



## Where do you find or start Microsoft Word?

If you have Microsoft Word or the entire Microsoft Office package installed on Microsoft Windows, you can find Microsoft Word in your Start menu.

Keep in mind that new computers do not include Microsoft Word. It must be purchased and installed before running it on your computer. If you do not want (or cannot afford) to purchase Microsoft Word, you can use a limited version for free at the Microsoft Office website.

If Microsoft Word is installed on your computer, but you can't find it in your Start menu, use the following steps to launch Microsoft Word manually.

1. Open My Computer.
2. Click on or select the C: drive. If Microsoft Office is installed on a drive other than the C: drive, select that drive instead.
3. Navigate to the **Program Files (x86)** folder, then the **Microsoft Office** folder.
4. In the Microsoft Office folder, if there is a **root** folder, open that folder. Then open the OfficeXX folder, where XX is the version of Office (e.g., Office16 for Microsoft Office 2016). If there is no root folder, look for and open a folder having "Office" in the name.
5. Look for a file named **WINWORD.EXE** and click or double-click that file to start the Microsoft Word program.

### **What are the uses of Microsoft Word?**

Microsoft Word is a word processor, and, like other word processors, it's capable of helping users create a variety of different types of documents. For example, users can create a résumé, business contract, instruction document, or a letter to another person. We've included a list of the top uses of a word processor on our word processor page.

### **How many lines are there on a page in Microsoft Word?**

By default, there are 29 lines on one page in Microsoft Word.

### **What type of files can Microsoft Word create and use?**

Early versions of Microsoft Word primarily created and used the .doc file extension, while newer versions of Word create and use the .docx file extension.

More recent versions of Microsoft Word can create and open the following types of files:

**.doc, .docm, .docx**

**.dot, .dotm, .dotx**

**.htm, .html**

**.mht, .mhtml**

**.odt**

**.pdf**

**.rtf**  
**.txt**  
**.wps**  
**.xps**  
**.xml**

### **Example of a Microsoft Word .doc file**

You can download an example of a Microsoft Word .doc document by clicking the Microsoft Word .doc file link.

### **Why use Word instead of a plain-text editor?**

Microsoft Word offers many features not found in a traditional text editor or a plain-text file. Reasons to use Microsoft Word instead of a plain-text editor include the ability to change the formatting (e.g., center), change the font type, size, and color, insert pictures, and much more.

### **Why use Word instead of a WordPad?**

A rich-text editor, like WordPad, offers many of the same basic features as Microsoft Word. Where Microsoft Word differs is the ability to do more advanced features. Some of the advanced features include mail merges, spellchecker, styles, tables, headers & footers, WordArt, columns, margins, and more.

### **What are the different versions of Microsoft Word?**

Microsoft Word has had several versions throughout its history. The different releases, along with release dates are listed below.

### **Introduction to desktop**

The desktop lies behind all of the other components in your desktop environment. The desktop is an active component of the user interface. You can perform the following tasks from your desktop:

- Start your applications, and open your files and folders.

You can add desktop objects for convenient access to files, folders, and applications that you use frequently. For example, you can add an application launcher to the desktop. You can create a symbolic link to a file that you use

often, then add this link to your desktop. You can also store files and folders on the desktop.

- Open the Desktop menu.

Right-click on the desktop to open the Desktop menu. You can use the Desktop menu to perform actions on the desktop.

- Work with Trash.

You can move objects to Trash and empty your Trash.

- Customize your desktop background.

You can customize the pattern or color of the desktop background.

By default, your desktop contains three objects.

## **Publishing**

With desktop publishing software and hardware you can:

- Design print communications such as brochures, fliers, ads, and posters.
- Design print communications such as catalogs, directories, and annual reports.
- Design logos, business cards, and letterhead.
- Design and publish newsletters, magazines, and newspapers.
- Design books and booklets.
- Convert print communications to formats for the web and smart devices such as tablets and phones.
- Create resumes and business forms including invoices, inventory sheets, memos, and labels.
- Self-publish books, newsletters, and e-books.
- Design and publish blogs and websites.
- Design slides shows, presentations, and handouts.
- Create and print greeting cards, banners, postcards, candy wrappers, and iron-on transfers.

- Make digital scrapbooks and print or digital photo albums.
- Create decorative labels, envelopes, trading cards, calendars, and charts.
- Design packaging for retail merchandise from wrappers for bars of soap to software boxes.
- Design store signs, highway signs, and billboards.
- Take work designed by others and putting it into the correct format for digital or offset printing or for publishing online.
- Create more attractive, readable reports, posters, and print or on-screen presentations for school or business.

## **How Desktop Publishing Has Changed**

In the '80s and '90s, desktop publishing was for print almost exclusively. Today, desktop publishing includes much more than just print publications. It's publishing as PDF or an e-book. It's publishing to blogs and designing websites. It's designing content for multiple platforms, including smartphones and tablets.

Desktop publishing is the technical assembly of digital files in the proper format for printing or for electronic distribution. In practical use, much of the graphic design process is also accomplished using desktop publishing, graphics software, and web design software and is sometimes included in the definition of desktop publishing.

Comparison of desktop publishing, graphic design, and web design:

- **Desktop publishing** is the process of using the computer and specific types of software to combine text and graphics to produce documents such as newsletters, brochures, books, and web pages.
- **Graphic design** uses text and graphics to communicate an effective message in the design of logos, graphics, brochures, newsletters, posters, signs, and other types of visual communication.
- **Web design** is a spin-off of graphic design and desktop publishing that focuses exclusively on visual communications for display on websites and mobile devices – to include text, graphics, sound, animation, and video.

Someone who does print design may or may not also do web design. Some web designers have never done any type of print design.

## **The Present and Future of Desktop Publishing**

At one time, only professional graphic designers used desktop publishing software. Then along came consumer-level desktop publishing software and an explosion of people who did desktop publishing for fun and profit, with or without a background in traditional design. Today, desktop publishing is still a career choice for some, but it is also increasingly a required skill for a wide range of jobs and careers.

## **Spreadsheets and Database packages**

### **Purpose**

Spreadsheets are an essential business and accounting tool. They can vary in complexity and can be used for various reasons, but their primary purpose is to organize and categorize data into a logical format. Once this data is entered into the spreadsheet, you can use it to help organize and grow your business.

### **Business Data Storage**

A spreadsheet is an easy way to store all different kinds of data. These data types can include financial data, customer data and product data. Excel spreadsheets can support more than a million rows and more than 16,000 columns, so you'll have plenty of space to store a huge amount. That's what makes them ideal for database creation.

### **Accounting and Calculation Uses**

Businesses across the world use spreadsheets to keep track of their business accounts. You can enter formulas that will do all of your business calculations as you go without the expense of using accounting software. Spreadsheets will do all the calculations for you, which saves you having to do those calculations manually.

### **Budgeting and Spending Help**

Keep track of your business spending on a spreadsheet. You can create custom budget spreadsheets to manage your income and your expenditures so you don't end up with any surprises when it's time to file your tax return.

### **Assisting with Data Exports**

Spreadsheets can be used to contain data that has been exported from other systems. Sometimes online data management systems don't present data in a format that is easy to read, or it is difficult to access the data offline.

### **Data Sifting and Cleanup**

Use your spreadsheets to identify inaccuracies and duplicates in your data. With a spreadsheet, it's easy to get rid of unwanted or low quality data. This is especially

necessary in relation to customer data, which you are required to keep up to date and accurate.

## **Generating Reports and Charts**

Use spreadsheets to report trends or make business forecasts. These reports can be made available to everyone at the company; they can take the time to analyze the data for themselves. It's easy to make comparisons between sets of data. You can pivot tables to showcase particular aspects of your data as well, which is necessary when you've got huge amounts of data to sort through.

Data in a spreadsheet can be used to create charts that can then be used for reporting. You can create graphs and pie charts that condense the data in a format that's easy to read at a glance. It's a fantastic feature that can be great for business presentations that require you to showcase lots of data in a short time.

## **Business Administrative Tasks**

Use spreadsheets for the creation of receipts and invoices. You can also use it to do business related forecasts and plan ahead for the future.

These are some of the common purposes spreadsheets are used for, but there are additional ways you can utilize a spreadsheet to achieve your business goals. Configure them to your needs, and tap into all the ways you can use this simple yet effective tool.

## **Usage**

Although spreadsheets are most often used with anything containing numbers, the uses of a spreadsheet are almost endless. Below are some other popular uses of spreadsheets.

### **Finance**

Spreadsheets are ideal for financial data, such as your checking account information, budgets, taxes, transactions, billing, invoices, receipts, forecasts, and any payment system.

### **Forms**

Form templates can be created to handle inventory, evaluations, performance reviews, quizzes, time sheets, patient information, and surveys.

## **School and grades**

Teachers can use spreadsheets to track students, calculate grades, and identify relevant data, such as high and low scores, missing tests, and students who are struggling.

## **Lists**

Managing a list in a spreadsheet is a great example of data that does not contain numbers, but still can be used in a spreadsheet. Great examples of spreadsheet lists include telephone, to-do, and grocery lists.

## **Sports**

Spreadsheets can keep track of your favorite player stats or stats on the whole team. With the collected data, you can also find averages, high scores, and statistical data. Spreadsheets can even be used to create tournament brackets.

### **How do I enter data in a spreadsheet?**

In a spreadsheet, data is entered in one or more cells. To enter data in a cell, follow the steps below.

Click the cell where you want to enter data.

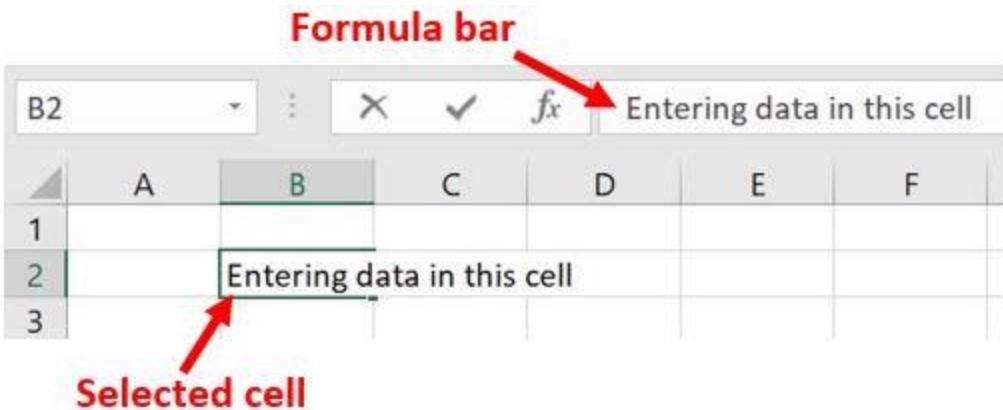
Start typing the data using your keyboard. The data is automatically entered in the selected cell.

or

Click the cell where you want to enter additional data.

Click in the formula bar, located between the Ribbon and all cells, where you want to start entering the additional data.

Type the data using your keyboard. The data is automatically entered in the selected cell.



If you want to add additional data to a cell that already has data entered in it, follow the steps below.

Click the cell where you want to enter additional data.

Click in the formula bar, located between the Ribbon and all cells, where you want to start entering the additional data.

Type the data using your keyboard. The data is automatically entered in the selected cell where the mouse cursor is placed in the formula bar.

### **Why not use a word processor instead of a spreadsheet?**

Although some uses above could be done in a word processor, spreadsheets have a considerable advantage over word processors when it comes to numbers. It would be impossible to calculate multiple numbers in a word processor and have the value of the calculation immediately appear. Spreadsheets are also more dynamic with the data and can hide, show, and sort information to make processing lots of information easier.

### **What is an active worksheet?**

An active worksheet is the worksheet that is currently open. For example, in the earlier Excel picture, the sheet tabs at the bottom show "Sheet1," "Sheet2," and "Sheet3," with Sheet1 being the active worksheet. The active tab usually has a white background behind the tab name.

### **How many worksheets open by default?**

In Microsoft Excel 2016 and earlier and OpenOffice Calc, by default, there are three sheet tabs that open (Sheet1, Sheet2, and Sheet3). In Google Sheets, your spreadsheets starts with one sheet (Sheet1).

In Microsoft Excel 365, by default, there is only one sheet tab that opens (Sheet1).

## **What is the length limit of a worksheet name?**

Not to be confused with the file name, in Microsoft Excel, there is a 31 character limit for each worksheet name.

## **How are rows and columns labeled?**

In all spreadsheet programs, including Microsoft Excel, rows are labeled using numbers (e.g., 1 to 1,048,576). All columns are labeled with letters from A to Z, then with two letters. For example, after the letter Z, the next column is AA, AB, AC, ..., AZ and then incrementing to BA, BB, BC, etc., to the last column XFD.

When working with a cell, you combine the column with the row. For example, the very first cell is in column A and on row 1, so the cell is labeled as A1.

How many sheets, rows, and columns can a spreadsheet have?

Download an example of a spreadsheet file

We've created a Microsoft Excel spreadsheet that can be downloaded and opened in any spreadsheet program including Microsoft Excel. This spreadsheet helps illustrate some a spreadsheet capability, formulas, and functions used in a spreadsheet, and allows you to experiment with a spreadsheet.

The same spreadsheet is also available on Google Sheets. Visit the link below to open the spreadsheet in view mode in Google Sheets. If you want to edit any of the values, click File and then Make a copy option to save it to your Google Drive.

## **What did people use before spreadsheets?**

Before computerized spreadsheets ledger paper was used to keep track of numbers and make calculations. In fact, many accountants and other individuals continued to use ledger paper even after the release of spreadsheet programs because they didn't trust computers to make proper calculations.

## **Command**

I've spent more than a decade working on Excel. Yet, there is so much to learn. If you dislike coding, excel could be your rescue into data science world (to some extent). Once you understand Excel operations, learning SQL is very easy.

## **Why can't you use Excel for serious data science work?**

Now at this stage, you might ask, why can't I use excel for all my work. There are several reasons for it:

1. For large datasets, excel is not effective. Computations on large datasets either won't happen or would take a lot of time. Just a caveat: Microsoft recently launched Power BI and I need to explore it. It might have changed the boundaries of large data.
2. There is no audit trail in Excel. With tools based on coding and work flow management, you can re-look and re-run the process again and again. It is very difficult to do so in excel. If you change or delete a cell in Excel in an accidental manner, it is difficult to trace it back.
3. Finally, Excel takes a lot of time to update libraries with latest algorithms in data science and machine learning. Try searching for XGboost and FTRL in excel!

Moving to SQL would address point 1 and point 2 to some extent. Moreover, SQL is one of the most sought out skills in a data scientist.

**If you don't know SQL yet and have worked in Excel, you can get started right now.** I've designed this tutorial with keeping in mind, the most commonly used excel operations. Your previous experience blended with this tutorial can quickly make you a SQL expert. (Note: If you find any trouble, please write to me in comments section below.

Related : [Basics of SQL and RDBMS for Beginners](#)



## List of Common Excel Operations

Here is the list of commonly used excel operation. In this tutorial, I've performed all these operations in SQL:

1. View Data
2. Sort Data
3. Filter Data
4. Delete Records
5. Add Records
6. Update Data in Existing Record
7. Show Unique Values
8. Write an expression to generate new column
9. LookUp data from another table
10. Pivot Table

To perform operations listed above, I'll use the data listed below (Employee):

ECODE	DOJ	Experience	Gender	Department	No_Of_Hours	Pay_Per_Hours	Total_Payout	City
A011	03-Jul-12	2.1	Male	Support	17.42	40	696.8	Delhi
A001	12-Jun-12	2.2	Male	Admin	15.45	45	695.25	Delhi
A007	13-Aug-12	2	Female	Support	13.54	44	595.76	Mumbai
A012	10-Dec-13	0.7	Female	HR	17.43	34	592.62	Chennai
A014	12-Jul-12	2.1	Male	Sales	13.43	41	550.63	Mumbai
A009	05-Mar-13	1.4	Male	Admin	12.7	42	533.4	Chennai
A015	19-Mar-12	2.4	Male	Support	15.56	33	513.48	Chennai
A013	06-Aug-12	2	Female	Admin	16.35	29	474.15	Bangalore
A008	14-Sep-12	1.9	Female	HR	14.35	31	444.85	Delhi
A006	02-Aug-12	2	Male	Sales	13.75	30	412.5	Bangalore
A010	11-Feb-13	1.5	Male	Sales	14.26	28	399.28	Delhi
A002	05-Oct-13	0.8	Female	Sales	13.75	29	398.75	Mumbai
A004	21-Oct-12	1.8	Male	HR	15.49	25	387.25	Bangalore
A003	21-Jan-12	2.5	Female	Support	14.6	25	365	Chennai
A005	02-Apr-12	2.3	Male	Admin	12.33	29	357.57	Chennai

## 1. View Data

In excel, we can view all the records directly. But, SQL requires a command to process this request. This can be done by using **SELECT** command.

### Syntax:

```
SELECT column_1,column_2,...column_n | * FROM table_name;
```

### Exercise:

#### A. View all data of Employee table

Select \* from Employee:

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payout	City
A005	02-04-2012	2.3	Male	Admin	12.33	29	357.57	Chennai
A003	21-01-2012	2.5	Female	Support	14.6	25	365	Chennai
A004	21-10-2012	1.8	Male	HR	15.49	25	387.25	Bangalore
A002	05-10-2013	0.8	Female	Sales	13.75	29	398.75	Mumbai
A010	11-02-2013	1.5	Male	Sales	14.26	28	399.28	Delhi
A006	02-08-2012	2	Male	Sales	13.75	30	412.5	Bangalore
A008	14-09-2012	1.9	Female	HR	14.35	31	444.85	Delhi
A013	06-08-2012	2	Female	Admin	16.35	29	474.15	Bangalore
A015	19-03-2012	2.4	Male	Support	15.56	33	513.48	Chennai
A009	05-03-2013	1.4	Male	Admin	12.7	42	533.4	Chennai
A014	12-07-2012	2.1	Male	Sales	13.43	41	550.63	Mumbai
A012	10-12-2013	0.7	Female	HR	17.43	34	592.62	Chennai
A007	13-08-2012	2	Female	Support	13.54	44	595.76	Mumbai
A001	12-06-2012	2.2	Male	Admin	15.45	45	695.25	Delhi
A011	03-07-2012	2.1	Male	Support	17.42	40	696.8	Delhi

## B. View only ECODE and Gender data of Employee table

ECODE	Gender
A005	Male
A003	Female
A004	Male
A002	Female
A010	Male
A006	Male
A008	Female
A013	Female
A015	Male
A009	Male
A014	Male
A012	Female
A007	Female
A001	Male
A011	Male

Select ECODE, Gender from Employee

## 2. Sort Data

Organizing information becomes important when you have more data. It helps to generate quick inferences. You can quickly **organize** an excel worksheet by **sorting** your data in ascending or descending order.

### Syntax:

```
SELECT column_1,column_2,...column_n | * FROM table_name order by column_1
[desc], column_2 [desc];
```

**Exercise:****A. Arrange records of Employee table in Descending order of Total\_Payout.**

Select \* from Employee order by Total\_Payout desc;

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payout	City
A011	03-07-2012	2.1	Male	Support	17.42	40	696.8	Delhi
A001	12-06-2012	2.2	Male	Admin	15.45	45	695.25	Delhi
A007	13-08-2012	2	Female	Support	13.54	44	595.76	Mumbai
A012	10-12-2013	0.7	Female	HR	17.43	34	592.62	Chennai
A014	12-07-2012	2.1	Male	Sales	13.43	41	550.63	Mumbai
A009	05-03-2013	1.4	Male	Admin	12.7	42	533.4	Chennai
A015	19-03-2012	2.4	Male	Support	15.56	33	513.48	Chennai
A013	06-08-2012	2	Female	Admin	16.35	29	474.15	Bangalore
A008	14-09-2012	1.9	Female	HR	14.35	31	444.85	Delhi
A006	02-08-2012	2	Male	Sales	13.75	30	412.5	Bangalore
A010	11-02-2013	1.5	Male	Sales	14.26	28	399.28	Delhi
A002	05-10-2013	0.8	Female	Sales	13.75	29	398.75	Mumbai
A004	21-10-2012	1.8	Male	HR	15.49	25	387.25	Bangalore
A003	21-01-2012	2.5	Female	Support	14.6	25	365	Chennai
A005	02-04-2012	2.3	Male	Admin	12.33	29	357.57	Chennai

**B. Arrange records of Employee table by City (ascending) and Total\_Payout(descending).**

Select \* from Employee order by City, Total\_Payout desc;

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payout	City
A013	06-08-2012	2	Female	Admin	16.35	29	474.15	Bangalore
A006	02-08-2012	2	Male	Sales	13.75	30	412.5	Bangalore
A004	21-10-2012	1.8	Male	HR	15.49	25	387.25	Bangalore
A012	10-12-2013	0.7	Female	HR	17.43	34	592.62	Chennai
A009	05-03-2013	1.4	Male	Admin	12.7	42	533.4	Chennai
A015	19-03-2012	2.4	Male	Support	15.56	33	513.48	Chennai
A003	21-01-2012	2.5	Female	Support	14.6	25	365	Chennai
A005	02-04-2012	2.3	Male	Admin	12.33	29	357.57	Chennai
A011	03-07-2012	2.1	Male	Support	17.42	40	696.8	Delhi
A001	12-06-2012	2.2	Male	Admin	15.45	45	695.25	Delhi
A008	14-09-2012	1.9	Female	HR	14.35	31	444.85	Delhi
A010	11-02-2013	1.5	Male	Sales	14.26	28	399.28	Delhi
A007	13-08-2012	2	Female	Support	13.54	44	595.76	Mumbai
A014	12-07-2012	2.1	Male	Sales	13.43	41	550.63	Mumbai
A002	05-10-2013	0.8	Female	Sales	13.75	29	398.75	Mumbai

### 3. Filter Data

In addition to sorting, we often apply filter to analyze data in a better way. When data is filtered, only rows that meet the filter criteria is displayed while other rows get hidden. Also, we can apply multiple criterion to filter data.

#### Syntax:

```
SELECT column_1,column_2,...column_n | * FROM table_name where  
column_1 operator value;
```

Below are the common list of operators, we can use to form a condition.

Operator	Description
=	Equal
<>	Not equal. <b>Note:</b> In some versions of SQL this operator may be written as !=
>	Greater than
<	Less than
>=	Greater than or equal
<=	Less than or equal
BETWEEN	Between an inclusive range
LIKE	Search for a pattern
IN	To specify multiple possible values for a column

#### Exercise:

### A. Filter observations associated with city “Delhi”

Select \* from Employee where City="Delhi";

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payout	City
A001	12-06-2012	2.2 Male	Male	Admin	15.45	45	695.25	Delhi
A008	14-09-2012	1.9 Female	Female	HR	14.35	31	444.85	Delhi
A010	11-02-2013	1.5 Male	Male	Sales	14.26	28	399.28	Delhi
A011	03-07-2012	2.1 Male	Male	Support	17.42	40	696.8	Delhi

### B. Filter observations of Department “Admin” and Total\_Payout >= 500

Select \* from Employee where Department="Admin" and Total\_Payout >=500;

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payout	City
A001	12-06-2012	2.2 Male	Male	Admin	15.45	45	695.25	Delhi
A009	05-03-2013	1.4 Male	Male	Admin	12.7	42	533.4	Chennai

## 4. Delete Records

Deleting records or columns is a commonly used operation in Excel. In excel, we simply press ‘Delete’ key on keyboard to delete a record. Similarly, SQL has command **DELETE** to remove records from a table.

### Syntax:

*DELETE FROM table\_name WHERE some\_column=some\_value;*

### Exercise:

#### A. Delete observations which have Total\_Payout >=600

Delete \* from Employee where Total\_Payout >=600;

It removes two record only since these two observations satisfy the condition stated above. But be careful! if we do not provide any condition, it will remove all records from a table.

#### B. Delete observations which have Total\_Payout >=600 and Department ="Admin"

Delete \* from Employee where Total\_Payout >=600 and Department ="Admin";

Above command will remove only one record which satisfies the condition.

## 5. Add records

We have seen methods to remove records, we can also add records to SQL table as we do in excel. **INSERT** command helps to perform this operation.

### Syntax:

*INSERT INTO table\_name VALUES (value1, value2, value3,...); -> Insert values to all columns*

OR,

*INSERT INTO table\_name (column1,column2,column3,...) VALUES (value1,value2,value3,...); -> Insert values to selected columns*

### Exercise:

#### A. Add below records to the table 'Employee'

A002	05-Nov-12	0.8	Female	Admin	12.05	26	313.3	Mumbai
------	-----------	-----	--------	-------	-------	----	-------	--------

Insert into employee values('A002','05-Nov-12',0.8,'Female','Admin',12.05,26,313.3,'Mumbai');

Select \* from Employee where ECODE='A002';

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payol	City
A002	05-10-2013	0.8	Female	Sales	13.75	29	398.75	Mumbai
A002	05-11-2012	0.8	Female	Admin	12.05	26	313.3	Mumbai

#### B. Insert values to ECODE (A016) and Department (HR) only.

Insert into employee (ECODE, Department) values('A016','HR');

Select \* from Employee where Department='HR';

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payol	City
A012	10-12-2013	0.7	Female	HR	17.43	34	592.62	Chennai
A008	14-09-2012	1.9	Female	HR	14.35	31	444.85	Delhi
A004	21-10-2012	1.8	Male	HR	15.49	25	387.25	Bangalore
A016				HR				

## 6. Update Data in Existing Observations

Suppose, we want to update the name of “HR” department to “Manpower” for all employees. For such cases, SQL has a command **UPDATE** which performs this function.

### Syntax:

*UPDATE table\_name SET column1=value1,column2=value2,... WHERE some\_column=some\_value;*

### Exercise: Rename Department “HR” to “Manpower”

Update Employee SET Department='Manpower' where Department='HR';

Select \* from Employee;

ECODE	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payol	City
A002	05-11-2012	0.8	Female	Admin	12.05	26	313.3	Mumbai
A005	02-04-2012	2.3	Male	Admin	12.33	29	357.57	Chennai
A013	06-08-2012	2	Female	Admin	16.35	29	474.15	Bangalore
A009	05-03-2013	1.4	Male	Admin	12.7	42	533.4	Chennai
A016				Manpower				
A004	21-10-2012	1.8	Male	Manpower	15.49	25	387.25	Bangalore
A008	14-09-2012	1.9	Female	Manpower	14.35	31	444.85	Delhi
A012	10-12-2013	0.7	Female	Manpower	17.43	34	592.62	Chennai
A002	05-10-2013	0.8	Female	Sales	13.75	29	398.75	Mumbai
A010	11-02-2013	1.5	Male	Sales	14.26	28	399.28	Delhi
A006	02-08-2012	2	Male	Sales	13.75	30	412.5	Bangalore
A014	12-07-2012	2.1	Male	Sales	13.43	41	550.63	Mumbai
A003	21-01-2012	2.5	Female	Support	14.6	25	365	Chennai
A015	19-03-2012	2.4	Male	Support	15.56	33	513.48	Chennai
A007	13-08-2012	2	Female	Support	13.54	44	595.76	Mumbai

## 7. Show unique values

We can show unique values of variable(s) by applying **DISTINCT** keyword prior to variable name.

### Syntax:

`SELECT DISTINCT column_name,column_name FROM table_name;`

### Exercise: Show unique values of City

City
Bangalore
Chennai
Delhi
Mumbai

Select distinct City from Employee;

## 8. Write an expression to generate new column

In excel, we can create a column, based on existing column using functions or operators. This can be done in SQL using the commands below.

### Exercise:

#### A. Create a new column Incentive which is 10% of Total\_Payout

Select \*, Total\_Payout\*01 as Incentive from Employee;

Incentive	Ecode	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payol	City
39.875	A002	05-10-2013	0.8	Female	Sales	13.75	29	398.75	Mumbai
31.33	A002	05-11-2012	0.8	Female	Admin	12.05	26	313.3	Mumbai
36.5	A003	21-01-2012	2.5	Female	Support	14.6	25	365	Chennai
38.725	A004	21-10-2012	1.8	Male	Manpower	15.49	25	387.25	Bangalore
35.757	A005	02-04-2012	2.3	Male	Admin	12.33	29	357.57	Chennai
41.25	A006	02-08-2012	2	Male	Sales	13.75	30	412.5	Bangalore
59.576	A007	13-08-2012	2	Female	Support	13.54	44	595.76	Mumbai
44.485	A008	14-09-2012	1.9	Female	Manpower	14.35	31	444.85	Delhi
53.34	A009	05-03-2013	1.4	Male	Admin	12.7	42	533.4	Chennai
39.928	A010	11-02-2013	1.5	Male	Sales	14.26	28	399.28	Delhi
59.262	A012	10-12-2013	0.7	Female	Manpower	17.43	34	592.62	Chennai
47.415	A013	06-08-2012	2	Female	Admin	16.35	29	474.15	Bangalore
55.063	A014	12-07-2012	2.1	Male	Sales	13.43	41	550.63	Mumbai
51.348	A015	19-03-2012	2.4	Male	Support	15.56	33	513.48	Chennai
	A016				Manpower				

#### B. Create a new column City\_Code which has first three characters of City.

Select \*, Left(City,3) as City\_Code from Employee where Department="Admin";

City_Code	Ecode	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payol	City
Che	A009	05-03-2013	1.4	Male	Admin	12.7	42	533.4	Chennai
Ban	A013	06-08-2012	2	Female	Admin	16.35	29	474.15	Bangalore
Che	A005	02-04-2012	2.3	Male	Admin	12.33	29	357.57	Chennai
Mum	A002	05-11-2012	0.8	Female	Admin	12.05	26	313.3	Mumbai

For more details on SQL functions, I would recommend you to refer this [link](#).

## 9. LookUp data from another table

The most used function of excel by any BI professional / data analyst is VLOOKUP(). It helps to map data from other table to parent table. In other words, we can say that it is the 'excel' way of joining 2 data sets through a common key.

In SQL, we have similar functionality known as **JOIN**.

SQL JOIN is used to combine rows from two or more tables, based on a common field between them. It has multiple types:

- INNER JOIN: Return rows when there is a match in both tables
- LEFT JOIN: Return all rows from the left table and the matched rows from the right table
- RIGHT JOIN: Return all rows from the right table and the matched rows from the left table
- FULL JOIN: Return all rows when there is a match in ONE of the tables

### Syntax:

```
SELECT table1.column1, table2.column2..... FROM table1 INNER | LEFT| RIGHT|  
FULL JOIN table2 ON table1.column = table2.column;
```

**Exercise: Below is city category table “City\_Cat”, now I want to map city category**

City	City_Category
Delhi	A
Mumbai	B
Chennai	C
Bangalore	D

**to Employee table and show all records of Employee table.**

Here, I want to show all records of table Employee. So, we will use **left join**.

```
SELECT Employee.* , City_Cat.City_Category  
FROM Employee LEFT JOIN City_Cat O  
N Employee.City = City_Cat.City;
```

ECode	DOJ	Experience	Gender	Department	No_Of_Hou	Pay_Per_Ho	Total_Payout	City	City_Catego
A007	13-08-2012	2	Female	Support	13.54	44	595.76	Mumbai	B
A012	10-12-2013	0.7	Female	Manpower	17.43	34	592.62	Chennai	C
A014	12-07-2012	2.1	Male	Sales	13.43	41	550.63	Mumbai	B
A009	05-03-2013	1.4	Male	Admin	12.7	42	533.4	Chennai	C
A015	19-03-2012	2.4	Male	Support	15.56	33	513.48	Chennai	C
A013	06-08-2012	2	Female	Admin	16.35	29	474.15	Bangalore	D
A008	14-09-2012	1.9	Female	Manpower	14.35	31	444.85	Delhi	A
A006	02-08-2012	2	Male	Sales	13.75	30	412.5	Bangalore	D
A010	11-02-2013	1.5	Male	Sales	14.26	28	399.28	Delhi	A
A002	05-10-2013	0.8	Female	Sales	13.75	29	398.75	Mumbai	B
A004	21-10-2012	1.8	Male	Manpower	15.49	25	387.25	Bangalore	D
A003	21-01-2012	2.5	Female	Support	14.6	25	365	Chennai	C
A005	02-04-2012	2.3	Male	Admin	12.33	29	357.57	Chennai	C
A002	05-11-2012	0.8	Female	Admin	12.05	26	313.3	Mumbai	B
A016				Manpower					

To know more about JOIN operations, I would recommend you to refer this [link](#).

## 10. Pivot Table

Pivot Table is an advanced way of analyzing data in excel. Not only it is useful, but it allows you to extract the hidden insights from data.

Moreover, it helps us to generate inference by summarizing data and allow us to manipulate it in different ways. This operation can be done in SQL by using aggregate functions and GROUP BY command.

### Syntax:

```
SELECT column, aggregate_function(column) FROM table WHERE column operator value GROUP BY column;
```

### Exercise:

#### A. Show sum of Total\_Payout by Gender

```
SELECT Gender, Sum(Total_Payout) from Employee Group by Gender;
```

Gender	Expr1001
Female	3184.43
Male	3154.11

#### B. Show sum of Total\_Payout and Count of Records by Gender and City

SELECT Gender, City, Count(City), Sum(Total\_Payout) from Employee Group by Gender, City;

Gender	City	PayOut	Count
			0
Female	Bangalore	474.15	1
Female	Chennai	957.62	2
Female	Delhi	444.85	1
Female	Mumbai	1307.81	3
Male	Bangalore	799.75	2
Male	Chennai	1404.45	3
Male	Delhi	399.28	1
Male	Mumbai	550.63	1

## End Notes

Once you work on SQL, you would realize data handling and manipulation can be much faster. For installation, mysql is open source. You can install it and get started.

In this article, we have looked at the SQL commands for 10 common excel operations like view, sort, filter, delete, lookup and summarizing data. We also looked at the different operators and types of Joins to perform SQL operation seamless.

## MS-Excel

MS Excel is a commonly used Microsoft Office application. It is a spreadsheet program which is used to save and analyse numerical data.

In this article, we bring to you the important features of MS Excel, along with an overview of how to use the program, its benefits and other important elements. Few sample MS Excel question and answers are also given further below in this article for the reference of Government exam aspirants.

Basics of MS Excel

### What is MS Excel?

MS Excel is a spreadsheet program where one can record data in the form of tables. It is easy to analyse data in an Excel spreadsheet. The image given below represents how an Excel spreadsheet looks like:

### How to open MS Excel?

To open MS Excel on your computer, follow the steps given below:

- Click on Start

- Then All Programs
- Next step is to click on MS Office
- And then finally, choose the MS-Excel option

Alternatively, you can also click on the Start button and type MS Excel in the search option available.

### **What is a cell?**

A spreadsheet is in the form of a table comprising rows and columns. The rectangular box at the intersection point between rows and columns forms a cell. Given below is an image of a cell:

### **What is Cell Address?**

The cell address is the name by which a cell can be addressed. For Example, if row 7 is interested in column G, then the cell address is G7.

<b>Other Related Links</b>	
<a href="#"><u>High-Level Computer Languages</u></a>	<a href="#"><u>Basics of Cloud Computing</u></a>
<a href="#"><u>Computer Networks</u></a>	<a href="#"><u>Internet</u></a>
<a href="#"><u>Computer Software and Hardware Questions</u></a>	<a href="#"><u>Types of Computer</u></a>

### **Features of MS Excel**

Various editing and formatting can be done on an Excel spreadsheet. Discussed below are the various features of MS Excel.

The image below shows the composition of features in MS Excel:

- **Home**
  - Comprises options like font size, font styles, font colour, background colour, alignment, formatting options and styles, insertion and deletion of cells and editing options

## **Insert**

- Comprises of options like table format and style, inserting images and figures, adding graphs, charts and sparklines, header and footer option, equation and symbols
- 

## **Page Layout**

- Themes, orientation and page setup options are available under the page layout option
- 

## **Formulas**

- Since tables with a large amount of data can be created in MS excel, under this feature, you can add formulas to your table and get quicker solutions
- 

## **Data**

- Adding external data (from web), filtering options and data tools are available under this category
- 

## **Review**

- Proofreading can be done for an excel sheet (like spell check) in the review category and a reader can add comments in this part
- 

## **View**

- Different views in which we want the spreadsheet to be displayed can be edited here. Options to zoom in and out and pane arrangement are available under this category

For those willing to learn more about MS Excel, can refer to the video given below and understand every small aspect of this program in detail.

## **Benefits of Using MS Excel**

MS Excel is widely used for various purposes because the data is easy to save, and information can be added and removed without any discomfort and less hard work.

Given below are a few important benefits of using MS Excel:

- **Easy To Store Data:** Since there is no limit to the amount of information that can be saved in a spreadsheet, MS Excel is widely used to save data or to analyse data. Filtering information in Excel is easy and convenient.
- **Easy To Recover Data:** If the information is written on a piece of paper, finding it may take longer, however, this is not the case with excel spreadsheets. Finding

and recovering data is easy.

- **Application of Mathematical Formulas:** Doing calculations has become easier and less time taking with the formulas option in MS excel
- **More Secure:** These spreadsheets can be password secured in a laptop or personal computer and the probability of losing them is way lesser in comparison to data written in registers or piece of paper.
- **Data at One Place:** Earlier, data was to be kept in different files and registers when the paperwork was done. Now, this has become convenient as more than one worksheet can be added in a single MS Excel file.

**Neater and Clearer Visibility of Information:** When the data is saved in the form of a table, analysing it becomes easier. Thus, information is a spreadsheet that is more readable and understandable.

Competitive exam aspirants must also be aware of other subjects which are a part of the Government exam syllabus. To review and analyse the same, refer to the links below:

<u>Logical Reasoning</u>	<u>Quantitative Aptitude</u>
<u>Verbal Ability</u>	<u>Current Affairs</u>
<u>Static GK</u>	<u>Banking Awareness</u>

#### MS Excel – Points To Remember

There are certain things which one must know with respect to MS Excel, its applications and usage:

- An MS Excel file is saved with an extension of .xls
- Companies with large staff and workers use MS Excel as saving employee information becomes easier
- Excel spreadsheets are also used in hospitals where the information of patients can be saved more easily and can be removed conveniently once their medical history is cleared
- The sheet on which you work is called a Worksheet
- Multiple worksheets can be added in a single Excel file
- This is a data processing application

## **Creation of files in MS-Access**

Microsoft Access is a Database Management System offered by Microsoft. It uses the Microsoft Jet Database Engine and comes as a part of the Microsoft Office suite of application.

Microsoft Access offers the functionality of a database and the programming capabilities to create easy to navigate screens (forms). It helps you analyze large amounts of information, and manage data

### **Database File:**

It is a file which stores the entire database. The database file is saved to your hard drive or other storage devices.

### **Datatypes:**

Datatypes are the properties of each field. Every field has one datatype like text, number, date, etc.

### **Table**

- A Table is an object which stores data in Row & Column format to store data.
- A Table is usually related to other tables in the database file.
- Each column must have Unique name
- We can also define Primary Key in a table.

### **Query**

- Queries answer a question by selecting and sorting and filtering data based on search criteria.
- Queries show a selection of data based on criteria (limitations) you provide.
- Queries can pull from one or more related Tables and other Queries.
- Types of Query can be SELECT, INSERT, UPDATE, DELETE.

## **Form**

- A form is a database object that you can use to create a user interface for a database application.
- Forms help you to display live data from the table. It mainly used to ease the process of data entry or editing.

## **Report**

- A report is an object in desktop databases primarily used for formatting, calculating, printing, and summarizing selected data.
- You can even customize the report's look and feel.

## **Macros**

Macros are mini computer programming constructs. They allow you to set up commands and processes in your forms, like, searching, moving to another record, or running a formula.

## **Modules:**

Modules are procedures(functions) which you can write using Visual Basic for Applications (VBA).

## **Microsoft Access Data Types**

MS Access common data types are listed below:

Type of Data	Description	Size
Short Text	Text, including numbers which does not need calculation. (e.g., Mobile numbers).	Up to 255 characters.
Long Text	This data type is used for lengthy text or alphanumeric data.	Maximum 63, 999 characters.
Number	Numeric data type used for storing mathematical calculations.	1, 2, 4, 8, and 16 bytes.

Date/Time	Store Date/time for the years 100 through 9999.	8 bytes.
Currency	It allows you to store currency values and numeric data with one to four decimal places.	8 bytes.
Auto Number	Assign a unique number or assigned by Microsoft Access when any new record is created. Usually used as the primary key	Four bytes (16 bytes if it is set as a Replication ID).
Yes/No	It only stores logical values Yes and No.	1 bit
Attachment	It stores files, such as digital photos. Multiple files can be attached per record.	Up to 2 GB Data can be stored.
OLE objects	OLE objects can store audio, video, other Binary Large Objects.	Up to 2 GB data can be stored.
Hyperlink	Text or combinations of text and numbers stored. That text is used as hyperlink address.	Each part of a Hyperlink data type allows you to store a maximum 2048 characters.
Calculated	Helps you to create an expression that uses data from one or more fields.	You can create an expression which uses data from one or more fields.

### Differences between Access and Excel

Microsoft Access and Excel are very similar yet very different. Here, are some important difference points between both of them-

Access	Excel
Deals with text, numbers, files and all kinds of data	Microsoft Excel generally deals with numerical data
All the data is stored one time, in one place.	Lots of worksheets or documents are a store with similar, repeated data.
Helps you to build highly functional data entry forms and	Only the primary data entry screen is available.

report templates.

Users will be able to enter the data more efficiently and accurately.

Data accuracy and speed is not much because of the format.

## **Advantages of MS Access**

- Now in this MS Access Tutorial, we will learn the pros/benefits for using MS Access application:
- Access offers a fully functional, relational database management system in minutes.
- Easy to import data from multiple sources into Access
- You can easily customize Access according to personal and company needs
- Microsoft Access online works well with many of the development languages that work on Windows OS
- It is robust and flexible, and it can perform any challenging office or industrial database tasks.
- MS-Access allows you to link to data in its existing location and use it for viewing, updating, querying, and reporting.
- Allows you to create tables, queries, forms, and reports, and connect with the help of Macros
- Macros in Access is a simple programming construct with which you can use to add functionality to your database.
- Microsoft Access online can perform heterogeneous joins between various data sets stored across different platforms

## **Disadvantages of MS Access**

Here, are the cons for using MS Access

- Microsoft Access database is useful for small-to-medium business sectors. However, it is not useful for large-sized organizations
- Lacks robustness compared to dbms systems like MS SQL Server or Oracle
- All the information from your database is saved into one file. This can slow down reports, queries, and forms
- Technical limit is 255 concurrent users. However, the real-world limit is only 10 to 80 (depending on the type of application which you are using)
- It requires a lot more learning and training compares with other Microsoft programs

## How to Start Microsoft Access

Note: We assume you have the latest Microsoft Access installed which comes bundled with Microsoft Office 365 package.

There are two ways to Start MS Access.

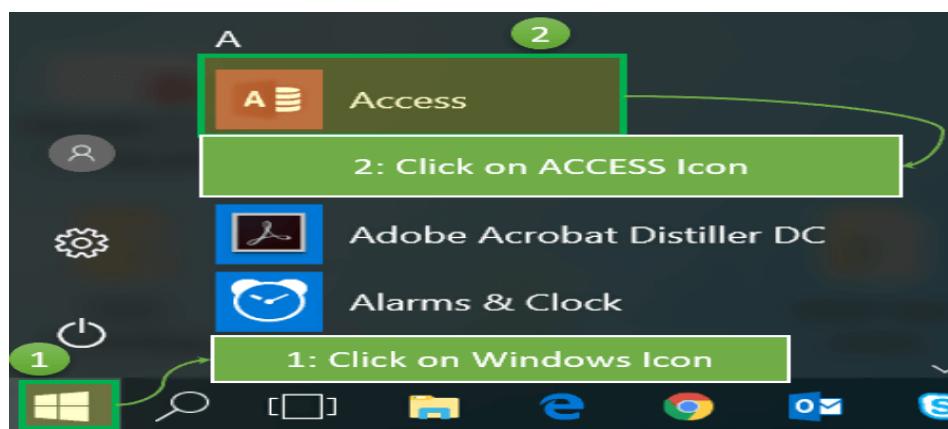
1. From Windows, 'Start' button.
2. From Desktop, Right Click> 'New' option.

Now in this Microsoft Access tutorial, let's have a look of starting MS Access using both the ways:

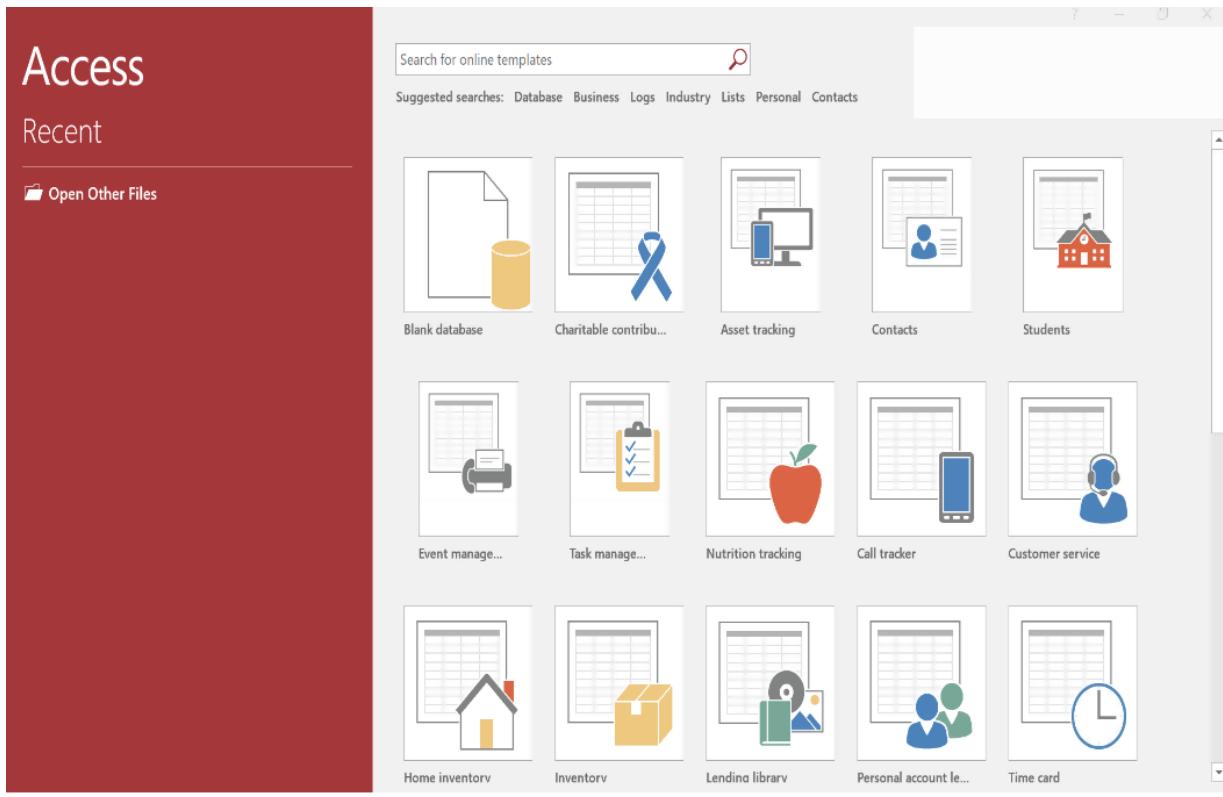
### Option 1) From Windows, Start button.

**Step 1)** Click on the 'Windows' icon. You will find the list of installed programs.

**Step 2)** Check and click on Access Icon.

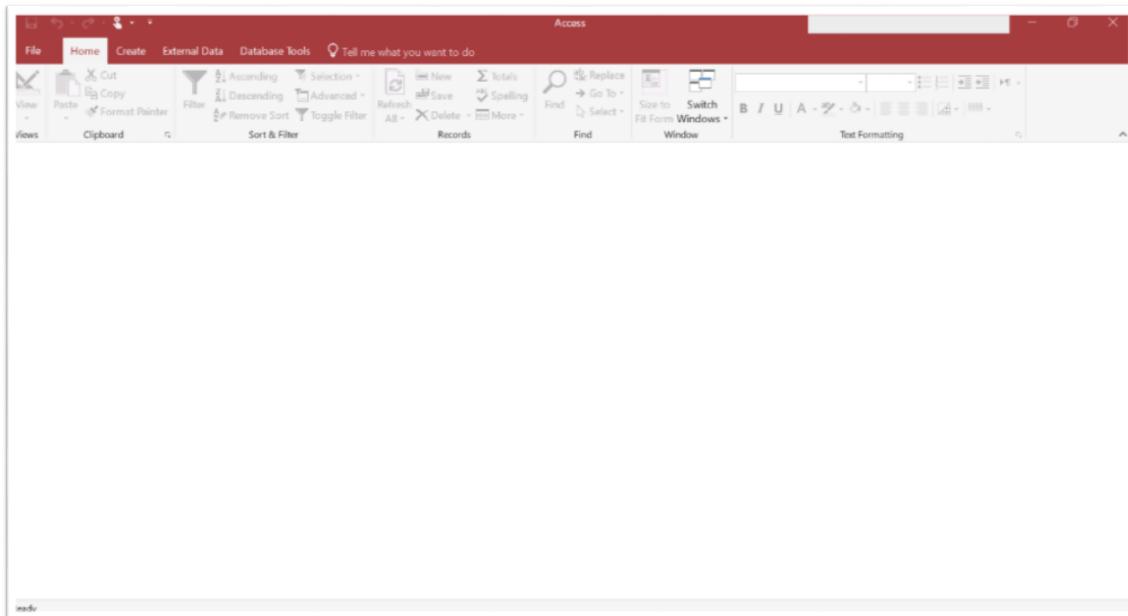


**Step 3) MS Access Application window will appear**



**Steps 4) Press 'Esc'**

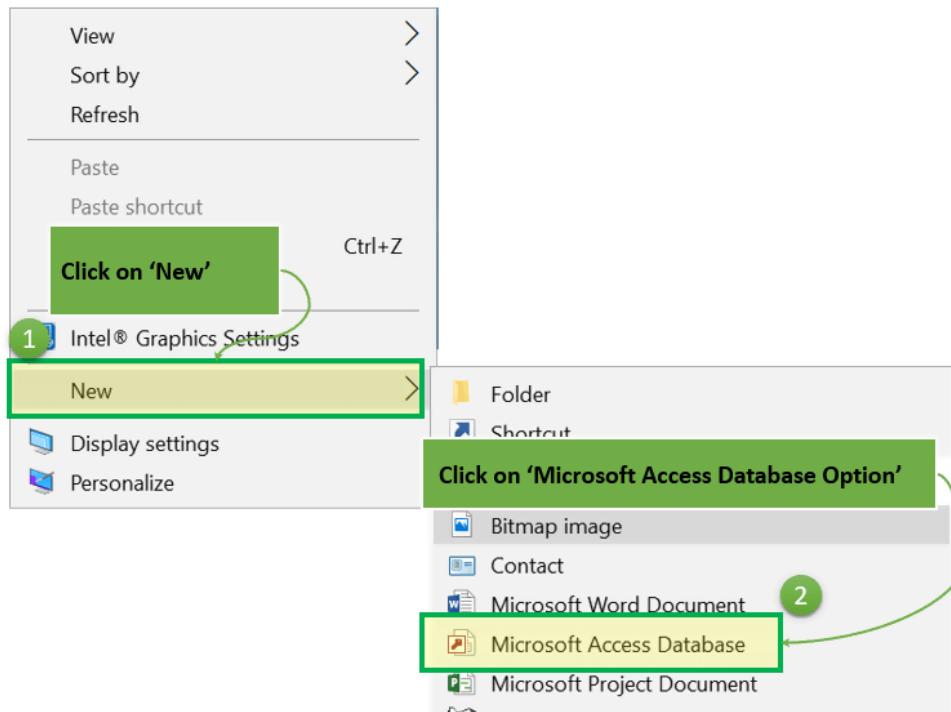
Result: This will open the MS Access windows application



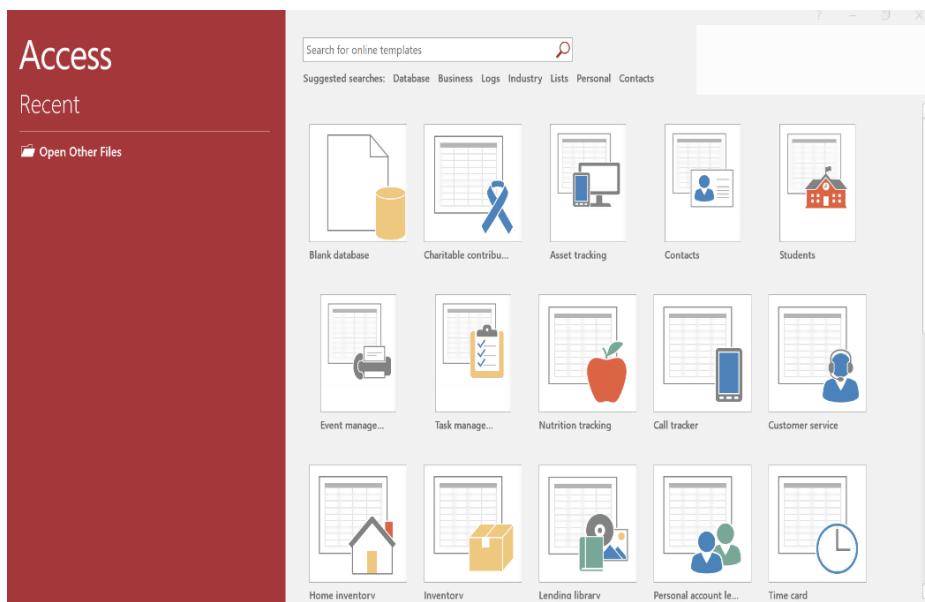
## Option 2) From Desktop, 'New' option.

**Step 1)** Right Click from Desktop and Click 'New'

**Step 2)** Click on 'Microsoft Access Database Option'



**Step 3)** Below MS Access Application window will appear

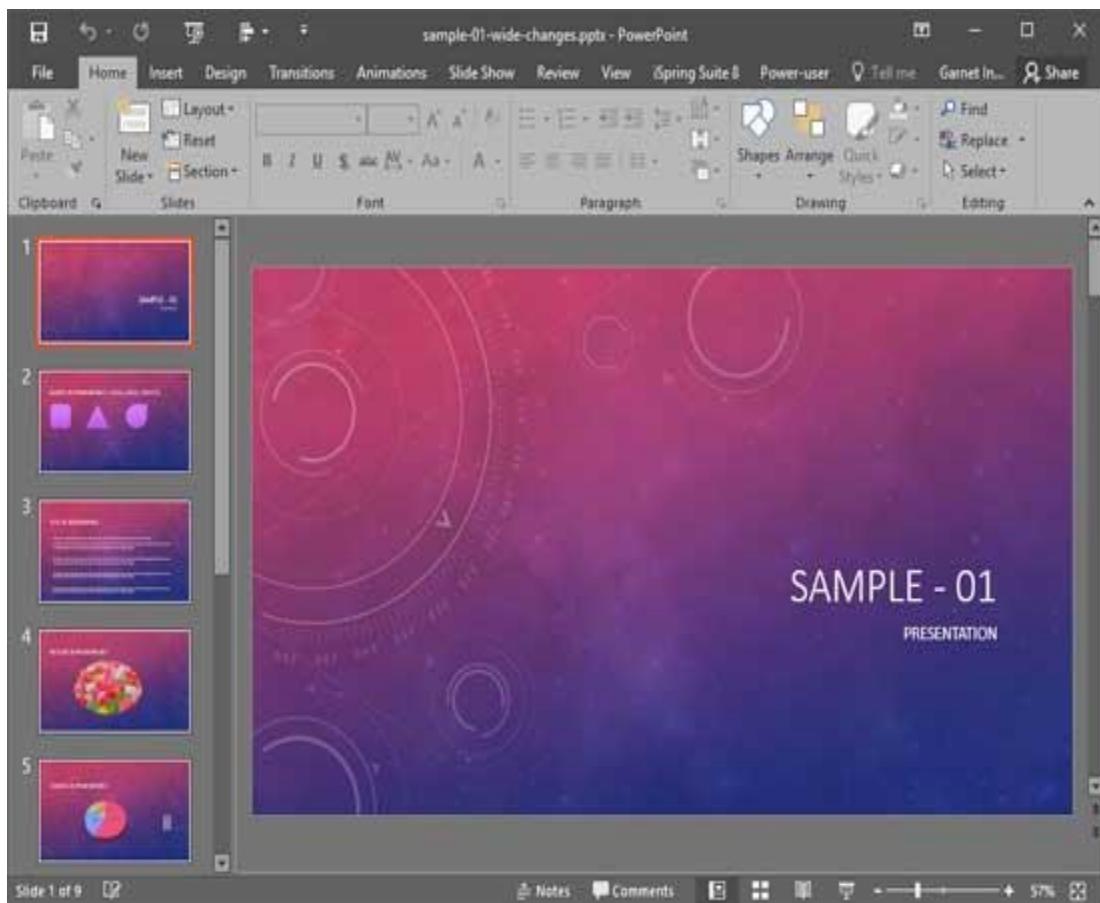


## Switching between application, MS-PowerPoint

If you want to work with more than one presentation in PowerPoint, you can open two or more presentations next to each other. This arrangement makes it easy to compare presentations and edit them as well. This is also helpful when you want to copy or move slides from one presentation to another. Let's imagine you have four presentations open and you can only see the one that is active. What about the other three presentations? How do you navigate to those presentations without having to close, or minimize the active presentation?

In this tutorial, you will learn how to switch between multiple open presentations in PowerPoint 2016. With this option, you can easily switch between different presentation windows, without reducing the window size. Follow these steps to learn more:

1. Open multiple presentations in PowerPoint 2016. As shown in Figure 1, only the last opened presentation is visible. Are you wondering about where the other presentations disappeared?



**Figure 1:** Only one of the multiple open presentations is visible

## Way 1

1. a. Access the View tab on the Ribbon, as shown highlighted in red within Figure 2.

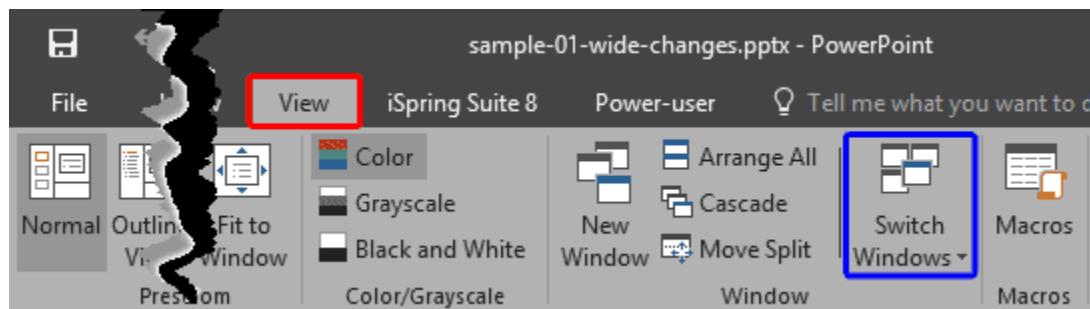


Figure 2: View tab on the Ribbon

- b. Within the View tab, click the Switch Windows button, as shown highlighted in blue within Figure 2, above.

- c. This opens the Switch Windows drop-down menu, as shown in Figure 3.

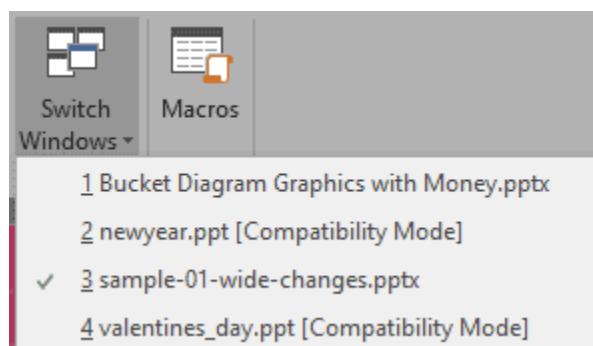


Figure 3: Switch Windows drop-down menu

- d. This drop-down list displays all the presentations which are open. To navigate to any of these open presentations, click on the name of the presentation within this menu.

## Way 2

- When your presentations are open, you will find an instance of PowerPoint on the Taskbar (highlighted in red within Figure 4).

Figure 4: PowerPoint instance on the Taskbar

- Hover your cursor over the PowerPoint instance to see a preview of all open presentations, as shown in Figure 5 below. Then click on the preview of the presentation you want to access now.

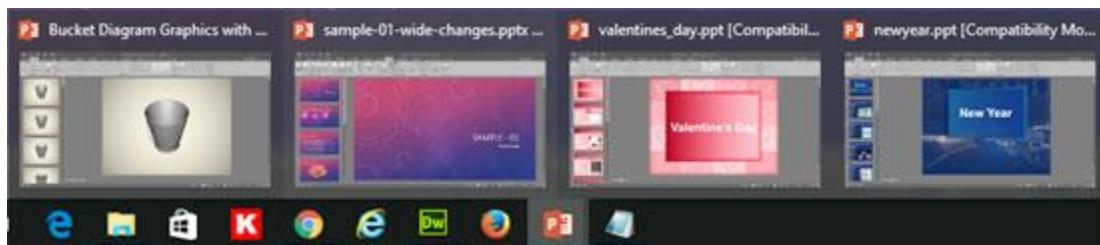


Figure 5: Preview of all open presentations

## Function Keys

F1	Display Help or the Office Assistant
F2	Select the text box containing an object or text
F4	Repeats the last presentation action ( <b>Edit &gt; Repeat</b> ) (not Format Autoshape dialog)
F5	Runs the presentation ( <b>View &gt; Slide Show</b> )
F6	Moves to the next pane in the presentation (clockwise)
F7	Displays the ( <b>Tools &gt; Spelling</b> ) dialog box
F10	Toggles the activation of the Menu Bar
F12	Displays the ( <b>File &gt; Save As</b> ) dialog box

## Shift + Function

Shift + F1	Activates the context sensitive <b>Whats this ?</b> prompt ( <b>Help &gt; Whats This</b> )
Shift + F3	Toggles between lowercase, mixedcase and uppercase on the selection
Shift + F4	Repeat the last Find, the same as ( <b>Edit &gt; Find Next</b> )
Shift + F6	Moves to the previous pane in the presentation (anti-clockwise)
Shift + F9	Toggles the display of Guide Lines
Shift + F10	Display the ( <b>Shortcut</b> ) menu for the selected item
Shift + F12	Saves, Displays the ( <b>File &gt; Save As</b> ) dialog box if a new presentation

## Ctrl + Function

Ctrl + F4	Closes the active presentation or window ( <b>File &gt; Close</b> )
Ctrl + F5	Restore the size of the active presentation or window
Ctrl + F6	Moves to the next presentation window
Ctrl + F7	Activates the Move window command
Ctrl + F8	Activates the Resize window command
Ctrl + F9	Minimises the size of the active presentation or window
Ctrl + F10	Maximise the size of the active presentation or window

Ctrl + F12	Displays the ( <b>File &gt; Open</b> ) dialog box
------------	---

### Other + Function

Alt + F2	Displays the ( <b>File &gt; Save As</b> ) dialog box
Alt + F4	Closes the active presentation (saving first) and exits PowerPoint ( <b>File &gt; Exit</b> )
Alt + F5	Restore the program window size
Alt + F7	Find next mispelt word - continue (Tools > Spelling) ??
Alt + F8	Displays the ( <b>Tools &gt; Macros &gt; Macro</b> ) dialog box
Alt + F9	Toggles the display of the Grid
Alt + F10	Maximise the program window
Alt + F11	Toggles between the <b>Visual Basic Editor</b> window and the PowerPoint window
Alt + Shift + F2	Displays the ( <b>File &gt; Save As</b> ) dialog box
Alt + Shift + F4	Closes the active presentation (saving first) and exits PowerPoint ( <b>File &gt; Exit</b> )
Alt + Shift + F10	Displays the drop-down menu for the corresponding smart tag
Ctrl + Shift + F10	Activates the Menu Bar or displays the ( <b>View &gt; Toolbars</b> ) dialog box
Ctrl + Shift + F12	Displays the ( <b>File &gt; Print</b> ) dialog box

### **Ctrl + Numbers**

Alt + Shift + 1	Show Heading 1 (Outline view)
Alt + Shift + 9	Expands all text in the presentation (Outline view)

### **Ctrl + Letters**

Ctrl + A	Selects all the objects on the active slide
Ctrl + B	Toggles bold on the current selection
Ctrl + C	Copies the current selection to the clipboard ( <b>Edit &gt; Copy</b> )
Ctrl + D	Make a duplicate of the selected slide ( <b>Edit &gt; Duplicate</b> )
Ctrl + E	Centre aligns the current selection
Ctrl + F	Displays the ( <b>Edit &gt; Find</b> ) dialog box
Ctrl + G	Displays the ( <b>View &gt; Grid and Guides</b> ) dialog box
Ctrl + H	Displays the ( <b>Edit &gt; Replace</b> ) dialog box
Ctrl + I	Toggles italics on the current selection
Ctrl + J	Justifies the current selection
Ctrl + K	Displays the ( <b>Insert &gt; Hyperlink</b> ) dialog box (in a textbox)
Ctrl + L	Left aligns the current selection

Ctrl + M	Inserts a new slide ( <b>Insert &gt; New Slide</b> )
Ctrl + N	Creates a new presentation ( <b>File &gt; New</b> )
Ctrl + O	Displays the ( <b>File &gt; Open</b> ) dialog box
Ctrl + P	Displays the ( <b>File &gt; Print</b> ) dialog box
Ctrl + R	Right aligns the current selection
Ctrl + S	Saves, Displays the ( <b>File &gt; Save As</b> ) dialog box if a new presentation
Ctrl + T	Displays the ( <b>Format &gt; Font</b> ) dialog box
Ctrl + U	Toggles (continuous) underlying of the selection
Ctrl + V	Pastes the entry from the clipboard ( <b>Edit &gt; Paste</b> )
Ctrl + W	Closes the active presentation or window ( <b>File &gt; Close</b> )
Ctrl + X	Cuts the current selection to the clipboard ( <b>Edit &gt; Cut</b> )
Ctrl + Y	Repeats the last Presentation action ( <b>Edit &gt; Repeat</b> )
Ctrl + Z	Undo the last Presentation action ( <b>Edit &gt; Undo</b> )

### Others + Letters

Ctrl + Shift + B	Opens the Outlook Address Book
Ctrl + Shift + C	Copies the formatting attributes from the current selection to the clipboard

Ctrl + Shift + F	Activates the <b>Font Names</b> drop-down on the Formatting toolbar
Ctrl + Shift + G	Groups the currently selected objects / shapes
Ctrl + Shift + H	Ungroups the currently selected object / shape
Ctrl + Shift + P	Activates the <b>Font Size</b> drop-down on the Formatting toolbar
Ctrl + Shift + V	Pastes the formatting attributes from the clipboard on to the selection
Alt + D	Displays the <b>(Slide Show)</b> menu
Alt + E	Displays the <b>(Edit)</b> menu
Alt + F	Displays the <b>(File)</b> menu
Alt + H	Displays the <b>(Help)</b> menu
Alt + I	Displays the <b>(Insert)</b> menu
Alt + K	Checks the names in the To, Cc and Bcc lines against the Address Book
Alt + O	Displays the <b>(Format)</b> menu
Alt + S	Displays an e-mail message containing the active presentation
Alt + T	Displays the <b>(Tools)</b> menu
Alt + U	Displays the AutoShapes drop-down menu on the Drawing toolbar
Alt + V	Displays the <b>(View)</b> menu

Alt + W	Displays the <b>(Window)</b> menu
Alt + Shift + A	Show all or collapse all text or headings (Outline view)

### Entering Data

Enter	Enters a new paragraph
Shift + Enter	Enters a line break (Soft break)
Ctrl + Tab	Inserts a tab in a table cell

### Extending Data

Shift + Home	Extends the selection to the beginning of the line
Shift + End	Extends the selection to the end of the line
Shift + Up Arrow	Extends the selection one line up
Shift + Down Arrow	Extends the selection one line down
Shift + Left Arrow	Extends the selection one character to the left
Shift + Right Arrow	Extends the selection one character to the right
Ctrl + Shift + Home	Extends the selection to the beginning of the textbox
Ctrl + Shift + End	Extends the selection to the end of the textbox

## Selecting Data

Ctrl + Shift + Up Arrow	Selects to the line above
Ctrl + Shift + Down Arrow	Selects to the line below
Ctrl + Shift + Left Arrow	Selects to the beginning of the word
Ctrl + Shift + Right Arrow	Selects to the end of the word
Delete	Deletes one character to the right
Backspace	Deletes one character to the left
Ctrl + Delete	Deletes one word to the right
Ctrl + Backspace	Deletes one word to the left

## Formatting Data

Ctrl + ]	Increases the font size to the next size in the drop-down list
Ctrl + [	Decreases the font size to the next size in the drop-down list
Ctrl + Shift + >	Increases the font size to the next size in the drop-down list
Ctrl + Shift + <	Decreases the font size to the next size in the drop-down list
Ctrl + =	Toggles <b>Subscript</b> on the selection
Ctrl + Shift + =	Toggles <b>Superscript</b> on the selection

## **Manoeuvring**

Arrow Keys	Moves one character or line in the given direction
Tab	Moves to the first or next hyperlink / object / cell
Shift + Tab	Moves to the last or previous hyperlink / object / cell
Home	Moves to the beginning of the line
End	Moves to the end of the line
Page Up	Moves to the previous slide
Page Down	Moves to the next slide
Shift + Page Up	Moves to the previous slide
Shift + Page Down	Moves to the next slide
Ctrl + Home	Moves to the beginning of the text box
Ctrl + End	Moves to the end of the text box
Ctrl + Up Arrow	Moves up one paragraph
Ctrl + Down Arrow	Moves down one paragraph
Ctrl + Left Arrow	Moves one word to the left
Ctrl + Right Arrow	Moves one word to the right
Ctrl + Enter	Moves to the next title or body text placeholder

## Other

Alt + Tab	Toggles between all your open applications
Alt + Shift + Tab	Toggles backwards between all your open applications
Ctrl + Shift + Tab	Toggles between the Outline tab and the Slides tab in Normal view.
Ctrl + Spacebar	Remove manual character formatting returning the text back to its default
Esc	Cancels the action or closes the dialog box
Alt + Shift + Left Arrow	Promotes a paragraph (Outline view)
Alt + Shift + Right Arrow	Demotes a paragraph (Outline view)
Alt + Shift + Up Arrow	Moves the selected paragraphs up (Outline view)
Alt + Shift + Down Arrow	Moves the selected paragraphs down (Outline view)
Alt + Shift + +	Expands the text below a heading (Outline view)
Alt + Shift + -	Collapses the text below a heading (Outline view)
/	Turn character formatting on or off (numeric keypad)
Alt + Escape	Switches to the next program
Ctrl + Escape	Displays the Start Menu
Print Screen	Copies a picture of the whole screen to the clipboard
Alt + Print Screen	Copies a picture of just the active window to the clipboard

Over the past thirty years, PowerPoint has become synonymous with presentations. Give a speech, present a new product, share finances in a board meeting—all are typically done with a PowerPoint presentation. That's easy enough if you're presenting from your laptop and have Microsoft Office installed.

Or it can be far more difficult. You might need to email your slide deck to the event organizer—and hope they have the same version of PowerPoint installed. Or you may carry your PowerPoint file around on a flash drive to open it on the presentation computer. Neither are great solutions, especially for all the times you need to make a last-minute change to your slides or if you don't typically use Microsoft Office.

PowerPoint Online is the alternative you need. Here's everything you need to use PowerPoint for free online, where you can edit and present your slides from anywhere.

It starts with Office Online. Launched in 2010 as *Office Web Apps*, Office Online today includes simplified, free versions of Microsoft Office's most popular apps: Word, Excel, PowerPoint, and OneNote.

If you've ever used the iPad or Android tablet versions of Office, Office Online will feel instantly familiar. The basics are the same. Each Office Online app includes an Office-style toolbar with *Home*, *Insert*, *Design*, and other tabs to organize core editing tools. Office Online apps don't include all of their Windows features. They include instead a focused set of editing tools that, for most documents, spreadsheets, and presentations, are all you need.

The big difference is that the apps are online. Instead of emailing files back and forth, or syncing changes via OneDrive or Dropbox then sending messages to colleagues when

something's finished, changes happen automatically in Office Online. Your team can open files at the same time, make changes or add comments, and Office will save and sync it to all your OneDrive accounts automatically. Office Online apps also work everywhere. Open any browser, go to Office.com, and your work is ready to pick up where you left off.

Office Online is free for personal use—log into Office.com with a Microsoft account and fill up OneDrive's free 5GB of storage with all your Office files. A business version is included with Office 365 for business and enterprise accounts as well.

The basics are the same. If you've used PowerPoint before, you'll feel at home in PowerPoint online. Here are the things to keep in mind, the tips to help you work efficiently in your browser, and ways to work around Office Online's limitations.