

INTRODUCTION TO INFORMATION TECHNOLOGY

1. Basics of Information and Data Processing

Up to now, the world has evolved through three societies: The agricultural society, the Industrial society and The Information society. Now a day (at the information society), remembering the world without information technology is not possible. The emergence of globalization necessitates the use of information technology in our daily lives. The Silicon chips technology has revolutionized the way activities are performed and it also narrowed the world into village.

Information technology has become something that we can't avoid using. It is now becoming the agent of change. There are rapid and considerable advancements in the area of information and communication technologies. Use of information technology simplifies the way things are done in offices or organizations, facilitates communication in different and distant areas. Hence, every one needs to have the knowledge of applying information technology in our daily activities.

We collect and use information in one way or the other in our daily life. When we ask a passerby what time it is, we are looking for information. If you go to the organization where your sister works in and ask the workers where your sister's office is, you are looking for information that will help you in getting your sister.

Therefore, ***Information*** is a collection of meaningful or useful data that can be used as a base for guidance and decision-making. The various sources of information are classified in to two major categories:

1. Documentary sources
2. Non-Documentary sources.

Documentary Sources are documented or recorded sources of information in different forms, while non-documentary sources are those that are not properly recorded or documented for public use. The documentary sources are further categorized into three groups: Primary, Secondary and Tertiary sources.

- **Primary Documentary Sources of Information:** are the first records of original research and development undertakings. Primary sources can be published in a variety of forms. Some of these are: periodicals, reports, patents standards, dissertations, etc. Primary documentary sources are not always in published form. There are also unpublished primary documentary sources like: laboratory reports, memoranda, diaries, letters, inscriptions on stones, coins, etc.
- **Secondary Documentary Sources of Information:** are those sources, which are either compiled from or referred to the primary sources of information. In order to serve a particular purpose, the original information in the primary sources is modified, selected and/or recognized so that the secondary sources of information are produced. Unlike the primary sources, the secondary sources of information contain filtered, organized, digested and repackaged Knowledge rather than new knowledge. **Examples:** Periodicals, Indexes, Bibliographies, Textbooks, Reference books, etc.

Tertiary Sources of Information: contain information refined or distilled and collected from primary and secondary sources of information. Tertiary sources are organized with the aim of assisting the searcher of information in the use of primary and secondary sources. All of these sources do not contain subject matter knowledge. **Examples** are: Catalogues in your library, Directories like telephone directory, File directory.

Note: To be valuable to users, information should have the following characteristics: accuracy, completeness, flexibility, reliability, relevance, accessibility and timeliness.

Technology: all the means people use their inventions and discoveries to satisfy their needs and desires.

Information Technology (IT): is the use of modern technology to aid the capture, processing & retrieval, communication of information. Information technology is divided into three primary components:

1. Computers
2. Communication Networks
3. Know-how

1. **A Computer:** is an electronic machine that can be instructed to accept, process, store and present information.
2. **Communication Networks:** A *network* is a system composed of interconnected computers, peripherals, telecommunications and other specialized devices that allow information to be moved between remote points of communication. Its advantages are: speeding the transmission of information and facilitating sharing of information. *Communication* is the means where by information is conveyed with in the communication industry such as book, radio, TV, newspaper, computer, facsimile, telex, telegram, internet, etc. Therefore, communication networks use media of communication to transport information from one location to another. Medium is the material on which information is recorded and transmitted.

In manual system, a medium is the material on which information and instructions are recorded such as paper.

In computing, medium is the material on which information and instruction are recorded such as magnetic tape/disk, CD's, physical cables (network cables, microwave and satellite), etc.

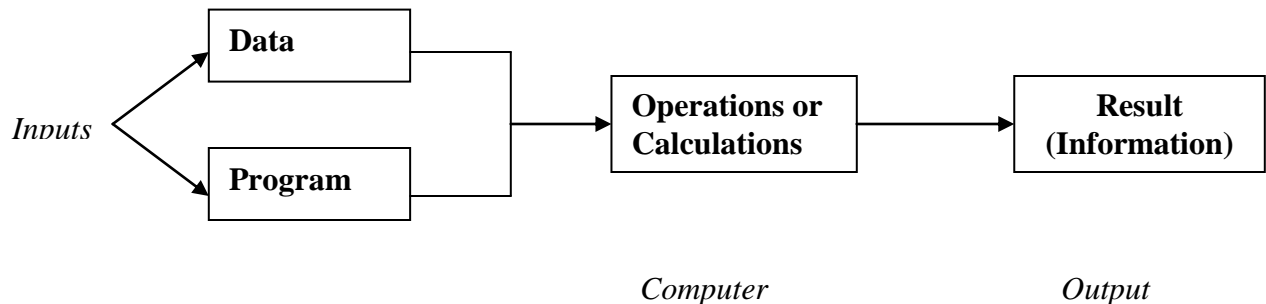
3. **Know-how:** is the ability to use the power of IT to solve problems and to take advantage of the opportunities it creates. Know-how includes:
 - Familiarity with the tools of IT
 - The skills needed to use these tools
 - What advantages do computers have?
 - Understanding when to use IT to solve a problem or capitalize an opportunity.

2. What is Computer?

A **Computer** can also be defined as an electronic device that processes data based upon the instructions provided and generates the desired output. **Data** is a raw fact or information or unprocessed information.



In Computers, two kinds of inputs are required: basic or raw data and set of instructions to process the data called a **program** or **Software**.



3. Characteristics of Computers

The main characteristics of computers that have made them so powerful and useful are:

- ❖ **Speed:** A computer is a very fast device. It can perform in few seconds the amount of work that a human being can do in an entire year if he works day and night & did nothing else. This can be gauged from the fact that the speed of computers is measured in terms of milli, micro, nano, or pico seconds. It is probable that the computers we are presently working on would be processing information at a speed of a million or a billion instructions per second.
- ❖ **Accuracy and Reliability:** A computer is extremely fast and perfect in reliability and accuracy. Since computers have tremendous accuracy, they function with out error. However, it must be remembered that the computer is capable of doing only what it is instructed to do. If faulty instructions are provided for processing data, obviously, faulty answers will be given. This is called GIGO (garbage in garbage out).

- ❖ **Consistency (Diligence):** Unlike human being, computers being machines are highly consistent, are free from monotony, tiredness, lack of concentration, etc and can work for hours with out creating error grumbling.
- ❖ **Storage Capacity:** computers can store huge amount of data. Once recorded a piece of information is never forgotten (unless some problems takes place) and information can be retrieved almost instantaneously. A single CD ROM can contain the entire Encyclopedia Britannica and more!
- ❖ **Flexibility (Programmability):** Computer is a versatile machine. A computer is perhaps the first general-purpose machine devised by man. All other machines like TV, typewriter, radio, etc do one thing they are designed for, nothing more nothing less. Unlike this, a computer can be used to play music, type letters, send faxes, diagnose illness, design buildings and bridges, etc, provided that it is given the right set of instructions to do the job.

5. Limitations of Computers

Although computers can be applied in different areas, there are activities that computers can't perform. Some of them are:

- a. Computers can't decide how to be programmed. It is always humans that are responsible for programming the computers.
- b. Computers do not provide their own inputs unless people provide it with the inputs.
- c. Interpretation of data and implementation of decisions is always left for humans. That is a computer does not interpret the information it produces based on the information obtained unless it is programmed.

6. Generation of Computers

Advances in computer technology have occurred in four major areas: cost, size, speed, and reliability. The different phases of the technological advancement of the computers are known as the **Generation of computers**. Modern electronic computers were developed beginning from 1940s. Depending on the kind of technology they use these computers are classified into five generations.

1. **First Generation Computers (1940-1959):** The major innovations in this period are the use of vacuum tubes and stored programs. The shortcomings of the first generation are:
 - Too big in size.
 - Expensive.
 - Slow on function.
 - Low level of accuracy and reliability.
 - High power consumption.
 - Machine breakdown rate was very high.
 - Fault finding was difficult
2. **Second Generation Computers (1959-1965):** The major innovations in this period are the use of transistors in place of vacuum tubes and magnetic core storage. Transistors perform similar functions as vacuum tubes but are much smaller in size, faster, more reliable and much greater in processing capacity. Built in error detecting devices were installed. This generation is also marked by the introduction of high level computer programming languages like FORTRAN.
3. **Third Generation Computers (1965-1972):** In this generation; the integrated solid-state circuitry (IC), improved secondary storage devices and new input-output devices were developed. Integrated circuits are electronic components that consist of several hundreds or even thousands of circuits on a single silicon chip. It decreased the cost of the machine substantially and increased the machine very much.
4. **Fourth Generation computers (since 1970):** This generation is marked by the use of large-scale integrated circuits (LSICs) and very large-scale integrated circuits (VLSICs). This generation is also the **Microcomputer** generation. In 1971, the Intel Corporation was able to produce a single chip, which performed all the operations of the computer's processor. Since it was so small it was called **MICROPROCESSOR**. It is a tiny solid-state device, not bigger than a pea, which in itself is a small computer capable of performing arithmetic and logic operations. Because of the introduction of microprocessor, the forth generation includes:
 - a. Large computers that are much faster, much less expensive and of much greater data processing capacity than the equivalents sized third generation computers.

- b. A multitude of relatively in expensive minicomputers (actually first introduced in the third generation).
 - c. Even further miniaturized computers, called Microcomputers.
3. **Fifth Generation Computers:** are characterized mainly by the programs they use. They use artificial intelligence systems that attempt to achieve human like qualities of intelligence, including the ability to reason.

7. Types of Computers

In general, computers can be categorized into four types based on their processing speed, power, cost and size. Namely:

- 1) **Super Computer:** is the fastest, most powerful, most expensive & largest computer. It generates tremendous amount of heat. Because of this, super computers demand special cooling requirements and the room itself should be air-conditioned. To operate Super computers, highly trained data processing professionals are required. These computers can take inputs from over 10,000 individual computers and users at the same time. Supercomputer is used in research organizations, military defense systems, national weather forecasting agencies, large corporations, aircraft manufacturers, etc.
- 2) **Mainframe Computers:** Contains multiple processor and capable of supporting a large number of users at once (multi-user) by sharing processor time (time-sharing). A Mainframe computer is generally found in a special computer room where environmental factors such as temperature, humidity, dust and air conditions closely monitored. It is an expensive machine with the capability of servicing the needs of major business enterprises, government departments, scientific research establishments, or the like. They are also used as the center of computer networking.
- 3) **Mini Computer:** It is smaller than mainframe in size and less powerful. They are popularly used in scientific laboratories, research centers, universities and colleges, engineering firms, industrial process monitoring and control, etc.

Minicomputers play a major role in computer-aided design (CAD) and computer aided manufacture (CAM). They are also being used as assistants to Mini frame computers in processing information.

- 4) **Microcomputers:** often called Personal Computers (PCs) as many individual purchase them for personal use. They are the smallest and most frequently category of computer particularly for end users. They are relatively small or compact in size and are found form table-top (desktop) size to portable types in a palm. Microcomputers are affordable by most individuses in offices, classrooms, homes and trips. Microcomputers come in a variety of sizes and shapes. Basically they can be grouped into three: Laptop, palmtop and desktop computers.
 - a. **Desktop computer:** is the most widely used type of personal computers (Micro computers). Unlike Laptop and Palmtop computers, Desktop computers have detachable parts. Since its size is larger than the other types of personal computers, it is not easily portable.
 - b. **Laptop Computers:** are smaller versions of Microcomputers about the size of a briefcase designed for portability. People can easily carry these PCs with them in their car, on airplane, or when walking from one location to another. Unlike Desktop PCs that have mostly detachable components, Laptops include all their components (except their printer) in a single unit. Despite their size, Laptop computers have as high capacity and processing speed as the Desktop personal computers.
 - c. **Palmtop Computer:** is the smallest Microcomputer that is about the same size as a pocket calculator. Palmtops are typically used for a limited number of functions such as maintaining personal calendar, name and address files, or electronic worksheets.

7. Applications of Computers

- ❖ Processing data
- ❖ Communication
- ❖ Education
- ❖ Record Keeping
- ❖ Guidance and Control
- ❖ Graphics and text Generating
- ❖ Medical diagnosis
- ❖ Simulation and Animation

8. The Computer Hardware

The computer system is basically categorized into two components: the hardware and software components.

The Hardware is the physical part of the Computer that you can see and touch. It is the general term for the physical machines or devices that carry out the activities of capturing, processing, storing and communicating data and information. The computer hardware is divided into four categories:

1. Input Devices
2. Central Processing Unit
3. Output Devices
4. Secondary storage Devices

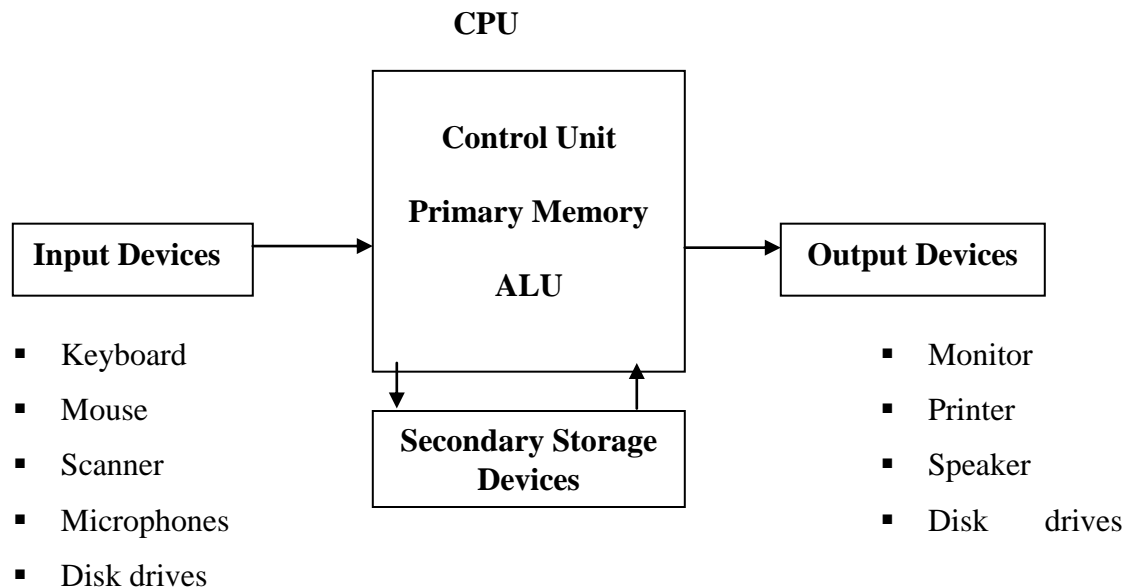


Fig. 1 Basic Units of a computer System

8.1 Input Devices

Input devices are devices through which data are entered into the computer. It is used to convert human readable form to machine-readable form. The different devices, which are commonly used to input data or information into a computer system, are: Keyboard, mouse, Image Scanner, Disk drives, etc.

- **Keyboard:** The keyboard is an input device used to enter information into your PC. There are essentially dozen keyboard designs. The keys on the keyboard can be divided into 5 sections.
- **Alphanumeric (Character Keys):** These keys work just like a conventional type writer which consists of letters (A-Z), numbers (0-9), Enter key, Spacebar, Backspace, Shift, Caps lock, etc.
 - **Function Keys:** These keys perform different tasks based on the type of application you are working on. Function keys are labeled as F1, F2... F12.
 - **Numeric Keys:** Let you enter numerical data more easily when you are working on numbers. To use this section of the keyboard, make sure that the **Num Lock key** is ON.
 - **Navigation (Cursor movement Keys):** These keys are used to navigate through your document. The keys are: Arrow keys, Home, End, Page up, Page down, etc.
 - **Computer (Special) keys:** They perform different tasks when used alone or in conjunction with other keys. Some of these keys are: Alt, Ctrl, Print Screen, Scroll Lock, Pause, Delete, and Insert.
- **Mouse:** The mouse is a pointing device that is used to move the insertion pointer around the screen. It is especially helpful when you are operating a computer that uses a graphical user interface, like MS-Windows. The buttons on the mouse are used to select on screen options.

- **Scanner:** Can be used to input images (including drawings, charts, and graphs) and words into a computer. Once the image is transferred to the computer, through the scanner, it can be modified, or combined with other information. The major uses of scanners are Desktop Publishing and sending fax messages.

- **Disk drives:** Are data reading or writing devices.
- **Microphones:** It captures the voices or sounds and translates them into digital signals for the computer.

8.2 Central Processing Unit

At the center of the computer system is the processor, which is commonly referred to as the Central Processing Unit (CPU). It executes program instructions and performs the computer's processing activities. The CPU is the computer's brain that is the microprocessor. The central processing unit has three major components:

- ❖ **The Arithmetic or Logic Unit (ALU):** Contains the electronic circuitry that performs the arithmetic (+, -, *, /) and logical (>, <, <=, >=, =) operations. Logical operations compare one element of information with other. This comparison is used to determine whether one unit of data or information is less than, greater than, or equal to the other unit. For example, arranging numbers in ascending or descending order, alphabetizing names, require logical comparison of the alphabets in the names.

- ❖ **The Control Unit:** Controls every activity of the computer. The control unit ensures that according to the stored instructions, the right operation is done on the right data at the right time. What our brain does for us will be done by the control unit for the computer.

- ❖ **The Main memory:** Memories are used to store programs and data. It is a means of storage that is found with in the computer itself and that is why it is called internal memory or primary memory. There are two types of primary memory:
 - **RAM:** is a random access memory (can be accessed randomly with out regard to any other memory location. The access time is the same for each memory location.

The largest area of the memory within a computer is composed of RAM. It is a volatile memory that is, it holds data as long as there is current flow. Because of this it stores data temporarily. It allows both read and write access.

- **ROM:** Stands for read only memory. Once programmed, it can only be read from it. Data cannot be written on it. ROM contains programs and instructions that enable the computer to start the entire operating system and other programs can be permanently stored in it by computer manufacturers. Since the contents cannot be changed and they are not lost when electric current is turned off, ROM is non-volatile. It has random characteristics similar to RAM.

8.3 Output Devices

The output devices enable the user to see the results of the computer's calculation or data manipulations. They convert the results of a process, which is only in machine understandable form to a form understandable by human being. Included in the output devices are:

- a. **Visual Display Unit (Monitor):** Sometimes also called screen, displays the output of the processing activity for the user on a television-like screen. Video displays differ in size, resolution, and in the number of colors displayed.
- **Size:** Monitors come in many different sizes. The size ranges from the small screen built on Palmtops and Laptops to extra large monitors used for special purposes. The standard monitor for personal computers however is 13 to 17 inches (32 to 42 cm), measured diagonally.
- **Resolution:** On the computer screen, all characters and images are produced as the result of combining dot patterns, which are also called **Pixels**. The number of these dots or pixels per-one inch space on the screen determines the quality or sharpness (resolution) of the character of the image. That means, the higher the number of pixels on one-inch space, the better the quality of the image will be. Common standard resolutions are:

SNNPR Capacity Building Bureau

640 columns X 480 rows of dots (307,200 pixels) on full screen.
800 columns X 600 rows (480,000 pixels), 1,024 columns X 768 rows (786,432 pixels).

- **Colors:** There are two most widely used types of video displays.
 - **Monochrome:** means one color, generally white on black background or vice versa.
 - **Color Monitors:** Many monitors display color-combining shades of red, green, and blue (RGB). These RGB displays or monitors can create 256 colors and other several variations on them by blending shades of red, green, and blue. Hence they are called RGB displays.

Video Adaptor Cards (Interface)

It is a device to which the monitor is connected at the system unit. One can choose between a monochrome or color graphic adaptor but the most popular is color.

- i. **Monochrome Display Adaptor (MDA):** Displays only text just like that of DOS screen. It is impossible to see colors, pictures, etc. and it is the oldest one.
- ii. **Color Graphic Adaptor (CGA):** The CGA was the first color graphic adaptor available for the PC. Using the CGA, users could display text and graphics. In text mode, the CGA supports 16 foreground and 8 background colors. In graphic mode, the CGA provides two resolutions 320 X 200 with available colors, or 640 X 200 with two colors.
- iii. **Enhanced Graphic Adaptor (EGA):** The EGA improves text and graphic display quality. In text mode, the EGA can display 25 rows of 80 columns. In graphic mode, EGA supports the two CGA resolutions and provides a 640 X 350 sixteen-color mode.
- iv. **Video Graphic Adaptor (VGA):** In text mode, VGA lets you display up to 50 rows of 80 characters. In graphic mode, the VGA displays 320 X 200, 640 X 200, 320 X 200, as well as 640 X 350 sixteen-color.

- v. **Super Video Graphic Adaptor (SVGA):** This adaptor has a resolution of 800 X 600. High-resolution monitors start with 1024 X 760 resolutions. As the number increases, the performance increases.
- vi. **Super VGA (SVGA).**
- vii. **Ultra video Graphics Adaptor (UVGA).**

Now a days, we can find only VGA, SUGA, and UVGA.

b. **Printer:** Printers are most widely used output devices. It produces hard copy materials that are paper output. Different types of printers are in use today. In general, there are two major categories of printers. Namely:

- **Impact Printers**
 - **Non-Impact printers.**
- **Impact Printers:** in impact printing, the paper and the character being printed come in contact with one another. That is, striking an inked ribbon with pins forms characters. Examples of Impact Printers are: Dot Matrix, Line and Character printers.

Dot matrix Printers: are designed to print characters as a pattern of dots. The print head consists of several pins with electromagnets attached at one end. By activating the electromagnets, the pins can be made to hit the inked ribbon. If you carefully examine the characters printed by these printers, you identify that each character is a collection of small dots.

Line Printers: These are high-speed impact printers that are mostly used by large computers. Line printers print a full line (up to 144 characters) at a time. They are able to print up to several thousand lines per minute.

Character Printers: These printers print one character at a time. Unlike Dot Matrix and Line Printers whose speed is measured in terms of the number of line printed per minute, the speed of character printers is measured in terms of the number of characters printed in one second.

- **Non-Impact Printers:** are printers that do not bring the paper and the print material into physical contact. The characters of the print material are produced on the paper through a

heat, chemical, or spraying process. Laser and Ink-Jet Printers are the most frequently used kinds of Non-Impact printers.

Laser Printers: print by depositing a black powder called **toner** on the paper. When a laser printer receives information in to a laser beam (a narrow beam of light) that in turn forms a photo conductor with the information. This process forms the character or the image to be printed. A toner, a black granular dust similar to the one used in photocopiers, is used in the process.

The photo conductor attracts toner particles which, when transferred to the paper, produce the image. Finally the image is fused to the paper by heat and pressure. The Laser printer prints an entire page at a time, and therefore, the speed of Laser printer is measured in terms of the number of pages that it can print per minute. They are very fast in printing and the quality of the print is also very good.

Ink Jet printers: These printers spray tiny streams of ink from holes in the print mechanism on to the paper. The spray makes up a dot pattern that represents the character or image to be printed.

c. Disk drives: since they are also used to record a result of a process on magnetic disks, they are also considered as output device.

d. Modem: links two or more computers by translating digital signals into analog signals so that data can be transmitted via telecommunications. Modem for instance lets two computers exchange information over phone lines. Modem comes into two types: internal and external modem. Internal modem is a hardware fitted into an expansion slot in the system unit. External modem sits outside your system and connects to serial port.

8.4 Secondary Storage Devices

They are also called Secondary memories or Mass Storage devices. Secondary storage devices are used for mass storage of programs and data files. Because of the primary storage doesn't store user's data permanently, their high price and limited capacity, the need to have other type of

storage to hold large amount of data for a longer period of time in a less expensive and yet accessible manner is evident. Hence secondary storage devices were created with this need in mind. Secondary storage devices have the capability to store large amount of data in a machine-readable form for a longer period of time. When needed, a data reading a writing device called drive is used to read the data stored and transfers to the primary memory for further process. There are two types of secondary storage:

- a. Magnetic Storage
- b. Optical storage.

a. **Magnetic Storage:** is further divided into two:

I. **Magnetic Tape:** is the earliest form of secondary storage. Data can be stored on and retrieved from tape sequentially. Magnetic tape is not so widely used for file processing, but still plays an important part in the file back up for security purposes.

II. **Magnetic disk:** are flexible plastic or metal (rigid aluminum) disks of easily magnetizable materials. There are two types of magnetic disks on which we can store and retrieve randomly.

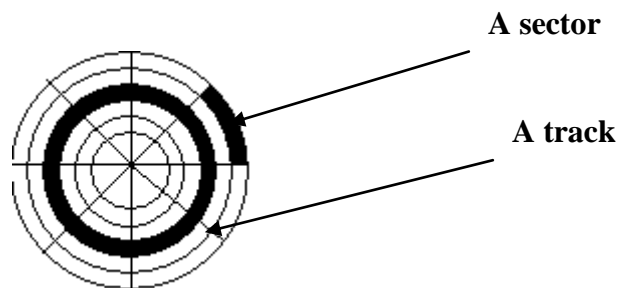
1. **Hard disk:** is a high capacity magnetic disk, which is fixed in the main unit of the computer. Hard disks cannot be removed from their disk-drive cabinets, which contain the electronics to read and write data on to the magnetic disk surfaces. It is advantageous than the floppy disk is that; it enables very fast accessibility of data and can store much more amount of data (40 MB to giga bytes) in capacity.

2. **Floppy disk:** is also called diskette. It is removable and has less capacity compared to the hard disk. The content of a floppy disk can be erased and re-used a number of times.

Two characteristics describe floppy disks: Size and Capacity. **Size** refers to the physical dimension of the disk and **Capacity** refers to the amount of information the disk can hold. Floppy disks come in two main sizes and capacity.

Size	Capacity
3 ½	720KB double density
3 ½	1.44MB High density
5 ¼	360KB DD
5 ¼	1.2MB HD

In magnetic disks (both floppy and hard disks), data is stored in concentric circles called **tracks**. Each track is further divided into sectors. A **sector** is the amount of information that can be read or written in a single operation.



b. **Optical Storage:** it uses the principle of light (laser beam), rather than magnetism to store information. Optical disks have huge capacity. They are three types:

- ⇒ CD-ROM (Compact disk read only memory).
- ⇒ WORM (Write once read many) that is record able CD (R-CD).
- ⇒ Erasable CDs that is re write able CD (CD-RW).

8.5 Building Blocks of Personal Computer

1. Mother board: is also known as system board (main board) that is the heart of the computer. It is a large circuit board that holds:

- a. **The Microprocessor (CPU):** is the brain of the computer that makes the computer smart.
- b. **RAM (Random Access Memory):** is the working table of the computer system. RAM comes in different modules:
 1. SIMM (Single in line memory module).
 2. DIMM (Dual in line memory module).

c. ROM-BIOS (Read only memory-Basic input output system).

- ⇒ BIOS is the program which is in the ROM.
- ⇒ Is the key that starts the computer.
- ⇒ Is the hardwire, which cannot be dismantled from the motherboard.
- ⇒ POST (power on self test) is on the BIOS, which check every peripheral like keyboard, mouse, monitor, etc as soon as the power is on.

d. Expansion Slots: are also called expansion buses which allow the user to add additional capabilities like network interface card, TV card, Sound card, internal modem, etc.

It is also called **expansion cards** or **daughter board**. There are different standard architectures of expansion slots:

- ⇒ ISA- Industry standard Architecture. Transmits 8 bits.
- ⇒ EISA- Extended ISA. Transmits 32 bits.
- ⇒ MCA- Micro channel Architecture. Transmits 32bits.
- ⇒ PCI- Peripheral connect interface. Transmits 64 bits.
- ⇒ VESA- Video expansion standard Architecture. Transmits 64 bits.

Now a days, EISA and PCI are the most common.

2. Power Supply: It delivers electrical power to the computer system. The computer components work with $\pm 5V$, and $\pm 12V$. The power supply steps down the voltage to the required value and changes AC to DC.

3. Ribbon buses (Cables): are used to connect the different components, and transfer data.

4. Disk drives: The most common types of disk drives are

- ⇒ Hard disk drive (HDD)
- ⇒ Floppy disk drive (FDD)
- ⇒ Compact disk drive (CDD)
- ⇒ Digital versatile disk (DVD)
- ⇒ ZIP drive

5. Ports: A port is the interface through which the microprocessor in the system unit can communicate with an option such as a monitor or a printer. In other words, a port is a connection point at which signals between the peripherals and the central computing system enter or leave the computer. There are two common types of ports: Serial and Parallel port.

Serial Ports: Allow data to send and receive serially (a bit at a time) over a single wire. It is slower in speed and is good for distance communication. Serial ports are also called *communication ports (Com-Ports)*.

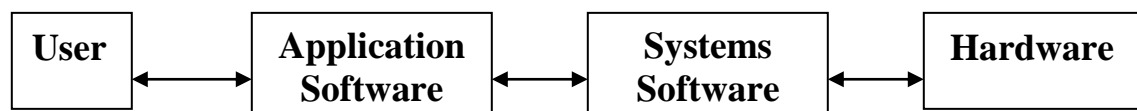
Parallel ports: Data come in parallel over eight parallel wires. Due to this it is faster in speed. It is good for short communication. Parallel ports are also called *line print-ports (LPT-Ports)*. Serial ports are called **male** because they have protruding pins and parallel ports are called **female** because they have holes into which the protruding pins of male cable may be inserted.

6. CMOS Battery (Complementary Metal oxide Semiconductor): It holds (retains) the configuration or information of the computer.

9. The Computer Software

The hardware alone cannot perform any particular calculation or data manipulation without being instructed exactly what to do and how to do it. That is, software is a series of instructions that tell the hardware what to do. Software (Program) makes the interface between the user and the electronic components of the computer. It facilitates communication between a human being and a machine (the computer). It is therefore, the combination of both hardware and software that makes a complete computer system. Computer software is divided into two broad categories:

- A. Systems Software
- B. Application Software



9.1 Systems Software

Systems software consists of all the programs, languages and documentations supplied by the manufacturer. These programs allow the user to communicate with the computer and write or develop his own programs. This software makes the machine easier to use, and makes an efficient use of the resources of the hardware possible. Systems software provides the interface between the hardware and the users, but does nothing to directly serve the user's needs. Interface is the

means by which a person interacts with a computer. Systems software includes: operating system, system support software, and systems development software.

- ❖ **Operating System:** is a master control program, permanently stored on the primary memory that interprets user commands requesting various kinds of services such as display, print, or copy a data file, list all files in a directory, or execute a particular program. The primary purpose of this software is to manage the hardware for the most efficient use of computer resources and to provide an interface between a user and an application program and the hardware. Examples of an operating system are: MS-DOS, MS-Windows, and UNIX.

- ❖ **System Support software:** provides system utilities and other operating services. System utility software is a broader line case between application software and system software. These softwares are either used as specific tools while development of a program or package, or to perform a limited specific task, such as scanning the hard disk for viruses. Operatimng services consist of programs that provide performance statistics for the operational staff and security monitors to protect the data and the system.

- ❖ **System Development Software:** includes the computer or programming language translators that are used to convert written programs to machine language for execution.

Programming Language

Programming language is the means of communication between a human being and a computer. The levels of programming language are discussed in terms of generation of languages, just like the generation of computers. Accordingly, there are four levels of computer programming languages:

- a. **Machine Language:** is the first generation of programming language that was available in the earliest days of computer .It is the only programming language that the computer can understand .Use of machine language is tedious, difficult and time consuming methods of programming. Machine language is the lowest level language that requires the programmer to have detailed knowledge of how the computer works. The computer has its own machine language which is made of streams of 0s and 1s.The reason that the

instruction in machine language must be in streams 0s and 1s is that the internal circuits of the computer is made of switches, transistors and other electronic devices that can be in one of two state: ON or OFF. The ON state is represented by 1 and the OFF state is represented by 0.

b. **Assembly Language:** Is the second-generation language. Use **mnemonics** in place of 1s and 0s to represent the operation codes. Mnemonics is an alphabetical abbreviation used as a memory aid.

Example: we use MOV, SUB, Del, to say move, subtract and Delete respectively .The assembly language uses assembler (is a language translator from human readable to machine readable).

c. **High-level Languages:** Is the third generation language. The instructions of high-level languages are called **statements**. Statements closely resemble human languages. Because of the close of resemblance to human language, high-level languages are much easier to learn and use than assembly language. Just like assembly languages, programs written using high level languages need to be translated to machine languages. Compilers and Interpreters are high-level programming language translators. A **compiler** translates a whole program, called the **source code** at once into machine language before the program is executed.

Once converted, the program is stored in machine-readable form called the object code. The object code can be immediately executed any time there after. **An Interpreter** translates a program into machine language one line at a time, executing each line of the program after it is translated. With most interpreters, the machine-readable form is not stored in primary storage or on secondary storage media. Therefore, the program must be interpreted each time, before it is executed.

Some of the major high-level languages are FORTRAN, COBOL, BASIC, Pascal, C++, Visual C++, Visual Basic (VB), etc.

d. **Fourth Generation Languages:** allow users to create programs with much less effort than is required by high-level languages. They are more English-like than high-level languages and they emphasize what outputs results are desired more than how programming

statements are to be written. Because of this, many users with very little computer training can use the fourth generation languages. Examples are database query languages, report generators, and application generators.

9. 2 Applications Software

It consists of programs or instructions to perform specific task or job or information processing activities. There are a number of application softwares. Some of such application softwares are:

- ✓ **Word Processing:** Allow creating documents like letters, reports, handouts, office memos, magazines, newspapers, etc. Examples of Word processing softwares are: MS-Word, Word Star, and Word Perfect.
- ✓ **Spreadsheets:** is a table of rows and columns to perform calculations and other related activities on a numerical data. Examples are MS-Excel, Lotus 1-2-3, and Quattro Pro.
- ✓ **Database Management system (DBMS):** are used to systematically handle, organize, or store data and latter get the stored data in a much flexible way. Examples: MS-Access Fox Pro.
- ✓ **Desktop Publishing Programs:** are used to create (publish) professional newsletters and reports using the PC that sits on your desktop. Examples: Page Maker, Ventura.
- ✓ **Computer Aided Design (CAD):** is used by engineers and designers to draw an object. Example: Auto CAD
- ✓ **Computer Games:** Example Chess, Solitaire, Dave, etc.

10. Computer Data Representation and Numbering System

Computers only identify each letter or number, symbol etc in the form of digital signals, which represent either a HIGH voltage state “ON”, or a LOW voltage state “OFF”. The **ON** and **OFF** states are commonly labeled with states **1** and **0** respectively. This two state system is called **binary number system**. Therefore; each letter, number, or symbol that we enter from the keyboard in our information processing activity, should be uniquely represented by the combinations of **0s** and **1s** before it can be used by the computer.

10.1 Binary Number system

A single binary digit that is either **1** or **0** is called **bit**. Single bits are usually not enough to store all the numbers, symbols and characters. For this reason, a group of **8** bits called a **byte** is used. Each byte generally represents one character. The byte is also the basic unit for measuring the size of the memory of a computer in terms of KB, MB, GB, etc. Since in computers, the two states (ON and OFF) are represented by the numbers 1 and 0 respectively, this two state digit representation is called **binary number system**. The binary number system is a base 2 system.

10.2 Octal and Hexadecimal Number Systems

Octal number system is a base 8 system using the digits 0-7. It is used to provide a short hand way to deal with the long strings of 1s and 0s created in binary.

The hexadecimal is a base16 system. It contains the digits 0 through 9 and the capital letters **A** through **F**. The hexadecimal system is often used in programming as a short cut to the binary number system like that of the octal number system.

Binary to decimal conversion

Any combination of 0s and 1s is a binary number system. To convert a binary number to a decimal numbers system, we follow expanding method.

Example: $(11011)_2 = 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
 $= 16 + 8 + 0 + 2 + 1$
 $= \underline{(27)_{10}}$

Another simple method for converting a binary number to its decimal equivalent is known as **double-babble method**. This method is described below.

1. Double the left most bit.
2. Add to it the bit on its right.
3. Double again the result.
4. Add to it the next bit.
5. Proceed in this manner until all the bits in number are considered.

The final sum obtained by a repeated doubling and adding is the desired decimal equivalent.

Decimal to Binary conversion

A positive integer can be easily converted to equivalent binary form by the repeated division by 2. Start by dividing the given decimal integer by 2. Let **r1** be the remainder and **q1** the quotient. Divided **q1** by 2 and let **r2** be the remainder and **q2** be the quotient. Continue the process of division by 2 until 0 is obtained as a quotient. Reading the remainders from the bottom to the first top can form the equivalent binary number.

Example: Find the binary equivalent of 25.

$$\begin{array}{rcl} 25 = 2 & q_1 = 12, & r_1 = 1 \\ 12 = 2 & q_2 = 6, & r_2 = 0 \\ 6 = 2 & q_3 = 3, & r_3 = 0 \\ 3 = 2 & q_4 = 1, & r_4 = 1 \\ 1 = 2 & & r_5 = 1 \end{array} \quad \begin{array}{c} \uparrow \\ | \\ | \\ | \\ | \end{array}$$

Therefore, the equivalent binary digit is: 11001_2

The conversion of decimal fractions to binary number system is performed by: multiplying the fraction by the base and saving at each multiplication the integral digit resulting from the multiplication. This process is continued until the fraction becomes zero. The integral digits form the new binary fraction reading from top to bottom.

Example: Convert 0.75 to binary.

Fraction	Integer
$0.75 \times 2 = 1.50$	1
$0.50 \times 2 = 1.00$	1

$\begin{array}{c} \uparrow \\ | \\ | \end{array}$

Therefore the equivalent binary is $(0.11)_2$

10.3. Conversion among Binary, Octal, and Hexadecimal.

To convert a **binary** number to **octal**, begin at the binary point and block off groups of three binary digits. Replace each group of three binary digits with its equivalent octal digit. The digits will range from 0 to 7.

To convert from **octal** to **binary**, replace each octal digit with the equivalent three binary digits. Use the same process for fractions starting at the point .Add more 0s to complete the last set of three.

The conversion to and from **hexadecimal** is identical, except that process of four binary digits are used and the hexadecimal values rang from 0 to F.

Example: Convert the binary 11110111011 to octal and hexadecimal.

Binary 011 110 111. 011

3 6 7 3 = (367.3)₈

Binary 1111 0111. 0110

F 7 6 = (F7.6)₁₆

Decimal	Binary	Octal	Hexadecimal
0	0	0	0
1	1	1	1
2	10	2	2
3	11	3	3
4	100	4	4
5	101	5	5
6	110	6	6
7	111	7	7
8	1000	10	8
9	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D
14	1110	16	E
15	1111	17	F

Converting from binary to octal and hexadecimal is done by grouping binary digits into groups of three for octal and groups of four for hexadecimal.

11. Encoding systems

Computer systems understand only binary number systems. Because of this, each letter or number that we enter through the keyboard should be converted to the binary number system to be understood and processed by the computer. For this purpose there are two standard encoding systems for representing data.

1. ASCII (American Standard Code for Information Interchange): It uses seven - bits to represent a character. It is used in almost all microcomputers and many minicomputers.

2.EBCDIC (Extended Binary-Coded Decimal Interchange): is an 8 bit-coding scheme used on many minicomputers and almost all mainframes. Eight bits allow 2^8 or 256 possible code combination.

A character that is represented using either ASCII or EBCDIC will fit with in 8 bits. EBCDIC is an 8-bit code. ASCII is a 7- bit, but by adding an extra, meaningless bit, it will fit an 8- bit space.

Most computers could use either coding scheme. The choice really depends on the scheme for which the software is written. Since both schemes represent the same group of characters, there is other software available to translate one code to the other so that ASCII computers can communicate with EBCDIC computers and vices versa.

MICROSOFT DISK OPERATING SYSTEM (MS-DOS)

1. Introduction

An operating system is a program or set of programs, which manages and controls the resources of the computer in accordance with certain objectives, providing a simplified hardware interface to higher levels of software. An operating system directs all processing activities within the computer that is calling in other systems software as needed, scheduling jobs, allocating storage facilities, Input/output facilities, and many other tasks to ensure the proper and efficient use of hardware by application programs.

The operating system sits between the hardware and the other software. It is through the operating system that all communication with computer's hardware is possible.

The operating system feature by which the user interacts with the operating system is called the *operating environments*. The two common operating environments are *command-line* and *graphical user interface environments*.

In command-line operating environment, you interact with the operating system by typing commands on a line at a *system prompt*. A system prompt is a character, symbol or combination of the two that tells you that the system is ready to accept a command.

The graphical user interface (GUI) environment uses dialog boxes, drop-down menus, buttons icons, scroll bars and pointers instead of requiring the user to type commands. In a GUI environment, you move a pointer around the screen with a mouse to activate features.

There are different makes of operating systems with varying capabilities that are available on the market today. But the most common ones are: *MS-DOS*, and *MS-WINDOWS*.

DOS is an acronym for disk operating system, which means that the operating system components reside on disk and are brought into computer memory in needed. DOS is a single user, single tasking operating system.

Lets make some analyze to understand DOS. If a computer were a car, DOS would be the key that starts the engine and you would be the driver. Much the same way that your keys allow you to open the doors to your house, DOS allows you to unlock the potential of your computer.

MS-DOS has a number of programs to perform different tasks, of which the following are basic component programs.

1. ***The Control Program***: It facilitates the control and coordination activity of the computer. The program that performs this activity is known by the file name ***MSDOS.SYS***.
2. ***The I/O Manager***: facilitates the utilization of the different input/output devices. The program that performs this activity is known by the file name ***IO.SYS***.
3. ***The command Interpreter***: Interprets the commands typed by the user at the system prompt into computer functions. The program that performs this activity is known by the file name ***COMMAND.COM***.

2. Internal and External Commands.

Command is a single word with which we tell MS-DOS what to do next. DOS commands can be grouped into internal and external commands.

When you boot up a computer, a file named COMMAND.COM loads a set of built in commands into memory called ***Internal or memory resident commands***. Most frequently needed commands such as DIR, DATE, TIME, RD, TYPE, LABEL, COPY, CD, DEL, VER, REN, CLS, VOL, MD, are referred to as internal commands.

External commands are those that reside on a hard disk or floppy disk. The file name of external commands has a COM, EXE, or BAT extension. Examples include: DISKCOPY, FORMAT, TREE, CHKDSK, PRINT XCOPY.

4. DOS Files

Any information that is stored on a disk is done through a facility called File. A file can be created, modified, renamed and deleted. You use two types of files while working with your computer.

- a. **Program Files:** are the files that allow you to perform a task. The applications software's that you use (word Processor, Spreadsheet, and others) are program files.
- b. **Data Files:** are the files that you create while using a program or application. The letters that you write, the budgets you keep, and the graphics you draw are stored as data files.

4. File Name

File name is a name that represents a file. Each file must have a unique name containing a primary identifier called **Primary file name**, and an optional extension called **file name extension**, and a **separator (period)**.

Primary name. Optional extension.

4.1 file Naming Rules

A file name must adhere to the following rules.

- ✓ The first character of a file name must be a letter.
- ✓ Primary name can have up to 8 characters.
- ✓ The optional extension can have up to 3 characters.
- ✓ A file name can't contain any of the following special characters: *, \, /, <, >, [], +, =, :, , ; @.
- ✓ A file name can't also contain any space either in the primary name or its extension. The following are valid file names.

- | | |
|--------------|----------------|
| ○ Letter.TXT | ○ Infotech.DOC |
| ○ Letter.1 | ○ Note1.txt |
| ○ Sample.BAT | ○ Aster.txt |

Extension name helps you identify the type of the file. MS-DOS uses the following extensions.

- ❖ .EXE (EXECUTABLE) OR COM (command) for files that contain program.
- ❖ .SYS (system) for files that contain information about your hardware.
- ❖ .BAT (batch) for files containing list of commands.

If you are naming a data file created using an application, it is not necessary to use the file extensions. Often an application will add its own file name extension even if you did not give the file extension. Thus, MS-Word and Notepad will add the file extensions DOC and TXT respectively.

4.2 Wildcard Characters

To facilitate certain uniform operations, MS-DOS allows the use of wildcard characters in file names. Wildcard characters represent a single character or a number of characters in a file name. A wildcard allows you to specify many different files at once. MS-DOS characters recognize two wildcard characters: the question mark (?) and the asterisk (*).

? -Represents a single character in the file name.

* -Represents any set of characters in the file name.

Example: *.TXT represents all files with extension .TXT.

?omputer.TXT: represents all files whose file name starts with any letter followed by omputer.TXT.

5. Directories.

Directory is used on storage devices the way cabinets are used in offices. It is a file cabinet that holds one or more related files and other directories.

Root Directory: is a directory where all other files and directories will be stored. The root directory of a hard disk is referred to as C:\ and that of a floppy disk is A:\.

The current Directory: is the directory you are currently working in.

6. Drives

Drives are disk compartments. Diskettes used on computers may be removable (floppy disk) or hard disk. The disk compartment for a floppy disk is known as A: drive and the hard disk drive is called C: drive.

Note: To change the drive on which you are working, type the drive name followed by a colon (:) and press the enter key.

Example: C:\A: ↵ changes the drive to A: drive.

A:\C: ↵ changes the drive to C: drive.

7. Syntax

The rule that you should follow to write a meaningful command is referred to as syntax.

8. Booting a Computer.

To boot a computer means to start a computer. You can start a computer with either of the following methods:

Cold Booting: the initialization of a computer from OFF state, which is done by turning on the switches, is known as cold booting. But some time we may be forced to initialize the computer by using a procedure known as warm booting. In this case, the computer is already ON, but due to some problem, communication between the machine and us fails. To solve this problem, we use warm booting which is done by pressing combination of keyboard keys Ctrl + Alt + Del.

➤ To start Command Prompt:

- Click Start
- Point to All Programs.
- Point to Accessories.
- Click command Prompt.

When the system is ready to accept your order, it displays what is called a prompt. A prompt is a symbol displayed on the screen by the operating system, which looks like the following:

C:\>

The prompt shows you that the computer is waiting for an order. After typing DOS command, we have to press the Enter key to get response from the computer.

9. Usage and Functions of Commands

In this topic, we learn the functions of the most widely used disk operating system (DOS) commands.

- **Ver:** displays MS-DOS version number.
 - ✓ *Syntax:* Ver ↵
- **Date:** displays the current date.
 - ✓ *Syntax:* Date ↵
- **Time:** displays the current time.
 - ✓ *Syntax:* Time ↵
- **Label:** creates and changes the volume label (name) of a disk.
 - ✓ *Syntax:* Label ↵
- **Dir:** displays list of files and sub directories that are in the directory or drive you specify.
 - ✓ *Syntax:* dir ↵
- **MD:** used to create a directory.
 - ✓ *Syntax:* MD [drive:][path] ↵
- **RD:** it is used to remove or delete a directory that is found on a dosk. Before you are able to remove a directory, you have to delete al the files in it and also the subdirectories if it contains. The directory must be empty.
 - ✓ *Syntax:* [drive:][path] ↵
- **TREE:** graphically displays the structure of the directory.
 - ✓ *Syntax:* Tree [drive][path] ↵
- **DELTREE:** deletes a directory and all the files and subdirectories that are in it.
 - ✓ *Syntax:* Deltree [drive:][path] ↵
- **CLS:** clears the screen. The cleared screen shows only the command prompt and cursor.
 - ✓ *Syntax:* CLS↵
- **EDIT:** starts MS-DOS editor (a text editor you can use to create and edit text files). MS-DOS editor is a full screen editor that allows you to create, edit save and print text files. Using MS-DOS editor, you can choose commands from menus and specify information and preferences in dialog boxes. MS-DOS editor includes extensive on line help about MS-DOS editor techniques and commands.

✓ *Syntax:* Edit↵

Note: To activate menus in the DOS editor, press the Alt key and the first character of menu name or simply click on the desired menu. For example, to activate the File menu, press Alt + F or click File menu.

➤ **REN:** The rename command is used to rename a file.

✓ *Syntax:* Ren [drive:][path]Old name New name ↵

➤ **DEL:** used for deleting files.

✓ *Syntax:* Del [drive:][path]file name ↵

➤ **UNDEL:** is used to recover files that have been deleted.

✓ *Syntax:* Undel [drive:][path]file name ↵

➤ **COPY:** copies one or more files to the location you specify.

✓ *Syntax:* [drive:][path]\source destination ↵

➤ **MOVE:** moves one or more files to the location you specify.

✓ *Syntax:* Move [drive:][path]\source destination ↵

➤ **DISKCOPY:** copy the entire contents of one floppy disk to another floppy disk. Diskcopy writes over the existing contents of the destination disk as it copies the new information to it.

✓ *Syntax:* Diskcopy drive1: drive2 ↵

➤ **MEM:** displays the amount of used and free memory on your computer. You can use the mem command to display information about allocated memory areas, free memory areas and programs that are currently located into memory.

✓ *Syntax:* Mem ↵

➤ **SCANDISK:** starts Microsoft scandisk (a disk analysis and repair tool that checks a drive for errors and corrects any problems that it finds).

✓ *Syntax:* Scandisk ↵

➤ **FORMAT:** the Format command creates a new directory and file allocation table (FAT) for the disk. It can also check for bad areas on the disk, and it can delete all data on the disk.
Warning: do not format a disk if you need the file in it.

✓ *Syntax:* Format drive: ↵