FUNDAMENTALS OF COMPUTER (DBC24)
(BACHELOR OF COMMERCE)

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CONTENTS

UNIT – I

COMPUTER BASICS

Objectives

In this unit introduces
- Uses Of Computers,
- Components In The Computer And
- Functionality Of The Computer.

1.1. What is A Computer

A computer is an electronic machine that accepts information, stores it until the information is needed, processes the information according to the instructions provided by the user, and finally returns the results to the user. The computer can store and manipulate large quantities of data at very high speed, but a computer cannot think. A computer makes decisions based on simple comparisons such as one number being larger than another. Although the computer can help solve a tremendous variety of problems, it is simply a machine. It cannot solve problems on its own.

1.2. uses of computers

- **Word Processing** - Word Processing software automatically corrects spelling and grammar mistakes. If the content of a document repeats you don't have to type it each time. You can use the copy and paste features. You can printout documents and make several copies. It is easier to read a word-processed document than a handwritten one. You can add images to your document.
- **Internet** - It is a network of almost all the computers in the world. You can browse through much more information than you could do in a library. That is because computers can store enormous amounts of information. You also have very fast and convenient access to information. Through E-Mail you can communicate with a person sitting thousands of miles

away in seconds. There is chat software that enables one to chat with another person on a real-time basis. Video conferencing tools are becoming readily available to the common man.

- **Digital video or audio composition** – Audio or video composition and editing have been made much easier by computers. It no longer costs thousands of dollars of equipment to compose music or make a film. Graphics engineers can use computers to generate short or full-length films or even to create three-dimensional models. Anybody owning a computer can now enter the field of media production. Special effects in science fiction and action movies are created using computers.
- **Desktop publishing** - With desktop publishing, you can create page layouts for entire books on your personal computer.
- **Computers in Medicine** - You can diagnose diseases. You can learn the cures. Software is used in magnetic resonance imaging to examine the internal organs of the human body. Software is used for performing surgery. Computers are used to store patient data.
- **Mathematical Calculations** - Thanks to computers, which have computing speeds of over a million calculations per second we can perform the biggest of mathematical calculations.
- **Banks** - All financial transactions are done by computer software. They provide security, speed and convenience.
- **Travel** - One can book air tickets or railway tickets and make hotel reservations online.
- **Telecommunications** - Software is widely used here. Also all mobile phones have software embedded in them.
- **Defense** - There is software embedded in almost every weapon. Software is used for controlling the flight and targeting in ballistic missiles. Software is used to control access to atomic bombs.
- **E-Learning** – Instead of a book it is easier to learn from an E-learning software.
- **Gambling**-You can gamble online instead of going to a casino.
- **Examinations**-You can give online exams and get instant results. You can check your examination results online.
- **Computers in Business** - Shops and supermarkets use software, which calculate the bills. Taxes can be calculated and paid online. Accounting is done using

computers. One can predict future trends of business using artificial intelligence software. Software is used in major stock markets. One can do trading online. There are fully automated factories running on software.

- **Certificates** - Different types of certificates can be generated. It is very easy to create and change layouts.
- **ATM machines** - The computer software authenticates the user and dispenses cash.
- **Marriage** - There are matrimonial sites through which one can search for a suitable groom or bride.
- **News**-There are many websites through which you can read the latest or old news.
- **Classmates**-There are many alumni websites through which you can regain contact with your classmates.
- **Robotics** - Robots are controlled by software.
- **Washing Machines** - They operate using software.
- **Microwave Oven** - They are operated by software.
- **Planning and Scheduling** - Software can be used to store contact information, generating plans, scheduling appointments and deadlines.
- **Plagiarism** - Software can examine content for plagiarism.
- **Greeting Cards** - You can send and receive greetings pertaining to different occasions.
- **Sports** – Software is used for making umpiring decisions. There are simulation software using which a sportsperson can practice his skills. Computers are also to identify flaws in techhnique.
- **Aeroplanes** – Pilots train on software, which simulates flying.
- **Weather analysis** – Supercomputers are used to analyze and predict weather.

Computers have leapfrogged the human society into another league. It is used in each and every aspect of human life. They will spearhead the human quest of eradicating social problems like illiteracy and poverty. It is difficult to imagine a world bereft of computers. This revolutionary technology is indeed a boon to the human race. May computers continue to shower their blessings to us.

1.3. History of Computers

Since civilizations began, many of the advances made by science and technology have depended upon the ability to process large amounts of data and perform complex mathematical calculations. For thousands of years, mathematicians, scientists and businessmen have searched for computing machines that could perform calculations and analyze data quickly and efficiently. One such device was the abacus.

The abacus was an important counting machine in ancient Babylon, China, and throughout Europe where it was used until the late middle ages. It was followed by a series of improvements in mechanical counting machines that led up to the development of accurate mechanical adding machines in the 1930's. These machines used a complicated assortment of gears and levers to perform the calculations but they were far to slow to be of much use to scientists. Also, a machine capable of making simple decisions such as which number is larger was needed. A machine capable of making decisions is called a computer.

The first computer like machine was the Mark I developed by a team from IBM and Harvard University. It used mechanical telephone relays to store information and it processed data entered on punch cards. This machine was not a true computer since it could not make decisions.

In June 1943, work began on the world's first electronic computer. It was built at the University of Pennsylvania as a secret military project during World War II and was to be used to calculate the trajectory of artillery shells. It covered 1500 square feet and weighed 30 tons. The project was not completed until 1946 but the effort was not wasted. In one of its first demonstrations, the computer solved a problem in 20 seconds that took a team of mathematicians three days. This machine was a vast improvement over the mechanical calculating machines of the past because it used vacuum tubes instead of relay switches. It contained over 17,000 of these tubes, which were the same type tubes used in radios at that time.

The invention of the transistor made smaller and less expensive computers possible. Although computers

shrank in size, they were still huge by today's standards. Another innovation to computers in the 60's was storing data on tape instead of punch cards. This gave computers the ability to store and retrieve data quickly and reliably.

1.3.1 Classification of Computers
Mainframe Computers
Minicomputers
Microcomputers
Supercomputers

Mainframe computers are very large, often filling an entire room. They can store enormous of information, can perform many tasks at the same time, can communicate with many users at the same time, and are very expensive. . The price of a mainframe computer frequently runs into the millions of dollars. Mainframe computers usually have many terminals connected to them. These terminals look like small computers but they are only devices used to send and receive information from the actual computer using wires. Terminals can be located in the same room with the mainframe computer, but they can also be in different rooms, buildings, or cities. Large businesses, government agencies, and universities usually use this type of computer.

Minicomputers are much smaller than mainframe computers and they are also much less expensive. The cost of these computers can vary from a few thousand dollars to several hundred thousand dollars. They possess most of the features found on mainframe computers, but on a more limited scale. They can still have many terminals, but not as many as the mainframes. They can store a tremendous amount of information, but again usually not as much as the mainframe. Medium and small businesses typically use these computers.

Microcomputers are the types of computers we are using in your classes at Floyd College. These computers are usually divided into desktop models and laptop models. They are terribly limited in what they can do when compared to the larger models discussed above because they can only be used by one person at a time, they are much slower than the larger computers, and they can not store nearly as much information,

but they are excellent when used in small businesses, homes, and school classrooms.   These computers are inexpensive and easy to use.   They have become an indispensable part of modern life.

1.4. Computer Tasks

   Input
Storage
Processing
Output

When a computer is asked to do a job, it handles the task in a very special way.
1. It accepts the information from the user.   This is called input.
2. It stored the information until it is ready for use.   The computer has memory chips, which are designed to hold information until it is needed.
3. It processes the information.   The computer has an electronic brain called the Central Processing Unit, which is responsible for processing all data and instructions given to the computer.
4. It then returns the processed information to the user.   This is called output.

Every computer has special parts to do each of the jobs listed above.   Whether it is a multimillion dollar mainframe or a thousand dollar personal computer, it has the following four components, Input, Memory, Central Processing, and Output.

1.4.1 Four Components of a Computer

A computer processes information. A toaster processes bread. Although it's a simpler device, a toaster is a good way to demonstrate the four components of computer processing: input, storage, processing, and output. Just watch the animation on this page for a moment.

Both a toaster and a computer have physical parts you can touch such as the keyboard and mouse. We call these parts hardware.

Here the similiarites between toaster and computer end and the differences begin. Only the computer has something called software that enables it to figure out what to do with the input you give it. You can't touch software. Software gives the computer the ability to process many kinds of information. In contrast, all a toaster can process is bread (and the occasional waffle).

Another difference is a computer has a microprocessor. The microprocessor is the device in the computer that performs most of the tasks we ask the computer to do—from playing computer games to graphing the number of people who prefer cricket to curling. The microprocessor reads and performs different tasks according to the software that instructs it. This ability is what makes the computer such a versatile machine.

The key thing to remember is this: both computer and toaster have four basic components to how they operate (input, storage, processing, and output.) Unlike the toaster, the computer is unlimited in the things it can do.

1.4.2 How Computers Get Input

Input Devices

A computer would be useless without some way for you to interact with it because the machine must be able to receive your instructions and deliver the results of these instructions to you. Input devices accept instructions and data from you the user. Some popular input devices are listed below.
    Keyboard

Mouse
Scanner
Microphone
CD-ROM
Joystick

Computers are information processing machines. That means that you can use them to access and change information like numbers, text, pictures, and even music. Think of what you can do to modify a single sentence. Using the computer, it's easy to add, delete, or rearrange words. To change a sentence with your computer, though, first you have to get the sentence into your computer.

Input devices are used to put information in your computer. You type a sentence on your keyboard and it goes into the computer. You speak into a microphone and your computer records your words. You make funny faces at the video camera and your computer records every one of them.

1.4.3 How Computers Store Information

When you use a telephone, it does not store information. You speak into the phone, the person on the other end hears what you say and then your words are gone. An answering machine is different. It answers the phone and stores the information given by the caller.

To process information, computers need to be able to store it. Otherwise, like the phone, information would come and go before anything could be done with it.

Computers store all kinds of information. They store the information you give them, instructions from the software you're using, plus the instructions they need to operate. To

store all this, they use two basic kinds of storage. Temporary storage is for information actively being used for processing. Random Access Memory (RAM) accepts new infomation for temporary storage. Long-term storage is for information computers use again and again, such as the instructions the computer prepares itself with every time you turn it on. These instructions are stored in read only memory (ROM), a type of memory that does not accept new information.

Computers also use a variety of devices to store information that isn't actively being used for processing. Hard drives, Optical Discs, storage, and Removable Media

1.4.4 Computers Need to Remember, Too

Just as you need to remember how to add when you face an addition problem, computers also rely on memory. A computer needs an addition program in its Random Access Memory (RAM) to "remember" how to perform addition. When the user switches to a word-processing program, the computer can check spelling because the word-processing program is now in RAM.

Some things come automatically to humans. When you breathe or move your arm, you do so without having to remember how your muscles work. Computers have a kind of built-in memory, too. It is called read only memory (ROM). ROM remembers only what it has been programmed to remember at the time the ROM chip was manufactured. "Read only" means it can never be told to do something different after it has left the factory. That would be like trying to reprogram you to breathe water instead of air.

1.4.5 Different Kinds of Storage Media

Storage Devices

> Hard disk
> Floppy disk
> Tape drive
> CD-ROM

Computers use Random Access Memory for the information they currently need to do a task. Parts of the program you are currently using and the data you are manipulating are held in RAM while you are working with them. But what about the rest of the programs and information on your computer? They are stored in a variety of other media. You are probably familiar with many of the ones shown on this page. What you might not know is the amazing amount of information some of these can hold.

Memory

A personal computer must have a means of storing information (data) and instructions so that it can perform processing tasks on the data. Personal computers have two types of memory. These are discussed below.

Read Only Memory   (ROM)
> ROM is a small area of permanent memory that provides startup instructions when the computer is turned on. You can not store any data in ROM. The instructions in ROM are set by the manufacturer and cannot be changed by the user. The last instruction in ROM directs the computer to load the operating system.
>
> Every computer needs an operating system. This is a special computer program that must be loaded into memory as soon as the computer is turned on. Its purpose is to translate your instructions in English into Binary so that the computer can understand your instructions. The operating system also translates the results generated by your computer into English when it is finished so that we can understand and use the results. The operating system comes with a computer.

Random Access Memory (RAM)
> This is the area of memory where data and program instructions are stored while the computer is in operation. This is temporary memory. NOTE: ***The data stored in RAM is lost forever when the power is turned off.*** For this reason it is very important that you save your work before turning off your computer. This is why we have peripheral storage devices like your computer's hard disk and floppy diskettes.

Permanent Memory (Auxiliary Storage)

Your files are stored in permanent memory only when saved to your disk in a: drive or saved to your computer's hard disk,
 Drive c: In the Floyd College labs, you can also save your work to a network drive. We will discuss this in class.

To better understand how a computer handles information and to also understand why information is lost if the power goes off, let's take a closer look at how a computer handles information. Your computer is made of millions of tiny electric circuits. For every circuit in a computer chip, there are two possibilities:

1. an electric circuit flows through the circuit or
2. An electric circuit does not flow through the circuit.

When an electric current flows through a circuit, the circuit is on. When no electricity flows, the circuit is off. An "on" circuit is represented by the number one (1) and an off circuit is represented by the number zero (0). The two numbers 1 and 0 are called bits. The word bit comes from "binary digit". Each time a computer reads an instruction, it translates that instruction into a series of bits, 1's and 0's. On most computers every character from the keyboard is translated into eight bits, a combination of eight 1's and 0's. Each group of eight bits is called a byte.

Byte – The amount of space in memory or on a disk needed to store one character. 8 bits = 1 Byte

Since computers can handle such large numbers of characters at one time, metric prefixes are combined with the word byte to give some common multiples you will encounter in computer literature.

Kilo means 1000   Kilobyte (KB)   =   1000 Bytes

Mega means 1,000,000   Megabyte (MB) =   1,000,000   Bytes

Giga Means 1,000,000,000   Gigabyte (GB)=   1,000,000,000 Bytes

At this point it would be good to point out why information stored in RAM is lost if the power goes off. Consider the way

the following characters are translated into binary code for use
by the computer.

A	01000001
B	01000010
C	01000011
X	01011000
Z	01011010
1	00110001
2	00110010

Consider the column at the right, which represents how the
computer stores information. Each of the 1's in the second
column represents a circuit that is "on". If the power goes off,
these circuits can NOT be "on" any more because the electricity
has been turned off and any data represented by these circuits
is lost. This is why we can not overemphasize the importance
of saving your work often.

1.4.6 **How Computers Process Information**
Computers use integrated circuit to process information. Of the
many chips in a computer, the microprocessor is the most
complex. It is where the information you give a computer is
processed.

A simpler kind of chip is used to make DVD players, remote
controls, and electronic calculators. The chips in these devices
are embedded processors . They're made to do one thing well
and the instructions are coded into them. You can't install new
software to change what they do. For example, you can't do
word processing on your VCR.

Microprocessors are much more versatile than embedded
processors. Change the software you're using and you can go
from doing word processing to playing a computer game.
Change the software again and you can explore the Internet.
Instead of being designed to do one thing, microprocessors are
designed to do whatever the software you select instructs them
to do.

The central processing unit (CPU) is the electronic brain of the
computer. The CPU in a personal computer is usually a single
chip. It organizes and carries out instructions that come from
either the user or from the software. The processor is made up

of many components, but two of them are worth mentioning at this point. These are the arithmetic and logic unit and the control unit. The control unit controls the electronic flow of information around the computer. The arithmetic and logic unit, ALU, is responsible for mathematical calculations and logical comparisons.

The processor is plugged into the computer's motherboard. The motherboard is a rigid rectangular card containing the circuitry that connects the processor and all the other components that make up your personal computer. In most personal computers, some of the components are attached directly to the motherboard and some are housed on their own small circuit boards that plug into the expansion slots built into the motherboard.

Central Processing Unit   (CPU)
The central processing unit is one of the two most important components of your microcomputer. It is the electronic brain of your computer. In addition to processing data, it controls the function of all the other components. The most popular microprocessors in IBM compatible computers are made by Intel. The generations of microprocessors are listed below.

1981	8088
1984	80286
1987	80386
1990	80486
1993	Pentium
1996	P-6
1998	Pentium III
2000	Pentium IV

Your computer has a Pentium IV processor.

1.4.7 How Computers Deliver Information
Output Devices
- Monitor
- Speakers
- Printer
    - Impact
        - Dot Matrix
    - Non-Impact
        - Ink Jet
        - Laser

INPUT, OUTPUT DEVICES

1.5. OVERVIEW OF INPUT, OUTPUT DEVICES

After reading this you will understand the following

Output devices and their working

Input devices and their working

1.5.1. OUTPUT DEVICES

A range of devices can be connected to the output ports. Some are shown below. They are usually connected to one of the serial or USB ports although the printer and keyboard have separate ports. Can you think of any other devices that can be connected to a computer unit?

 Output ports, are found at the back of the computer. A good example is a parallel port which is where the *printer* is connected to the computer. It is known as an output port because data from the computer travels down the ribbon cable between the computer and the printer and is printed on paper. A printout is also known as a hard copy.
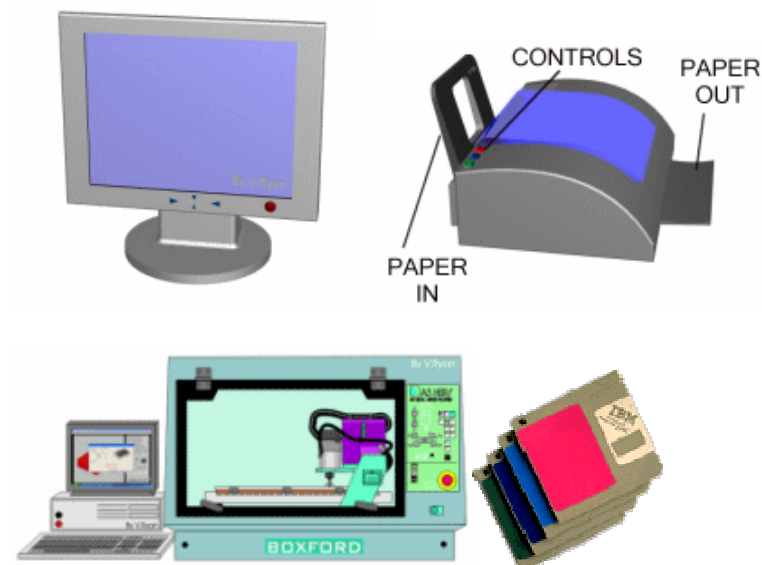
1. List the devices shown on this page and say clearly what they are and how they are used.
2. Describe any other output devices.

Output Devices

In order to communicate with the computer and get the results of the information you have put into the computer, output devices are needed. Outputed information can be displayed as screen information, printed on paper, or outputed as sound.

Examples of output devices include speakers, monitor, printers, and I/O Architecture

Speakers:

Sound Card

The sound card is a device that can be installed into a system to give the computer the ability to play sound files through speakers from CD-ROMS and disks, except audio input through a microphone, and to produce sound audio output through speakers and earphones.

Sound Card or Sound Converter

The digital to analog (D/A) conversion process is rather a simple procedure. The voice that we use is analog and the computer cannot read analog because it is too complex. Even in voice recognition programs the computer only map parts and tones of the target voices. On most multimedia computers today there is a voice recorder on it, a sure sign that there is a D/A on your sound card.

It works by converting the analog of your voice into electrical impulses which is then sent to the D/A which is converted into binary. These impulses are then interpreted by your sound card, which is stored or played by your command. Most digital to analog converters are found on a multimedia center and also on sound interpreters.

Types of Sound Cards

- **8 Bit:** The 8 bit sound card is considered obsolete. It has a lower quality than a 16 bit or 32 bit sound card, but has less requirements for the system's hardware.

- **16 Bit:** The 16 bit sound card is of the next higher quality because of the extended holding capacity. This card creates a more accurate sample of the signal than the 8 bit card. The sample rate, or speed is also another factor in higher resolution sampling. To create a sample that is CD quality, your hardware needs to sample sounds with 16 bit resolution at a sample rate of at least 44.1 kHz.

- **32 Bit:** The 32 bit card is of course the most recent advancement. This card gives the highest quality but also requires more of the system's resources and costs quite a bit more.

Speakers

How well the sound card works depends upon the quality of the speakers. Most multimedia computers come with very low quality speakers. They work well, but they do not give really high quality sound. If you would like to hear really great CDs, then purchase quality speakers. Have you ever heard of subwoofers? They are really great for rich quality sound and a great bass. They can even produce surround sound. One word of advice is to not hook up your speakers from your stereo to your computer directly. The sound card's amplifier is what drives the sound, and it is not powerful enough to produce good sound. Another disadvantage to using your home stereo speakers is that you can warp your motherboard. The home speakers are not magnetically shielded.(There is a giant magnet inside the middle of the speaker.) Your computer's data and hard drive could be erased, or you could loose data.

An important feature of the sound card and speakers is the type of interface found on the computer. One important feature is the MIDI or the Musical Instrumental Digital Interface. MIDI is a set of rules that allow synthesizers, musical instruments, and computers to exchange data. This is an important feature because if a sound cards supports MIDI, then the computer can play the sounds found in games and CD-ROMS.

Two ways sound cards can produce MIDI sounds:

1. wave table- It uses the actual recordings of musical instruments. (It is really good quality sound, but costs more.)
2. FM-It imitates the sounds of musical instruments (not as high quality as a wave table).

What is found on the sound card?

PORTS

1. **LINE IN** -Allows computer to connect to the cassette or CD player to play music.
2. **MIC IN** -Microphone to record voices and other sounds
3. **VOLUME** (min-max) volume control-adjust sound volume.

4. **SPK OUT**- Connect to home stereo speakers to play music through the sound card.(This is so you can get good quality.)
5. **JOYSTICK** -connect joystick for games.

Monitor and Video Display Adapter

What is it?

The monitor is primarily an output device. It converts electronic signals from the computer into a visual display that is the result of processing information. It can be thought of as a high resolution TV set. The monitor can also determine if the display will be color, black and white, or include graphical objects (pictures). The monitor displays text and images (pictures) converted to output from the video adapter. The video adapter is an expansion card that plugs into the motherboard. The adapter changes the instructions from the central processing unit (CPU) into a way that the monitor can understand it.

Myths

You can get radiation poisoning from your computer monitor.

Electromagnetic radiation if a by product of most home appliances such as microwaves, TVs, radios, and computer monitors. Today's computers are required to be MPRII compliant. Which means within an acceptable level of EMR (electromagnetic radiation). Be sure and look for the label MPR II reliant on the specifications for your computer.

How Does it Produce an Image?

Within the monitor there are red, green, and blue electron guns. Each one shoots out a stream of electrons which all come together to form pixels on the screen. The higher the intensity (red, blue, or green) that is beamed from each of the guns results in the color of the pixel. The guns begins firing in the upper-left corner of the screen and moves quickly across each line of the screen to paint the image that you see. When the gun reaches the bottom right hand corner of the screen, it goes back to the top upper-left hand corner to start all over again.

Monitors have some features that are similar to a television set. There are controls that allow for brightness and contrast, and also the ability to turn the monitor on and off even while the computer is running. Other features of a good monitor would be a non-interlaced monitor that reduces screen flicker and is easier on your eyes. An interlaced monitor means that the electron gun goes across on all even numbered lines on one pass and then scans the odd number of lines on the next pass. The interlaced monitor creates a screen flicker at higher resolutions which tends to be harder on your eyes. If possible buy a non-interlaced monitor.
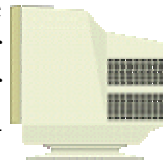
The size of the monitor is determined by measuring diagonally across the screen. Most monitors are 14" and 15". Be sure and look for the words" actual viewing size "on the specifications when buying a monitor to determine how large the viewing area is.. Also some computers and monitors display the screen image within a frame or border on the screen and the actual viewing area is not what you think it is. The larger the monitor display, the more information that can be displayed. One drawback is the it costs more.

Video Display Adapter:

Today, most systems are sold with a display adapter that connects to a PCI "local bus", supports some Windows accelerator, and provides SVGA resolutions. The "local bus" means that the CPU can send data to the card at high speed. The video display adapter is also called the video card or

graphics card. It is an expansion card that creates a circuit pathway so that data can travel from the main board to the monitor.

Elements of the Video Display Adapter:

- Resolution : is determined by the number of colors and the amount of video memory
- Color Depth :number of colors determined by the number of bits assigned to hold color value.
- Refresh Rate : the speed that the display uses to paint the dots on the screen.
- Accelerator : means the display adapter can draw line and boxes and can move windows and scroll itself

Resolution

Resolution refers to the number of dots on the screen or pixels. . It is expressed as a pair of numbers that give the number of dots on a line (horizontal) and the number of lines (vertical). Four resolutions commonly used today.

- 640x480 PIXELS (VGA) (SVGA)(images are larger)
- 800x600 PIXELS (SVGA)
- 1024x768 PIXELS (SVGA)
- 1280x1024 PIXELS (SVGA)(images are smaller, but more information can be displayed)

The smaller the pixels, the clearer and sharper the picture appears on the monitor. Most monitors come with a .28 dot pitch. This is the standard for monitors. Do not buy a monitor if the dot pitch is more than .28. The smaller the dot pitch the better the monitor.
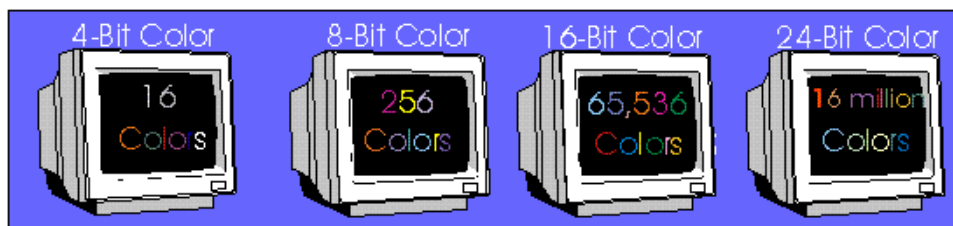
Color Depth

Memory on the video adapter limits the number of colors that can be display at each resolution. If you want to do really high quality photography you need at least 1MB of memory. Multimedia applications with high resolution graphics need at least 2 MB of memory.

- 4 bits - 16 colors (original VGA) (256K of memory) (very primitive color)
- 8 bits - 256 colors (SVGA) (good for business and home applications)
- 16 bits - 32 thousand colors (multi-media and desktop publishing)
- 24 bits - 16 Million (Truecolor) (high-end production and desktop publishing and virtual environments)More video RAM required.

Refresh Rate

The Refresh Rate determines the speed that the display uses to paint the dots on the screen. The refresh rate requirement of a typical monitor is 70Hz. Simply speaking, refresh rate relates to the number of times a screen is redrawn. In many of the popular Internet browsers you will notice a refresh option or reload. This tells the computer to redraw the screen.

Graphics Accelerator

With the invention of the graphics accelerator chip on the video card, the display adapter can draw lines and boxes, scroll text, rotate graphics, make background fills, and also use and manage a mouse pointer, and other pointing devices. Application programs can now send requests and with the help of a Windows Driver routine, the adapter can calculate the bits without the help of the CPU, making the procedure faster.

Dot Matrix Printer - this printer is the cheapest but loudest of the printers. The printer uses a fine stripe of carbon and depending on what pin it is, will determine the quality of the printing. The pin sizes range from 9-24. The printhead hits the ink ribbon with one of its many pins causing it to form

a letter number or charature. With the pins hitting the ribbon this printer becomes quite loud. The ppm (page per minute ranges from 1 to 3 but in new changes in technology its is becoming more and more used in offices today and also can print 3 - 6 ppm plus it is much more quiter. The drawback in most dot matrix printers is the on-roll paper which has a track which feeds it through the printer. Also in most new dot matrix printers there is a paper feed which allows most forms of paper.

Ink Jet Printer - This printer is set at the standard for home use. The print head sprays ink onto paper forming an image or text. With imagery on the ink jet it is lost by premature smearing if tuoched prematurly or if the wrong paper was used. The paper best used for imagry is a high clay content paper and for the ink a smudge resistince or oil based ink. For buisnes letters a ink jest printer is the most common one used for its text plus imagry to add to the paper. The common speed on a ink jet printer is about 3 ppm and 300 dpi (dots per inch).

Laser Printer - This printer is used for high speed text printing and rough draft image quality, this orinter is ideal for rough draft or proofing work. This is the most complicated of all printers because of its printing ability, Thus making this printer more exspensvie than the others on the market. This printer has its own iterpritation language called PCL (printer control language).

The laser printer works simularly to a photocopier by sending a beam or a laser of positive electrons to the paper, when passed to the ink or toner it becomes attracted (remember oppisites attract) causing it to stick to the paper then passed through to a hot presser which causes the ink to be permenintly enscribed on the paper. This printer print ne where from 4 - 12 ppm.

Post Script Laser Printer - This printer has more option than a PCL printer when you are using different color because of its professional quality. This printer is espeacially used in graphic arts studios.

Color Laser Printer - Is more expensive than a color ink jet printer because it produces a great quality picture.

Thermal-Wax Printer - A thermal wax printe pruduces sharp,rich colors non-smearing colors. This printer uses 3-4 full page color ribons of wax. A heated print head melts the wax and places it on speacily coated hat sensitive paper. The dpi on this monitor is 300 to 600. This printer is used in high quality imagry and color overhead transparencies.

Dye Sublimation Color Printer (or) (Thermal dye printer) - is the highest quality graphic producing printer there is. this printer uses heat to transfer the ink from colored ribbons into a gas which turns into a glass like substince. This printer has such good graphics it is said to be photographic quality.

The print buffer - can send data faster than a printer can accept and the process the daa/ A print spooler or print buffer axts like a dam, holding the data and then releasing it at a speed the printer can handle.

These are most commonly used output devices used to get prints of documents on the paper. The output printed on the paper is called hard copy. The hard copy is also called as print

out. The print out resolution is measured in dots per inch. A printer is connected to a parallel port or a USB port of a system unit by a cable.

Different printers have different printing mechanisms. Therefore printers are callisified into 2 categories depending upon their printing mechanisms. These are:

1. Impact Printers
2. Non-Impact Printers

1. Impact Printers

An impact printer prints characters and graphics on the paper with the strikes of hammer on a ribbon. A simple example of an impact printer is typewriter, which uses small hammers to strike the ribbon. Each hammer is embosed witht the shape of alphanumeric character; that shape is printed on the paper through inked ribbon. there are many types of impact printers but the most popular and commonly used is the dot matrix printer.

2. Non-Impact Printers

Thr printers that produce the output on a paper without striking the paper are known as non-impact printers. They use electro static, chemicals, ink jet and thermal technologies for printing. The main features of non-impact printers are:

- Faster than impact printers.
- Print high quality output.
- Produce no noice during printing.

The examples of non-impact printers are; Laser printer, Inkjet printers etc.

Dot Matrix Printer

In the early years, the dot matrix were the most commonly used printing devices. Dot matrix printer is an impact character printer. A dot matrix printer makes a hard copy by printing one character at a time.

A dot matrix printer prints output on a paper by using a mechanisms called a print haead, which contains a matrix of tiny pins arranged in rows and columns. On receiving instructions from computer, the printer can push any of the pins out in any combination. It prints each character or any symbol as pattern of dots. When pins on head strikes on inked ribbon, it creates dots that form characters and graphics. Typically a print head contains 9 to 24 pins. The print quality depends on the number of pins that a print head contains. The higher number of pins means the printer prints more dots per character so that the print out quality is higher. The low quality dot matrix printers print head contain 9 pins while the high quality printers print head contains 24 pins.

Dot matrix printer can use tractor feed paper also called continuous feed paper, in which sheets of paper are joined together end to end. The pages have holes along the sides to help feed the paper thurough the paper.

The speed of dot matrix printer is measured by the number of characters per second (CPS) it can print. The speed of dot matrix printer is from 52 to 500 CPS. The printing quality is measured in dot per inch (DPI). In dot matrix printer, it is about 100 to 300 dpi.

Inkjet Printer

The Inkjet printer is non-impact chracter printer and prints one character at a time. The Inkjet printer has fine spray nozzles that create the image of character or graphics on the paper (without striking the paper) by spraying tiny or small drops on inks onto the paper.

The print head of Inkjet printer contains ink filled print cartridges. Each cartridge has fifty to several hundreds small ink nozzles. Each nozzle in the printer cartridge is similar to an individual pin on a dot matrix printer. The combination of the nozzles is actviated to form the shape of character or image on the paper. Most Inkjet printers have at least 2 print cartridges: one containing black ink and the other containing colour. A single cartridge can print upto 300 pages. You can re-fill the cartridge.

Colour Inkjet printer has 4 ink nozzles: Blue, Rad, Yellow and Black. These 4 colours are used in almost all colour printing because it is possible to combine them to create any colour. Inkjet printers have become the most popular type of colour printers for use in offices and busniess because of their lower cost.

The printing quality of Inkjet printer is measured by the number of tiny ink of drops per inch (dpi) it can spray. Most Inkjet printers range from 300 to 2400 dpi. Printers with higher dpi usually are more expensive but having high printing quality.

The speed of an Inkjet printer is measured by the number of pages per minute (ppm) it can print. Its printing speed upto 15 ppm.

In the early years, the Inkjet printers needed a special paper, and each sheet had to dry before you could touch it. Today you can use normal photo copy paper and the ink is dry within a few seconds. Inkjet printers normally uses individual sheets of paper places in a removable or stationary tray.

Laser Printer

A Laser printer is the fastest and high quality non-impact printer. Laster printers are most expensive than Inkjet printers and their print quality is also higher. The print quality and printing speed of Laser printers make them ideal for offices and business.

Laser printers work like photo copiers. A Laser printer create images on the paper using a laser beam and powered ink called toner. The laser beam produces an image on a special drum inside the printer. The laser printer uses heat and pressure to transfer the image from drum to the paper. Laser printers for personal computers use individual sheets of paper placed in a removable tray.

The Laser printer can print text and graphics in very high quality resolution. The commonly used Laser printers have resolution of 300 or 600 dpi. The printing speed is from 5 to 30 ppm. The high quality Laser printers have resolution of 300 or 600 dpi. The printing speed is from 5 to 30 ppm. The high

quality Laser printers have resolution from 600 to 2400 dpi. The printing speed of these printers is also more than 150 ppm.

The price of Laser printer depends on the quality and printing speed. The colour printers are most costly than black and white Laser printers. The higher the resolution and speed the more expensive the printer.

1.5.2. INPUT DEVICES

Input Devices

What good is a computer, unless you have a way to get information into it? Therefore, input devices are necessary to provide ways to communicate with the computer. Information and commands are issued to the computer by way of these devices.

Examples of input devices include the keyboard, mouse, modem, joystick, digitizing pen and tablet, microphone, touch screens, scanner, camera, I/O Architecture

keyboard

What is it?

The keyboard is an input device. It has letter and number keys, and what are called function keys, computer specific task keys, that allow you, the user, to use an English-like language to issue instructions to an electronic environment. It is the primary input device. It uses a cursor to keep your place on the screen and to let you know where to begin typing. You are able to input commands, type data into documents, compose documents, draw pictures with use of certain keys, pull down menus, and respond to prompts issued by the computer. Almost all computers require you to use a keyboard unless, of course, it is adapted for individuals with disabilities or for a specified alternative input devices.

The keyboard contains special keys to manipulate the user interface. When a key is touched, an electrical impulse is sent through the device which is picked up by the operating system software, and sent through the computer to be processed.

The keyboard operates as a typical typewriter and uses a standard "QWERTY" keyboard. QWERTY is the way the keyboard is set up for typing. If you look at the keyboard under the top number row, you will see that the alphabet top row begins with QWERTY.

Special Features

Special features of the keyboard include:

Numeric keypad: This portion of the keyboard allows you to use the keyboard like a calculator and input numbers into application programs. It has a Num lock key that when depressed, will activate that portion of the keyboard so that numbers can be entered. When the lock key is not on, there are arrow keys on the keys which then work to move the cursor in different directions. The "NUM LOCK" key is a toggle key which switches back and forth between these two modes.

Caps Lock: The "CAP LOCKS" key works in this same manner as the "NUM LOCK" key. If the Cap Lock is lit on your screen the keyboard will type only in capitals. If the Cap Lock light is not lit it will type only in small letters.

Function Keys: The function keys are used to initiate commands on help menus or database programs especially before the development and use of computer pointing devices. They are still used extensively today as options on the keyboard to pull down menus or to be programmed to do specific functions in application programs. Ctrl or Shift keys also work with Function keys to add more commands to programs and what are called shortcuts, ways to operate functions like saving and deleting without going through elaborate features and steps. Short cuts speed up typing and input into the computer.

Escape Key: One of the most important keys is the escape key. It usually cancels the last command or takes you back to the previous step in a program.

Types

Main Types of Keyboards:

Keyboards come in may shapes and sizes. They can be large and small, almost like a custom car. They come in various colors and can be designed specifically for the user, especially in the case of the disabled.

QWERTY: The most popular is the standard QWERTY keyboard. The newer keyboards can have a trackball built into the keyboard. This allows the user the convenience of a built in pointing device. The trackball acts as the mouse and saves time and space in the work area.

Ergonomic: This keyboard is built so that the keyboard is divided into two parts. One half fits the right hand and the other half fits the left hand. This split keyboard arrangement is built to fit the natural positioning of the hand and to help with repetitive motion hand injury which occurs when a job is carried out over and over again, such as in keyboarding.

Mouse

How Does It Work?

Mousing Around

The computer mouse moves by way of a roller and ball system. When you move the mouse across the desktop, the ball underneath rolls. This ball corresponds to the position of what is called a pointer on the screen. The pointer is usually shaped like an arrow, though some people like to change their pointer

to look like objects. (One person in our group has changed his pointer to an ink pen icon.) When you move the pointer around it is called mousing. The speed of the mouse can be managed by your computer operating system software, or a commercial application program for your mouse. You can drag objects on the screen by clicking on the object, holding down on the mouse button, and rolling the mouse across the desktop until you get the object to a new location. When you reach the spot that you want, let go of the mouse button.

Most mice come with two buttons. You use the left button on the mouse to do most selecting of objects. The right button can be used for some menu actions. This is especially true when using browser software to examine and manipulate pictures and graphics on the Internet. There is a three button mouse and the middle button can be programmed for specific application software, but usually the two button mouse is used the most. If you are left handed, you can change to a left-handed mouse option in your software so that you can use your mouse in your left hand.

Types Of Pointing Devices

Pen- The pen lets you draw on what is called a digitizing tablet that mirrors the surface area of the computer screen. The pen can be used as a standard mouse (without wires connected to it) or also as a free flowing drawing device. The pen is useful for drawing since drawing graphics with a mouse tends to be somewhat difficult.

Mouse - The mouse is a hand held device that lets you point to and selected items on your screen. In a PC mouse there are mostly 2-3 buttons and on a Mac there is one. A ball under the mouse senses movement. To ensure smooth motion your should remove the ball and clean it regularly.

Cordless Mouse - The cordless mouse is a lot better than a normal mouse thus by reducing the clutter of the work space needed to move the mouse around. This mouse runs on a battery. When you move the mouse it sends an infrared beam to a sensor which interprets it causing it to move.

Trackball - The trackball is an upside-down mouse that remains stationary on your desk. It is the same principle as the mouse except that the rollers are reversed and the ball is on top. This ball does not need as much attention as the normal mouse because the only thing that touches it is your hand as the normal mouse touches a surface.

Touchpad - The touchpad has sensors that sense your touch. When they sense your touch they send a signal to the computer to move the mouse pointer to that location on the screen.

Joystick- The joystick allows the user to move quickly in computer games.

Light pen- The light pen system allows the user to touch the computer screen with a lighted pen to activate commands and make selections.

Touch Screen- The touch screen lets the user touch the area to be activated by using the finger or hand.

Head Mounted Virtual Reality Displays, Wands, Special Trackballs, Data Gloves, and Special 3-D Flying Mice that can go in six different directions- These devices are currently the newest pointing devices.

Modem:

What is a Modem?

The piece of equipment that allows a computer to communicate with other computers over telephone lines is called a modem. The modem allows the individual to access information from all overthe world and use that information in everyday life. Connecting with banks, Automatic Teller Machines, cash registers to read credit cards, access travel agents, buy products, e-mail,access databases, and teleconferencing, the modems provides easy access to many services. Files can be transferred easily, by uploading to another machine, or downloading to your own machine within a matter of minutes. The computer modem can be used as a telephone answering system, and documents can be faxed from one computer to another assuring fast and easy access to important documents.

Squawk or Talk?

Does a modem really talk? Some people seem to think so. Modems really squawk at each other. A computer is a digital device, and communicates with other computers in a language made up of digits or numbers. That is why you hear a high pitched squawking or squealing sound when a modem is in use. The modem converts data into sound so that it can be sent through the phone system. The modem sends large amounts of data by sending combinations of tones at different frequencies.

## "Didgit" Know It Worked This Way?

A modem takes computer information and changes it into a signal that can be sent over telephone lines. The modem is a bridge between digital and analog signals. The computer being of the digital type, and the telephone using analog technology. The modem converts the "0"s and "1"s ofthe computer (off-on switches)into an analog signal by modulating the frequency of the electronicwave or signal. The modem does just the opposite and demodulate the signal back into digitalcode. The modem gets its name from the MOdulate and the DEModulate.

Most people believe that you need a separate phone line for a modem, but that is not true.Your modem and telephone can share one line, the problem arises when someone else needs to use the telephone while the modem is in use. Also disable call waiting, it could disrupt your modem connection while the modem is in use.

In order for the modem to work you need some kind of communications software. This software manages the communication with other modems. When exchanging information, modems use the same speed. If the modem is communicating with a slower modem, both modems will communicate at the slower speed.This is determined by the "handshake" which is how modems establish the way they will communicate
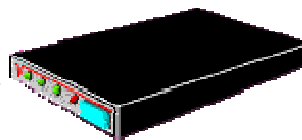
with each other.
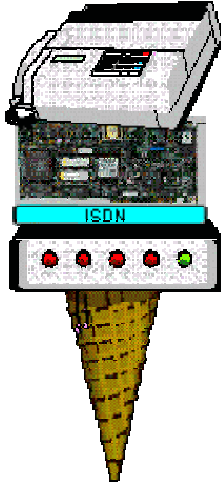
When one modem has successfully made connection with another modem, it is said to be "Online".The speed of the connection is of course determined by the connection with the other computer.The speed of the modem is measured in bits per second (bps). Most modern modems currently run at 28,800 bps or 33,600 bps. The newest modems being developed for the general public are 56K modemsbut have limitations, because most of the hardware and software solutions have not upgraded to accomodate them. Another measurement for modem speeds is in kilobits per second (Kbps). A 33,600bps modem would also be referred to as a 33.6Kbps modem.

What Flavor Do You Favor?

There are three kinds of modems internal,external, and fax. All modems do the same thing, they allow computers to communicate through telephone lines. This lets computers exchange information everywhere.

- *Internal Modem:* This device is a circuit board that plugs into one of the expansion slotsof the computer. Internal modems usually are cheaper than external modems, but when problems occur, fixing and troubleshooting the modem can sometimes prove to be quite difficult. The telephone line plugs into the modem port in the back of the computer.
- *External Modem:* This device attaches to the back of the computer by way of a cable that plugs into the modem

port. It is usually less expensive and very portable. It can be used with other computers very easily by unplugging it and plugging it into another computer. (Remember that you need the right modem software on all the computers you wish to use the modem with.)

- *Fax Modem:* This device can be hooked up to your telephone and used to send information to your computer. Your computer can also send information to a fax machine. Most computer modems are modems with faxing capabilities.
- *ISDN Modem:* The ISDN modem requires a special phone line called an ISDN line. This modem sends data at a very fast rate. (56K). The advantage of this modem is that it is very fast and is able to transfer data and graphics at an amazing speed with very little interference. These modems and lines tend to be quite expensive.

1.6. Characteristics of Computers

Now-a-days computer is playing a main role in everyday life it has become the need of people just like television, telephone or other electronic devices at home. It solves the human problems very quickly as well as accurately.

The important characteristics of a computer are described below:

Speed
The computer is a very high speed electronic device. The operations on the data inside the computer are performed through electronic circuits according to the given instructions. The data and instructions flow along these circuits with high speed that is close to the speed of light. Computer can perform million of billion of operations on the data in one second. The computer generates signals during the operation process therefore the speed of computer is usually measure in mega hertz (MHz) or gega hertz (GHz). It means million cycles units of frequency is hertz per second. Different computers have different speed.

Arithmetical and Logical Operations

A computer can perform arithmetical and logical operations. In arithmetic operations, it performs the addition, subtraction, multiplication and division on the numeric data. In logical operation it compares the numerical data as well as alphabetical data.

Accuracy

In addition to being very fast, computer is also very accurate device. it gives accurate output result provided that the correct input data and set of instructions are given to the computer. It means that output is totally depended on the given instructions and input data. If input data is in-correct then the resulting output will be in-correct. In computer terminology it is known as garbage-in garbage-out.

Reliability

The electronic components in modern computer have very low failure rate. The modern computer can perform very complicated calculations without creating any problem and produces consistent (reliable) results. In general, computers are very reliable. Many personal computers have never needed a service call. Communications are also very reliable and generally available whenever needed.

Storage

A computer has internal storage (memory) as well as external or secondary storage. In secondary storage, a large amount of data and programs (set of instructions) can be stored for future use. The stored data and programs are available any time for processing. Similarly information downloaded from the internet can be saved on the storage media.

Retrieving data and programs

The data and program stored on the storage media can be retrieved very quickly for further processing. It is also very important feature of a computer.

Automation

A computer can automatically perform operations without interfering the user during the operations. It controls automatically different devices attached with the computer. It executes automatically the program instructions one by one.

Versatility
Versatile means flexible. Modern computer can perform different kind of tasks one by one of simultaneously. It is the most important feature of computer. At one moment your are playing game on computer, the next moment you are composing and sending emails etc. In colleges and universities computers are use to deliver lectures to the students. The talent of computer is dependent on the software.

Communications
Today computer is mostly used to exchange messages or data through computer networks all over the world. For example the information can be received or send throug the internet with the help of computer. It is most important feature of the modern information technology.

Diligence
A computer can continually work for hours without creating any error. It does not get tired while working after hours of work it performs the operations with the same accuracy as well as speed as the first one.

No Feelings
Computer is an electronic machine. It has no feelings. It detects objects on the basis of instructions given to it. Based on our feelings, taste, knowledge and experience: we can make certain decisions and judgments in our daily life. On the other hand, computer can not make such judgments on their own. Their judgments are totally based on instructions given to them.

Consistency
People often have difficulty to repeat their instructions again and again. For example, a lecturer feels difficulty to repeat a same lecture in a class room again and again. Computer can repeat actions consistently (again and again) without loosing its concentration:

- To run a spell checker (built into a word processor) for checking spellings in a document.
- To play multimedia animations for training purposes.
- To deliver a lecture through computer in a class room etc.

A computer will carry out the activity with the same way every time. You can listen a lecture or perform any action again and again.

Precision
Computers are not only fast and consistent but they also perform operations very accurately and precisely. For example, in manual calculations and rounding fractional values (That is value with decimal point can change the actual result). In computer however, you can keep the accuracy and precision upto the level, you desire. The length calculations remain always accurate.

1.7 Types of Computers:

Computers can also be divided into three categories depending upon their instruction and form of input data that they accept and process. These are:

1. Analog Computers
2. Digital Computers
3. Hybrid Computers

Analog Computers

The word "Analog" means continuously varying in quantity. The analog computers accept input data in continuous form and output is obtained in the form of graphs. It means that these computers accept input and give output in the form of analog signals. The output is measured on a scale. The voltage, current, sound, speed, temperature, pressure etc. values are examples of analog data. These values continuously increase and decrease. The analog computers are used to measure the continuous values. The thermometer is an example of analog device because it measures continuously the length of a mercury column. Another example of analog computer is the analog clock because it measures the time by means of the distance continuously covered by the needle around a dial. Similarlym speedometer, tire-pressure gauge are also examples of analog devices.

The analog computers have low memory size and have fewer functions. These are very fast in processing but output return

is not very accurate. These are used in industrial units to control various processes and also used in different fields of engineering.

Digital Computers

The word "Digital" means discrete. It refers to binary system, which consists of only two digits, i.e. 0 and 1. Digital data consists of binary data represented by OFF (low) and ON (high) electrical pulses. These pulses are increased and decreased in discontinuous form rather than in continuous form.

In digital computers, quantities are counted rather than measured. A digital computer operates by counting numbers or digits and gives output in digital form. A digital computer represents the data in digital signals 0 and 1 and then processes it using arithmetic and logical operations. Examples of digital devices are calculators, personal computers, digital watches, digital thermometers etc. Today most of the computers used in offices and homes are digital computers.

The main features of the computers are:

- Give accurate result.
- Having high speed of data processing.
- Can store large amount of data.
- Easy of program and are general purpose in use.
- Consume low energy.

Hybrid Computers

The hybrid computers have best features of both analog and digital computers. These computers contain both the digital and analog components. In hybrid computers, the users can process both the continuous (analog) and discrete (digital) data. These are special purpose computers. These are very fast and accurate. These are used in scientific fields. In hospitals, these are used to wathc patient's health condition in ICU (Intensive Care Unit). These are also used in telemetry, spaceships, missiles etc.

Differentiate between Analog and Digital Computers

ANALOG	DIGITAL
1. Accept input data in continuous form and output is measured on a scale. 2. It may have some errors in output. 3. Have low internal memory. 4. Have fewer functions. 5. It is used only in scientific, industrial and medical fields. 6. It is costly. 7. It is not easily programmed.	1. Accept input data in digital form and output is received in digital form. 2. Output is accurate. 3. Have large internal memory. 4. Have large number of functions. 5. It is general purpose in use. 6. It is low in cost. 7. It is easily programmed.

Computers are classified according to their data processing speed, amount of data that they can hold and price. Generally, a computer with high processing speed and large internal storage is called a big computer. Due to rapidly improving technology, we are always confused among the categories of computers.

Depending upon their speed and memory size, computers are classified into following four main groups.

1. Supercomputer.
2. Mainframe computer.
3. Mini computer.
4. Microcomputer.

Supercomputer

Supercomputer is the most powerful and fastest, and also very expensive. It was developed in 1980s. It is used to process large amount of data and to solve the complicated scientific problems. It can perform more than one trillions calculations per second. It has large number of processors connected

parallel. So parallel processing is done in this computer. In a single supercomputer thousands of users can be connected at the same time and the supercomputer handles the work of each user separately. Supercomputer are mainly used for:

- Weather forecasting.
- Nuclear energy research.
- Aircraft design.
- Automotive design.
- Online banking.
- To control industrial units.

The supercomputers are used in large organizations, research laboratories, aerospace centers, large industrial units etc. Nuclear scientists use supercomputers to create and analyze models of nuclear fission and fusions, predicting the actions and reactions of millions of atoms as they interact. The examples of supercomputers are CRAY-1, CRAY-2, Control Data CYBER 205 and ETA A-10 etc.

Mainframe Computers

Mainframe computers are also large-scale computers but supercomputers are larger than mainframe. These are also very expensive. The mainframe computer specially requires a very large clean room with air-conditioner. This makes it very expensive to buy and operate. It can support a large number of various equipments. It also has multiple processors. Large mainframe systems can handle the input and output requirements of several thousand of users. For example, IBM, S/390 mainframe can support 50,000 users simultaneously. The users often access then mainframe with terminals or personal computers. Tere are basically two types of terminals used with mainframe systems. These are:

i) Dumb Terminal
Dumb terminal does not have its own CPU and storage devices. This type of terminal uses the CPU and storage devices of mainframe system. Typically, a dumb terminal consists of monitor and a keyboard (or mouse).

ii)   Intelligent   Terminal
Intelligent terminal has its own processor and can perform some processing operations. Usually, this type of terminal does

not have its own storage. Typically, personal computrers are used as intelligent terminals. A personal computer as an intelligent terminal gives facility to access data and other services from mainframe system. It also enables to store and process data locally.

he mainframe computers are specially used as servers on the World Wide Web. The mainframe computers are used in large organizations such as Banks, Airlines and Universities etc. where many people (users) need frequent access to the same data, which is usually organized into one or more huge databases. IBM is the major manufacturer of mainframe computers. The examples of mainframes are IBM S/390, Control Data CYBER 176 and Amdahl 580 etc.

Minicomputers
These are smaller in size, have lower processing speed and also have lower cost than mainframe. These computers are known as minicomputers because of their small size as compared to other computers at that time. The capabilities of a minicomputer are between mainframe and personal computer. These computers are also known as midrange computers.

The minicomputers are used in business, education and many other government departments. Although some minicomputers are designed for a single user but most are designed to handle multiple terminals. Minicomputers are commonly used as servers in network environment and hundreds of personal computers can be connected to the network with a minicomputer acting as server like mainframes, minicomputers are used as web servers. Single user minicomputers are used for sophisticated design tasks.

The first minicomputer was introduced in the mid-1960s by Digital Equipment Corporation (DEC). After this IBM Corporation (AS/400 computers) Data General Corporation and Prime Computer also designed the mini computers.

Microcomputer
The microcomputers are also known as personal computers or simply PCs. Microprocessor is used in this type of computer. These are very small in size and cost. The IBM's first microcomputer was designed in 1981 and was named as IBM-PC. After this many computer hardware companies copied the

design of IBM-PC. The term "PC-compatible" refers any personal computer based on the original IBM personal computer design.

The most popular types of personal computers are the PC and the Apple. PC and PC-compatible computers have processors with different architectures than processors in Apple computers. These two types of computers also use different operating systems. PC and PC-compatible computers use the Windows operating system while Apple computers use the Macintosh operating system (MacOS). The majority of microcomputers sold today are part of IBM-compatible. However the Apple computer is neither an IBM nor a compatible. It is another family of computers made by Apple computer.

Personal computers are available in two models. These are:

1. Desktop PCs
2. Tower PCs

A desktop personal computer is most popular model of personal computer. The system unit of the desktop personal computer can lie flat on the desk or table. In desktop personal computer, the monitor is usually placed on the system unit.

Another model of the personal computer is known as tower personal computer. The system unit of the tower PC is vertically placed on the desk of table. Usually the system unit of the tower model is placed on the floor to make desk space free and user can place other devices such as printer, scanner etc. on the desktop. Today computer tables are available which are specially designed for this purpose. The tower models are mostly used at homes and offices.

Microcomputer are further divided into following categories.

1. Laptop computer
2. Workstation
3. Network computer
4. Handheld computer

1. Laptop computer

Laptop computer is also known as notebook computer. It is small size (85-by-11 inch notebook computer and can fit inside a briefcase. The laptop computer is operated on a special battery and it does not have to be plugged in like desktop computer. The laptop computer is portable and fully functional microcomputer. It is mostly used during journey. It can be used on your lap in an airplane. It is because it is referred to as laptop computer.

The memory and storage capacity of laptop computer is almost equivalent to the PC or desktop computer. It also has the hard dist, floppy disk drive, Zip disk drive, CD-ROM drive, CD-writer etc. it has built-in keyboard and built-in trackball as pointing device. Laptop computer is also available with the same processing speed as the most powerful personal computer. It means that laptop computer has same features as personal computer. Laptop computers are more expensive than desktop computers. Normally these computers are frequently used in business travelers.

2. Workstations

Workstations are special single user computers having the same features as personal computer but have the processing speed equivalent to minicomputer or mainframe computer. A workstation computer can be fitted on a desktop. Scientists, engineers, architects and graphic designers mostly use these computers.

Workstation computers are expensive and powerful computers. These have advanced processors, more RAM and storage capacity than personal computers. These are usually used as single-user applications but these are used as servers on computer network and web servers as well.

3. Network computers

Network computers are also version of personal computers having less processing power, memory and storage. These are specially designed as terminals for network environment. Some types of network computers have no storage. The network computers are designed for network, Internet or Intranet for

data entry or to access data on the network. The network computers depend upon the network's server for data storage and to use software. These computers also use the network's server to perform some processing tasks.

In the mid-1990s the concept of network computers became popular among some PC manufacturers. As a result several variations of the network computers quickly became available. In business, variations of the network computer are Windows terminals, NetPCs and diskless workstations. Some network computers are designed to access only the Internet or to an Intranet. These devices are sometimes called Internet PCs, Internet boxes etc. In home some network computers do not include monitor. These are connected to home television, which serves as the output devices. A popular example of a home-based network computer is Web TV, which enables the user to connect a television to the Internet. The Web TV has a special set-top box used to connect to the Internet and also provides a set of simple controls which enable the user to navigate the Internet, send and receive e-mails and to perform other tasks on the network while watching television.

Network computers are cheaper to purchase and to maintain than personal computers.

4. handheld computer

In the mid 1990s, many new types of small personal computing devices have been introduced and these are referred to as handheld computers. These computers are also referred to as Palmtop Computers. The handheld computers sometimes called Mini-Notebook Computers. The type of computer is named as handheld computer because it can fit in one hand while you can operate it with the other hand. Because of its reduced size, the screen of handheld computer is quite small. Similarly it also has small keyboard. The handheld computers are preferred by business traveler. Some handheld computers have a specialized keyboard. These computers are used by mobile employees, such as meter readers and parcel delivery people, whose jobs require them to move from place to place.

The examples of handheld computers are:

1. Personal Digital Assistance
2. Cellular telephones
3. H/PC Pro devices

1. Personal Digital Assistance (PDAs)

The PDA is one of the more popular lightweight mobile devices in use today. A PDA provides special functions such as taking notes, organizing telephone numbers and addresses. Most PDAs also offer a variety of other application software such as word processing, spreadsheet and games etc. Some PDAs include electronic books that enable users to read a book on the PDA's screen.

Many PDAs are web-based and users can send/receive e-mails and access the Internet. Similarly, some PDAs also provide telephone capabilities.

The primary input device of a PDA is the stylus. A stylus is an electronic pen and looks like a small ballpoint pen. This input device is used to write notes and store in the PDA by touching the screen. Some PDAs also support voice input.

2. Cellular phones

A cellular phone is a web-based telephone having features of analog and digital devices. It is also referred to as Smart Phone. In addition to basic phone capabilities, a cellular phone also provides the functions to receive and send e-mails & faxes and to access the Internet.

3. H/PC Pro Devices

H/PC Pro dive is new development in handheld technology. These systems are larger than PDAs but they are not quite as large as typical notebook PCs. These devices have features between PDAs and notebook PCs. The H/PC Pro device includes a full-size keyboard but it does not include disk. These systems also have RAM with very low storage capacity and slow speed of processor.

1.8 Computer software

What most people think of as a <u>computer</u> can actually be divided into two parts. The first part, computer hardware, does all of the physical work computers are known for. The second part, computer software, tells the hardware what to do and how to do it. If you were to think of a computer as a living being, then the hardware would be the body that does things like seeing with eyes, lifting objects, and filling the lungs with air; the software would be the intelligence, interpreting the images that come through the eyes, telling the arms how to lift objects, and forcing the body to fill the lungs with air.

Computer hardware, being part of a machine, can only understand two basic concepts: on and off. The on and off concept is called <u>binary</u>. Computer software was developed in order to make binary into a useful way to tell the computer hardware what to do. Computer software translates concepts and directions that people can understand into something that can actually be done on the computer hardware.

Computer software is most commonly created by computer programmers using a programming language. The <u>programmer</u> writes commands in the programming language that are similar to what someone might use in everyday speech. These commands are called *source code*. Another <u>computer program</u> called a *compiler* is then used on the <u>source code</u>, transforming the commands into a language that the computer can understand. The result is an executable computer program, which is another name for software.

Computer software falls into two primary categories: <u>system software</u> and application software. System software represents programs that allow the hardware to run properly. Application software represents programs that allow users to do something besides simply run the hardware. Some experts also include a third category, programming software, though others put those programs into one of the other previously mentioned categories.

A few different types of computer software include:

Computer Games **–** a form of entertainment software that has many genres. Some of these genres include MMOs (Massive Multiplayer Online games), first-person shooters, action games, roleplaying games, and adventure games.

Driver Software **–** programs that allow a computer to interact with additional hardware devices such as printers, scanners, and video cards.

Educational Software **–** programs and games that teach the user or provide drills to help memorize facts. Educational software is diverse, and can teach anything from computer-related activities like typing to higher education subjects like chemistry.

Media Players and Media Development Software **–** software designed to play and/or edit digital media files such as music and videos.

Productivity Software **–** an older term that refers to any programs that would allow the user to be more productive in a business sense. Word processors, database management utilities, and presentation software all fall into this category.

A set of instructions (in machine code) given to the computer to solve user problems and to control different operations of the computer is know as computer software. The software is developed in programming languages.

SOFTWARE CLASSIFICATION

The Computer software is classified into two main categories:

1. Application software.
2. System software.

Application Software

A set of programs used to solve particular problems of user through computer is called Application software. It is also known as application package. The ready packages are also available in market on CDs for various purposes. These are

used by user who does not know the computer programming. The users solve their problems by using ready packages more easily and quickly. Some of application packages are:

1. Word processing software.
2. Spreadsheet software.
3. Database Management System software.
4. Graphics software.
5. Communication software.

1. Word Processing Software

This software is used to create and to edit documents such as letters, reports, essays etc. The word processing software provides several features for document editing and formatting. In. editing process, text is entered into the document, deleted, copied or moved to another location etc. In formatting process, different formats can be applied on the text to make the document more attractive before to print on the printer. The most popular word processing software programs are: Microsoft Word, Word Perfect etc.

2. Spreadsheet Software

Spreadsheet software is used to store and process data in an electronic sheet having columns and rows. The data is entered into the cells of the sheet. The intersection of a row and a column is known as cell. Each cell is a unique address. The numbers and formulas are entered into the cells and the computer can automatically perform the calculation on numerical data in cells.

The spreadsheet software is commonly used for business application such as for performing financial calculations and recording transactions. The most popular example of spreadsheet software is Microsoft Excel etc.

3. Database Management Software

Database management software is used to create and manage databases. A database is a collection of related information or records on any subject such as records of the books in a library, information about the students of a college etc.

Database Management Software stores and manages records in databases. These records can be accessed very quickly when required. The Microsoft Access, Oracle etc. are most popular examples of Database Management Software.

4. Presentation Graphics Software

The presentation graphic software is used to create slides for making presentations. The presentation graphic software also has pre-drawn clip art images, which can be inserted into slides and can be modified. The PowerPoint is an example of presentation graphic software.

5. Communication Software

The Communication software is used to exchange information electronically. It is most commonly used software to send and receive information on the Internet. It also allows for sending and receiving faxes directly. The computer files can also be transferred from one PC to another through this software. The Internet Explorer is an example of this software.

System Software

System software is a set of programs that control the operations of a computer and devices attached with the computer. It creates links between user and computer as well as controls the execution of application programs. System software are essential for a computer to do work, Without this software no link can be created between user and computer.

The examples of system software are:

- Operating systems.
- Utility programs.
- Device Drivers.
- Language Processors.

In the past, the operating systems were computer. (or device) dependent. An operating system running on one machine could not be run on another different model machine. When a manufacturer introduces a new computer or new model of computer then an operating system has to be developed to

operate that machine. The application programs often would not work on the new computer because the applications were designed to work with a specific operating system.

Some operating systems are still device dependent. Now-a-days, operating systems are mostly device (or computer) independent and can run on computers made by different companies. The operating systems are divided into different categories. Three basic categories are:

1. Personal computer operating system.
2. Network operating system.
3. Embedded operating system.

1- Personal Computer Operating System

The personal computer operating systems are also called the stand-alone operating systems or single user operating systems that are used to operate personal computers. The examples of personal computer operating system are:

1. DOS
2. Mac OS
3. Windows

1. DOS

DOS stands for Disk Operating System. It is a single user operating system used in microcomputers. It is a command line interface operating system. Microsoft Corporation developed it for IBM 8086 microprocessor computers. It was the most popular operating system in microcomputers before the Windows.

The DOS is updated periodically. It has different versions like DOS 3.0, DOS 3.1, DOS 3.2 DOS 7.0 and soon. Today it is rarely used.

2. Mac OS

Mac OS is developed by Apple Corporation in 1984 for Macintosh It was one of first computers. This operating system provides the GUI. It was one of first operating system that introduced the GUI.

3. Windows

Microsoft Windows introduced by Microsoft. It is most used and powerful GUI operating system

2. Network Operating System

A network operating system is an operating system that supports the network. A network operating system typically resides on a server and controls the devices or computers connected to the network. The examples of the network operating system are:

- Windows NT Server
- Windows 2000 Server
- UNIX
- Solaris
- Novell's Netware

1) Windows NT Server
Windows NT Server is developed by Microsoft for Client/Server networks. The Server in the network uses this operating system and the Client computer uses Windows NT workstation or some other (personal computer) version of Windows operating system.

2) Windows 2000 Server

Windows 2000 Server is an upgraded form of Windows NT Server. It is also used in networking. It consists of three products:

1. Windows 2000 server
2. Windows 2000 Advanced server
3. Windows 2000 data center server

3) UNIX

UNIX is a multi-user and multi-tasking operating system. It is very popular operating system used in microcomputers to Supercomputer. It provides the command line interface. It was developed at AT&T Bell Laboratories of USA. It was specially developed at AT&T for their own minicomputers. Microsoft Company of USA also developed a version of UNIX, which is

named as XENIX. It is mainly used in network environment because it has powerful security features.

4) Solaris

Solaris is a version of UNIX. It was developed by Sun Microsystems. It is a network operating system designed specifically for F-commerce applications. It has very advanced security features and is used for online transactions systems. The client computers also use a version of Solaris called CDE (Common Desktop Environment).

5) Novell's Netware

Novell's Netware is network operating system designed for client/server networks. It has two portions.

Server portion: It resides on the network server. **Client portion**: It resides on each client computer connected to the network.

The Server portion of the network operating system controls the devices' such as printers, computers connected to the network as well as manages the files and application software on the Server. The Client portion establishes the communication between Client computer and the Server. The Client computers also have their own operating systems such as Windows, DOS etc.

3. Embedded Operating System

Different special electronic devices (or handheld computers) are also controlled by the operating systems that are stored into a ROM chip. These operating systems are called the Embedded Operating Systems. The examples of embecl4ed Operating system are:

- Windows CE
- Pocket PC 2002
- Palm operating system

i) Windows CE

Windows CE is designed for the use in wireless communication devices, smaller computer such as handheld computer, in-vehicle devices etc. Windows CE interface is similar to that of Windows operating system. This operating system also supports multitasking, Internet access, e-mails etc. Many application programs such as Microsoft Word, Microsoft Excel etc. that are developed for this operating system can be run with Windows CE.

ii) Pocket PC 2002

Pocket PC 2002 is, also developed by Microsoft and is used on a specific type of handheld computer called the pocket PC. It is similar to Windows XP operating system and is used to access Internet, listen to music, and watch a video and to create word processing and spreadsheet documents etc.

UNIT – II

HISTORY OF COMPUTERS

Objectives

In this unit introduces
- Generation Of Computers
- Evolution Of Computing machine,

2.1 Generation of computers:

The tem generation indicates the type of technology used in the computer construction. As new technology was emerging, it was being used in the making of computer. The new technology improved the speed, accuracy and storage capacity of the computers. Different technologies have been used for computers in different times.

Therefore, computers can be divided into five generations depending upon the technologies used. These are:

1. First Generation (1942 – 1955)
2. Second Generation (1955 – 1964)
3. Third Generation (1964 – 1975)
4. Fourth Generation (Since 1975)
5. Fifth Generation (Since 1980)

1. First Generation Computers (1942 – 1955)

The vacuum tube technology was used in first-generation computers. Mark-1m, ENIAC, EDSAC, EDVAC, UNIVAC-1 etc. machines belong to the first generation of computers. The machine language only was used in first-generation computers.

Advantages

The main advantages of first-generation computers were:

1. These computers were the fastest of their time.
2. They were programmed using machine language.
3. The electronic digital computers were introduced due to the vacuum tube technology.

Disadvantages

The main disadvantages of first-generation computers were:

1. Very big in size
2. Not reliable
3. Consumed large amount of energy
4. Constant maintenance required
5. More heat generated and air-conditioning was required
6. More costly
7. Very slow in speed (data processing)
8. It was difficult to programmed, because they used only machine language
9. Non-portable
10.   Limited commercial use

2. Second Generation Computers (1955 – 1964)

The transistor technology was used in second-generation computers. The electronic component transistor was invented in 1948 at Bell Laboratories. The transistor is smaller in size and more reliable than vacuum tube. Therefore, the transistor technology was used in computer in place of vacuum tube technology. The programming assembly language was also introduced in second-generation of computers.

Advantages

The main advantages of second-generation computers as compared to first-generation computers are:

1. Low in cost
2. Smaller in size
3. Fast in speed
4. Less heat generated More reliable and accurate in calculations
5. Consume low power etc.
6. Used for commercial purposes

7. Portable
8. Assembly language was introduced. This language is easy to write program than machine language

Disadvantages

The main disadvantages of this generation computers were:

1. Air-conditioning required
2. Commercial production was difficult and these were very costly
3. Constant (or frequent) maintenance required
4. Only used for special purposes

3. Third Generation Computers (1964 – 1975)

The IC (Integrated Circuits) technology was used in third-generation computers. In a small IC chip (5 mm square size) a circuit is designed having large number of electronic components like transistors, capacitors, diodes, resistors etc. Initially, an IC contained only about ten to twenty components. Thus the IC technology was named as Small Scale Integration (SSI). The third-generation was based on IC technology and the computers were designed using this technology.

Advantages

The main advantages of third-generation as compared to previous generations of computers were:

1. Smaller in size
2. Production cost was low
3. Very fast in computational power
4. More reliable
5. Low power consumption
6. Maintenance cost was low because failure rate of harware was very low
7. Magnetic disk, used for externale storage
8. More storage capacity
9. Easily portable
10. Easy to operate
11. Upgraded easily
12. Widely used for various commercial applications all over the world
13. Lower heat generated

14. High-level languages were commonly used
15. Many input/ouput devices were introduced such as mouse and keyboard etc.

Disadvantages
The main disadvantages of thir-generation computers were:

1. Air-conditioning required
2. Highly sophisticated technology required for the manufacturer chips

4. Fourth Generation Computers (1975 onwards)

The microchip technology was introduced in this generation of computers. With the advancement in IC technology, LSI (Large Scale Integration) chips were developed. It was possible to itegrate over 30,000 or more components on to single LSI chip. After LSI, the VLSI (Very Large Scale Integration) was developed and the development of microprocessor possible. It is expected that more than one million components will be integrated on a single chip of VLSI. Using VLSI technology, the entire CPU is designed on a single silicon chip. The use of microprocessor as CPU introduced another class of computers called the microcomputers. Thus fourth-generation may be called Microcomputer generation. IBM introduced its personal computer for use in 1981.

Advantages
The advantages of fourth-generation as compared to previous generation computers are:

1. Smaller in size
2. Production cost is very low
3. Very reliable
4. Harware failure is negligible
5. Easlity portable because of their small size
6. Totally general purpose
7. Air conditioning is not compulsory
8. Very high processing speed
9. Very large internal and external storage capcity
10. Used advanced input & ouput devices such as optical readers, laser printers, CD-ROM/DVD-ROM drives etc.

Disadvantages

The main disadvantages of fourth-generation computers is:

1. Highly sophisticated technology required for the manufacturer of microprocessor chips

5. Fifth Generation Computers (In process)

The main drawback of first to fourth generation computers is that the computers have not their own thinking power. These are totally depending upon the instructions given by the users.

Fifth generation computers are supposed to be the ideal computers, but do not exist. The scientists are working to design such computers that will have the following features.

1. Having their own thinking power
2. Making decisions themselves
3. Having capabilities of learning
4. Having capabilities of reasoning
5. Having large capacity of internal storage
6. Having extra high processing speed
7. Having capabilities of parallel processing

In these computers following technologies will be used:

- ULSIC (Ultra Large Scale Integrated Circuits) technology
- Artificial Intelligence (AI) technology also called the kowledge Processor. The AI means automatic programs that let the machines to think and decide themselves. The programming languages LISP (List Processor) and PROLOG (Programming with Logic) are used for artificial intelligence. The scientists at ICOT in Japan use the PROLOG to develolp the Artificial Intelligence software.

2.2 Impact of computers on society:

The following is a list of the societal impact of computers that the students may have identified.

2.2.1 Personal Impact

- privacy and personal rights
  - data banks, computer terminals, data security
- employment
  - job opportunities, new careers, the need for retraining
- business transactions
  - automated billing, credit cards, interac, consumer spending
- the replacement of people through automation
  - robots, word processing
- the impact that a machine has on a human
  - pro and con

2.2.2 Community Impact

- employment
- traffic control
- urban planning
- law enforcement

2.2.3 National Impact

- communications media
  - the use of information for control
- vote counting
- electronic funds transfer
- stock-market transactions
- defense
- surveillance
- national data banks
- employment
  - shifting patterns
- telecommunications
- satellite broadcasting
- the possibility of fraud or theft using computer based systems
- standards for computer hardware and software

2.2.4 Global Impact

- reporting of current events
  - communications media
- world government
- international standards
- exploration of space and sea
- world wide access to data

2.2.5 Future Impact

- computers in the home
  - gaming
  - learning
  - electronic mail
  - shopping
  - business transactions
  - information processing, storage and retrieval
- the home as a work center
- effect on the family unit and on familiar patterns of life
- travel
  - computer communication as a replacement for travel
- the possible disappearance of hard copy as a medium of communication
- the cashless society
- possible effects on the formal education system
- the use of robots in industry and in the home
- teleprocessing networks
  - communications networks

2.3 Evolution of Computing Machines

• 1780: Benjamin Franklin discovers electricity.

• 1800: Alessandro Volta invents the first electric battery, the voltaic pile.

• 1823: Charles Babbage received a gold medal for his development of the difference engine. It was a mechanical device to perform programmable calculations considered the world's first computer.

• 1831: Michael Faraday discovered electricity could be produced through motion when a magnet was moved inside a

coil of copper wire, the first electric generator which he called a dynamo.

• 1842: Lady Ada Byron, Countess of Lovelace uses the difference engine to mechanically translate a short written work. She is generally regarded as the first programmer.

• 1854: George Boole published 'An investigation into the Laws of Thought' which introduced the concept of Boolean algebra. These simplified logic formulas are the basis for modern computer logic circuits.

• 1876: Alexander Graham Bell US patent #174,465 was accepted for the invention of the telephone.

• 1882: Thomas Edison used a DC generator to provide electricity to light his laboratory and later to illuminate the first New York street to be lit by electric lamps. The following year he would discover the Edison Effect electric current flows in a vacuum.

• 1886: William Burroughs develops the first commercially successful mechanical adding machine.

• 1903: Nikola Tesla first patents electrical logic circuits called gates or switches based on the algebraic treatment of logic introduced by George Boole almost fifty years earlier.

• 1911: The Computing-Tabulating-Recording Company (CTR) founded later renamed IBM in 1924.

• 1928: Vladimir Zworykin invents the vacuum tube or cathode ray tube (CRT) based on the Edison Effect.

• 1937: Alan M. Turing Publishes his paper `On Computable Numbers..` that applies the notion of using algorithms for the computation of functions. His theoretical Turing machine is capable of computing any calculable function. The paper anticipated many computer-related concepts, like input, output, memory, coded programs, algorithms, compilers/interpreters, and the finite-state machine.

• 1937: George Stibitz builds the first binary calculator at Bell Telephone Laboratories.

• 1938 Konrad Zuse builds the Z1 relay based computer in his parent's living room in Berlin, Germany. A later model the Z3 was the first functional tape-stored-program-controlled computer which pre-dated the Mark I by three years.

• 1944: Harvard Mark I (IBM ASCC - automatic sequence controlled calculator) is completed, based on the work of Professor Howard H. Aiken at Harvard and IBM. It was a relay-based computer and weighed nearly five tons and cost about $300,000 dollars to build. The first large scale fully automatic computer it is considered along with the Z3 to be beginning of the era of modern computing.

• 1946: John Tukey first uses the term bit for binary digit.

• 1947: William Bradford Shockley with John Bardeen and Walter H. Brattain invent the first transistor at Bell Labs.

• 1947: The Association for Computing Machinery, or ACM, was founded

• 1949: EDVAC (Electronic Discrete Variable Automatic Computer) supports the first tests of magnetic disks.

• 1950: Konrad Zuse leases the Z4 to a Zurich bank to become the world's first commercial computer.

• 1953: IBM introduces the first magnetic tape drive is with 100 character-per-inch density and 75 inches-per-second speed.

• 1951: Jay Forrester and Ken Olsen Whirlwind computer becomes operational at MIT, the first real-time computer.

• 1952: IBM introduces the 701, its first electronic stored-program computer.

• 1952: RCA develops Bizmac with iron ferrite core memory and a magnetic drum supporting the first database.

• 1957: DEC Digital Equipment Corporation is founded by Ken Olsen.

• 1958: Jack Kilby of Texas Instruments makes the first integrated circuit.

• 1958: NEC builds the first electronic computers in Japan, the NEC-1101 and -1102.

• 1958: Frank Rosenblatt builds the Perceptron Mark I the first system with a computer monitor using a CRT as an output device.

• 1959: Computer Science Corporation becomes the first company to packaged software providing programming tools such as assemblers and compilers.

• 1959: Harvard Mark I powered down for the last time after 15 years of operation.

• 1960: IBM 7070 is the first transistorized computer sold by the company although a mile stone the system architecture was based 650 which had a character set problem among other design limitations hence the system was not a quantum leap in other respects.

• 1960: Small-Scale Integration (SSI) chips emerged using circuits containing transistors numbering in the tens. These early ICs served intrumental for the Minute-man missle and Apollo space program.

• 1962: Ferranti Atlas inaugurated as first computer to utilize virtual memory.

• 1963: IEEE, Institute of Electrical and Electronics Engineers society is formed. The members are engineers, scientists and other professionals whose technical interests are in electrical and computer sciences, engineering and related disciplines.

• 1964: IBM introduces the System 360 the first in a line of compatible computers.

• 1967: Medium-Scale Integration (MSI) The next step in the development of integrated circuits introduced devices which contained hundreds of transistors in a single chip.

• 1970: Computer Chess tournament is held by ACM for the first time.

• 1971: First network email sent between computers by engineer Ray Tomlinson.

• 1974: Large-Scale Integration (LSI) New technology alloed fabrication of integrated cicuits with tens of thousands of transistors per chip.

• 1975: Microsoft is founded by Bill Gates and Paul Allen.

• 1977 Commodore PET the first all-in-one home computer. The basic sytem had 8Kb or RAM.

• 1978: Intel introduces the 8086-8080, an 8 bit microprocessor. This chip was later selected by IBM as the brains for their new personal computer, the IBM PC.

• 1980: Very Large-Scale Integration (VLSI) Integrated circuits emerge fabricated with hundreds of thousands of transistors; then several million later in the decade.

• 1981: IBM PC introduced

• 1982: Sun Microsystems is founded.

• 1984: Apple Macintosh computer is released with fully functional windows based GUI.

• 1985: Mark Maxwell sends & receives his first email 14 years after the 1st ever email between computers in 1971 by an engineer Ray Tomlinson in Cambridge, MA.

• 1986 Mark Maxwell a research assistant at Philips Research, Briarcliff Manor, NY installs the lab's first facility-wide (LAN) local area network based on a passive thick ethernet 802.3 10B5 solution using 50 Ohm coaxial cable. The new network replaced the original 10B5 network that ran aprox. 30 meters between two labs on the building's ground floor. The network that began with less than half a dozen nodes exploded to more than fifty within the first twelve months as more distributed devices became available on the market taking advantge of the emerging network technologies.

• 1989: Intel i486 (80486) CPU introduced using VLSI containing over a million transitors.

UNIT – III

DISK OPERATING SYSTEM (DOS)

OBJECTIVES

At the end of this lesson, you would be able to;

- explain the concept operating system
- discuss the functions of operating system
- understand the procedures of loading operating system into the memory
- use file management features of operating system
- create separate locations for logically related files
- copy files from one computer to another
- use Windows for File Management

3.1 INTRODUCTION

When the computer starts, it starts the operating system that takes the control of the machine. An Operating System is a set of programs that help in controlling and managing the Hardware and the Software resources of a computer system. A good operating system should have the following features;

1. Help in the loading of programs and data from external sources into the internal memory before they are executed.

2. Help programs to perform input/output operations, such as;

- o Print or display the result of a program on the printer or the screen.

- o Store the output data or programs written on the computer in storage device.

    o Communicate the message from the system to the user through the VDU.

    o Accept input from the user through the keyboard or mouse.

3.2 DISK OPERATING SYSTEM

As the name suggests, the operating System is used for operating the system or the computer. It is a set of computer programs and also known as DOS (Disk Operating System). The main functions of DOS are to manage disk files, allocate system resources according to the requirement. DOS provides features essential to control hardware devices such as Keyboard, Screen, Disk Devices, Printers, Modems and programs.

Basically, DOS is the medium through which the user and external devices attached to the system communicate with the system. DOS translate the command issued by the user in the format that is understandable by the computer and instruct computer to work accordingly. It also translates the result and any error message in the format for the user to understand.

(a) Loading of DOS

The BOOT Record into the computer memory loads DOS. BOOT Record in turn is triggered by ROM program already there in the computer.

The system start-up routine of ROM runs a reliability test called Power On Self Test (POST) which initializes the chips and the standard equipment attached to the PC, and check whether peripherals connected to the computer are working or not. Then it tests the RAM memory. Once this process is over, the ROM bootstrap loader attempts to read the Boot record and if successful, passes the control on to it. The instructions/programs in the boot record then load the rest of the program. After the ROM boot strap loader turns the control over to boot record, the boot tries to load the DOS into the memory by reading the two hidden files IBMBIO.COM and IBMDOS.COM. If these two are found, they are loaded along with the DOS command interpreter COMMAND.COM. COMMAND.COM contains routines that interpret what is typed in through the keyboard in the DOS command mode. By

comparing the input with the list of command, it acts by executing the required routines/commands or by searching for the required routine utility and loads it into the memory.

3.3 COMPUTER FILES IN DOS

A file may contain a program or any other kind of information. Generally, a file must be given a name that can be used to identify it. DOS permits the user to assign a name consisting of two parts to a file - primary and secondary names. Primary name can be of a maximum of eight characters consisting of Characters, Alphabets, Number and Hyphen), and the Secondary name should consist of three characters, which is optional. The primary name and the secondary (or extension) name, if any, are to be separated by a dot (.).

Primary name can be linked to proper name, whereas extensions are like surnames of people. Using an extension with the file name is preferable, though optional. However, once the extension is specified, using the complete name (primary name and extension, with the period separating them can only refer the file). Using extensions can be an excellent way of naming a file so that it can be identified easily.

Examples:

Filename	Primary Name	Separator	Secondary Name
Employee	Employee		
Employee.Exe	Employee		. Exe
Employee.Dbf	Employee		. Dbf

DOS has a way of showing which disk drive is currently active. The floppy disk drives are assigned alphabets **A** and **B**, whereas the hard disk drive is assigned the alphabet **C**. If your PC has a single floppy drive, the drive would be **A** and if it has two, they would be termed as **A** and **B**. If your PC includes a hard disk, besides a FDD (Floppy Disk Drive), the drive names would be **A** and **C**. If the prompt is **A**, then it implies that the first floppy disk drive is active. Where as the DOS prompt would be **C**, if the hard disk is active. Data as well as instructions reside in a file stored in a disk.

3.4 DIRECTORY STRUCTURE IN DOS

The files in the computer come from various sources. Some files come with DOS, while other comes with publications such as a word processor. These files contain codes and other information that is necessary to make the computer application operational. Before long, there will be hundreds or even thousands of files in the computer, which can make it difficult to locate specific files.

The names of all the files created in a disk are stored in its directory. Directory is just like a file folder, which contain all the logically related files. DOS files are organized in a hierarchical or an inverted tree-like structure. The general analogy is with a file cabinet containing a number of drawers, which in turn may contain folders. The content of these folders is the needed information.

The file cabinet here is the **ROOT DIRECTORY**, the drawer is INDIVIDUAL **DIRECTORY**, the folders are **SUBDIRECTORY** and the information in these folders may in turn be classified as **FILES**.

Otherwise, the large number of files that get created for various purposes in a disk can make the directory huge and difficult to view and manage. Therefore, DOS enables the user to organize the files in a disk into directories and sub-directories in a hierarchical structure. Directories can contain other directories. A directory within another directory is called a sub-directory.

Of course, there may be sub-directories of sub-directories, but a file name is the furthest you may descend down the (inverted) tree of directories and files. Thus, a file name corresponds to a tree leaf, a sub-directory to a branch, the directory to the trunk, and the root directory to the root of the tree, hence the name ROOT DIRECTORY.

Sample of Directory Structure
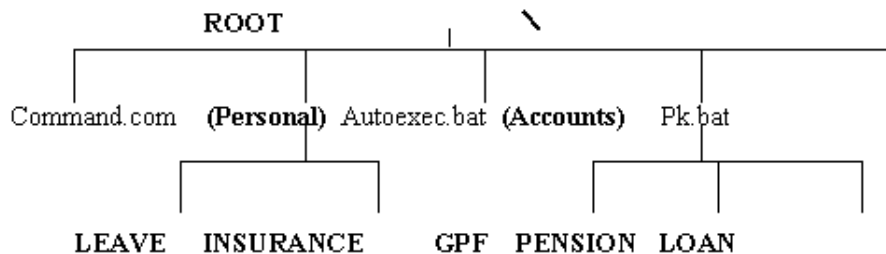
The directory/sub-directory is represented in **bold letters.**

3.4.1 DIRECTORY COMMAND

The content of each of the sub-directory cannot be viewed unless it is made active, or a sub-directory is specified as part of the DIR command. Doing either of these requires an understanding of the concepts of navigating around the disk.

The directory, the user is in at any point of time, is called the WORKING/PRESENT/CURRENT directory.   DOS   indicates which directory you are in by displaying the directory's name in the command prompt. For example, the following command prompt indicate that you are in the DOS directory: C:\DOS>. Knowing which directory is current helps you find files, and to move from one directory to another more easily. Typically, the **ROOT DIRECTORY (\)** is the initial working directory. The entire specification of directory from root is called a **PATH**. By itself, the DIR command is applicable to the working/present directory. The names of the sub-directories at adjacent levels are separated by backslash (\), while specifying the path to be followed while traveling to a sub-directory.

3.4.2 DIR COMMAND

The DIR command gives the list of is there on the disk that is mounted on the active drive.

Syntax : C:\> DIR A:\> DIR

Example

A:\> DIR

Volume in drive A has no label
Directory of A:\

COMMAND COM   23612   10-20-88   11.30a
DISKCOPY COM   4235   10-20-88   12.00p
FORMAT   COM   15780   03-12-89   12.00p
3 files   325012   bytes free

A:\>

As can be seen, on typing DIR followed by <Enter> key at DOS
 prompt, five columns of data followed by the number of files
 and bytes that are free in the disk are displayed. The first
column contains the primary name of each file resident on the
disk. However, most files are named with an extension, which
appear in the second column. Whereas, the third column
contains the size of the file in bytes, and the fourth and fifth
columns show the date and time on which the files was created
or last modified. The last line displays the number of file(s)
and remaining disk space free in bytes. It is important to note
that the DIR command only displays the names of the files
and not their contents.

3.4.3 CHANGING A DIRECTORY

All the names displayed using DIR command that have <DIR>
 besides them are directories. You can see the list of files in
another directory by changing to that directory and then using
the DIR command again.

The Change Directory (CHDIR) or CD command enables the
 user to travel around the directories in a disk. Type the CD
command at the command prompt.

Syntax:

A:\> CHDIR {path} or a:\> CD {path}

Examples : (Refer to the figure)

1. A:\>CD \NOS

This command makes the NOS sub-directory under the root directory (\) active.

2. A:\>CD \NOS\LETTERS

The backslash indicates the root, and LETTERS, which is a sub-directory under the NOS directory, becomes the working directory.

3. A:\> CD \

The root directory becomes the working directory; i.e. you will change back to the root or main directory. The slash typed in this command is a backslash (\). No matter which directory you are in, this command always returns you to the root directory of a drive. The root directory does not have a name, it is simply referred to by a backslash (\).

3.4.5 MAKING OR CREATING DIRECTORY

As the number of files increases in a disk, a need is felt to organize them in a meaningful way by creating sub-directories to store a group of logically related/similar files.

To create a directory, DOS provides the MKDIR (Make Directory) or MD command.

Syntax:

A:\>MKDIR [drive:] {pathname} or A:\>MD [drive:] {pathname}

Square brackets indicate that [drive:] entry is optional.

The MD or MKDIR command creates a new empty directory whose name is the last item specified in the pathname, in the specified drive. If active, the drive need not be specified. If the directory is to be created as a sub-directory of the working directory on the active drive, typing MD {directory name} at the DOS prompt or command prompt is sufficient.

Examples:

1. A:\> MD \ACCT\SALARY

makes a SALARY directory in the: drive, under ACCT directory.

2. A:\> MD C:\> SALARY

Makes a salary directory in the C: drive, under root directory.

3.4.6 DELETING A DIRECTORY

You may want to delete or remove a directory to simplify your directory structure. DOS provides RD (Remove Directory) to delete a directory.

Example:

1. A:\> RD \ACCT\SALARY

removes the SALARY sub-directory in ACCT directory.

NOTE: You cannot delete a directory if you are in it. Before you can delete a directory, you must type cd.. at the command prompt. At the same point of time, the directory to be deleted should be empty.

Management of directories Overview

See the chapter on the directories.

> CD\ (Type CD + Alt 92) Return to the principal directory.

> CD.. Return to the preceding directory.

> CD WORD Open the directory WORD.

> MD NAME Creation of the directory NAME.

> RD NAME Delete of the directory NAME. With beforehand one must open the file and erase all the files being in this file (including under directories), then to return to the root comprising this file.

DELTREE (MSDOS 6 and superior). Delete a directory even if it contains files.

3.5 FILE MANAGEMENT

3.5.1 COPYING FILES

To copy a file, DOS provides `COPY' command. When you use `copy' command, you must use the following two parameters; the location and the name of the file you want to copy, or the source; and the location and the file name to which you want to copy the file or the target (destination). You separate the source and the destination or target with a space. The syntax of the `COPY' command is

COPY {source} {destination} or,

COPY [drive:] [path] [filename] [drive:] [path] [filename]

i.e. the first set of drive, path and filename refers to the source file, and the second set of drive, path and filename

refers to the destination file.

(a) Copying Single File

To copy the DEBUG.EXE file from the DOS directory to the NOS

directory

1. Return to the root directory by typing the following command prompt: CD\

2. Change to the DOS directory by typing the following commands at the DOS prompt: CD DOS

3. To copy the file DEBUG.EXE file from the DOS directory to the
NOS, directory type the following at the command prompt:

Copy c:\dos\debug.exe c:\nos and the following message appears: 1 file (s) copied

Examples:

1. A:\> copy a:\letter\office.doc \letter\office.bak

makes a copy of the office.doc file in the current or working
directory with a new name office.bak

2. A:\> copy office.doc a:\letters\nos.mem

copy the file office.doc from the root directory to the sub-
directory LETTER under root directory with a new name
nos.mem.

If the target drive is not specified, the copied file will reside in
the disk mounted on the active drive.

3.5.2 RENAMING FILES

To rename a file, DOS provides REN command. The REN
command stands for "Rename". When you use the REN
command, you must include two parameters. The first is the
file you want to rename, and the second is the new name for
the file. You separate the two names with a space. The REN
command follows this pattern:

REN oldname newname

Example: REN NOS.DOC NOS.MEM

Rename the old filename NOS.DOC to a new filename
NOS.MEM.

3.5.3 DELETING FILES

This section explains how to delete or remove a file that is no
longer required in the disk. DOS provides DEL command,
which means to delete.

Syntax : DEL {drive:} {path} {filename}

Example:

1. DEL \DOS\EDIT.HLP

delete the EDIT.HLP from the DOS directory under ROOT directory.

3.5.4 PRINTING A FILE

The `PRINT' command of DOS works more or less like `TYPE' com

mand, but at the same time, it enables the content of a text file

to be printed on a paper.

Syntax:

A:\> PRINT [drive:] {path} {filename}

Example:

A:\> PRINT \AIAET\LETTER\AIAET.LET

3.5.5 Selection of one or more files

All the commands followed by a space then various following syntaxes, will act on the selected files:

> NOM.EXT Selection of a file which one specifies the NAME and EXTension.

> *.EXT Selection of all the files which one specifies EXTension.

> B*.* Selection of all the files whose name starts with B.

> C*.EXT Selection of all the files whose name starts with C and which one specifies EXTension.

> *.* Selection of all the files without exception.

3.5.6 Attributes of files

The four attributes which interest us here are: Reading alone, files, hidden, and system. We will see the three first.

Syntax:

ATTRIB toto.doc +r Activates the reading alone with the file toto.doc. One cannot erase any more this file with the command erase.

ATTRIB toto.doc -r Desactive reading alone with the file toto.doc.

ATTRIB toto.doc Display the attributes of the file toto.doc.

ATTRIB *.* Display attributes of all the files.

ATTRIB *.* +r /s Put all input files alone including the files located in under directories (parameter /s).

Parameters: Reading alone +r or -r, files +a or -a, hidden +h or -h, and system +s or -s.

The attribute "reading alone" makes it possible to avoid erasing by error such or such file by the command erase. It's necessary to give this attribute to -r to inhibit it.

The hidden attribute (ATTRIB toto.doc +h for activated this attribute on the file toto.doc) makes it possible the file not to be displayed at the time of a listing of files (command DIR).

The attribute file indicate if the file were modified since its last backup. This attribute is useful for command XCOPY seen further.

The attribute system indicate to the operating system if such or such file is a file forming part of those used by the operating system. In practice we do not have to serve to us directly as this attribute nor of the files reserved by MS-DOS.

3.5.7 Catalogue (listing of the file names stored on mass memory)

DIR Catalogues of the current drive.

DIR A: Catalogue of reader A (idem for B and C).

DIR *.COM Catalogues of all the files whose extension is COM.

DIR X:*.* Catalogue of all the files whose name starts with X.

In this case one obtains the list of all the files with their co-ordinates, cuts, date and hour of the last backup of the files. There are two options which make it possible to differently present the list of these files (/P and /W).

Options of DIR

DIR /S Displays also the contents of under directory.

DIR /W Displays only the name of the files on five columns.

DIR /P If the number of files is not due to the screen, /P mark a pause before displaying the continuation.

DIR /B Gives only the name of the files without their co-ordinates (size and date).

One can of course combine these options. Example:

DIR *.DOC /S /P Display the files whose extension is DOC while including there under directories and by marking a pause in the run of the list of the files.

3.5.8 Visualization of the contents of a textual file

TYPE NOM.EXT Sending with the screen contents of the file nom.ext. This file being with the format text such as the batch where txt.

MORE < NOM.TXT Idem that previously but with the difference that visualization marks a pause before displaying the continuation of the text if the file does not hold on a screen.

3.5.9 Printing

After the commands DIR and STANDARD, if command PRN > is specified, that will send to the printer the list files (DIR) or the contents of a file (STANDARD):

DIR > PRN. Printing of all the list of the files.

DIR * DOC > PRN. Printing of all the list of the files whose extension is DOC.

TYPE NOM.EXT > PRN. Printing of the contents of a file which one specifies the NAME and EXTension.

3.5.10 Virtual drive

We can attribute a letter at a directory for that it to be seen as a drive.
Example, instead of to do dir c:\toto, we can do dir e:.
Dir e: list the files of c:\toto.

The instruction is **subst**. Syntaxe : subst drive directory.

Options

subst e: toto, attribute the letter e at the directory toto.
subst, list the letters associated at the directory.
subst e: /d, delete the relation between the letter and the directory.

Warning

When we attribute the letter at the directory, we must to put the whole directory. Example : subst e: c:\toto.
We can use subst e: toto, but if at this moment we are in the directory c:\document, the drive e: will are attributed at c:\document\toto and not at c:\toto.
For the example, after to have did subst e: toto when you are in the directory c:\document, at the next copy a:*.* e:, the files will are copied in c:\document\toto and not in the directory c:\toto. It's the reason why you must to put the whole directory (subst e: c:\toto) for to be certain that the new drive select the good directory (c:\toto in our example).

We can put the subst in the autoexec.bat if we wish a automatical relation for the letter at the directory when the computer start.

3.5.11 Others

CLS Erasure of the screen.

3.5.12 The batch

The batch are files which allow the processing in batch of commands MSDOS. If there is a succession of commands which one must regularly carry out, one places these commands in a file called batch. One can thus put at it all the commands of the cls type, cd... ; but certain instructions (which we will see) are specific to the batch.

These files batch have the extension "bat" and are with the format text, therefore being able to be to create with any text editor recognizing the ASCII.

Instruction echo

This instruction is used for two things, to display text with the screen and to require to display or not the continuation of the instructions to be carried out.

The sign arrobas (@) makes it possible not to display the instruction in the course of execution. Example :   the

instruction "@copy toto titi" copies the file toto in a file titi but without displaying the instruction "copy toto titi".

To avoid having to put the arrobas at all the instructions, we can put @echo off. The instruction is execute but not to display. The instruction "@echo on" restore the display.

The instruction "@echo." print a empty line.

The instruction "@echo toto" print the text toto.

Example :

```
@echo off
cls
echo Hello
echo.
echo toto
```

Result :

```
Hello
toto
```

Instruction exist

Example 1 :

```
if exist toto echo The file toto exist.
if not exist toto echo The file toto don't exist.
```

The first line (if exist) test if the file exist.
The second line (if not exist) test if the file don't exist.
In the two case, the test if print the good message.
Example 2 :
```
if not exist rep md rep.
```
If the folder don't rep exist, then rep is created.
Example 3 :
```
if exist toto goto next
rem Put here the instruction at to do if the file (or the
directory) toto don't exist.
:next
```

Here, we go at next if the file toto exist, else the instruction
following the test if is did.

This examples test if a file exist. For to test if a folder exist, we
must put the parameter \nul after the name of folder. Example
for to test if the folder toto exist :

```
if exist toto\nul goto suite
echo toto don't exist
goto fin
:suite
echo toto exist
:fin
```

Command choice

The command choice ask à the user to push a letter among the
letter proposed. The letter selected is tested by the command
errorlevel.

Option :

/C[:]keys: Specify the keys at to propose. It's YN (Yes or
No) if the keys aren't specified.
/N : Don't print the keys and the ?.
/S : The difference between the capital and the small
letter are did.
/T[:]c,nn : The key "c" is choice if the use don't push a
key after nn second.

Example (menu.bat) :

```
@echo off
:menu
cls
echo d) execute defrag
echo s) execute scandisk
echo q) quit
choice /c:sdq What do you want
if errorlevel = 3 goto fin
if errorlevel = 2 goto def
if errorlevel = 1 goto scan
:def
defrag
```

```
goto menu
:scan
scandisk
goto menu
:fin
```

This batch is execute until we push the key q. Else it's the soft defrag when we push d and scandisk when it's s.

Parameters

The directive %1 (sign percent and a number from 1 at 9) give the nine parameters that the batch accept.

Example : If the batch x.bat have the command "echo %1", if we type "x toto" then the word toto will are printed.

Example with the test if :

```
if "%1"=="toto" goto xxx
goto end
:xxx
echo You have taped toto.
:end
```

Warning, the test if do the difference between the capital and the small letter. In our example, if we type Toto, the message (You have taped toto.) isn't printed.

Command shift

This command shift the parameters. The first parameter take the value of the second, the second take the value of the third, until the last (the ninth). After the last is empty.

Example of application :

We want copy all the files with the extension that the user want.

Batch :

```
:again
if "%1"=="" goto finish
```

```
copy *.%1 a:
shift
goto again
:finish
```

Example : batch txt doc.

Remark :

    The instruction if test if the first parameter is empty. In this case we go the end of the batch.
    Else the batch copy the file with the extension given by the first parameter (%1), shift the parameter and to go at again for the next extension.

With this instruction if, the batch copy the files until the first parameter are empty.

Others

In the batch, we can put all the commmand msdos (attrib, copy, dir...)

3.6 USE OF WILDCARD CHARACTERS

If you want to carry out a task for a group of files whose names have something in common, you can use wildcard characters to specify groups of files. DOS recognize two wildcard characters: asterisk (*) represents one or more characters that a group of files has in common; and the question mark (?) represents a single character that a group of files has in common. You can use wildcards to replace all or part of a file's name or its extension. The following table shows examples of wildcards:

Wildcard	What it Represents	Example
*.TXT	All files with a .TXT extension	JULY.TXT LETTER.TXT
REPORT.*	All files named REPORT with any extension	REPORT.TXT REPORT.LET

		REPORT.WRI
M*.*	All files beginning with letter regardless of their extension	M MEMO.TXT MARCH.XLI
???.*	All files having 3 letter names, with any or no extension	SUN.BMP WIN.LET

You can include the wildcard in the command.

Use of wildcard characters in COPY command

1. A:\>COPY \letters*.COB B:

It means, copy all files with extension *.COB from the directory LETTERS under the ROOT directory to the working or ROOT directory of the `B' drive.

2. A:\> COPY B:\COMPANY\OPEL.*

The command is to copy all files with primary name OPEL (irrespective extension) in the directory COMPANY under ROOT of the drive `B' into the current working directory of the disk  mounted in `A' drive. Incase of one drive, the system will ask for the source and

target drive.

The command,

#3.A:\>COPY C:*.*

copies all files of the ROOT directory of the 'C' drive into the working directory of the 'A' drive.

4. A:\> COPY LETTE?.* B:

copies all files with primary name consisting of 6 characters in total and LETTE as the first five characters (irrespective of extension name) into drive `B'.

5. A:\> COPY B:\?.DOC

copies all files having a primary name of one character with an extension .DOC from ROOT directory of 'B' to the ROOT directory of `A' drive.
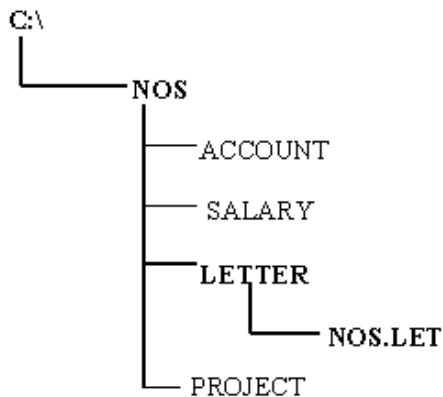
3.7 DOS VERSIONS

Year	Event
1981	MS-DOS 1.0 was released August, 1981.
1982	MS-DOS 1.25 was released August, 1982.
1983	MS-DOS 2.0 was released March, 1983.
1984	Microsoft introduces MS-DOS 3.0 for the IBM PC AT and MS-DOS 3.1 for networks.
1986	MS-DOS 3.2 was released April, 1986.
1987	MS-DOS 3.3 was released April, 1987.
1988	MS-DOS 4.0 was released July, 1988.
1988	MS-DOS 4.01 was released November, 1988.
1991	MS-DOS 5.0 was released June, 1991.
1993	MS-DOS 6.0 was released August, 1993.
1993	MS-DOS 6.2 was released November, 1993
1994	MS-DOS 6.21 was released March, 1994
1994	MS-DOS 6.22 was released April, 1994

3.8 USING PATH TO SPECIFY THE LOCATION OF FILES

A path is the route that leads from the root directory of a drive to the file you want to use.

For example, to access the NOS.LET file in the LETTER
 subdirectory of NOS directory, DOS must go from the ROOT (\) directory through the NOS directory to the LETTER directory, as shown in the following figure:

```
C:\
    |
    |____NOS
         |____ACCOUNT
         |
         |____SALARY
         |
         |‾LETTER
         |    |
         |    |_____NOS.LET
         |
         |____PROJECT
```

To specify the same path at the command prompt, you would type it as shown in the following illustration:

C:****NOS\LETTER\NOS.LET

This is the path or route to the file NOS.LET. The first letter and the colon (C:) represent the drive the file is on. The first back slash (****) represents the root directory. The second backslash separates the NOS directory from the LETTER sub-directory. The third backslash separates the LETTER sub-directories from the file name, NOS.LET.

Note: MS-DOS recognizes path up to 67 characters long (including the Drive letter, colon, and backslash).

3.9 DOS COMMAND SET

MS-DOS secret and/or unknown commands
Below is a listing of MS-DOS commands that are not listed in any available help manual or in the commands syntax or are commonly unknown commands. Many of these commands that are known can be very useful when using MS-DOS, while some of the other commands are unknown and/or appear to do nothing.

Please use these commands cautiously, some of the commands can erase data and/or erase data without warning.

ATTRIB ,	The command is short for ATTRIB -a -h -r -s *.* (removes all attributes of a file).
BACKUP /HP	Unknown
DIR ,	This lists all files including hidden files, does not work in Windows 95 / 98 / NT / 2000.
DIR ...	Lists all directories that do not have extensions. In Windows 95 / Windows 98 will list the contents of the directories previous to the directory currently in.
DOSKEY /APPEDIT	Utilize doskey functions in MS-DOS command utilities such as edlin and debug.
DOSKEY /COMMAND	Unknown
DOSKEY /PERMANENT	Unknown
DOSKEY /SCRSIZE	Unknown
DOSKEY /XHISTORY	Unknown
FDISK /MBR	Recreates the Master Boot Record See CH000175 for additional information.
FDISK /PRI	See FDISK Page for additional information.
FDISK /EXT	See FDISK Page for additional information.
FDISK /LOG	See FDISK Page for additional information.
FDISK /Q	Prevents fdisk from booting the system automatically after exiting fdisk.
FDISK /STATUS	Shows you the current status of your hard drives.

FORMAT /AUTOTEST	Formats the hard drive without any prompting.
FORMAT /BACKUP	Like /AUTOTEST but it will ask you for a volume label.
FORMAT /Z:n	Command used with FDISK supporting FAT32, used to specify the cluster size in bytes where n is multiplied by 512.
MEM /A or /ALL	Adds a line into the MEM command tells the available space in HMA.
RESTORE /Y	Unknown
RESTORE /Z	Unknown
SET DIRCMD=0	Will make all directories hidden however still accessible, to get them back **SET DIRCMD=**
SHARE /NC	Unknown
TRUENAME	When placed before a file, will display the whole directory in which it exists.
VER /R	Tells you the Revision and if DOS is in HMA.

3.9.1 INTERNAL COMMANDS

assoc

The assoc command displays the file association for each of the different file extensions on the computer.

Additional information and help with computer file extensions can also be found on our file extensions page.

atmadm

Lists connections and addresses seen by Windows ATM call manager.

call

Enables a user to execute a batch file from within another batch file.

cd

CD (Change Directory) is a command used to switch directories in MS-DOS. For example, if you needed to run Windows 3.11 from DOS, you would type:

cd windows - Changing the directory to Windows;
win - To run the win.com file within the windows directory.

chdir

Chdir (Change Directory) is a command used to switch directories in MS-DOS.

cls

Cls is a command that allows a user to clear the complete contents of the screen and leave only a prompt.

color

The color command enables users running Microsoft Windows 2000 and Windows XP to quickly and easily change the default color of their background and/or text in their MS-DOS window.

copy

Allows the user to copy one or more files to an alternate location

date

The date command can be used to look at the current date of the computer as well as change the date to an alternate date.

echo

Echo is used to repeat the text typed in back to the screen and/or can be used to echo to a peripheral on the computer, such as a COM port.

exit

The exit command is used to withdrawal from the currently running application and/or the MS-DOS session.

goto

Moves a batch file to a specific label or location, enabling a user to rerun a batch file or skip other lines depending on user inputs or events.

for

The FOR variable is used for batch files to run a specified command when a parameter is met or specified.

md

Allows you to create your own directories in MS-DOS.

move

Allows you to move files or directories from one folder to another, or from one drive to another.

prompt

Allows you to change the MS-DOS prompt to display more or less information.

rd / rmdir

Removes empty directories in MS-DOS. To delete directories with files or directories within them the user must use the

deltree command, or if you are running Microsoft Windows 2000 or Windows XP use the /S option.

ren and rename

Used to rename files and directories from the original name to a new name.

In earlier releases of MS-DOS instead of using ren or rename you need to use the move command to rename your MS-DOS directories or files.

setlocal

Enables local environments to be changed without affecting anything else.

switches

Loaded in the config.sys switches allows you to add and remove various functions of MS-DOS.

set

Allows you to change one variable or string to another.

lock / unlick

Lock allows a user to lock a drive, enabling direct disk access for an application.

Unlock allows a users to unlock a drive, disabling direct disk access for an application

ver

Displays the version of MS-DOS or if running Windows 95 or above the version of Windows.

Information about Windows versions can be found on our Windows version page.

verify

Enables or disables the feature to determine if files have been written properly.

vol

Displays the volume information about the designated drive.

3.9.2 EXTERNAL COMMANDS

ansi.sys

Defines functions that change display graphics, control cursor movement and reassign keys. The ANSI.SYS device driver supports ANSI terminal emulation of escape sequences to control your system's screen and keyboard. An ANSI escape sequence is a sequence of ASCII characters, the first two are the escape character (1Bh) and the left-bracket character (5Bh). The character or characters following the escape and left-bracket characters specify an alphanumeric code that controls

a keyboard or display function. ANSI escape sequences distinguish between uppercase and lowercase letters; for example, "A" and "a" have completely different meanings.

append

Similar to the PATH MS-DOS command, the append command enables a user to open files in the specified directory as if they were in the current directory.

arp

Displays, adds and removes Arp information from network devices.

assign

Introduced with MS-DOS 2.0 and has been available up to 6.0 where it was removed because of concern with data issues. Was latter made available on the MS-DOS 6.0, 6.2 and 6.22 supplemental disks. The assign command redirects disk operation on one drive to a different drive.

Any users using Windows 95 or above should not use this command and consider using the SUBST command as a substitute.

assoc

The assoc command displays the file association for each of the different file extensions on the computer.

Additional information and help with computer file extensions can also be found on our file extensions page.

at

Enables users to schedule tasks to be performed at a specified time and date.

attrib

Attrib allows a user to change the properties of a specified file. Using attrib, the user has the capability of changing the file to have any of the below attributes. Note if you're wanting to change the ACL's of a file see the CACLS command.

Read-only - allowing the file to be only viewed and not written to.

Archived - allowing Microsoft backup and other backup programs to know what files to backup.

Hidden - making the file invisible to standard users.

System - making the file an important system file.

backup

MS-DOS application that enables users to backup their data on their computer.

MS-DOS 6.0, 6.2, 6.21, and 6.22 users use the msbackup command. However, this file is still available to these users on the MS-DOS 6.0 and 6.22 supplemental disk.

batch
The batch command is a recovery console command that executes a series of commands within a file.
If you are looking for additional information about batch files we suggest you look at our batch file page.

cacls
The cacls command enables a user to view and modify the ACLs of a file. If you're wanting to change the read/write, hidden, system settings of the file see the attrib command.

chcp
Before the chcp command can be used, the nlsfunc must be loaded, as well as the country.sys must be loaded into the config.sys.
The chcp command is used to supplement the International keyboard and character set information, allowing MS-DOS to be used in other countries and with different languages.

chkdsk
Chkdsk is a utility that checks the computer's hard disk drives' status for any cross-linked or any additional errors with the hard disk drive.
MS-DOS   versions   2.x   -   4.x   used   chkdsk.com, MS-DOS versions 5.x and beyond used chkdsk.exe.

chkntfs
The chkntfs command is used to display or modify the checking of the disk drive using NTFS at boot time.

choice
Allows for batch files and scripts to wait for the user to choose a set of choices.
Microsoft Windows 2000 and Windows XP users who have batch files that utilize the choice command should modify the batch file to use the MS-DOS set command.

cipher
Displays or alters the encryption of directories [files] on NTFS partitions.

command
The command.com is the command interpreter for MS-DOS and is required for the majority of Microsoft's operating systems. Without command.com the computer running a Microsoft operating system would be unable to boot.
When running Windows NT, 2000, XP, or future operating systems there are two versions of the command interpreter, command.com and cmd.exe. Cmd offers additional environment variables than command.com; however, it is recommend if you are attempting to run a MS-DOS utility that you utilize the

command.com. To use command.com, click Start / Run and type command.

- Information about creating a bootable diskette, which also requires command.com, can be found on our boot diskette page.
- Additional information about shells can be found on our shell dictionary definition.
- Additional information about COMMAND vs. CMD can be found on document CH000395.

convert

Converts FAT volumes to NTFS.

control

Control enables Microsoft Windows users to open the Control Panel and items within the Control Panel from the command prompt.

Defrag

Microsoft Defrag was first introduced with MS-DOS 6.0 and is a software utility capable of organizing the files on the hard disk drive.

compact

Compact is a MS-DOS command used to compress, uncompress, and view compressed files.

diskcopy

The diskcopy utility allows a user to copy the complete contents of a diskette to another diskette.

It is not recommended that the diskcopy command be used for anything but a floppy diskette

edit

Edit allows a user to view, create, and/or modify their computer files.

If you are unable to get this program to work, try typing in "path c:\windows\command" if you have Windows95/98, or type in "path c:\dos" if you have Dos 5.x/6.x/7.x or Windows 3.x and try again. If you still are not able to get edit to work, it may not be on the hard drive; type in **dir edit.com /s** at the c:\>. If it says that the file is not found, you may not have this feature.

If you are running a MS-DOS version 4.x or lower or you are unable to find edit.com on your hard disk drive, you can also use the below command to create a file.

copy con <name of file>

Once you have entered the above command this will create the file with the name specified. Once you have typed all the lines you wish to be in the file, press and hold CTRL + Z. This should

enter ^Z, once on the screen, press enter and one file should be copied.

extract

The Windows extract command is used to take files that are compressed in a Windows Cabinet file and place it into a specified location on the hard disk drive.

An additional definition and related terms for "extract" can be found on our extract definition page.

format

Format is used to erase **all** of the information off of a computer diskette or fixed drive.

find

Allows you to search for text within a file. Although MS-DOS itself is not case sensitive, when typing in the string that you are looking for with the find command, it is case sensitive. Additionally, this command is used to find text within a file, not the actual file itself. If you are wanting to search or find a file with a particular name, use the dir command.

Users who are running Microsoft Windows 2000 or Windows XP should also consider using the improved findstr command.

enable

The enable command is a recovery console command to enable a disabled service or driver.

fasthelp

Command that provides instant access to all of the MS-DOS commands, giving you a brief on each command; may not work in some versions of MS-DOS.

gpupdate

Refreshes the local computers policy and any Active Directory-based Group policies.

help

Help is used to access the information and help file from a MS-DOS prompt.

MS-DOS 5.x uses help.exe.

MS-DOS 6.x uses help.com.

Microsoft Windows 2000 uses help.exe

Microsoft Windows XP uses help.exe

For quick reference help with MS-DOS commands in any of the versions of MS-DOS or Windows, you can also use the -help or /? after a command; for example:

dir -help

or

dir /?

if command
Syntax
Windows 95, Windows 98, and Windows ME syntax
Performs conditional processing in batch programs.
IF [NOT] ERRORLEVEL number command
IF [NOT] string1==string2 command
IF [NOT] EXIST filename command

NOT	Specifies that Windows should carry out the command only if the condition is false.
ERRORLEVEL number	Specifies a true condition if the last program run returned an exit code equal to or greater than the number specified.
command	Specifies the command to carry out if the condition is met.
string1==string2	Specifies a true condition if the specified text strings match.
EXIST filename	Specifies a true condition if the specified filename exists.

Windows 2000 and Windows XP syntax
Performs conditional processing in batch programs.
IF [NOT] ERRORLEVEL number command
IF [NOT] string1==string2 command
IF [NOT] EXIST filename command

NOT	Specifies that Windows 2000 / XP should carry out the command only if the condition is false.
ERRORLEVEL number	Specifies a true condition if the last program run returned an exit code equal to or greater than the number specified.
string1==string2	Specifies a true condition if the specified text strings match.
EXIST filename	Specifies a true condition if the specified filename exists.
command	Specifies the command to carry out if the condition is met. Command can be followed

	by ELSE command that will execute the command after the ELSE keyword if the specified condition is FALSE

The ELSE clause must occur on the same line as the command after the IF. For
example:

```
IF EXIST filename. (
del filename.
) ELSE (
echo filename. missing.
)
```

The below example would NOT work because the del command needs to be terminated by a newline:

```
IF EXIST filename. del filename. ELSE echo filename. missing
```

Nor would the below example work, since the ELSE command must be on the same line as the end of the IF command:

```
IF EXIST filename. del filename.
ELSE echo filename. missing
```

The below example would work if you want it all on one line:

```
IF EXIST filename. (del filename.) ELSE echo filename. missing
```

If Command Extensions are enabled IF changes as follows:

```
IF [/I] string1 compare-op string2 command
IF CMDEXTVERSION number command
IF DEFINED variable command
```

where compare-op may be one of:

```
EQU - equal
NEQ - not equal
LSS - less than
LEQ - less than or equal
GTR - greater than
GEQ - greater than or equal
```

and the /I switch, if specified, says to do case insensitive string compares. The /I switch can also be used on the string1==string2 form of IF. These comparisons are generic, in that if both string1 and string2 are both comprised of all numeric digits, then the strings are converted to numbers and a numeric comparison is performed.

The CMDEXTVERSION conditional works just like ERRORLEVEL, except it is comparing against an internal version number associated with the Command Extensions. The first version is 1. It will be incremented by one when significant enhancements are added to the Command Extensions. CMDEXTVERSION conditional is never true when Command Extensions are disabled.

The DEFINED conditional works just like EXISTS except it takes an environment variable name and returns true if the environment variable is defined.

%ERRORLEVEL% will expand into a string representation of the current value of ERRORLEVEL, provided that there is not already an environment variable with the name ERRORLEVEL, in which case you will get its value instead. After running a program, the below example illustrates ERRORLEVEL use:

```
goto answer%ERRORLEVEL%
:answer0
echo Program had return code 0
:answer1
echo Program had return code 1
```

You can also using the numerical comparisons above:

```
IF %ERRORLEVEL% LEQ 1 goto okay
```

%CMDCMDLINE% will expand into the original command line passed to CMD.EXE prior to any processing by CMD.EXE, provided that there is not already an environment variable with the name CMDCMDLINE, in which case you will get its value instead.

%CMDEXTVERSION% will expand into the a string representation of the current value of CMDEXTVERSION, provided that there is not already an environment variable with

the name CMDEXTVERSION, in which case you will get its value instead.

ipconfig

Ipconfig is a DOS utility that can be used from MS-DOS and a MS-DOS shell to display the network settings currently assigned and given by a network. This command can be utilized to verify a network connection as well as to verify your network settings.

logon

The logon command is a recovery console command that lists the installations of Windows 2000 / Windows XP and requests the local administrator password for those installations.

logoff

The logoff command is an external command that allows a user to quickly logoff their computer from the command line or within a batch file.

loadfix

Loads a program above the first 64K of memory, and runs the program.

mode

Mode status is used to view and/or modify a port or display setting.

more

More allows information to be displayed one page at a time.

msbackup

A later MS-DOS application that enables users to backup their data on their computer.

The msbackup is a MS-DOS version of the new backup command and mwbackup is the Windows version of this backup program.

MS-DOS 6.0, 6.2, 6.21, and 6.22 users can still find the older backup file on the MS-DOS 6.0 and 6.22 supplemental disk.

nbtstat

MS-DOS utility that displays protocol statistics and current TCP/IP connections using NBT.

netsh

MS-DOS command that enables users to change network settings such as changing their network device from a dynamic address to a static address or changing the IP address.

nslookup

MS-DOS utility that enables a user to look up an IP address of a domain or host on a network.

Users who are using earlier versions of Microsoft Windows 95, Windows 98, or Windows ME and need the options available

with the nslookup command will need to download an alternative, third-party program.

path

Path is used to specify the location where MS-DOS looks when using a command. For example, when using the command "format", if the path is not specified to where the command is you will receive bad command or file name.

pathping

Similar to the tracert command, pathping provides users with the ability of locating spots that have network latency and network loss.

ping

Helps in determining TCP/IP Networks IP address as well as determine issues with the network and assists in resolving them.

power

Allows you to conserve power with computer portables.

qbasic

QBasic is a variant of the BASIC programming language designed by Microsoft. With QBasic the user can design computer programs and/or utilities.

reg

Command line registry tool that enables you to change, display, update, and otherwise manipulate the registry from the prompt.

shutdown

Enables a user to shutdown a Windows XP computer from the command line as well as perform additional features that are not available through Windows.

sys

Sys is used to copy the system files from one drive to another drive, allowing that drive to be bootable.

When running sys, the below files will be copied.

command.com

io.sys

msdos.sys

drvspace.bin

SETVER

For setver to work, setver.exe device must be loaded in the config.sys.

Setver is used to imitate the version of DOS in case an application was unable to run because of a newer version of MS-DOS.

sort
Sorts the input and displays the output to the screen.
scandisk
Microsoft Scandisk was first introduced with MS-DOS 6.2 and is a software utility capable of checking the hard disk drive and/or floppy diskette drive for any disk errors.
share
Installs support for file sharing and locking capabilities.
taskkill
Allows a user running Microsoft Windows XP professional or Windows 2003 to kill a task from a MS-DOS prompt.
Note: Users running Windows XP home edition do not have access to this command. You will need to use the command **tskill**.
telnet
Enables a user to telnet to another computer from the command prompt.
The availability of this command has only been listed as Windows 2000 and Windows XP because these are the only two versions of Microsoft Windows that support the telnet command from the command prompt (with additional switches). Additional information and help about using telnet from any version of Windows can be found on our telnet help page.
tracert
The tracert command is used to visually see a network packet being sent and received and the amount of hops required for that packet to get to its destination.
Users with Microsoft Windows 2000 and Windows XP who need additional information network latency and network loss should also consider using the pathping command.
tree
Allows the user to view a listing of files and folders in an easy to read listing.
undelete
Allows you to restore files that may have been deleted.
unformat
Used to unformat a drive that has been formatted.
xcopy
Xcopy is a powerful version of the copy command with additional features; has the capability of moving files, directories, and even whole drives from one location to another.

UNIT – IV

WORD PROCESSING

Objectives

In this unit introduces
- Meaning ,Purpose and Advantages of word processing
- Word star package

4.1 MEANING AND PURPOSE OF WORD PROCESSING

Using a computer to create, edit, and print documents. Of all computer applications, word processing is the most common. To perform word processing, you need a computer, a special program called a *word processor*, and a printer. A word processor enables you to create a document, store it electronically on a disk, display it on a screen, modify it by entering commands and characters from the keyboard, and print it on a printer.

The great advantage of word processing over using a typewriter is that you can make changes without retyping the entire document. If you make a typing mistake, you simply back up the cursor and correct your mistake. If you want to delete a paragraph, you simply remove it, without leaving a trace. It is equally easy to insert a word, sentence, or paragraph in the middle of a document. Word processors also make it easy to move sections of text from one place to another within a document, or between documents. When you have made all the changes you want, you can send the file to a printer to get a hardcopy.

Word processors vary considerably, but all word processors support the following basic features:

☐ **insert text:** Allows you to insert text anywhere in the document.

☐ **delete text:** Allows you to erase characters, words, lines, or pages as easily as you can cross them out on paper.

☐ **cut** and **paste :** Allows you to remove (*cut*) a section of text from one place in a document and insert (*paste*) it somewhere else.

☐ **copy :** Allows you to duplicate a section of text.

☐ **page size and margins :** Allows you to define various page sizes and margins, and the word processor will automatically readjust the text so that it fits.

☐ **search and replace :** Allows you to direct the word processor to search for a particular word or phrase. You can also direct the word processor to replace one group of characters with another everywhere that the first group appears.

☐ **word wrap :** The word processor automatically moves to the next line when you have filled one line with text, and it will readjust text if you change the margins.

☐ **print:** Allows you to send a document to a printer to get hardcopy.

Word processors that support only these features (and maybe a few others) are called *text editors*. Most word processors, however, support additional features that enable you to manipulate and format documents in more sophisticated ways. These more advanced word processors are sometimes called *full-featured word processors*. Full-featured word processors usually support the following features:

☐ **file management :** Many word processors contain file management capabilities that allow you to create, delete, move, and search for files.

☐ **font specifications:** Allows you to change fonts within a document. For example, you can specify bold, italics, and underlining. Most word processors also let you change the font size and even the typeface.

☐ **footnotes and cross-references:** Automates the numbering and placement of footnotes and enables you to easily cross-reference other sections of the document.

☐ **graphics** graphics**:** Allows you to embed illustrations and graphs into a document. Some word processors let you create the illustrations within the word processor;

others let you insert an illustration produced by a different program.

☐ **headers , footers , and page numbering:** Allows you to specify customized headers and footers that the word processor will put at the top and bottom of every page. The word processor automatically keeps track of page numbers so that the correct number appears on each page.

☐ **layout :** Allows you to specify different margins within a single document and to specify various methods for indenting paragraphs.

☐ **macros :** A *macro* is a character or word that represents a series of keystrokes. The keystrokes can represent text or commands. The ability to define macros allows you to save yourself a lot of time by replacing common combinations of keystrokes.

☐ **merges:** Allows you to merge text from one file into another file. This is particularly useful for generating many files that have the same format but different data. Generating mailing labels is the classic example of using merges.

☐ **spell checker :** A utility that allows you to check the spelling of words. It will highlight any words that it does not recognize.

☐ **tables of contents and indexes:** Allows you to automatically create a table of contents and index based on special codes that you insert in the document.

☐ **thesaurus:** A built-in thesaurus that allows you to search for synonyms without leaving the word processor.

☐ **windows :** Allows you to edit two or more documents at the same time. Each document appears in a separate *window*. This is particularly valuable when working on a large project that consists of several different files.

☐ ***WYSIWYG (what you see is what you get):*** With WYSIWYG, a document appears on the display screen exactly as it will look when printed.

The line dividing word processors from desktop publishing systems is constantly shifting. In general, though, desktop publishing applications support finer control over layout, and more support for full-color documents.

4.2 *Features of word processing under DOS*

Word has a built-in spell checker, thesaurus, dictionary, Office Assistant and utilities for transferring, copy, pasting and editing text, such as PureText.

4.*2.1* Normal.dot

Normal.dot is the master template from which all Word documents are created. It is one of the most important files in Microsoft Word. It determines the margin defaults as well as the layout of the text and font defaults. Although normal.dot is already set with certain defaults, the user can change normal.dot to new parameters. This will change other documents that were created using the template and saved with the option to manually update the formatting styles.

4.*2.2* WordArt

WordArt enables drawing text in a Microsoft Word document such as a title, watermark, or other text, with graphical effects such as skewing, shadowing, rotating, stretching in a variety of shapes and colors and even including three-dimensional effects. In Word 2010, users can apply formatting effects such as shadow, bevel, glow, and reflection to their document text as easily as applying bold or underline. Users can also spell-check text that uses visual effects, and add text effects to paragraph styles.

4.*2.3* Macros

Like other Microsoft Office documents, Word files can include advanced macros and even embedded programs. The language was originally WordBasic, but changed to Visual Basic for Applications as of Word 97.

This extensive functionality can also be used to run and propagate viruses in documents. The tendency for people to exchange Word documents via email, USB flash drives, and floppy disks made this an especially attractive vector in 1999. A prominent example was the Melissa worm, but countless others have existed in the wild. Nearly all anti-virus software can detect and clean common macro viruses.

These macro viruses were the only known cross-platform threats between Windows and Macintosh computers and they were the only infection vectors to affect any Mac OS X system up until the advent of video codec trojans in 2007. Microsoft released patches for Word X and Word 2004 that effectively eliminated the macro problem on the Mac by 2006.

Word's macro security setting, which regulates when macros may execute, can be adjusted by the user, but in the most recent versions of Word, is set to HIGH by default, generally reducing the risk from macro-based viruses, which have become uncommon.

4.2.4 Layout issues

Before Word 2010 (Word 14) for Windows, the program was unable to handle ligatures defined in TrueType fonts[50] those ligature glyphs with Unicode codepoints may be inserted manually, but are not recognized by Word for what they are, breaking spell checking, while custom ligatures present in the font are not accessible at all. Since Word 2010, the program now has advanced typesetting features which can be enabled:[51] OpenType ligatures,[52] kerning, and hyphenation. Other layout deficiencies of Word include the inability to set crop marks or thin spaces. Various third-party workaround utilities have been developed.[53] Similarly, combining diacritics are handled poorly: Word 2003 has "improved support", but many diacritics are still misplaced, even if a precomposed glyph is present in the font.

Additionally, as of Word 2002, Word does automatic font substitution when it finds a character in a document that does not exist in the font specified. It is impossible to deactivate this, making it very difficult to spot when a glyph used is missing from the font in use. If "Mirror margins" or "Different odd and even" are enabled, Word will not allow the user to freshly begin page numbering an even page after a section break (and vice versa). Instead it inserts a mandatory blank page which cannot be removed.[54]

4.*2*.5 Bullets and numbering

Word has extensive list bullets and numbering feature used for tables, list, pages, chapters, headers, footnotes, and tables of content. Bullets and numbering can be applied directly or using a button or by applying a style or through use of a template. Some problems with numbering have been found in Word 97-2003. An example is Word's system for restarting numbering.[56] The Bullets and Numbering system has been significantly overhauled for Office 2007, which is intended to reduce the severity of these problems. For example, Office 2007 cannot align tabs for multi-leveled numbered lists. Often, items in a list will be inexplicably separated from their list number by one to three tabs, rendering outlines unreadable. These problems cannot be resolved even by expert users. Even basic dragging and dropping of words is usually impossible. Bullet and numbering problems in Word include: bullet characters are often changed and altered, indentation is changed within the same list, bullet point or number sequence can belong to an entirely different nest within the same sequence.

4.*2*.6 Creating tables

Users can also create tables in MS Word. Depending on the version, Word can perform simple calculations. Formulas are supported as well.

4.*2*.7 Using formulas

As mentioned in Creating Tables, MS Word supports the use of formulas. To access Word's formula function in Word 2007, click anywhere in a table, then choose Table Tools>>Layout. To access Word's formula function in Word 2003, select Table>>Formula. The formula function is on the ribbon in the Data section. Click on the Formula icon to open the Formula Dialog box. At the top of the Formula box is a place to enter a formula. Formulas use a similar convention as that used in Excel. Cell references use the "A1" reference style. Formulas are written using cell references (for example =A1+A2).[57] Word tables don't display column and row ids, the address must be determined by counting the number of columns and rows. For example, cell **C4** appears three columns from the left and four rows down. Once cell addresses are known the formula can be

written. Examples are: =C3+C4; =sum(C2:C10). An optional Microsoft Word add-in program called Formula Builder provides cell references in a number of different ways so the user doesn't have to determine it by counting columns and rows. For example, cell references may be added to a formula by double-clicking the cell.

As an alternative to using actual cell references as the arguments in the formula, you can use ABOVE, BELOW, LEFT, or RIGHT instead (i.e., =SUM(ABOVE)) which adds a range of cells.[58] There are limitations to this method. The cells in the range must not be empty and they must contain numeric values otherwise the calculation will not include the entire range expected.[59][60] Another problem is that ABOVE, BELOW, LEFT, or RIGHT doesn't recognize negative numbers when the number is surrounded by parenthesis and as a result does not calculate correctly.[61] Word also adds the heading row if it contains a numeric value provided the cells in the range are contiguous and all contain values.[62]

4.2.8 AutoSummarize

AutoSummarize highlights passages or phrases that it considers valuable. The amount of text to be retained can be specified by the user as a percentage of the current amount of text.

According to Ron Fein of the Word 97 team, AutoSummarize cuts wordy copy to the bone by counting words and ranking sentences. First, AutoSummarize identifies the most common words in the document (barring "a" and "the" and the like) and assigns a "score" to each word—the more frequently a word is used, the higher the score. Then, it "averages" each sentence by adding the scores of its words and dividing the sum by the number of words in the sentence—the higher the average, the higher the rank of the sentence. "It's like the ratio of wheat to chaff," explains Fein.[63]

4.2.9 AutoCorrect

In Microsoft Office 2003, AutoCorrect items added by the user stop working when text from sources outside the document is pasted in.

4.*2.10* **Subscript and superscript issues**

In any of the Microsoft word packages, it is impossible to display superscript exactly lying above subscript. It can only be done using the equation editor.

4.3 Versions

This section **may contain an excessive amount of intricate detail that may only interest a specific audience**. Please relocate any relevant information, and remove excessive trivia, praise, criticism, lists and collections of links. *(June 2010)*
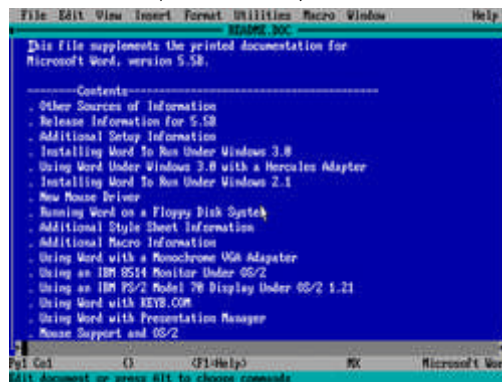
Versions for Microsoft Windows include the following:

Year Released	Name	Comments
1989	Word for Windows 1.0	code-named Opus
1990	Word for Windows 1.1	code-named Bill the Cat
1990	Word for Windows 1.1a	for Windows 3.1
1991	Word for Windows 2.0	code-named Spaceman Spiff
1993	Word for Windows	code-named T3 (renumbered 6 to bring Windows version numbering in line with

	6.0	that of DOS version, Macintosh version and also WordPerfect, the main competing word processor at the time; also a 32-bit version for Windows NT only)
1995	Word 95	(version 7.0) – included in Office 95
1997	Word 97	(version 8.0) included in Office 97
1998	Word 98	(version 8.5) only included in Office 97 Powered By Word 98—only released in Japan and Korea
1999	Word 2000	(version 9.0) included in Office 2000
2001	Word 2002	(version 10) included in Office XP
2003	Word 2003	(officially "Microsoft Office Word 2003") – (ver. 11) included in Office 2003
2006	Word 2007	(officially "Microsoft Office Word 2007") – (ver. 12) included in Office 2007; released to businesses on November 30, 2006, released worldwide to consumers on January 30, 2007
2010	Word 2010	(version 14) Included in Office 2010

Note: Version number 13 was skipped due to superstition.

Versions for the Macintosh (Mac OS and Mac OS X) include the following:

Year Released	Name	Comments
1985	Word 1	Word 1 for the Macintosh
1987	Word 3	Also known as Microsoft Word 4.0 for the PC
1989	Word 4	
1991	Word 5	
1993	Word 6	
1998	Word 98	
2000	Word 2001	the last version compatible with Mac OS 9
2001	Word v.X	the first version for Mac OS X only

2004	Word 2004	part of Office 2004 for Mac
2008	Word 2008	part of Office 2008 for Mac

Versions for MS-DOS

Year Released	Name	Comments
1983	Word 1	
1985	Word 2	
1986	Word 3	
1987	Word 4	Also known as Microsoft Word 4.0 for the PC
1989	Word 5	
1991	Word 5.1	
1991	Word 5.5	
1993	Word 6.0	

Versions for the Atari ST include the following:

Year Released	Name	Comments
1988	Word 1.05 (released as Microsoft Write)	

Versions for OS/2 include the following:

Year Released	Name	Comments
1992	Microsoft Word for OS/2 version 1.1B	

4.4 WordStar Package:

WordStar for Windows 1.5 Product Description

Introduction

The text below is taken from the original WordStar International (then owners of WordStar for Windows) release announcement (WSWIN1.5.TXT) for WordStar for Windows 1.5.

Note: The program is no-longer available except on the second user or surpless market; also note that the contact number and pricing details no-longer apply.

WSWIN1.5.TXT

WordStar for Windows Release 1.5
Product Description File
v1

1. About WordStar for Windows 1.5
   a. General Description
   b. History and Origin
   c. Platform
   d. System Requirements

2. WordStar for Windows 1.5 Availability
   a. Release Date
   b. Price
   c. Ordering Information (Phone and Times)
   d. Current Bundles

3. Features
   a. New Features
   b. General Features

1. ABOUT WORDSTAR FOR WINDOWS 1.5

a. WordStar for Windows Release 1.5 is the second major release of WSWin. Improvements have been made to the product in the areas of reliability, stability and performance, along with improved functionality for tables. Support for Object Linking and Embedding (OLE), TrueType, and Drag and Drop

Launching have been added, and graphics import filters have been improved. Finally, the tutorial has been revised to make learning the program easier, and the Getting Started, What's New, User Guide books have been consolidated into a single manual.

b. WordStar for Windows was developed from the NBI Legacy code base. Release 1.0 was made available in October 1, 1991; it was designed to combine high-end word processing features with easy-to-use desktop publishing capabilities. WordStar for Windows Release 1.5 is a further refinement of this idea.

c. WordStar for Windows Release 1.5 requires Windows 3.0 or 3.1; the latter is recommended.

d. WordStar for Windows Release 1.5 requires a minimum of 2MB; 4MB is preferred. An additional 1MB is needed to use DDE, and another 1MB for each application sharing links with WordStar for Windows. A minimum of 5MB disk space is required; 11MB is needed for the full installation (all tutorials, filters, and templates). An additional 1.6 MB is needed to add Correct Grammar for Windows.

2. WORDSTAR FOR WINDOWS RELEASE 1.5 AVAILABILITY
a. WordStar for Windows Release 1.5 became available June 23, 1992.

b. The full retail price is $119. The price for upgrading from a previous version is $29.95 plus $5.50 shipping and handling in the U.S.

c. The upgrade can be ordered by calling toll-free (800) 227-5609, Monday through Friday, 6:00 a.m. - 5:00 p.m. Pacific Time. If you currently use WordStar for Windows 1.0, and have experienced any software problem that could not be resolved by WordStar technical support, please send a request by CompuServe Mail to James Burton 76702,334, including serial number, address information, and disk format, and a WordStar for Windows Release 1.5 package will be sent to you at no charge.

d. The WordStar for Windows Release 1.5 update package includes the necessary disks, What's New and Getting Started

booklets, Correct Grammar for Windows 2.0, and Correct
Writing Guide for Windows.

3. FEATURES
a. NEW IN WORDSTAR FOR WINDOWS RELEASE 1.5

OLE. Object Linking and Embedding (OLE), a new Windows 3.1
feature, has been incorporated into WSWin 1.5. Using OLE, you
can drop a spreadsheet right into your WordStar for Windows
document; when it's time to change the spreadsheet, double-
clicking it brings up Excel (or whatever application created the
spreadsheet). No need to save the document, exit WSWin, load
Excel, open the file, etc.

COMMON DIALOGS. In this release of WSWin, we implemented
the Windows 3.1 Common Dialogs for File Access (New, Open,
Save As, Import, Export), making it easier to search your hard
disk for files you have forgotten the name or location of.

TRUETYPE. In Windows 3.1, Microsoft has adopted TrueType
as a font standard. WSWin 1.5 supports TrueType fonts and
also automatically maps (converts) the fonts from your old
WSWin 1.0 documents into a comparable font under TrueType.

DRAG AND DROP LAUNCHING. This feature makes it easier to
start WSWin after locating your file with File Manager. Just
drag the file name out of File Manager onto the WSWin icon,
double-click, and you are editing your document.

NEW GRAPHICS IMPORT FILTERS. GIF and Lotus PIC formats
can now be imported. We have replaced the Legacy import
engine with a new one that conforms to the Aldus Graphics
Import Mechanism. Now, high-resolution color import filters for
TIFF and PCX files import a 24-bit color image in all of its
splendor.

b. GENERAL FEATURES
As in version 1.0, WordStar for Windows combines high-end
word processing features with advanced page layout functions
and connectivity tools. For those not familiar with version 1.0, a
description of the program's features follows.

Text features include indexing, tables of contents, up to 15

user-definable lists, and dynamic references, as well as WYSIWYG editing of text, graphics, and layout at 25 to 200 percent magnification. WordStar 7.0 or WordStar 2000 keystroke accelerators and auto-conversion of WordStar 7.0 and WordStar 2000 files are available.

Page layout features include dynamic, movable rulers, drop caps, bullets and frame captions. Typographical controls include leading, kerning and tracking to an accuracy of 1/1000th of an em. The program's color wheel displays RGB, CMY and HSI color models and print text, graphics, tables and borders in up to 16.7 million custom colors. Objects can be positioned precisely and linked, layered, floated and resized as needed. Table generation tools that allow up to three levels of column subdivision can create tables of up to 45" by 45", spanning multiple pages.

In the area of connectivity, WordStar for Windows provides auto-recognition and conversion of over 50 word processing and text file formats and 12 graphics file formats. The product provides DDE-like connectivity to DOS files, and advanced DDE support as both a client and server to other Windows applications. Novell Netware, 3Com 3+Open, 3Com 3+Share, IBM PC LAN, Microsoft Networks and Banyan VINES are supported.

Graphics can be created and imported easily, and cropped, scaled, grouped, ungrouped, aligned and rotated in one degree increments. Imported object-oriented graphics can be edited using a variety of drawing tools based on Micrografx Designer 3.1. The product supports DRW, TIFF, BMP, EPS, PIX, MacPaint, WMF, PLT, PCX and CGM formats. Also, graphics and text can be stretched and compressed vertically and horizontally. The graphics line/fill bar offers 34 fill patterns and 16 line types.

WordStar for Windows provides WordStar for Windows offers a complete Windows Help facility, along with context-sensitive Help and a complete online interactive tutorial that walks you through every major aspect of the program. The tutorial knows when you make a mistake, and guides you through the steps needed to correct it.

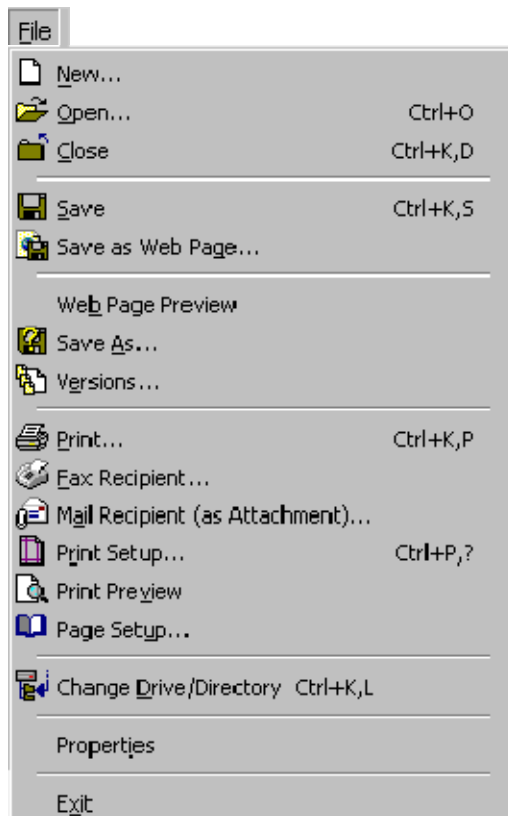## *4.5 WordStar Command Emulator Customised Menus*

This page illustrates the customisations to Word's pull-down menu system. Only menus and sub-menus that have been customised are shown. This page is necessarily graphic intensive and so may take a little while to fully load - the total graphics size is around 85Kb.

4.5.1 Menu Bar

File Edit View Insert Style Layout Utilities Table Window Help

[File][Edit][View][Insert][Style][Layout][Utilities][Table][Window][Help]

The main changes here are that the Format menu is replaced by Style and Layout menus, and that the Tools menu becomes Utilities.

File Menu

File	
New...	
Open...	Ctrl+O
Close	Ctrl+K,D
Save	Ctrl+K,S
Save as Web Page...	
Web Page Preview	
Save As...	
Versions...	
Print...	Ctrl+K,P
Fax Recipient...	
Mail Recipient (as Attachment)...	
Print Setup...	Ctrl+P,?
Print Preview	
Page Setup...	
Change Drive/Directory	Ctrl+K,L
Properties	
Exit	

The File menu gains WordStar command shortcuts

A new Change Drive / Directory item

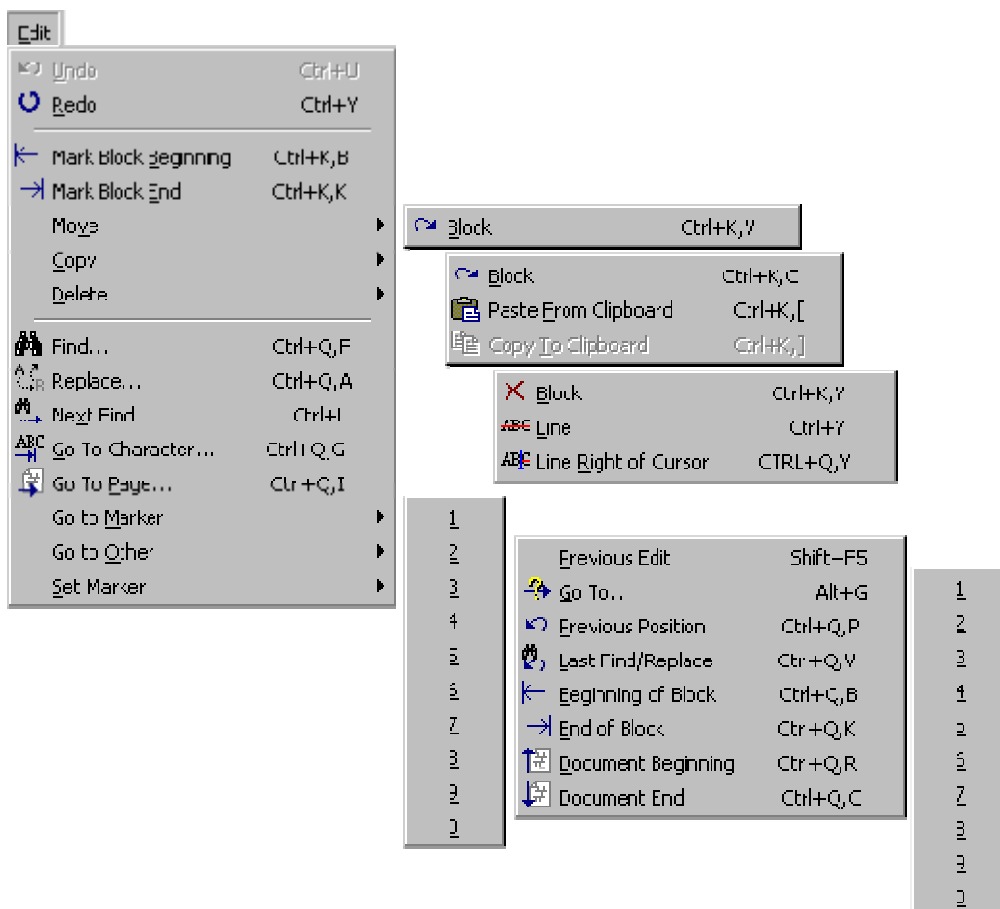New icons for some menu items

4.5.2 Edit Menu

The Edit menu is extensively changed and has several
new sub-menus added.
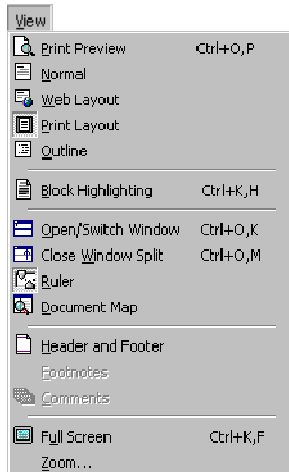
It gains WordStar's Block marking commands.

Copy and Cut are changed to WordStar's more
comprehensive versions.

Block Move is added.

Find, Replace, and GoTo options are all brought onto the
menu from various dialog boxes. These are supplimented
by WordStar's additional Block and Marker (Bookmark)
commands.

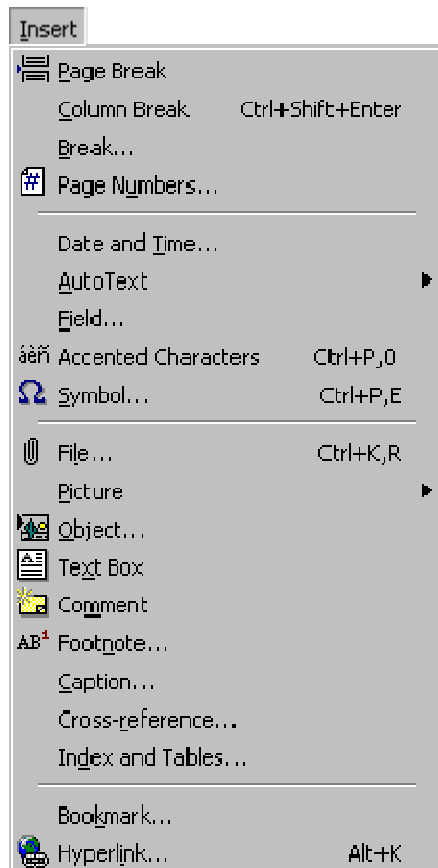### 4.5.3 View Menu

The View menu gets a Print Preview

A new Block Highlighting item

A new set of WordStar window control items (duplicated on the Window menu)

New icons for some menu items

Removal of the Toolbars item

4.5.4 Insert Menu

The Insert menu introduces several small changes to the Break items (mainly brought onto the menu from dialog boxes)

A new Accented Characters item

WordStar command shortcuts have been added
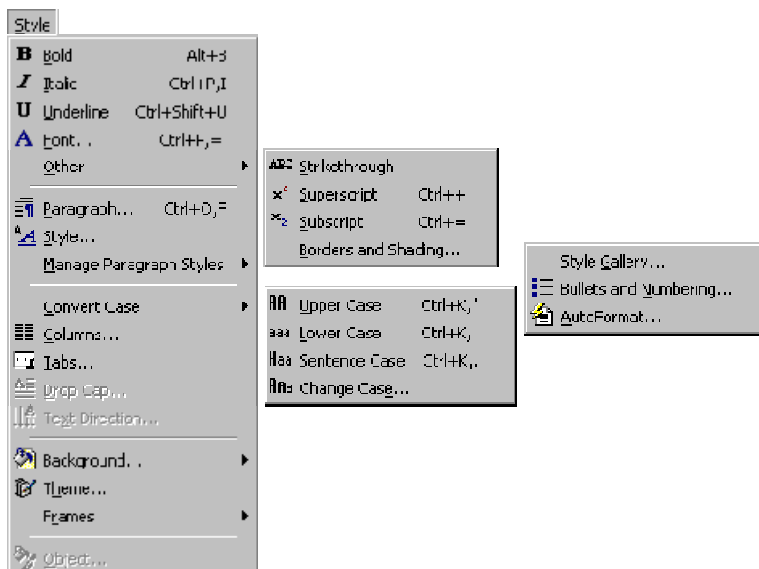
New icons for some menu items

4.5.5 Style Menu (New)

The new Style menu adds several items from Word's Format menu, which has been removed. These items are, in the main, brought onto the main menu from various dialog boxes thus allowing quicker access.

Several completely new items have been added.

Several new icons are provided.

The sub-menus that aren't shown are unchanged.
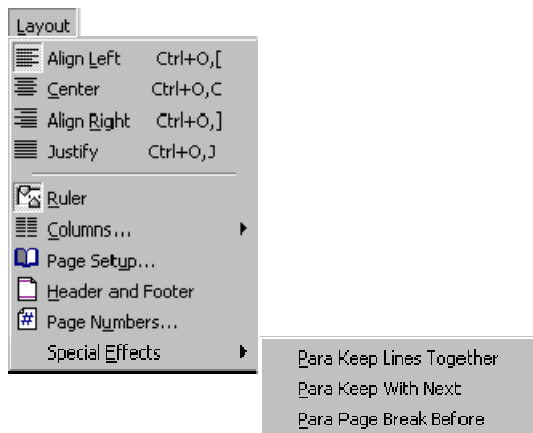

4.5.6 Layout Menu (New)

The new Layout menu takes some of the items from the removed Format menu (the others are covered on the new Style menu).

Other items come from dialogs.

There are also additional icons provided.

```
Layout
≣  Align Left      Ctrl+O,[
≣  Center          Ctrl+O,C
≣  Align Right     Ctrl+O,]
≣  Justify         Ctrl+O,J
──────────────────────────
⌦  Ruler
≣  Columns...                    ▶
📖 Page Setup...
📄 Header and Footer
#  Page Numbers...
   Special Effects               ▶     ┌──────────────────────────────┐
                                       │ Para Keep Lines Together     │
                                       │ Para Keep With Next          │
                                       │ Para Page Break Before       │
                                       └──────────────────────────────┘
```
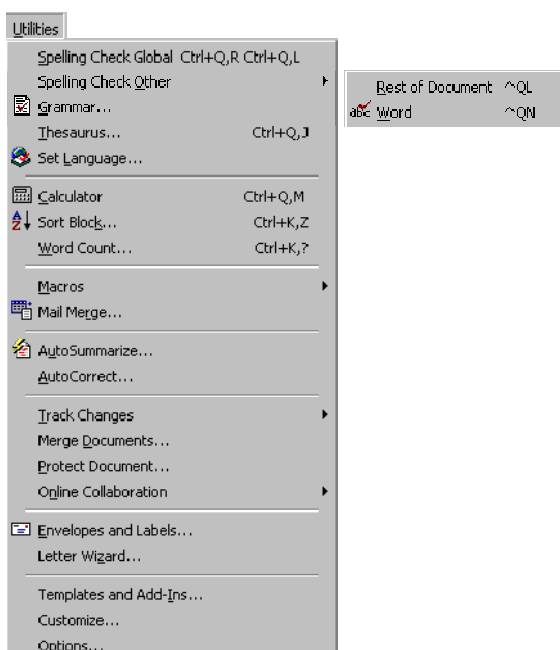
4.5.7 Utilities Menu (was Tools)

The new Utilities menu replaces Word's Tools menu.

This menu adds WordStar shortcut commands.

Spelling and Grammar options are brought onto the menu from a sub-menu.

A Calculator option is added, as is a Sort command.

```
Utilities
   Spelling Check Global  Ctrl+Q,R Ctrl+Q,L
   Spelling Check Other              ▶     ┌───────────────────────────────┐
   Grammar...                              │    Rest of Document   ^QL     │
   Thesaurus...              Ctrl+Q,J      │ ab✓ Word              ^QN     │
🌐 Set Language...                         └───────────────────────────────┘
─────────────────────────────────────
▦  Calculator               Ctrl+Q,M
A↓ Sort Block...            Ctrl+K,Z
Z
   Word Count...            Ctrl+K,?
─────────────────────────────────────
   Macros                           ▶
🖳 Mail Merge...
─────────────────────────────────────
   AutoSummarize...
   AutoCorrect...
─────────────────────────────────────
   Track Changes                    ▶
   Merge Documents...
   Protect Document...
   Online Collaboration             ▶
─────────────────────────────────────
   Envelopes and Labels...
   Letter Wizard...
─────────────────────────────────────
   Templates and Add-Ins...
   Customize...
   Options...
```

4.5.8 Table Menu

This is unchanged except for the addition of the
WordStar shortcut command for sorting.

4.5.9 Window Menu
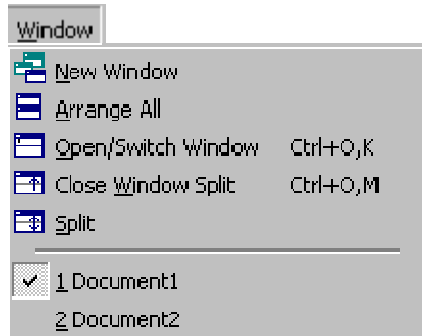
The Window menu has extra WordStar Open / Switch, and Close Split commands added.

4.5.10 Help Menu

The Help menu gains extra WordStar help sub-menu items, and a Help About option for the WordStar Add-In. These items all open dialog boxes and are shown below.
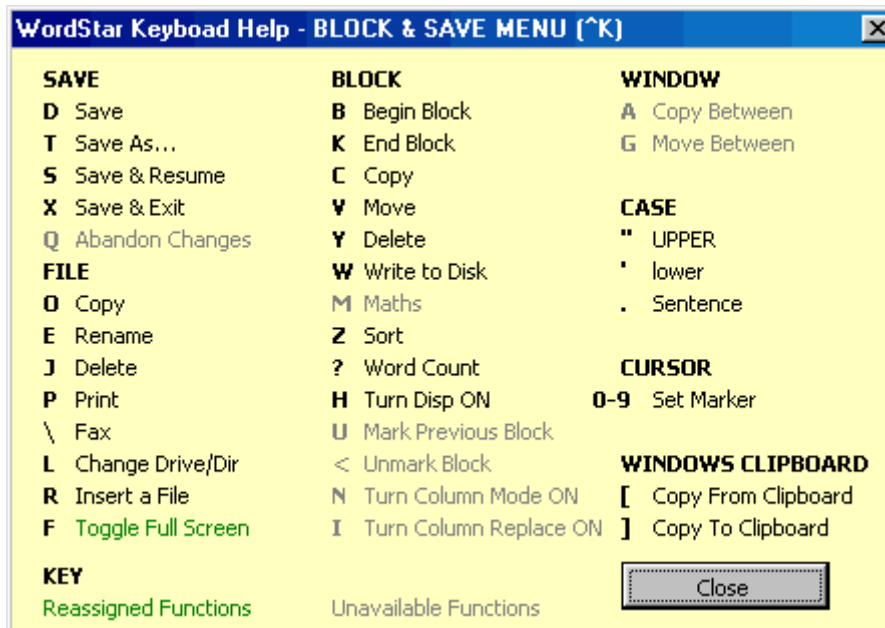
The four Help Screens are:

- Block Commands (^K)
- On-Screen Commands (^O)
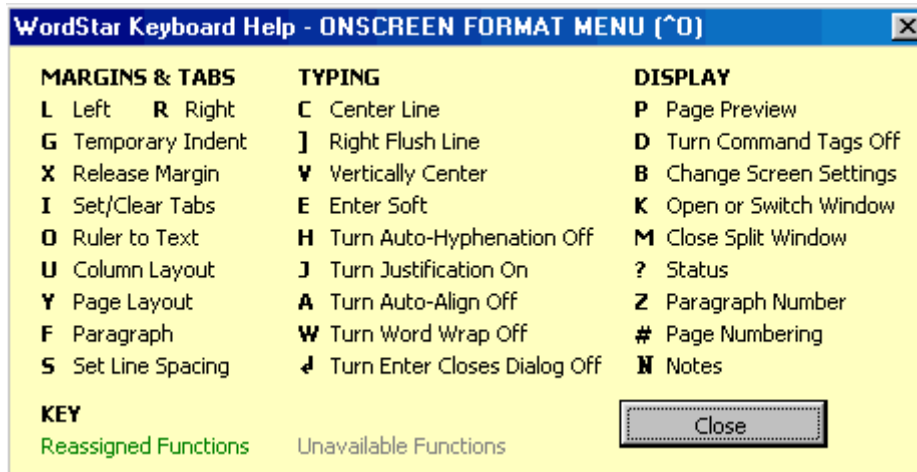- Print Commands (^P)
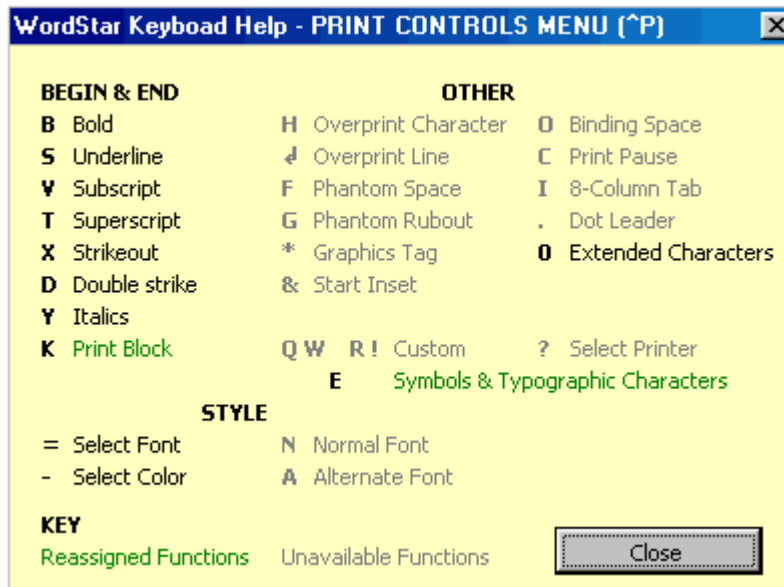- Quick Navigation Commands (^Q)
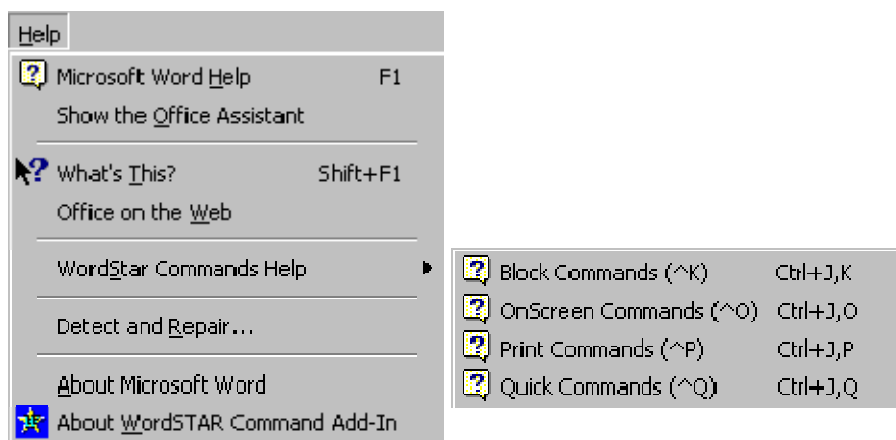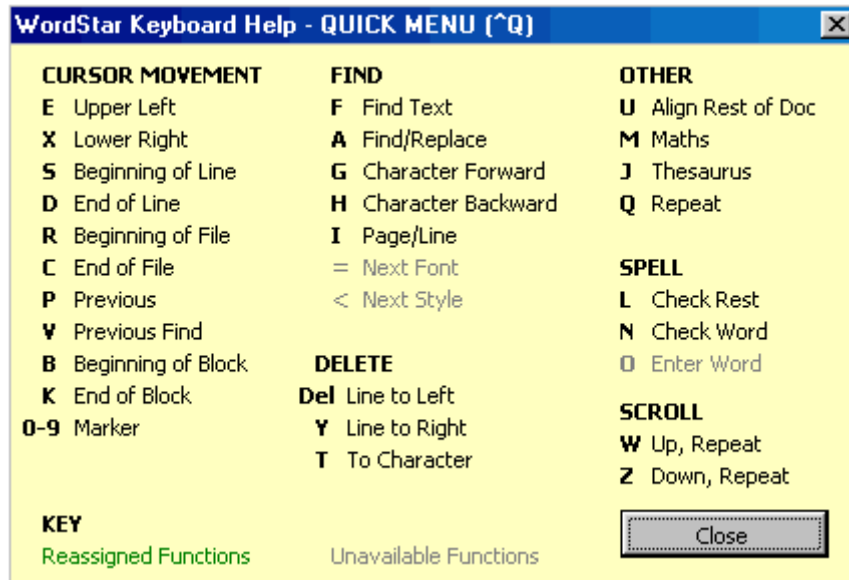
4.5.11 Help About

4.5.12 Block Commands Help

4.5.13 On Screen Commands Help

4.5.14 Print Commands Help

4.5.15 Quick Commands Help

WordStar Keyboard Help - QUICK MENU (^Q)

CURSOR MOVEMENT	FIND	OTHER
E Upper Left	**F** Find Text	**U** Align Rest of Doc
X Lower Right	**A** Find/Replace	**M** Maths
S Beginning of Line	**G** Character Forward	**J** Thesaurus
D End of Line	**H** Character Backward	**Q** Repeat
R Beginning of File	**I** Page/Line	
C End of File	**=** Next Font	**SPELL**
P Previous	**<** Next Style	**L** Check Rest
V Previous Find		**N** Check Word
B Beginning of Block	**DELETE**	**O** Enter Word
K End of Block	**Del** Line to Left	
0-9 Marker	**Y** Line to Right	**SCROLL**
	T To Character	**W** Up, Repeat
		Z Down, Repeat
KEY		
Reassigned Functions	Unavailable Functions	Close

UNIT – V

COMPUTER LANGUAGES

Objectives

In this unit describes
- Machine codes,
- Assembly codes,
- Problem solving (algorithm, flow chart)
- Elements of BASIC programming language

5.1 Computer Languages

Generations Of Programming Languages -

1. **Classification of Prog Langs**
   o Computers can only understand binary. We have already covered how this binary code (a programme) is dealt with by the processor when we covered basic machine operation and the fetch execute cycle.
   o This binary programme is known as the first generation language. When computers were first made this was your only option. Since then programming languages have become increasingly detached from this original binary code with successive generations. You are required to be able to classify different programming languages.
2. **What you need to be able to do**
   o With regards the Exam board there are 4 generations of programming language, you need to be able to identify the key characteristics of each and ideally give some examples.
3. **First Generation (Machine Code)**
   o As already mentioned the processor can only deal with programs in the form of binary (1's and 0's). With a very simple computer setup such as a musical card it is often necessary to write your

programme like this but generally it is far to tedious and hard for a human to understand.

o You should note ALL the other generations of programming languages will convert your programme into this machine code.

o Each different type of processor will have it's own form of machine code.

4. Second Generation (Assembly)

o In recognition of how hard it is to code in binary the second generation programming languages were rapidly invented. The principle is very simple, it is much easier to remember/understand a short word than a binary number. Essentially the op-code is represented by a mnemonic which in some way describes the action of the machine code (such as save, mov, load, store, add).

o Just like with machine code these instructions are specific to a particular family of processor.

5. Third Generation (most languages in use to develop software)

o Machine code is impractical and even Assembly language is very hard to use for larger programs as it is hard to track what exactly is going on. They are also very specific to individual processor families so would need to be re-written for the large number of processors out there (imagine a different copy of word for your dual core laptop to the old pentium 4 in the study).

o Third generation languages address these problems somewhat and are relatively easy to program in compared to generation 1 and 2.

o The program is written in a way which can be grouped and organised by the user with routines and sub-routines (remember ks3 control). These are then converted into machine code with a single line often representing several hundred lines of machine code. As a separate program converts your code into machine code it deals with the fact that the machine code might be for a different family of processor.

o Java, php, C, C+, C#, Fortran, Cobol, Basic, Visual Basic, etc are all examples of third generation programming languages.

6. Fourth Generation
- o Fourth generation programming languages are more aimed at problem solving. The key difference is that they are more concerned with what is to be done than the actual how. These are generally to do with accessing databases. They are probably the easiest of the four generations to read as they have been deliberately designed to reflect normal language and are often tolerant of errors.
- o Examples include Prolog, SQL, MySQL, etc
- o Because they are so far removed from first generation languages they tend to be very platform independent and willing to run on many different families of processor.

5.2 PROGRAM:

A **computer program** (often simply called a **program**) is an example of computer software that prescribes the actions ("computations") that are to be carried out by a computer. Most programs consist of a loadable set of instructions which determines how the computer will react to user input when that program is running, i.e. when the instructions are 'loaded'.

5.3 PROGRAMMIING:
creating a sequence of instructions to enable the computer to do something.

5.4 SYNTAX:

"**Syntax** is the study of the principles and processes by which sentences are constructed in particular languages. Syntactic investigation of a given language has as its goal the construction of a grammar that can be viewed as a device of some sort for producing the sentences of the language under analysis."

"**Syntax** and vocabulary are overwhelming constraints--the rules that run us. Language is using us to talk--we think we're using the language, but language is doing the thinking, we're its slavish agents."

Definition:

(1) In linguistics, the study of the rules that govern the ways in which words combine to form phrases, clauses, and sentences. Syntax is one of the major components of grammar.

(2) The arrangement of words in a sentence. Adjective: *syntactic.*

5.5 TRANSLATION:

Translation is the communication of the meaning of a source-language text by means of an equivalent target-language text.

Interpreter:

In computer science, an **interpreter** normally means a computer program that executes, i.e. *performs*, instructions written in a programming language. An *interpreter* may be a program that either

1. executes the source code directly
2. translates source code into some efficient intermediate representation (code) and immediately executes this
3. explicitly executes stored precompiled code[1] made by a compiler which is part of the interpreter system

Perl, Python, MATLAB, and Ruby are examples of type 2, while UCSD Pascal and Java are type 3: Source programs are compiled ahead of time and stored as machine independent code, which is then linked at run-time and executed by an interpreter and/or compiler (for JIT systems). Some systems, such as Smalltalk, BASIC and others, may also combine 2 and 3.

While interpretation and compilation are the two principal means by which programming languages are implemented, these are not fully distinct categories, one of the reasons being that most interpreting systems also perform some translation work, just like compilers. The terms "interpreted language" or "compiled language" merely mean that the canonical implementation of that language is an interpreter or a compiler;

a high level language is basically an abstraction which is (ideally) independent of particular implementations.

Compiler:

A **compiler** is a computer program (or set of programs) that transforms source code written in a programming language (the *source language*) into another computer language (the *target language*, often having a binary form known as *object code*). The most common reason for wanting to transform source code is to create an executable program.

The name "compiler" is primarily used for programs that translate source code from a high-level programming language to a lower level language (e.g., assembly language or machine code). If the compiled program can only run on a computer whose CPU or operating system is different from the one on which the compiler runs the compiler is known as a cross-compiler. A program that translates from a low level language to a higher level one is a *decompiler*. A program that translates between high-level languages is usually called a *language translator*, *source to source translator*, or *language converter*. A *language rewriter* is usually a program that translates the form of expressions without a change of language.

A compiler is likely to perform many or all of the following operations: lexical analysis, preprocessing, parsing, semantic analysis, code generation, and code optimization.

Program faults caused by incorrect compiler behavior can be very difficult to track down and work around and compiler implementors invest a lot of time ensuring the correctness of their software.

The term compiler-compiler is sometimes used to refer to a parser generator, a tool often used to help create the lexer and parser.

5.6 Programming language

A "**programming language**" is a language designed to describe a set of consecutive actions to be executed by a computer. A programming language is therefore a practical way for us (humans) to give instructions to a computer.

On the other hand, the term "natural language" defines a means of communication shared by a group of individuals (for example: English or French)

Languages that computers use to communicate with each other, have nothing to do with programming languages, they are referred to as communication protocols, these are two very different concepts. A programming language is very strict:

EACH instruction corresponds to ONE
processor action.

The language used by the processor is called **machine code**. The code that reaches the processor consists of a series of 0s and 1s known as (binary data).

Machine code is therefore difficult for humans to understand, which is why intermediary languages, which can be understood by humans, have been developed. The code written in this type of language is transformed into machine code so that the processor can process it.

The assembler was the first programming language ever used. This is very similar to machine code but can be understood by developers. Nonetheless, such a language is so similar to machine code that it strictly depends on the type of processor used (each processor type may have its own machine code). Thus a program developed for one machine may not be *ported* to another type of machine. The term "**portability**" describes the ability to use a software program on different types of machines. A software program written in assembler code, may sometimes have to be completely rewritten to work on another type of computer!

A programming language has therefore several advantages:

- it is much more understandable than machine code;

- it allows greater portability, i.e. can be easily adapted to run on different types of computers.

Imperative and functional programming languages

Programming languages are generally divided into two major groups according to how their commands are processed:

- imperative languages;
- functional languages.

Imperative programming language

An imperative language programs using a series of commands, grouped into blocks and comprising of conditional statements which allow the program to return to a block of commands if the condition is met. These were the first programming languages in use, even today many modern languages still use this principle.

Structured imperative languages suffer, however, from lack of flexibility due to the sequentiality of instructions.

Functional programming language

A **functional programming language** (often called *procedural language*) is a language which creates programs using functions, returning to a new output state and receiving as input the result of other functions. When a function invokes itself, we refer to this as recursion.

Interpretation and compilation

Programming languages may be roughly divided into two categories:

- **interpreted languages**
- **compiled languages**

Interpreted language

A programming language is by definition different to machine code This must therefore be translated so that the processor

can understand the code. A program written in an interpreted language requires an extra program (the interpreter) which translates the programs commands as needed.

Compiled language

A program written in a "**compiled**" language is translated by an additional program called a **compiler** which in turn creates a new stand-alone file which does not require any other program to execute itself, such a file is called an **executable**.

A program written in a compiled language has the advantage of not requiring an additional program to run it once it has been compiled. Furthermore, as the translation only needs to be done once, at compilation it executes much faster. However, it is not as flexible as a program written in an interpreted language, as each modification of the source file (the file understandable by humans: the file to be compiled) means that the program must be recompiled for the changes to take effect.

On the other hand, a compiled program has the advantage of guaranteeing the security of the source code. In effect, interpreted language, being a directly legible language, means that anyone can find out the secrets of a program and thus copy or even modified the program. There is therefore a risk of copyright violation. On the other hand, certain secure applications need code confidentiality to avoid illegal copying (bank transactions, on-line payments, secure communications...).

Intermediary languages

Some languages belong to both categories (LISP, Java, Python...) as the program written in these languages may in certain cases undergo an intermediary compilation phase, into a file written in a language different to the source file and non-executable (requiring an interpreter). Java applets, small programs, often loaded in web pages, are compiled files, which can only be executed from within a web browser (these are files with the .class extension).

Some examples of widely used languages

Here is a non-exhaustive list of current programming languages:

Language	Main application area	Compiled/interpreted
ADA	Real-time	Compiled language
BASIC	Programming for educational purposes	Interpreted language
C	System programming	Compiled language
C++	System object programming	Compiled language
Cobol	Management	Compiled language
Fortran	Calculation	Compiled language
Java	Internet oriented programming	Intermediary language
MATLAB	Mathematical calculations	Interpreted language
Mathematica	Mathematical calculations	Interpreted language
LISP	Artificial intelligence	Intermediary language
Pascal	Education	Compiled language
PHP	Dynamic website development	Interpreted language
Prolog	Artificial intelligence	Interpreted language
Perl	Processing character strings	Interpreted language

5.7 ALGORITHM-FLOW CHART:

Algorithms, Flow Charts, and Problem Solving

Programs used in this lecture:
program02.f90 Range of a projectile.

In the Lecture

This lecture introduces ideas about problem solving with computers; we make use of flowcharts, algorithms, and consider the importance of defining a problem sufficiently and what assumptions we may make during the solution.

Consider the calculation of the range of a projectile:

We have a simple analytical solution from *motion under the action of constant acceleration*:

Range = Speed² x Sine(2xAngle) / g
where *Speed* is the initial speed of the projectile, and *Angle* is the angle of elevation at launch.
A solution might look something like program02.f90, the key section is below:

```
REAL :: g = 9.81
REAL :: Speed, Angle, Range
PRINT *, "Input the speed (m/s), and angle of elevation (degrees)"
READ *, Speed, Angle
Range = Speed**2 * SIN(2*Angle/57.29578) / g
PRINT *, "Projectile range = ", Range, " m."
```

But maybe it is not as simple as this: Was the problem defined clearly? What assumptions did we make in the solution, are they valid?

This will be discussed in more detail in the lecture; some notes are given below.

Problem Solving
Problem solving with computers involves several steps:

1. Clearly define the problem.
2. Analyse the problem and formulate a method to solve it (see also .validation.).

3. Describe the solution in the form of an algorithm.
4. Draw a flowchart of the algorithm.
5. Write the computer program.
6. Compile and run the program (debugging).
7. Test the program (debugging) (see also .verification.).
8. Interpretation of results.

Verification and Validation

If the program has an important application, for example to calculate student grades or guide a rocket, then it is important to test the program to make sure it does what the programmer intends it to do and that it is actually a valid solution to the problem. The tests are commonly divided as follows:
Verification - verify that program does what you intended it to do; steps 7(8) above attempt to do this.

Validation - does the program actual solve the original problem i.e. is it valid? This goes back to steps 1 and 2 - if you get these steps wrong then your program is not a valid solution.

Algorithms
The algorithm gives a step-by-step description of the solution. This may be written in a non-formal language and structure. An example is given in the lecture.

Flow Charts

A flow chart gives the logical flow of the solution in a diagrammatic form, and provides a plan from which the computer program can be written. The logical flow of an algorithm can be seen by tracing through the flowchart. Some standard symbols used in the formation of flow charts are given below.

An oval is used to indicate the beginning
or end of an algorithm.

A parallelogram indicates the input
or output of information.

A rectangle indicates a computation, with the
result of the computation assigned to a variable.

A diamond indicates a point where a decision
is made.

A hexagon indicates the beginning of the
repetition structure.

A double lined rectangle is used at a point
where a subprogram is used.

An arrow indicates the direction of flow of the algorithm.
Circles with arrows connect the flowchart between pages.

An example flowchart is given in the lecture.

☐ **Fortran program structure**
The basic program structure used in this course is:

```
PROGRAM A_Program_Name
! Comment explaining the purpose of the program

 IMPLICIT NONE
 REAL :: Var1, Var2      a declaration part...
 INTEGER :: Var3, Var4

 Var1 = 0.              an initialisation part ...
 Var2 = 0.
 Var3 = 0.
 Var4 = 0.
```

> *... some operations ...*
>
> PRINT *, *some output*
>
> END PROGRAM *A_Program_Name*

☐ **Data Types and Constants**

There are five basic data types: REAL, INTEGER, COMPLEX, CHARACTER, LOGICAL.

Most commonly used in numerical analysis are type REAL and type INTEGER. Example: program03.f90

Named constants are declared with the PARAMETER attribute. Such data is assigned a value at declaration and cannot be changed; for example: program04.f90. In this program it is not necessary to give identifier FtoM the PARAMETER attribute; but, as we do not intend the value of FtoM to change during program execution it is good programming practice to declare it as a constant.

☐ **Arithmetic operators**

The symbols ( ) ** * / + - are used in arithmetic operations. They represent parenthesis, exponentiation, multiplication, division, addition and subtraction, respectively.

If integers and reals are mixed in arithmetic operations the result is a real. Operations involving only reals yield a type real result. Operations involving only integers yield a type integer result. Be especially careful when dividing two integers - the result is truncated to an integer; for example, 3/2 = 1, and 1/2 = 0. See program05.f90. It is advisable to avoid integer division, get into the habit of using the following forms in operations:

1. Real constants should always be written with a decimal point
   e.g., instead of X=A/<u>5</u>

   write X=A/<u>5.</u>.

2. Integer identifiers should be converted to real type in operations
   e.g., instead of X=A/<u>N</u>

write X=A/<u>REAL(N)</u>.
If A is type real then both these case are not necessary - but it is good programming practice to make a habit of using these forms (write explicitly what you mean).

Arithmetic operations follow the normal priority; proceeding left to right, with exponentiation performed first, followed by multiplication and division, and finally addition and subtraction. Parenthesis can be used to control priority.

Long arithmetic expressions such as
Z = ((X**2 + 2.*X + 3.) / (5.+Y)**0.5 - ((15. - 77.*X**3) / Y**1.5)**0.5) / (X**2 - 4.*X*Y - 5.*X**-0.8)
Can be written more clearly (and carefully) by breaking them down into composite parts;
see program06.f90.

☐ **Declaring and Initialising Variables**
Again, it is good programming practice to get into the habit of:

1. Always use IMPLICIT NONE. This forces you to declare all variable you use and so avoids the potential of using a misspelled identifier.
2. Always initialise variables; an uninitialised variable will take, depending on the particular compiler or compiler options you are using, a value which is either zero or an unpredictable value. You can remove such uncertainties by initialising all variables you declare. For example:

INTEGER :: K REAL :: S K = 0 S = 0. . . .	or	INTEGER :: K = 0 REAL :: S = 0. . . .

5.8 BASIC PROGRAMMING LANGUAGE

5.8.1 HIERARCHY OF OPERATIONS

IF A=100 OR B=100 THEN 20 (if A or B is 100 then the result is true)

A=64 OR 32: PRINT A   (A = 96)

IF NOT X<Y THEN 30   (if X>=Y the result is true)

X= NOT 96   (result is -97 (two's complement))

HIERARCHY OF OPERATIONS

All expressions perform the different types of operations according to a fixed hierarchy. In other words, certain operations are performed be- fore other operations. The normal order of operations can be modified by enclosing two or more operands within parentheses ( ), creating a "subexpression." The parts of an expression enclosed in parentheses will be reduced to a single value before working on parts outside the parentheses.

When you use parentheses in expressions, they must be paired so that you always have an equal number of left and right parentheses. Otherwise, the BASIC error message **?SYNTAX ERROR** will appear.

Expressions which have operands inside parentheses may themselves be enclosed in parentheses, forming complex expressions of multiple levels. This is called nesting. Parentheses can be nested in expressions to a maximum depth of ten levels-ten matching sets of parentheses. The inner-most expression has its operations performed first. Some examples of expressions are:

$$A+B$$
$$C^\wedge(D+E)/2$$
$$((X-C^\wedge(D+E)/2)*10)+1$$
$$GG\$>HH\$$$
$$JJ\$+"MORE"$$
$$K\%=1 \text{ AND } M<>X$$
$$K\%=2 \text{ OR } (A=B \text{ AND } M<X)$$
$$NOT (D=E)$$

The BASIC Interpreter will normally perform operations on expressions by performing arithmetic operations first, then relational operations, and logical operations lost. Both arithmetic and logical operators have an order of precedence (or hierarchy of operations) within themselves. On the other hand, relational operators do not have an order of precedence and will be performed as the expression is evaluated from left to right.

If all remaining operators in an expression have the same level of precedence then operations happen from left to right. When performing operations on expressions within parentheses, the normal order of precedence is maintained. The hierarchy of arithmetic and logical operations is shown in Table 1-3 from first to last in order of precedence.

Table 1-3. Hierarchy of Operations Performed on Expressions

OPERATOR	DESCRIPTION	EXAMPLE
^	Exponentiation	BASE ^ EXP
-	Negation (Unary Minus)	-A
*	Multiplication	AB * CD
/	Division	EF / GH
+	Addition	CNT + 2
-	Subtraction	JK - PQ
> = <	Relational Operations	A <= B
NOT	Logical NOT (Integer Two's Complement)	NOT K%
AND	Logical AND	JK AND 128
OR	Logical OR	PQ OR 15

5.9 STRING OPERATIONS

Strings are compared using the same relational operators (=, <>, <=, >=, <, >) that are used for comparing numbers. String comparisons are mode by taking one character at a time (left-to-right) from each string and evaluating each character code position from the PET/ CBM character set. If the character codes are the same, the characters are equal. If the character codes differ, the character with the lower code number is lower in the character set. The comparison stops when the end of either string is reached. All other things being equal, the

shorter string is considered less than the longer string. Leading or trailing blanks ARE significant.

Regardless of the data types, at the end of all comparisons you get an integer result. This is true even if both operands are strings. Because of this a comparison of two string operands can be used as an operand in performing calculations. The result will be - 1 or 0 (true or false) and can be used as anything but a divisor since division by zero is illegal.

5.9.1 STRING EXPRESSIONS

Expressions are treated as if an implied "<>0" follows them. This means that if an expression is true then the next BASIC statements on. the same program line are executed. If the expression is false the rest of the line is ignored and the next line in the program is executed.

Just as with numbers, you can also perform operations on string variables. The only string arithmetic operator recognized by CBM BASIC is the plus sign (+) which is used to perform concatenation of strings. When strings are concatenated, the string on the right of the plus sign is appended to the string on the left, forming a third string as a result. The result can be printed immediately, used in a comparison, or assigned to a variable name. If a string data item is compared with (or set equal to) a numeric item, or vice-versa, the BASIC error message **?TYPE MISMATCH** will occur. Some examples of string expressions and concatenation are:

```
10 A$="FILE": B$="NAME"
20 NAM$=A$+B$                  (gives the string: FILENAME)
30 RES$="NEW "+A$+B$           (gives the string: NEW FILENAME)
       ^
       |       +----------------+
     +-------+ Note space here.|
             +----------------+
```

It is important to differentiate between the two types of variables:

1. NUMERIC
2. STRING

You probably remember from the earlier sections that numeric variables are used to store number values such as 1, 100, 4000, etc. A numeric variable can be a single letter (A), any two letters (AB), a letter and a number (AI), or two letters and a number (AB1). You can save memory space by using shorter variables. Another helpful hint is to use letters and numbers for different categories in the same program (AI, A2, A3). Also, if you want whole numbers for an answer instead of numbers with decimal points, all you have to do is put a percent sign (%) at the end of your variable name (AB%, AI%, etc.) Now let's look at a few examples that use different types of variables and expressions with the INPUT statement.

```
10 PRINT"ENTER A NUMBER": INPUT A
20 PRINT A

10 PRINT"ENTER A WORD": INPUT A$
20 PRINT A$

10 PRINT"ENTER A NUMBER": INPUT A
20 PRINT A "TIMES 5 EQUALS" A*5
```

5.10 Assigning a value:

- LET Command - assigns a value (which may be the result of an expression) to a variable.

an expression in an assignment:

LET X = 5 + 3

- DATA Statement - holds a list of values which are assigned sequentially using the READ Command.

5.11 Reading Input:

INPUT Statement - asks the user to enter the value of a variable. The statement may include a prompt message.

INPUT *prompt*; *variable*

The INPUT command prompts the user for input. It assigns the user's input to the variable. For example:

INPUT "Please enter your age"; A

PRINT "You are " + A + " years old."

5.12 Printing output:

PRINT *expr*

Print output to the output area. This can be as simple as:

100 PRINT "Hello world!"

PRINT *expr*;

Print output to the output area. Note the semi colon. It indicates that we want to continue printing more on the same line.   For   example:

PRINT "Hello ";

PRINT "world!"

5.13 BRANCHING AND LOOPING

IF *expr* THEN *command*

The IF command embeds a second command that is only executed if the first expression (called the conditional) is true. For example:

110 IF 7 * 8 = 56 THEN PRINT "Yes"

will print "Yes", but:

110 IF 7 > 8 THEN PRINT "Yes"

will not print anything.

IF *expr* THEN *command* ELSE *command*

The IF command with both a THEN and an ELSE. If the conditional is true then the command following THEN is

executed, otherwise the command following ELSE is executed. For example:

110 IF A > 0 THEN PRINT "Yes" ELSE PRINT "No"

GOTO *line*

Ah, the trusty old GOTO command. It simply means what it says: goto a new line in the program. It is often combined with the IF command. For example to avoid division by zero:

100 IF A = 0 THEN GOTO 120

110 LET A = 1 / A

120 PRINT A

In large computer programs a command like GOTO makes life hard for programmers. In fact it has given classic BASIC quite a bad reputation. But for small programs like the ones we are writing it is just fine. And it is easy to understand too.

FOR *I* = *expr* TO *expr*

The FOR command is the classic BASIC loop command. You use it if you want to do the same thing may times over. Here's an example:

100 FOR I = 1 TO 10

110 PRINT I

120 NEXT I

Try it! The program loops back to the FOR command ten times, each time incrementing the *loop variable* (I) by one. The NEXT command is where the program jumps back. Note that the loop variable is an argument to the NEXT command. This is so the program knows which FOR loop (in case the program has more than one).

FOR *I* = *expr* TO *expr* STEP *expr*

The FOR loop with a step other than one. For example you may want to loop over only odd numbers like this:

```
100 FOR I = 1 TO 9 STEP 2
```

```
110 PRINT I
```

```
120 NEXT I
```

GOSUB *line*

The classic BASIC subroutine. The command GOSUB *line* makes the program jump to a new line in the program like the GOTO command, but there is an important difference. The program remembers from where it jumped, and when it encounters a RETURN command, it comes back to where it started. This way you can write reusable parts of your program (called subroutines). Here is an example:

```
100 LET A = 17
```

```
110 GOSUB 1000
```

```
120 LET A = 50
```

```
130 GOSUB 1000
```

```
140 END
```

```
1000 PRINT A;
```

```
1010 PRINT " is an ";
```

```
1020 IF A % 2 == 0 THEN PRINT "even"; ELSE PRINT "odd";
```

```
1030 PRINT " number."
```

```
1040 RETURN
```

END

The END command simply stops the program. You saw the use of the END command in the GOSUB example.

INPUT *prompt*; *variable*

The INPUT command prompts the user for input. It assigns the user's input to the variable. For example:

```
100 INPUT "Please enter your age"; A
```

110 PRINT "You are " + A + " years old."

PAUSE *duration*

The pause command pauses the program for a number of milliseconds. For example,
the following example pauses for one second:

10 PAUSE 1000
PLOT *X, Y*
Plot a black point on the canvas. The point on the lower left on the canvas is 0,0. You can change the size of the canvas on the View menu, and when you create a new project you can also select the canvas size. The canvas is not exactly high resolution, but you'll be surprised how much fun you can have with it! Take a look at the welcome project for an example of how to draw circles using the trigonometric functions.
PLOT *X, Y, color*

Plot in a given color. Some available colors are: "red", "pink", "green", "blue", "yellow", "magenta", "cyan", "orange", "black", "white",
"gray". Try this for example:

100 PLOT 5, 5, "cyan"

The full set of available colors depends on your browser.
WARNING: If you accidentally try to plot a color that doesn't exist, you will
get a rather cryptic error (it could look like this: [Object error]) or worse,
the program just stops without any message at all.
REM *remark*

A remark. Remarks (aka comments) don't have any effect on the program when it runs, but they can make the program much easier to read and understand. It is good practice to sprinkle REM commands in the code explaining the meaning of variables and how the program works. Example:

110 REM The variable A holds the user's age

CLS
Clear the output area from all text and the canvas from all graphics. No arguments, just:
100 CLS
CLT
Clear only the output text area. No arguments, just:

100 CLT
CLC
Clear only the canvas. No arguments, just:

100 CLC

5.14 Writing and running simple programs in basic
Unstructured BASIC
New BASIC programmers on a home computer might start with a simple program similar to the Hello world program made famous by Kernighan and Ritchie. This generally involves simple use of the language's PRINT statement to display the message (such as the programmer's name) to the screen. Often an infinite loop was used to fill the display with the message. Most first generation BASIC languages such as MSX BASIC and GW-BASIC supported simple data types, loop cycles and arrays. The following example is written for GW-BASIC, but will work in most versions of BASIC with minimal changes:

```
10 INPUT "What is your name: ", U$
20 PRINT "Hello "; U$
30 INPUT "How many stars do you want: ", N
40 S$ = ""
50 FOR I = 1 TO N
60 S$ = S$ + "*"
70 NEXT I
80 PRINT S$
90 INPUT "Do you want more stars? ", A$
100 IF LEN(A$) = 0 THEN GOTO 90
110 A$ = LEFT$(A$, 1)
120 IF A$ = "Y" OR A$ = "y" THEN GOTO 30
130 PRINT "Goodbye "; U$
140  END
```

Structured BASIC

Second generation BASICs (for example QuickBASIC and PowerBASIC) introduced a number of features into the language, primarily related to structured and procedure-oriented programming. Usually, line numbering is omitted from

the language and replaced with labels (for GOTO) and procedures to encourage easier and more flexible design.[12]

```
INPUT "What is your name: ", UserName$
PRINT "Hello "; UserName$
DO
  INPUT "How many stars do you want: ", NumStars
  Stars$ = STRING$(NumStars, "*")
  PRINT Stars$
  DO
    INPUT "Do you want more stars? ", Answer$
  LOOP UNTIL Answer$ <> ""
  Answer$ = LEFT$(Answer$, 1)
LOOP WHILE UCASE$(Answer$) = "Y"
PRINT "Goodbye "; UserName$
```