



**MADHYA PRADESH BHOJ(OPEN) UNIVERSITY BHOPAL**

## **Computer Application in Management**

**MBA-STEM-104**

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- 9.14 Network Operating Systems
- 9.15 Network Management
- 9.16 LAN in Business Environments
- 9.17 Summary
- 9.18 Keywords
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## **Further Readings**

### UNIT-1

- Computer Software Applications in Chemistry; Peter C. Jurs; Wiley-IEEE
- Information Technology for 'O' Level; Manoj Kumar, M. Shamir Bhudookan; Editions De L'Ocean Indien

### UNIT-2

- Computer Aided Management (Using MS-Office 2003 Tools); Sanjeev Gupta, Shameena Gupta; Excel Books
- Information Technology for 'O' Level; Manoj Kumar, M. Shamir Bhudookan; Editions De L'Ocean Indien

### UNIT-3

- Data Processing for Business and Management; Robert J Thierauf; John Wiley & Sons
- Business Systems; Ramesh Bangia; Laxmi Publication

### UNIT-4

- A Practical Handbook for Software Development; N.D.Birrell, M.A.Ould; Cambridge University Press
- An Integrated Approach to Software Engineering; Pankaj Jalote; Springer

### UNIT-5

- Computer Aided Management (Using MS-Office 2003 Tools); Sanjeev Gupta, Shameena Gupta; Excel Books
- Information Technology for 'O' Level; Manoj Kumar, M. Shamir Bhudookan; Editions De L'Ocean Indien

### UNIT-6

- Programming Concepts - A Brief Tutorial for new Programmers; Richard Holowczak; <http://cisnet.baruch.cuny.edu/holowczak/classes/programming/>
- Information Technology for 'O' Level; Manoj Kumar, M. Shamir Bhudookan; Editions De L'Ocean Indien

### UNIT-7

- Concepts, Techniques, and Models of Computer Programming; Peter Van Roy and Seif Haridi; MIT Press
- Programming Concepts - A Brief Tutorial for new Programmers; Richard Holowczak; <http://cisnet.baruch.cuny.edu/holowczak/classes/programming/>

### UNIT-8

- MS-Office; K.K.Shahjahan; Excel Books
- Computer Aided Management (Using MS-Office 2003 Tools); Sanjeev Gupta, Shameena Gupta; Excel Books

### UNIT-9

- Data Communications Principles; Richard D Gitlin, Jeremiah F Hayes, Stephen B Weinstein; Springer
- Data and Computer Communications; William Stallings; Prentice Hall
- Data Communications and Networking; Behrouz A. Forouzan, DeAnza College; McGraw-Hills

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# UNIT

# 1

## COMPUTER – AN INTRODUCTION

### L E A R N I N G O B J E C T I V E S

After studying this unit, you should be able to understand:

- Define a computer and its various parts.
- Classify computer according to purpose, technology used, size and capacity.
- Describe various characteristics of computer.
- Describe various Input and output devices.
- Understand the concept of Office Automation.
- Describe various components of a computer system.
- Describe various generations of the computer.

### U N I T S T R U C T U R E

- 1.1 Introduction
- 1.2 What is a Computer?
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## 1.1 INTRODUCTION

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Nothing has revolutionized modern life the way rapid progress of computers has. For better or worse, computers have infiltrated every aspect of our society. Today, computers do much more than simply compute. They make airline or railway reservation and teach on-line; some super store scanners calculate our grocery bills while keeping the store inventory; computerised telephone switching has greatly improved the telephone system and Automatic Teller Machines (ATM) let us conduct banking transactions from virtually anywhere in the world.

As computers become more widespread in the workplace, new ways to harness their potential developed. As smaller computers become more powerful, they could be linked together, or networked, to share memory space, software, and information and communicate with each other.

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## 1.2 WHAT IS A COMPUTER?

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In a laymans language, a computer is a fast calculating device that can perform arithmetic operations. Although the computer was originally invented mainly for doing high speed and accurate calculations, it is not just a calculating device. The computer can perform any kind of work involving arithmetic and logical operations on data. It gets the data through an input device, processes it as per the instructions given and gives the information as an output. We can define computer as follows:

### Definition

A computer is a fast electronic device that processes the input data according to the instructions given by the programmer/user and provides the desired information as an output.

The terminology used in the above definition is summarized in Table 1.1.

Table 1.1: Terminology Used in Definition of Computer.

Term	Meaning
Data	A set of basic facts and entities which itself has no meaning
Information	Data which has some meaning or value
Instruction	A statement given to computer to perform a task
Input	Data and instructions given to computer
Process	Manipulation of data
Output	Information obtained after processing of data

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## 1.3 IMPORTANCE OF COMPUTERS (MAN VS. MACHINE)

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Computers play a vital role for processing of data in an organization. Computer: help in processing the volumes of data efficiently and accurately within a short time. A computer has the following characteristics which make it so important for an organization:

1. **Fast:** A computer is so fast that it can perform the given task (arithmetical or logical) in few seconds as compared to man who can spend many months for doing the same task. A computer can process millions of instructions per second.
2. **Accurate:** While doing calculations, a computer is more accurate than man can make mistakes in calculations but a computer does not make mistakes, if it is provided accurate instructions.
3. **Diligence:** A computer does not suffer from the human traits of tiredness and boredom. Man will be tired and bored while doing millions of calculations but a computer, being a machine, does this job very efficiently and without any tiredness and boredom.
4. **High Memory:** A computer has much more memory or storage capacity than human being. It can store millions of data and instructions, which can be retrieved and recalled even after a number of years. This is not possible in case of human brain.
5. **No Intelligence:** A computer is a machine and obviously has no intelligence of its own. Each and every instruction must be given to the computer for doing a task. Man has an intelligence and it is the man who invented computer and gives it all the instructions and logic to work. A computer cannot take decisions on its own and it is the main drawback of computer.

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## 1.4 CLASSIFICATION OF COMPUTERS

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The classification of computers is based on the following three criteria:

- (a) According to Purpose
- (b) According to Technology used
- (c) According to size and Capacity



Based on these criteria, the classification of computers is illustrated in Figure 1.1 and discussed below:

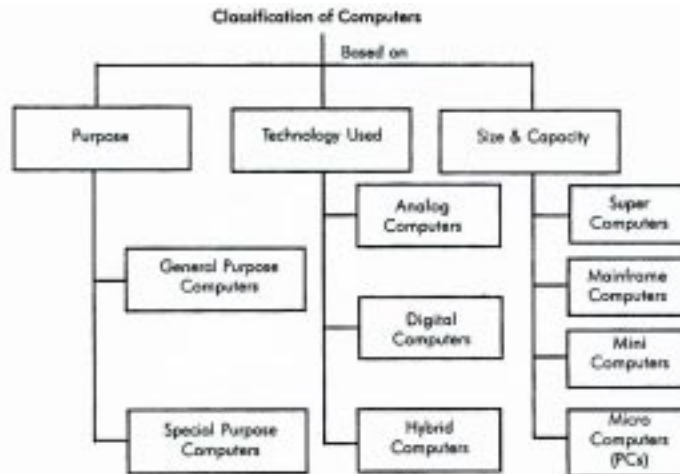


Figure 1.1 : Classification of Computers Based on Different Criteria

### According to Purpose

According to the utilization of computer for different uses, computers are of following two types:

1. **General Purpose Computers:** Computers that follow instructions for general requirements such as sales analysis, financial accounting, invoicing, inventory, management information etc. are called General Purpose Computers. Almost all computers used in offices for commercial, educational and other applications are general purpose computers.
2. **Special Purpose Computers:** Computers designed from scratch to perform special tasks like scientific applications and research, weather forecasting, space applications, medical diagnostics etc. are called Special Purpose Computers.

### According to Technology Used

According to the technology used, computers are of following three types:

1. **Analog Computers:** Analog computers are special purpose computers that represent and store data in continuously varying physical quantities such as current, voltage or frequency. These computers are programmed for measuring physical quantities like pressure, temperature, speed etc. and to perform computations on these measurements. Analog computers are mainly used for scientific and engineering applications. Some of the examples of analog computers are given below:
  - (i) **Thermometer:** It is a simple analog computer used to measure temperature. In thermometer, the mercury moves up or down as the temperature varies.
  - (ii) **Speedometer:** Car's speedometer is another example of analog computer where the position of the needle on the dial represents the speed of the car.
2. **Digital Computers:** Digital computers are mainly general purpose computers that represent and store data in discrete quantities or numbers. In these computers, all processing is done in terms of numeric representation (Binary Digits) of data and information. Although the user enter data in decimal or character form, it is converted into binary digits (0's and 1's). Almost all the computers used nowadays are digital computers and we will discuss the detailed working and components of these computers in subsequent sections of this unit.
3. **Hybrid Computers:** Hybrid computers incorporate the technology of both analog and digital computers. These computers store and process analog signals which have been converted into discrete numbers using analog-to-digital converters. They can

also convert the digital numbers into analog signals or physical properties using digital-to-analog converters. Hybrid computers are mainly used in artificial intelligence (robotics) and computer aided manufacturing (e.g. process control).

### Student Activity 1

1. What is a computer?
2. What are the main characteristics of computer?
3. What are general purpose computers?
4. What are analog computers? Give examples.
5. What are hybrid computers?

### According to Size and Capacity

According to the size and memory/storage capacity, computers are of following four types:

1. **Supercomputer:** Supercomputer is the biggest and fastest computer, which is mainly designed for complex scientific applications. It has many CPUs (Central Processing Units - main part of computer) which operate in parallel to make it as a fastest computer. It is typically used for the following applications:

- Weather Forecasting
- Petroleum Exploration and Production
- Energy Management
- Defense
- Nuclear Energy Research
- Structural Analysis
- Electronic Design
- Real-time Animation
- Medicine

Some of the examples of supercomputers are CRAY3, CRAY-XMP-14, NEC500, P ARAM 9000 and P ARAM 10000.

2. **Mainframe Computer:** Mainframe computers are very large and fast computers but smaller and slower than supercomputers. These are used in a centralized location where many terminals (input/output devices) are connected with one CPU and thus, allow different users to share the single CPU. They have a very high memory (several hundred Megabytes) and can support thousands of users. They are mainly used for following applications:

- Railway and Airline Reservations
- Banking Applications
- Commercial Applications of Large Industries/Companies

Some of the examples of mainframe computers are IBM 3090, IBM 4381, IBM 4300 and IBM ES-9000.

3. **Minicomputer:** Minicomputers are medium-scale, smaller and generally slower than mainframe computers. Like mainframes, they have many terminals which are connected with one CPU and can support many users. The cost of minicomputer is very less as compared to mainframe. Therefore, it is mainly used in applications where processing can be distributed among several minicomputers rather than using a mainframe computer.

Some of the examples of minicomputers are PDP-1, IBM AS/400 and DEC Micro VAX. IBM AS/400, which is actually a midicomputer (computer with performance between a mainframe and minicomputer) is becoming very popular among minicomputers.

4. **Microcomputer:** A microcomputer is the smallest digital computer, which uses a microprocessor as its CPU. Microprocessor is a single chip (Integrated Circuit) CPU. Microcomputer is popularly called as Personal Computer (PC). It can be used both as a stand-alone machine and a terminal in a multi-user environment. Microcomputers are becoming very popular nowadays due to

very high processing power and memory. Today, a powerful microcomputer may be used as a substitute for mini or mainframe computer.

Microcomputers are either of desktop or portable model. Portable computers can be carried from one place to another. Some of the models are called as laptops while others as notebook computers. Notebook computers are smaller, lighter and costlier than laptops. Desktop computers fit on a desktop and are used widely in offices and homes. The pictures of some of the desktop and portable computers are shown in Figure 1.2.



**Figure 1.2: Some Desktop and Portable Computers**

There are many types and models of microcomputers, which are summarized in Table 1.2.

**Table 1.2: Different Types of Microcomputers along with the Technical Specifications of CPU**

CPU Model	Clock (MHz)	Date Bus	Register (BIT)	Max. Memory (RAM)	Comments
8088	8	8	16	1 MB	First 8 bit microprocessor (Original PC)
8086	8	16	16	1 MB	First 16 bit CPU on a chip (PC/XT)*
80286	20	16	16	16 MB	5 times faster than PC/XT (PC/AT)**
80386 SX	33	16	32	16MB	80386 with an 80286 bus
80386 DX	40	32	32	4 GB	True 32 bit CPU on a chip
80486 SX	40	32	32	4 GB	Math co-processor disabled
80486DX2	66	32	32	4 GB	More speed with Math co-processor enabled
80486 DX4	100	32	32	4 GB	More speed than 486 DX2
Pentium Pro (P5)	200	64	32	4 GB	Superscope architecture Able to execute 2 instructions simultaneously
Pentium II (P6)	266	64	32	64 GB	Faster than Pentium Pro

## **1.5 POPULARITY OF PERSONAL COMPUTERS (IBM PC VS. APPLE MAC PC)**

IBM PC is the first personal computer, introduced in 1981 by the world's largest computer company - IBM (International Business Machines Corp., New York). This computer was based on Intel's 8088 microprocessor or chip. It became a success almost overnight. In later years, IBM manufactured 80286, 80386, 80486 and recently the Pentium PCs. Although IBM is still the largest supplier of PCs, the majority of PCs are manufactured by other companies as per the standards set by IBM. This whole family of PCs is known as IBM-compatible PCs.

\*XT stands for Extended Technology

\*\*AT stands for Advanced Technology

So, whenever we talk about a Pc, it usually means one of the IBM-compatible PCs. PS/2 and PS/1 (PS stands for Personal System) are IBM computer series introduced in 1987 and 1990 respectively.

Apple Macintosh PC (popularly called as Mac) is another series of 32-bit personal computers, introduced in 1984 by one of the first microcomputer manufacturing company - Apple (Apple Computer, Inc.). Apple is the largest independent manufacturer of non-IBM-compatible PCs. Apple Mac PC uses the Motorola (a leading manufacturer of semiconductor devices) 68000 processor family and a proprietary operating system. As this PC comes with its own operating system, there is no need of DOS or other operating system for operating it. The method of operating a Mac PC is known as Macintosh user interface. All Mac PCs have graphics displays, as their operating systems provide Graphical User Interface (GUI). The Mac PC always displays a row of menu titles at the top of the screen, from which options are selected.

Although the first Mac PC was praised by many users due to its ease of use and low-cost system, it was not exciting for most corporate buyers due to its slow speed, small screen and closed architecture (a system whose technical specifications are not made public). In 1987, Apple manufactured Mac II, which offers full-size screens, high-speed and open architecture (a system whose technical specifications are made public). In 1991, IBM formed an alliance with Apple to fully integrate Macs into IBM enterprise networks for developing PowerPC with Motorola.

IBM-compatible PCs are used as stand-alone machines or as workstations/ file servers in a local area network (we will discuss about local area network in later part of this unit). These PCs are very popular as stand-alone systems, which run under DOS. IBM-compatible PCs (80486 & above) are also popular for using as client/server systems (we will also discuss about client/server systems in later part of this unit). On the other hand, Apple/Macintosh PCs are rarely used as the primary client computers in client/server systems. Macintosh PCs are useful mainly for desktop publishing systems, due to graphical user interface. IBM compatible PCs, on the other hand, are useful for any kind of business applications. They have become very popular among all users in India and abroad.

### Student Activity 2

1. What are super computers?
2. What is the difference between mainframes and mini computers?
3. What are micro computers?

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## 1.6 ARCHITECTURE OF A COMPUTER SYSTEM

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In last section, we discussed that there are many types of computers. The internal architectural design of computers differ from one model to another, however the basic components of a computer remains the same for all models. The diagram of a generalized architecture of a computer system is shown in Figure 1.3. Before discussing the details of computer architecture, we would define the computer system as follows:

### Definition

A complete computer installation including the central processing unit, the peripherals such as hard disk drives, floppy disk drives, monitor, printer, mouse and operating system which are designed to work and interact with each other and with the user is called a computer system.

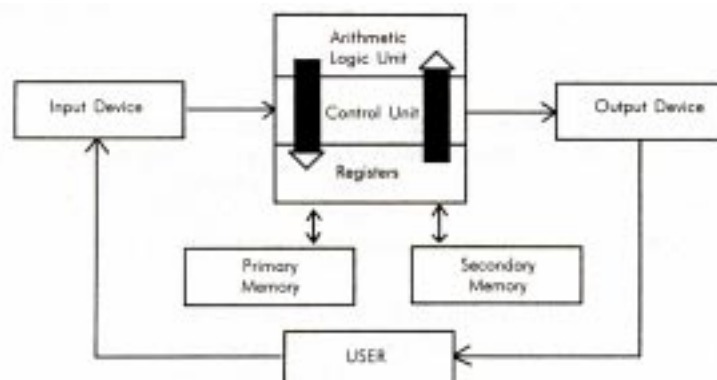


Figure 1.3: Functional Diagram of a Generalised Architecture of a Computer System

A computer system has following three main components:

- (a) Input/Output Unit
- (b) Central Processing Unit
- (c) Memory Unit

### **Input/Output Unit**

We know that the computer is a machine that processes the input data according to given set of instructions and gives the output. Before a computer does processing, it must be given data and instructions. After processing, the output must be displayed or printed by the computer. The unit used for getting the data and instructions into the computer and displaying or printing output is known as an Input/Output Unit (I/O Unit).

The Input Unit is used to enter data and instructions into a computer. There are many peripheral devices which are used as input/output units for the computer. The most common form of input device is known as a terminal. A terminal has a electronic typewriter like device, called keyboard along with a display screen, called Visual Display Unit (VDU) or monitor. Keyboard is the main input device while monitor can be considered both as an input as well as an output device. There are some other common input devices like mouse, punched card, tape, joystick, scanner, modem etc., which are explained in later part of this unit. Monitor, printer and plotter are the main peripheral devices used as output units for the computer.

### **Central Processing Unit**

Central Processing Unit (CPU) is the main component or "brain" of a computer, which performs all the processing of input data. Its function is to fetch, examine and then execute the instructions stored in main memory of computer. In microcomputers, the CPU is built on a single chip or Integrated Circuit (IC) and is called as Microprocessor. The CPU consists of following distinct parts:

1. **Arithmetic Logic Unit (ALU):** The arithmetic and logic unit of CPU is responsible for all arithmetic operations like addition, subtraction, multiplication and division as well as logical operations such as less than, equal to and greater than. Actually, all calculations and comparisons are performed in the arithmetic logic unit.
2. **Control Unit (CU):** The control unit is responsible for controlling the transfer of data and instructions among other units of computer. It is considered as a "Central Nervous System" of computer, as it manages and coordinates all the units of computer. It obtains the instructions from the memory, interprets them and directs the operation of the computer. It also performs the physical data transfer between memory and the peripheral device.
3. **Registers:** Registers are the small high speed circuits (memory locations) which are used to store data, instructions and memory addresses (memory location numbers), when ALU performs arithmetic and logical operations. Registers can store one word of data (1 word = 2 bytes & 1 byte = 8 bit; details of BITS and BYTES are discussed in later part of this unit) until it is overwritten by another word. Depending on the processor's capability, the number and type of registers vary from one CPU to another. Registers can be divided into six categories viz. General Purpose Registers, Pointer Registers, Segment Registers, Index Registers, Flags Registers and Instruction Pointer Registers, depending upon their function. The detailed functions of each and every register is beyond the scope of this book.
4.  **Buses:** Data is stored as a unit of eight bits (BIT stands for Binary Digit i.e. (0 or 1) in a register. Each bit is transferred from one register to another by means of a separate wire. This group of eight wires, which is used as a common way to transfer data between registers is known as a bus. In general terms, bus is a connection between two components to transmit signal between them. Bus can be of three major types viz. Data Bus, Control Bus and Address Bus. The data bus is used to move data, address bus to move address or memory location and control bus to send control signals between various components of a computer.

5. **Clock:** Clock is another important component of CPU, which measures and allocates a fixed time slot for processing each and every micro-operation (smallest functional operation). In simple terms, CPU is allocated one or more clock cycles to complete a micro-operation. CPU executes the instructions in synchronization with the clock pulse.

The clock speed of CPU is measured in terms of Mega Hertz (MHz) or Millions of Cycles per second. The clock speed of CPU varies from one model to another in the range 4.77 MHz (in 8088 processor) to 66 MHz (in Pentium) CPU speed is also specified in terms of Millions of Instructions Per Second (MIPS) or Million of Floating Point Operations Per Second (MFLOPS).

## Memory Unit

Memory Unit is that component of a computer system, which is used to store the data, instructions and information before, during and after the processing by ALU. It is actually a work area (physically a collection of integrated circuits) within the computer, where the CPU stores the data and instructions. It is also known as a Main/Primary/Internal Memory. It is of following three types:

- (a) Read Only Memory (ROM pronounced as "Ra-om")
  - (b) Random Access Memory (RAM pronounced as "R-aem")
  - (c) Complementary Metal Oxide Semiconductor Memory (CMOS)
- (a) **Read Only Memory:** Read Only Memory is an essential component of the memory unit. We know that the computer, being a machine, itself has no intelligence or memory and requires the instructions which are given by man. Whenever the computer is switched on, it searches for the required instructions. The memory, which has these essential instructions, is known as Read Only Memory (ROM). This memory is permanent and is not erased when system is switched off. As appears with its name, it is read type of memory i.e. it can be read only and not be written by user/programmer. The memory capacity of ROM varies from 64 KB to 256 KB (1 Kilobyte = 1024 bytes) depending on the model of computer.

ROM contains a number of programs (set of instructions). The most important program of ROM is the Basic Input Output System (BIOS, pronounced as "bye-os") which activates the hardware (physical components of computer) such as keyboard, monitor, floppy disk etc. in communicating with the system and application software (set of instructions or programs).

Types of ROM: There are many types of ROM available for microcomputers like Mask ROM, PROM, EPROM, EEPROM and EAPROM.

### Definitions

**Mask ROM:** Mask ROM is the basic ROM chip. In this type of ROM, the information is stored at the time of its manufacturing. So, it cannot be altered or erased later on.

**PROM:** PROM stands for Programmable Read Only Memory. In this type of ROM, the information is stored by programmers after its manufacturing. It cannot be altered or erased later on.

**EPROM:** EPROM stands for Erasable Programmable Read Only Memory. It is similar to PROM, but its information can be erased later on by ultra violet light and it can be reprogrammed.

**EEPROM:** EEPROM stands for Electrically Erasable Programmable Read Only Memory. It is similar to EPROM, but its information can be erased by using a high voltage current.

**EAPROM:** EAPROM stands for Electrically Alterable Read Only Memory. As compared to EPROM and EEPROM, the information stored in EAPROM can be altered later.

- (b) **Random Access Memory:** Random Access Memory (RAM) is another important component of Memory Unit. It is used to store the data and instructions during the

execution of programme. Contrary to ROM, RAM is temporary and is erased when computer is switched off. RAM is a read/write type of memory and, thus can be read and written by user/programmer. As it is possible to randomly use any location of this memory, therefore, this memory is known as random access memory. The memory capacity of RAM varies from 640 KB to several megabytes (1 Megabyte = 1024 KB) with different models of Pc.

**Types of RAM:** There are two types of RAM used in PCs - Dynamic and Static RAM.

#### Definitions

**Dynamic RAM (DRAM):** The information stored in Dynamic RAM has to be refreshed after every few milliseconds, otherwise it is erased. DRAM has higher storage capacity and is cheaper than Static RAM.

**Static RAM (SRAM):** The information stored in Static RAM need not be refreshed, but it remains stable as long as power supply is provided. SRAM is costlier but has higher speed than DRAM.

- (c) **Complementary Metal Oxide Semiconductor Memory:** Complementary Metal Oxide Semiconductor (CMOS) memory is used to store the system configuration, date, time and other important data. When computer is switched on, BIOS matches the information of CMOS with the peripheral devices and displays error in case of mismatching.

#### Student Activity 3

1. State the basic units of a computer.
2. What are the various parts of CPU?
3. What is the function of ALU and CU?
4. What are registers?
5. What is the function of clock in CPU?
6. Define memory. Describe its various types.
7. Define CMOS.

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## 1.7 COMPUTERS IN BUSINESS

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Computers can process vast quantities of business data at enormous speed with unflinching consistency and unimaginable flexibility.

These capabilities of computers open new approaches to problem solving and data processing.

Following six characteristics of computers make them indispensable for use in business:

- (a) **Speed:** Computers speed up data processing by many orders of magnitude as compared to the manual system.
- (b) **Data Volume:** Vast amount of data can be stored and processed very quickly.
- (c) **Repetitiveness:** The more repetitive the task, the more profitable it is to automate it.
- (d) **Complexity:** Problems with several interacting variables can be solved quickly and accurately.
- (e) **Accurate Output:** As high accuracy can be obtained as needed; also accuracy is not affected by boredom and fatigue and is not Subjective. '
- (f) **Declining Costs:** There has been a steady decline in the cost of per unit of data processed.

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## 1.8 FACILITIES AVAILABLE IN COMPUTERISED SYSTEM

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### For Data Capture

Data capture is the identification of new data to be input. It is always best to capture the data as soon as possible after it is originated.

The commonly used input device is a keyboard. Mouse, joy stick, light pen, touch screen, and trackballs are some of the devices which do not require typing of input information.

## **On-line Mode**

Following devices are used to capture data on-line.

### **Keyboard**

- A computer keyboard is a sophisticated electromechanical component designed to create special standardized electronic codes when a key is pressed.
- The codes are transmitted along the cable that connects the keyboard to the computer system unit or terminal, where the incoming code is analyzed and converted into the appropriate computer usable code.

### **Light Pen**

- It is a pointing device, used to select a displayed menu option on the CRT. Light pens are frequently used by graphics designers, illustrators, and drafting engineers.
- It is capable of sensing a position on the CRT screen when its tip touches the screen.
- A user can draw directly on the CRT screen with the light pen if the computer system is provided with Computer Aided Design (CAD) package such as AutoCad 14.

### **Mouse**

- A mouse is also a pointing device.
- As the mouse is rolled across the desktop, the cursor moves across the screen.
- The user can select menu or command by pushing a button on the mouse once or twice.

### **Scanners**

Scanners are a kind of input device. They are capable of entering information directly into the computer.

The main advantage of direct entry of information is that users do not have to key in the information.

This provides faster and more accurate data entry.

Important types of scanners are:

- (i) Optical scanners
- (ii) Magnetic ink character readers

### **Optical Scanners**

The following are the commonly used optical scanners:

- Optical Character Readers (OCR)
- Optical .Mark Readers (OMR)
- Optical Bar-Code Readers

### **Terminals**

Terminals can be "dumb", "smart", or "intelligent", and are used mainly by those who do their work on mini or mainframe computers (or supercomputers).

A variety of computer terminals are used to enter data, including the following popular types:

- Point-of-Sale (POS) terminals
- Financial transaction terminals



- Executive workstations
- Portable terminals
- Microcomputers used as terminals

### **Smart Cards**

- It contains a build-in microcomputer chip.
- In case of smart cards, there are less chances of fraud.
- How much cash a customer has to his credit is stored in the chip before it is issued to him.
- When the customer uses the card to make purchases, the required amount is deducted from the balance by a special electronic machine used by merchants.
- The electronic machine used by merchants communicates with the card issuing company's computer from time to time for money transactions. Thus, a card holder has the facility of keeping electronic money with him.
- When his electronic money is used up, he can replenish electronic money by depositing money at automated banking machine of card-issuing company.
- A record of purchases made by the customer can also be stored in a smart card.

### **Off-line Mode**

Off-line data entry involves devices through which data are recorded on some media and then into the computer later.

In almost 90% of the applications, data entry is done off-line. This saves the precious computer processing time.

The following devices are used to capture data off-line.

#### **Key-to-tape**

A Key-to-tape device, also known as magnetic tape encoder, is designed to record keyed data directly onto magnetic tape.

#### **Key-to-floppy**

These data entry machines are used to store data directly on flexible disks, called diskettes or floppies.

#### **Key-to-disk**

Used as data recording stations in systems where data from different points has to be recorded for processing at one point.

### **For Data Validation**

The accuracy of input data should either be verified manually or by a computer program. Some of the techniques used for this purpose are described below:

#### **Using Control Totals**

In this technique, the verification program verifies the total.

When business transaction occurs, it is noted down and calculated at the point of transaction (by clerk) and the same transaction data is entered by the computer operator in the computer system.

The data entered by the operator are totalled by the computer. If the two entries do not match, then it is a clear indication that there is a mistake.

In this manner only correct data will be passed to the machine before processing is done.

### **Using Built-in Checks by the Computer Program**

There should be some control to make sure that no data are entered which is beyond a certain value.

For example, the salary cheques for a particular organization may not exceed Rs. 20,000.

If so, then if a cheque is made for an amount more than Rs. 20,000, then computer will point an error.

### **For Storage and Retrieval**

Once the valid data has been entered in the system, it is essential that this data is stored securely for future use.

Major types of external storage devices used in computerised systems are:

- Magnetic tapes or cartridge
- Hard disks
- Floppy disks
- Compact Disk (CD)

### **For Output**

There are two basic categories of computer-produced output:

- Output for immediate use by people, and
- Output that is stored in computer-usable form for later use by the computer. Output can be in either hardcopy or softcopy form.

#### **(a) Hardcopy Output Devices**

The commonly used hardcopy output devices are:

- (i) Printers
- (ii) Plotter
- (iii) Microfilm/microfiche

#### **Printers**

These are the most popular commonly used output devices.

- Capable of printing characters, symbols, and sometimes graphics on paper.
- Printers are categorized according to whether the image produced is formed by physical contact (impact printers) or not (non-impact printers) of the print mechanism with the paper.

#### **Plotters**

- A plotter is a specialized output device designed to produce high-quality graphics in a variety of colors.
- There are two basic types of plotters: those that use pens and those that do not. Drum plotters and flatbed plotters both use pens. Electrostatic plotters do not.

#### **Microfilm and Microfiche**

- In this technique the output from the computer is recorded on a microfilm as microscopic film images. The information recorded on the microfilm can be read with the help of a microfilm reader.
- A microfiche (pronounced as fish, French word, which means card) is a 4 x 6 inch film sheet.
- It can store up to 270 pages of information.
- It is easier to read a microfiche as compared to a microfilm.

#### **(b) Softcopy Output Devices**

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

- Probably, the most popular softcopy output device.

- Used with terminals connected to large computer systems and as a monitor for microcomputer system.
- The CRT's screen display is made up of small picture elements, called pixels for short. The smaller the pixels, the better the image clarity, or resolution.

### **Voice Output Systems**

- Relatively new and can be used in some situations where traditional display screen softcopy output is inappropriate.
- Two different approaches to voice output have evolved, speech coding and speech synthesis.
- Used in applications such as automobiles, toys, and games.

### **For Transmission**

The most exciting developments in data processing today is data communication.

Communications, the transfer of information is the basis of office automation.

Some examples of everyday data communication are:

#### **Airline Reservation**

Computer is usually located far from the agent; data communication must be used to relay data from the terminal to the computer and back.

#### **Automated Banking**

ATMs are now widely used in most banks for better customer services. The user can make deposits and withdrawals, check balances, and even pay utility bills through the machines.

#### **Point-of-Sale Terminals**

Used in retail stores, instead of cash registers. These terminals send records of sales to a central computer, which maintains accounting and inventory records.

Data communication takes on several forms. These are given below:

- (a) Data can be transferred between two geographically distant personal computers by using modems, the dial-up telephone system, and a communications program in each computer.
- (b) Data can be transferred between two side-by-side computers by hooking up a cable from one computer's serial port to the other computer's serial port.
- (c) PC can act like a remote terminal to a mini or mainframe computer.
- (d) PC can be part of a local area network, in which software and hardware resources can be shared among many user.

#### **Student Activity 4**

1. What are the characteristics of computer?
2. What do you mean by data capture?
3. List some commonly used input devices.
4. Define scanners.
5. Define smart cards.
6. Define plotters.
7. What are softcopy output devices? Give examples.
8. Define printers.
9. How are computers useful for Airline Reservation and Automated Banking?

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## **1.9 INDIAN COMPUTING ENVIRONMENT**

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Office work includes many administrative and management activities. The preparation, distribution, processing and review of documents are the common activities of an organization. Prior to the advent-of computers, these office activities were either performed manually or with the help of mechanical and electrical machines. During the past few decades,

the basic nature of office has changed remarkably. Office automation deals in application of latest technologies in improving the overall proficiency of the office. We may define office automation as follows:

**Definition**

Office automation is the application of computer and related technologies like communication and networking to integrate the general office tasks so that the efficiency of office work is improved.

Office automation does not mean just to install computers and communication devices in an office, but it is much more than that. We will discuss in later part of this unit, how an office can be automated in a real sense.

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## 1.10 OFFICE AUTOMATION

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### Needs for Office Automation

Although all the work of a small or big office can be performed manually, but it is very difficult or even impossible today for an organization to compete in the market without office automation. There are many essential requirements of today's office environment, which are listed below:

- To reduce cost of administrative overhead;
- To increase the efficiency of office tasks;
- To provide better service to the customers;
- To provide accurate information to the management;
- To provide best and fastest way of communication.

The above requirements cannot be achieved without using latest technologies and therefore, office automation is needed for an organization.

### Office Functions Needed to be Automated

Many types of functions are performed in an office. The basic functions, which are needed to be automated in any office are

1. **Document Generation:** In all offices, many documents are needed to be prepared, typed and printed. Typewriters, computers and printers are widely used in automating this routine task of offices.
2. **Document Processing:** Documents are also needed to be processed in order to extract useful information required for MIS and other official purposes. Many office automation tools like word processing, desktop publishing etc. are used to perform this task.
3. **Document Distribution:** All offices require an electronic distribution system for transferring documents and data within and outside the organization. The main office automation tools for distribution of documents are Photocopiers, Teletax and Fax machines.
4. **Archival Storage:** The office documents are also needed to be stored for a long period, so that they can be retrieved when required. This task is achieved by the use of different storage devices like tapes, disks etc.

### Office Automation Systems

For achieving the basic functions of an office, different types of office automation systems are used. These systems can be broadly classified into following four types:

1. **Document Management Systems:** These systems include computerised tools for generation, storage, processing and distribution of documents.
2. **Communication Systems:** These systems are used for sending messages, documents and data within and outside the organization.
3. **Teleconferencing Systems:** An electronic means of communication for conducting seminars and training programmes in an organization is achieved through various teleconferencing systems.

4. **Support Systems:** Besides the above major office automation systems, certain support systems for managing the activities of work groups are also used in some offices.

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## **1.11 COMPONENTS OF A COMPUTER SYSTEM**

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Computer components can be broadly divided into two categories - Hardware and Software. Hardware refers to any physical component of a computer. For example, CPU, Monitor, Keyboard, Hard Disk, Floppy Disk etc. are physical components and thus, are hardware. Software refers to the programmes which are required to operate the computer. For example, DOS (Disk Operating System), BASIC, COBOL, dBASE, An Accounting Software etc. are all software. An analogy of hardware can be the book which you are reading and then software would be the text written on this book. Another analogy could be - 'brain' is a hardware but 'memory stored in brain' is a software.

Both hardware and software are dependent on each other. CPU, Memory Unit, Hard Disk etc. are useless until they are provided instructions and data for storage and processing. Similarly, BASIC or COBOL language has no use until it is stored and processed by hardware components of computer.

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## **1.12 HARDWARE COMPONENTS OF MICRO COMPUTER**

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In today's computer industry, a wide variety of hardware components are available for microcomputers. Managers must be aware of the working and uses of different hardware components, so that they can make good decisions about purchase of computer systems. The hardware components of microcomputer can be classified into following types:

- (A) Motherboard
- (B) Input Devices
- (C) Output Devices
- (D) Storage Devices
- (E) Cards
- (F) Ports and Cords
- (G) Power Supply

All these hardware devices except motherboard are called peripheral devices, as they are connected to the motherboard.

### **Motherboard**

Motherboard, also called as System Board, is the most important hardware component of a microcomputer. Motherboard is so called as all the other boards (printed circuit boards having chips or other electronic components) of the computer are connected to this board, hence it is like mother of all other boards.

#### **Notes**

##### **Components of Motherboard**

A motherboard contains the CPU chip, Memory chip (ROM and RAM chips), I/O interface, expansion slots and many other logic circuits. It may also contain a maths co-processor chip. CPU or processor chip is the main component of motherboard. The types of CPU chip (8088/80286/80386/80486 etc.) vary from one model of PC to another. The function of maths coprocessor chip (8088/80287 etc.) is to support the CPU chip in processing of mathematical calculations.

Memory chips are physically installed on the motherboard by different packing methods. There are three different types of packing of RAM chips DIP, SIMM and SIPP. DIP (Dual Inline Package) is the most common packing, having a small rectangle box with leads on both sides. SIMM (Single Inline Memory Module) packing contains a number of chips soldered on an expansion board having an edge connector. SIPP (Single Inline Pin Package) is similar to SIMM, but uses pin rather than an edge connector. Expansion slots are connectors on motherboard where expansion cards like display card, hard disk controller card etc. can be connected. I/O interface is the channel between the CPU and a peripheral devices (keyboard, monitor etc.).

## Input Devices

Input devices are used to input data, information and instructions into the RAM, The common input devices of a PC are described below and shown in Figure 1.4.

**Keyboard:** Keyboard (similar to a typewriter) is the main input device of computer. It contains 3 types of keys - alphanumeric keys, special keys and function keys. When a key is pressed, an electronic signal is produced. This signal is detected by a keyboard encoder that sends a binary code corresponding to the key pressed to the Cpu. There are many types of keyboards but 101 Keys Keyboard is the most popular one.

**Mouse:** Mouse (similar to a mouse) is another important input device. It is a pointing device used to move cursor, draw sketches/diagrams, selecting a text/object/menu item etc. on monitor screen while working on windows (graphics based operating environment of computer). Mouse is a small, palm size box containing 3 buttons and a ball underneath, which senses the movement of the mouse and sends the corresponding signals to CPU on pressing the buttons.

**Trackball:** A trackball looks like a mouse, as the roller is on the top with selection buttons on the side. It is again a pointing device used to move the cursor and works like a mouse.

**Light Pen:** Light pen (similar to a pen) is a pointing device which is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube. When its tip is moved over the monitor screen and pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

**Touch Screen:** Touch screen is sensitive to human fingers. Using this device, the user can point to a selection on the screen instead of pressing keys.

**Joystick:** Joystick is also a pointing device which is used to move cursor position on a monitor screen. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

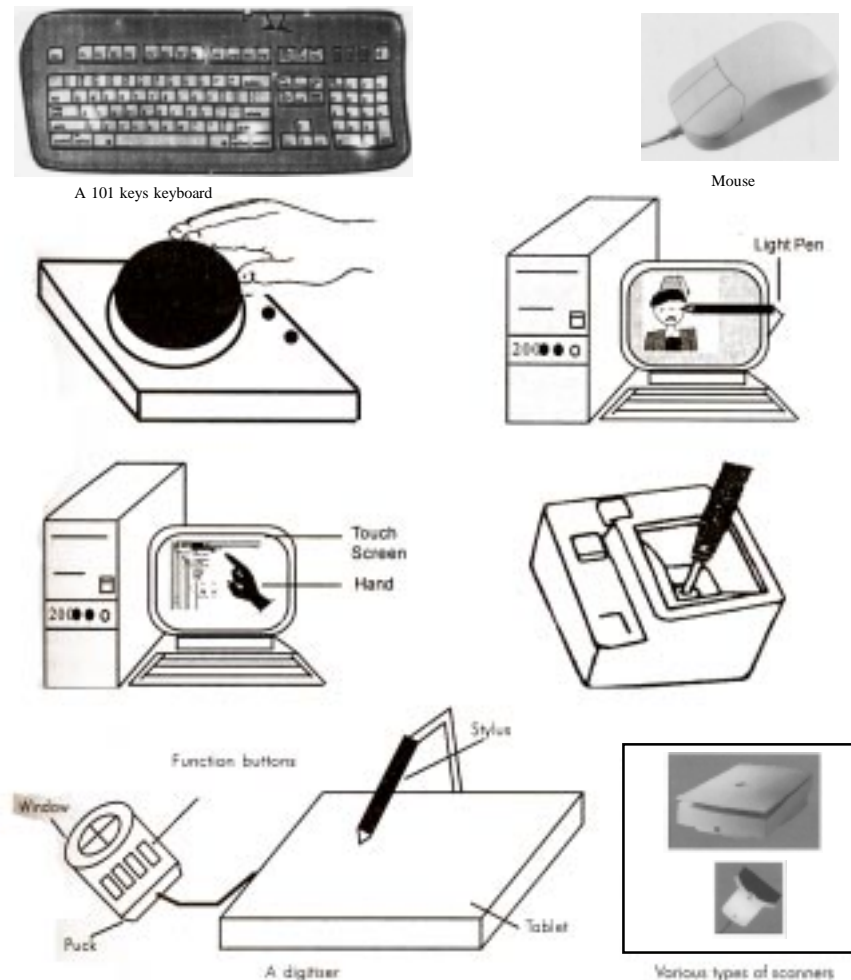


Figure 1.4: Common Input Devices of a PC

**Digitiser:** Digitiser is used to create drawings and pictures using a digitiser tablet by a process called digitising. Digitising is a process by which graphic representations are converted into digital data. The user makes contact with the flat digitiser tablet with a pen-like stylus. As the stylus is connected to the tablet by a wire, the traced image is stored in RAM and displayed on monitor.

**Scanner:** Scanner is mainly used in Desktop Publishing (DTP) applications. Scanner is used for digitising images such as photographs, forms, documents etc. into computer memory. Some scanners can also read text by converting them to digital code. These scanners are very useful for converting the typed pages into word-processing files. Graphics scanners convert a printed image into video image without converting it to digital code.

**Optical Mark Reader (OMR):** It is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked. It is specially used for checking the answer sheets of examination having multiple choice questions.

**Optical Character Reader (OCR):** It is also an optical scanner, which is capable of detecting alphanumeric characters typed or printed on paper using an OCR font. OCR devices are used for large volume applications like reading of passenger tickets, computer printed bills of credit card companies and reading of ZIP codes in postal services.

**Bar Code Reader:** This device is an optical scanner used for reading bar-coded data (data in form of light and dark lines). Bar-coded data is generally used in labelling goods, numbering the books or encoding ID or A/c numbers.

**Magnetic Ink Character Recognition (MICR):** MICR is used to recognize the magnetically-charged characters, mainly found on bank cheques. MICR is used by the banking industry for the processing of cheques. A special equipment is used to encode, decode and process the cheques.

**Voice-Input Devices:** These devices can recognize the human voice. They seem to be very useful but are not popular due to storage of limited vocabularies and variations in way of pronouncing words by different persons.

### Student Activity 5

1. What do you mean by office automation?
2. List various office functions needed to be automated.
3. Describe Teleconferencing Systems.
4. Define hardware and software.
5. Define : (a) Motherboard (b) Input device (c) Output device.
6. Describe any five input devices.
7. What is a Digitiser?
8. Define OMR and OCR.

### Output Devices

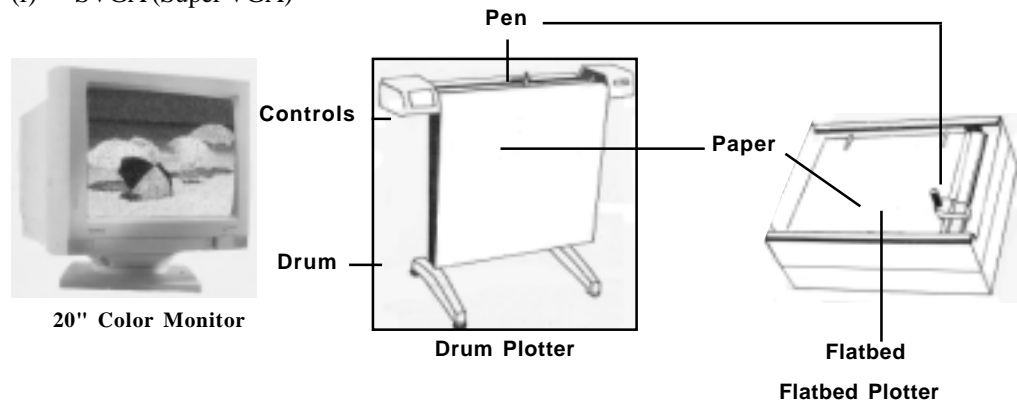
Output devices are hardware components which are used to display or print the processed information. The common output devices are described below and shown in Figure 1.5.

**Monitor:** Visual Display Unit (VDU), commonly called as monitor is the main output device of computer. It consists of a Cathode Ray Tube (CRT), which displays characters as an output. It forms images from tiny dots, called pixels, that are arranged in a rectangular form. The sharpness of the image (screen resolution) depends upon the number of the pixels.

**Types of Monitors:** There are different kinds of monitors depending upon the number of pixels. Depending upon the resolution, monitors can be classified as follows:

- (a) CGA (Color Graphics Adapter) .
- (b) MDA (Monochrome Display Adapter).

- (c) HGA (Hercules Graphics Adapter)
- (d) EGA (Enhanced Graphics Adapter)
- (e) VGA (Video Graphics Adapter)
- (f) SVGA (Super VGA)



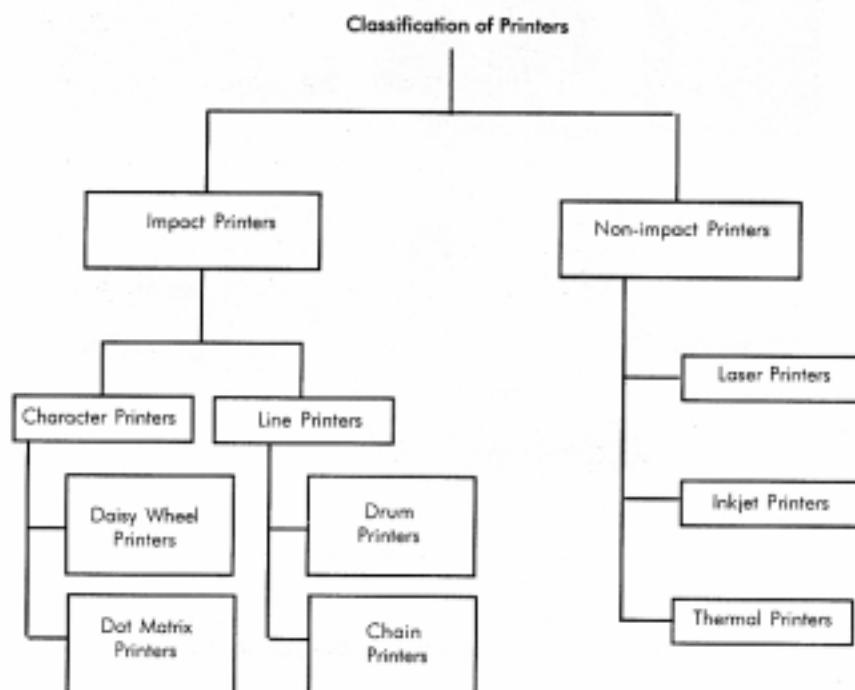
**Figure 1.5: Common Output Devices of a PC**

Depending upon color of display, monitors can be classified as Monochrome (with single color black/white display) and Color (with all colors display) Monitors.

**Printer:** Printer is the most important output device, which is used to print information on papers. Printers are essential for getting output of any computer based application.

**Types of Printers:** There are many types of printers which are classified on various criteria as illustrated in Figure 1.5 Printers can be broadly categorized into two types.





**Figure 1.6: Classification of Printers**

- (a) **Impact Printers:** The printers that print the characters by striking against the ribbon and onto the paper, are called Impact Printers. These printers are of two types
- (i) **Character Printers:** These printers print one character at a time. These printers are again of two types Daisy Wheel and Dot Matrix Printers. Daisy Wheel Printers these printers print the characters by a mechanism that uses a plastic or metal hub with spokes, called daisy wheel. The characters are embossed on the radiating spokes and printed by striking these spokes against the ribbon and paper. Daisy Wheel printers give a good quality but they are expensive than Dot Matrix printers. Dot Matrix Printers these printers print the characters by putting dots onto the paper. They do not give better printing quality than daisy wheel printers, but are faster in speed. The printing speed of a dot matrix printer can be upto 360 cps (characters per second). They are widely used with microcomputers in most of the offices.
  - (ii) **Line Printers:** These printers print one line at a time. Their printing speed is much more than character printers. They are again of two types Drum Printers and Chain Printers. Drum Printers these printers print the line by a rotating drum having a ring of characters for each print position. The hammers strike each character of the drum simultaneously, so that entire line is printed for one full rotation of the drum. These printers are also called as Barrel Printers. The printouts obtained from these printers, have even character spacing but uneven line height. Chain Printers these printers print the line by a rotating chain having ring characters for each print position. Their printing mechanism is similar to drum printers. The printouts obtained from these printers, have uneven character spacing but even line height.
- (b) **Non-Impact Printers:** The printers that print the characters without striking against the ribbon and onto the paper, are called Non-Impact Printers. These printers print a complete page at a time, therefore, also called as Page Printers. Page printers are of three types
- (i) **Laser Printers:** These printers look and work like photocopiers. They are based on laser technology, which is the latest development in high speed and best quality printing. In these printers, a laser beam is used to write the image on a paper. First, the image is formed by electrically charged thousands of dots on a paper by laser beam. Then, the paper is sprayed with a toner having the opposite

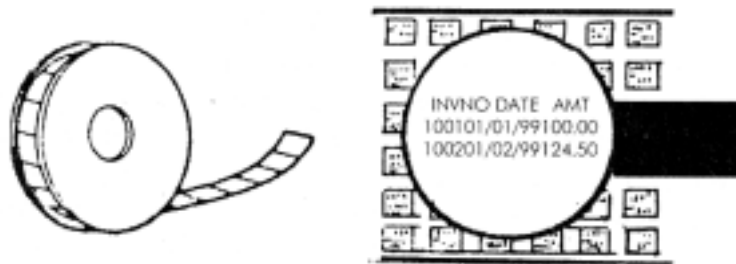
charge and is passed over a heated roller to make the image permanent. Laser printers are very popular and have become an essential part of Desk Top Publishing (DTP). Although laser printers are costlier than dot matrix, they are generally preferred in all offices due to their best quality of printing. There are many models of laser printers depending upon the speed and number of dots printed. The latest model of laser printer is 1200 DPI (Dots Per Inch), which can print 10 pages/minute. Some high speed laser printers give a speed of upto 100 pages/minute.

- (ii) **Inkjet Printers:** These printers print the characters by spraying the paper with electrically charged ink. These printers give better quality than character printers but not better than laser printers. They are cheaper than laser printers, hence used widely in many offices. They also offer an option of using color cartridges for multi-color printing.
- (iii) **Thermal Printers:** These printers print the characters by melting a waxbased ink off a ribbon onto a special heat sensitive paper. They give letter-quality printing but are relatively expensive in maintenance than other printers.

**Plotter:** Plotter is an important output device, used to print high quality graphics and drawings. Although the graphics can be printed on printers, the resolution of such printing is limited on printers. Plotters are generally used for printing/drawing graphical images such as charts, drawings, maps etc. of engineering and scientific applications. Some important types of plotters are discussed below:

- (i) **Flatbed Plotters:** These plotters print the graphical images by moving the pen on stationary flat surface material. They produce very accurate drawings.
- (ii) **Drum Plotters:** These plotters print the graphical images by moving both the pen and the drum having paper. They do not produce as accurate drawings as printed by flat bed plotters.
- (iii) **Inkjet Plotters:** These plotters use inkjets in place of pens. They are faster than flatbed plotters and can print multi-colored large drawings.

**Computer Output Microfilm:** Computer Output Microfilm (COM) is a technique to produce output on a microfilm media (microfilm reel or microfiche card) as illustrated in Figure 1.7. A microfilm is a continuous film strip that can store several thousands miniaturized document pages. A microfiche card is a 4 by 6 inch film sheet, which can store several hundred pages.



**Figure 1.7: Computer Output/Microfilm**

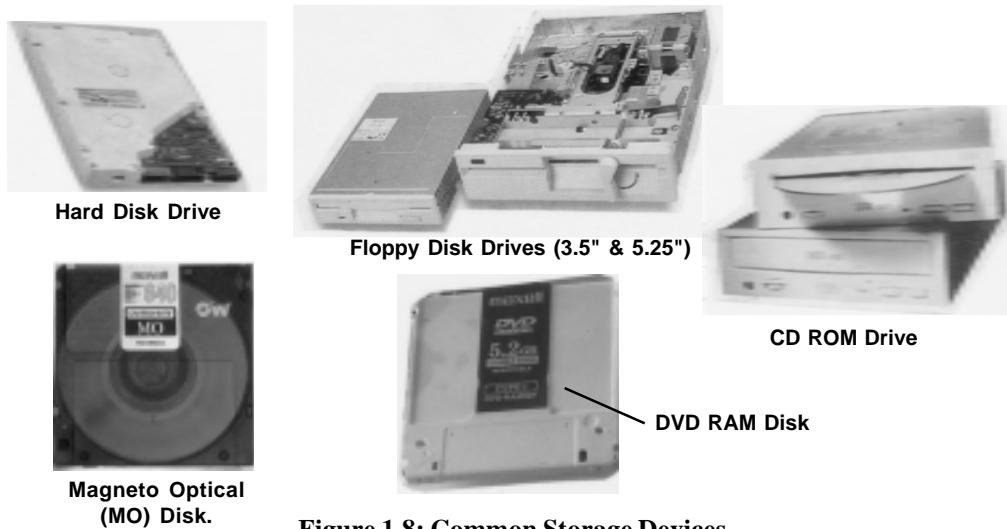
The process of producing microfilm or microfiche takes place on a special COM unit. The information recorded on the microfilm is read with the help of a microfilm viewing system. It is generally easier to read a microfiche than microfilm. Computer Output Microfilm is particularly useful for organizations which need to store and manipulate large amount of data. It helps them in tremendous savings in paper and document handling costs.

#### **Student Activity 6**

1. What are output devices? Give examples.
2. Write the full form of the following:  
(a) CGA (b) MDA (c) HGA (d) EGA (e) VGA (f) SVGA
3. What is the difference between character printers and line printers?
4. Describe laser printer.
5. What are plotters? Describe its various types.

## Storage Devices

In preceding part of this unit, we have discussed about the primary memory of computer. Primary memory (especially RAM) stores the data, instructions and informations temporarily during processing by CPU. When computer is switched off, this memory gets erased. How does a computer store the data, information and software permanently, so that they can be retrieved whenever required? Certainly, there must be some storage devices in computer. Now, we will discuss about different Storage Devices, sometimes also called as Secondary Memory Devices.



**Figure 1.8: Common Storage Devices**

There are many storage devices used with microcomputers. Some of the common storage devices are explained below and shown in Figure 1.8.

- (i) **Winchester Disk (Hard Disk):** Winchester Disk is the most common storage device of present day microcomputers. It is popularly called as Hard Disk Drive (HDD) or sometimes as Fixed Disk Drive. It is fixed inside the computer and is not easily removable. It is used for storing the software and data inside computer. It is known as 'Winchester Disk', probably because this drive was first made by IBM at Hursley Laboratory, located near Winchester in England.

Winchester Disk consists of one or more disk platters, an access mechanism and read/write heads which are sealed in a case. Hard disk size depends upon the disk platter's diameter. There are many different platter sizes (such as 5 1/2, 3 1/2, 2 1/2 inch etc.). The 3 1/2 inch size platter is common with PCs and 2 1/2 inch with laptop/ portable computers. Read/ write head is used to write any information on the disk surface or to read it back.

There are different types of hard disks depending upon their storage capacities. Storage capacities of hard disks range from 10 MB to 6.3 GB, but 4.3 GB are nowadays a common part of Pentium computers

- (ii) **Floppy Disk:** Floppy Disk (FD) is another common storage device which is small, flexible and easily removable. It is made of a plastic disk coated with magnetic material, which is sealed inside a square plastic jacket. It is called as 'Floppy' because it is soft having flexible physical property. Data can be written on or read from this floppy by a drive, called Floppy Disk Drive (FDD), which is fixed inside the computer.

**Table 1.3: Comparison among Different Types of Floppies**

Type of Floppy	Size	Density	Sectors	Tracks	Storage Capacity
DSDD*	5.25 inch	Double	9	40	360 K
DSLDD*	3.5 inch	Low	9	80	720K
DSHD* Big	5.25 inch	High	15	80	1.2MB
DSHD Small	3.5 inch	High	18	80	1 .44 MB

\* DS stands for Double Sided, LD for Low Density and HD for High Density

There are many types of floppies depending upon their sizes and storage capacities as illustrated in Table 1.3. The original floppy, developed by IBM, is an 8" floppy, but the most popular sizes available for present day PCs are 5 1/4" and 3 1/2". The storage capacity of floppies vary from 360 KB to 1.44 MB. The floppies can store data on both sides (Double-sided Floppies) or on single side (Single-sided Floppies) depending upon the floppy drive. Double sided floppy drives are most frequently used in present day PCs. The latest floppy drive, that packs two high density floppy drives (5.25 & 3.5 inch) into a single package, is known as Combo Drive.

- (iii) **Compact Disk:** Compact Disk (CD) is the latest storage device, used to store data, information and software, which can be read only and not be changed or erased. It is an optical read only memory, made up of a resin. Therefore, it is actually called as Compact Disk Read Only Memory (CD-ROM). However, the information is stored on CDs by using an expensive drive, called CD-ROM drive.

Nowadays compact disks are very popular storage devices for microcomputers because a large number of software including multimedia, audio and graphics software are available only on these disks. Compact Disks can store a large volume of data (upto 680 MB), which is almost same a storage capacity of 630 MB Hard Disk.

WORM (Write Once Read Many) is a type of compact disk which can be recorded only once and not erased. It can store more data than CD-ROM, generally measured in gigabytes.

- (iv) **Magnetic Tape:** Magnetic tape is the oldest storage device available for microcomputers. It is generally used to store a large volume of data that is needed to be sequentially accessed and processed. The tape is made up of a plastic ribbon coated with an iron-oxide material, which can be magnetized. The data stored on tape can be read as well as erased and written again.

Magnetic tape is a sequential access storage device, hence it is not possible to read the data randomly or directly. Therefore, magnetic tapes are suitable only for storing data for backups and batch mode applications and not for on-line applications. On the other hand, magnetic disks (floppy and hard disks), which are discussed above, are considered best storage devices for on-line applications.

- (v) **Video Disk:** Video disk is used to store text, video and audio data. It is widely used for training applications as it can be played like a phonograph record.
- (vi) **Magneto Optical Drive:** Magneto Optical (MO) drive is the latest of all storage devices. This drive uses both a laser and an electromagnet to record data on a removable cartridge. The surface of the cartridge contains tiny embedded magnets. The unique feature of MO drive is that it has a very high storage capacity. Although MO drive is costlier and slower than HDD, it has a long life and is more reliable.
- (vii) **DVD ROM/RAM Disk:** DVD ROM and DVD RAM disks are optical disks having a storage capacity of 4.7 GB and 5.2 GB respectively. These disks are becoming the next generation's new standard for higher capacity removable media. They are ideal for storage of huge amount of information required for multimedia applications. One can put 133 minutes of high quality of video with digital sound on a DVD RAM Disk.

## Cards

Cards are the printed circuit boards used to hold the chips (integrated circuits). There are many types of cards used in PC, the important ones are Video Card, Sound Card, I/O Card, Controller Card and Memory Card. Video card (Display Card) generates the text and graphic images for monitor while sound card generates the sound. Pentium computers, generally, use a PCI (Peripheral Component Interconnect) video card to speed up graphics. I/O Card provides a place for connecting mouse and printer. Cables of hard disk and floppy disk are connected to controller cards. Memory Card provides a place for memory chips.

## Ports and Cords

Besides the important hardware discussed above, the computer has several components which are used as pathway for flow of data. The rear of a PC has many empty holes or external sockets called ports or connectors. There are many types of ports in a PC, the most

important ones are Serial Port, Parallel Port, Game Port and Video Port. Serial Port is used to connect a mouse, modem or scanner. Parallel Port is generally used to connect a printer. Game Port is used to connect the joystick while Video Port is a connector for monitor.

Cords are the cables used to plug into the ports. There are different types of cables for connecting different types of input, output and storage devices. The important cords used in a PC are keyboard cords, power cords, monitor cords and printer cords.

## Power Supply

Power supply is considered as the 'Heart' of a Pc. Computer requires a clean and steady power source for working properly. Power supply is that important hardware, which provides the power source to a computer. It provides a voltage range of 4.95 to 5.25 volts for the highest performance of the system. Power supplies vary in size and power (in watt).

**Notes:** An Uninterrupted Power Supply (UPS) keeps the computer running for few minutes even when the electricity supply goes off. UPS is not a part of computer and is purchased separately. It is optional but mostly preferred to CVT (Constant Voltage Transformer) and is always recommended for computerised applications like MIS.

### Student Activity 7

1. Define Winchester Disk.
2. Define floppy disk.
3. Define CD-ROM and WORM.
4. What is the function of magnetic tape?
5. What is magneto optical drive?
6. Define cards.

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## 1.13 CLASSIFICATION OF SOFTWARE

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Software are broadly classified into following two types:

- (a) System Software
- (b) Application Software

### System Software

Software, which are required to control the working of hardware and aid in effective execution of a general user's applications are called system software. These software perform a variety of functions like file editing, storage management, resource accounting, I/O management, database management, etc. Some of the examples of system software are DOS (Disk Operating System), Windows, BASIC, COBOL and PC TOOLS. These software are developed by System Programmers.

#### Types of System Software

System software can be further categorized into following three types:

- (i) System Management Software  
(Operating Systems, DBMS, Operating Environments)
- (ii) System Development Software  
(Language Translators, Application Generators, CASE Tools)
- (iii) System Software Utilities

### Application Software

Software which are required for general and special purpose applications like database management, word processing, accounting etc. are called as application software. Some of the examples of application software are dBASE, Word Star, Tally etc. Application software are developed using system software by Application Programmers.

- (i) General Purpose Application Software  
(Database Management Packages, Word Processors, Spreadsheets, Office Automation Packages)
- (ii) Special Purpose Application Software  
(Desktop Publishing, Multimedia, Business Applications)

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## 1.14 GENERATION OF COMPUTERS

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The computer evolved as a result of man's search for a fast and accurate calculating device. Abacus was the first manual calculating device, which was invented in Asia many centuries ago. In 1617, John Napier, a Scottish mathematician invented a mechanical calculator called the 'Napier's bones'. Thereafter, many kinds of computers have been designed and built during the evolution of the modern digital computer. In order to provide a framework for the growth of computer industry, the computer era has been referred in terms of generations. Computers are classified into following six types based on their historical advancement and electronic components used.

### Zeroth Generation Computers

The zeroth generation of computers (1642-1946) was marked by the invention of mainly mechanical computers. Pascaline was the first mechanical device, invented by Blaise Pascal, a French mathematician in 1642. In 1822, Charles Babbage, an English mathematician, designed a machine called Difference Engine to compute tables of numbers for naval navigation. Later on, in the year 1834, Babbage attempted to build a digital computer, called Analytical Engine. The analytical engine had all the parts of a modern computer, i.e.; it had four components the store (memory unit), the mill (computation unit), the punched card reader (input unit) and the punched/printed output (output unit). As all basic parts of modern computers were thought out by Charles Babbage, he is known as Father of Computers. In later years, Herman Hollerith invented a machine for doing counting for 1880 US census, which was called the Tabulating Machine. In 1944, Howard A. Eiken invented first American general purpose electro-mechanical computer, called Mark I and later on its successor, Mark II. The Zeroth generation of computers or the era of mechanical computers ended in 1946 when vacuum tubes were invented.

### First Generation Computers

The first generation of computers (1946-1954) was marked by the use of vacuum tubes or valves for their basic electronic component. Although these computers were faster than earlier mechanical devices, they had many disadvantages. First of all, they were very large in size. They consumed too much power and generated too much heat, when used for even short duration of time. They were very unreliable and broke down frequently. They required regular maintenance and their components had also to be assembled manually. The first generation of computers became out-dated, when in 1954, the Philco Corporation developed transistors that can be used in place of vacuum tubes.

#### Examples:

- **ENIAC** (Electronic Numerical Integrator and Calculator) It was the first electronic computer using vacuum tubes. - 1946
- **EDSAC** (Electronic Delay Storage Automatic Calculator) It was the first stored-program computer. - 1949
- **EDVAC** (Electronic Discrete Variable Automatic Computer) It was successor of EDSAC. - 1951
- **IAS machine** (Princeton's Institute of Advanced Studies) It was a new version of the EDVAC, built by von Neumann. - 1952

The basic design of IAS machine is now known as von Neumann machine, which had five basic parts the memory, the arithmetic logic unit, the program control unit, the input and the output unit.

## Second Generation Computers

The second generation of computers (1954-64) was marked by the use of transistors in place of vacuum tubes. Transistors had a number of advantages over the vacuum tubes. As transistors were made from pieces of silicon, they were more compact than vacuum tubes. The second generation computers, therefore, were smaller in size and less heat generated than first generation computers. Although they were slightly faster and more reliable than earlier computers, they also had many disadvantages. They had limited storage capacity, consumed more power and were also relatively slow in performance. Like first generation computers, they also required regular maintenance and their components had also to be assembled manually. Manual assembly of components was very expensive and later many attempts were made to reduce such manual assembly. It was in 1964, when it was discovered that a number of transistors could be sealed up into a tiny package, called an Integrated Circuit (IC) or a Chip. Second generation computers became out-dated after the invention of ICs.

### Examples:

- PDP-1, developed by DEC was the first minicomputer.
- NCR 304 (National Cash Register), was first all-transistorized computer.

## Third Generation Computers

The third generation of computers (1964-1980) was marked by the use of Integrated Circuits (ICs) in place of transistors. ICs were more compact than transistors, as hundreds of transistors could be put on a single small circuit. These computers removed many drawbacks of second generation computers. The third generation computers were even smaller in size which generated less heat and required very less power as compared to earlier two generation of computers. These computers required less human labor at the assembly stage. Although, third generation computers were faster and more reliable, they also had a few disadvantages.

They still had less storage capacity, relatively slower performance and thus could not fulfil the requirements of the users and programmers. The third generation computers became out-dated around the year 1978 when it was found that thousands of ICs could be integrated onto a single chip, called LSI (Large Scale Integration).

### Examples:

- IBM 360, developed by IBM in 1964 was the first product line designed as a family.
- PDP-8, developed by DEC in 1965 was the first mass-market minicomputer.
- PDP-11, developed by DEC in 1970 was the first highly successful minicomputer.
- CRAY-1, developed by Cray in 1974 was the first supercomputer.
- VAX, developed by DEC in 1978 was the first super minicomputer.

## Fourth Generation Computers

The fourth generation of computers (1978-till date) was marked by use of Large Scale Integrated (LSI) circuits in place of ICs. As thousands of ICs could be put onto a single circuit, so LSI circuits are still more compact than ICs. In 1978, it was found that millions of components could be packed onto a single circuit known as Very Large Scale Integration (VLSI). VLSI is the latest technology of computer that led to the development of the popular Personal Computers (PCs), also called as Microcomputers. All present day computers belong to the fourth generation of computers. These computers are very powerful having a high memory and a fast processing speed. Today's PCs are even more powerful than mainframe computers. Although fourth generation computers offer too many advantages to users, the major drawback of these computers is that they have no intelligence on their own. Scientists are now trying to remove this drawback by making computers which would have artificial intelligence.

**Examples:**

- **IBM PC**, developed in 1981 was the first industry standard personal computer, having Intel 8088 memory chip.
- **IBM PC/AT**, developed in 1982 was the first advanced technology PC, having Intel 80286 memory chip.
- **386**, developed in 1985, had Intel 80386 memory chip.
- **CRAY-2**, developed in 1985, was the fourth generation supercomputer.
- **486**, developed in 1989, had Intel 80486 memory chip.
- **Pentium**, developed in 1995, has pentium (80586) memory chip.

**Fifth Generation Computers**

The fifth generation computers (Tomorrow's computers) are still under research and development stage. These computers would have artificial intelligence. They will use ULSI (Ultra Large Scale Integration) chips in place of VLSI chips. One ULSI chip contains millions of components on a single IC. The most important feature of fifth generation computers is that they will use an intelligent software. This software will enable the user to tell computer 'What to do' and not 'How to do' by using intelligent programming and knowledge-based problem solving techniques. So, the programmers or users would not be required to give each and every instruction to the computer for solving a problem. These computers will also have user interface in form of speech in natural languages.

**Example:**

- Yet to develop but ROBOTS have few features of fifth generation computers.

**Student Activity 8**

1. What are system software? Give example.
2. What are application software? Give example.
3. What are first generation computers?
4. What are the limitations of third generation computers?
5. Describe fourth generation computers.

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**1.15 COMPUTER LANGUAGES**

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One man communicates with another in a language, which another man can understand. Similarly, man communicates with computer in a language, which machine can understand. This language which consists of a set of commands, understandable by computer directly or after translating, is known as Computer Programming Language. There are many types of computer languages, which can be categorized into following four types

- (a) Low-level Languages (First and Second Generation Languages);
  - (b) High-level Languages (Third Generation Languages);
  - (c) User-Friendly Languages (Fourth Generation Languages);
  - (d) Object Oriented Languages (Fifth Generation Languages).
- (a) **Low-level Languages:** In early days of computers, only those languages were used for programming, which could be directly executed on computer. Languages, which computer can understand directly and are machine dependent, are called low-level languages. For example, Machine Language and Assembly Language are two important low-level languages. Machine language is the oldest and most difficult of all the languages. It is also known as First Generation Language. In machine language, all the instructions are given to computer in binary digits, and hence are directly understood by the computer. On the other hand, assembly language is easier than machine language, and is known as Second Generation Language. In assembly language,



instructions are given using mnemonic operation codes (such as ADD, MUL etc.) instead of binary digits.

Low-level languages are used for development of system software. As they are not used for applications development, managers or application programmers do not need to learn these languages.

- (b) **High-level Languages:** Development of applications using low level languages requires a deep understanding of the hardware. In order to facilitate the programmers to write programs without knowing the internal details of computer components, many languages were developed. These languages use common English words and are translated into low-level languages before processing by the computer. These languages which computer cannot understand directly and are not machine dependent, are called High-Level Languages (HLL). These languages are also known as Third Generation Languages. Some of the common high-level languages are
- (i) BASIC (Beginners All Purpose Symbolic Instruction Code);
  - (ii) COBOL (Common Business Oriented Language);
  - (iii) FORTRAN (Formula Translator);
  - (iv) PASCAL (Name of a Scientist);
  - (v) C (it does not stand for anything).

These languages were widely used for applications development, but most of them are outdated nowadays due to popularization of 4GLs. The uses of different 3GLs are summarized in Table 1.4.

**Table 1.4: Uses of 3GLs (Third Generation Languages)**

Language	Uses
BASIC (Beginner's All Purpose Graphics Symbolic Instruction Code)	Used for all purposes (Commercial, Scientific, Educational, etc.) by beginners.
COBOL (Common Business Oriented Language)	Mainly used for development of commercial applications on all types Computers.
FORTRAN (Formula Translator)	Used for development of scientific (mathematical) applications.
PASCAL (Name of a Scientist)	Used for both commercial and scientific applications.
C (No full form)	Very powerful language for development of both system and application software.

- (c) **User-friendly Languages:** Although high-level languages are simpler to codify than low-level languages, they still require a lot of time to learn their programming syntax. Hence, these languages are beyond the reach of many computer users (including MIS professionals), who do not want expertise in programming. Therefore, a new category of languages have been developed which are user-friendly, very easy to codify and simplest to learn. These languages are called as User-friendly Languages and popularly known as 4GLs (Fourth Generation Languages). Some of the common 4GLs are dBASE, Foxbase, Foxpro, MS Access, Oracle, Sybase and Ingres. The uses of different 4GLs are summarized in Table 1.5.
- (d) **Object-oriented Languages:** We have discussed that the object-oriented programming is the latest approach in programming. The languages which are based on Object-Oriented Programming (OOP) approach, are called as Object Oriented Languages. They may be classified into Fifth Generation Languages. Object Oriented Languages are specially useful for development of GUI (Graphical User Interface) applications. These languages also offer a unique feature of Reusable Code. Some of the popular object-oriented languages are Smalltalk, C++ and Object COBOL, Object Pascal, Simula, Eiffel, Java & Visual J++. C++ and Visual J++ are widely used nowadays for development of windows-based applications. The uses of different object-oriented languages are summarized in Table 1.6.

**Table 1.5: Uses of 4GLs (Fourth Generation Languages)**

Language	Uses
dBASE	Used for development of mainly single user DOS based database applications.
Foxbase	Used for development of both single and multiuser DOS based database applications.
Foxpro	Used for development of both DOS and Windows based database applications.
Oracle	Used for development of relational database applications on any operating environment.
Sybase	Mainly used for development of on-line applications such as Decision Support Systems and Transaction Processing.
Ingres	Used for development of relational database applications of VAX/UNIX operating System.

**Table 1.6: Uses of Object Oriented Languages (Fifth Generation Languages)**

Language	Uses
Smalltalk	Used for development of mainly graphical applications.
C++	Used for development of all types of object oriented applications.
Object COBOL	Used for development of object oriented applications on mainframe computer.
Object PASCAL	Used for general object oriented applications.
Simula	Mainly used in research environment.
Eiffel	Used for general object oriented applications.
VisualJ++	Very popular for development of Windows based applications.

**Notes:** There are certain languages which support most of the features of object-oriented programming except inheritance. These languages are not pure object-oriented languages and are known as object-based languages. For example, Ada, a high level language designed for process control, is an object-based language.

## **1.16 LANGUAGE TRANSLATORS**

Regardless of the programming language used (except machine language), the symbolic instructions have to be translated into a form, that can be executed by computer. The software, which convert the codes of other languages into machine code, are collectively called as Language Translators.

### **Types of Language Translators**

Language Translators are categorized into three types

- (a) **Assemblers:** Assemblers translate the assembly language code (source program) into machine language code (object program). After assembling, a linker program is used to convert the object program into an executable program. The Microsoft Assembler Program (MASM) and Borland Turbo Assembler Program (TASM) are two popular assemblers. Assemblers are used mainly in development of system software.
- (b) **Interpreters:** Instructions of a high-level language are coded in many statements. At the time of their execution, they are converted into machine code statement by statement, by using system software, called Interpreters. For example, programs written in BASIC language are executed by using BASIC A or GWBASIC interpreters. Programs written in some fourth generation languages, like dBASE III plus are also executed using dBASE interpreter. There are certain disadvantages of interpreters. As instructions are translated and executed simultaneously using interpreters, they are very slow for executing large programs. Hence, interpreters are not suitable for most of applications development.

- (c) **Compilers:** In contrast to interpreters, compilers provide faster execution speed. Compilers do not translate and execute the instructions at the same Time. They translate the entire program (source code) into machine code (object code). Using linker, the object code is converted into executable code. Compilers are widely used in translating codes of high level languages (e.g. COBOL, FORTRAN, PASCAL, Turbo/ Quick BASIC, Turbo/ Microsoft C etc.) and fourth generation languages (dBASE IV, Foxpro etc.). As compared to interpreters or assemblers, they are preferred in development of application software.

### Student Activity 9

1. Which language is understandable by computer?
2. What are high-level languages?
3. What are object-oriented languages?
4. What is the function of language translators?
5. Describe the following:
  - (a) Assembler (b) Interpreter (c) Compiler.

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## 1.17 SUMMARY

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A computer is an electronic device that can perform a variety of operations according to the instructions given by the programmer/user and provides the desired information as an output. Computers are fast, accurate, diligent, having high memory, but no intelligence.

Computer are classified as general purpose or special purpose computers according to the purpose of their requirement. According to the technology used, computers are classified as analog which are used for scientific and engineering application, digital which are considered as general purpose computers or hybrid computers. Which incorporate the technology of both analog and digital computers. According to their size, computer can be classified as super computer, mainframe computer, minicomputer and micro computer.

The main components of computer are input/output units central processing unit and memory unit. Input unit is used to enter data and instructions into a computer. CPU performs all the processing of input data: Memory is used to store the data, instructions and information before during and after the processing by ALU. Output unit makes available output to the users.

CPU consists of ALU (Arithmetic Logic Unit) which is responsible for all arithmetic and logical operations, CU (Control Unit) which controls the transfer of data and instructions among other units of computer Registers, which are used to store data, instructions and memory addresses when ALU performs arithmetic and logical operations, Buses which are used to transfer data between registers and clock which measures and allocates a fixed time slot for processing each and every micro operation.

Memory is the internal storage area, which holds the data and instructions during processing. The three types of main memory or Internal memory are RAM (Random Access Memory), ROM (Read Only Memory) and CMOS (Complementary Metal Oxide Semiconductor Memory).

Computers are used in business for data capturing in on-line as well as off-line mode, for storage and retrieval of information, for output and for transmission. Offices are needed to be automated to reduce cost of administrative overhead and to increase efficiency of office tasks and staff. The hardware components of microcomputer can be classified into motherboard, Input devices, output devices, storage devices, cards, ports and cords and power supply. Various Input devices are keyboard, mouse back ball, light pen, touch screen, Joy stick, digitizer, Scanner, Optical Mark Reader (OMR), Optical Character Reader (OCR) Bar Code Reader (BCR), Magnetic Ink Character Recognition (MICR) and voice input devices various output devices include monitor printer plotter and computer output micro file. Storage

devices include hard disk, floppy disk, compact disk, Magnetic tape, video disk, Magneto optical drive, DVD ROM/RAM disk, etc.

Computer software as classified as system software which are required to control the working of hardware, and software which are required for general and special purpose applications.

Computers are classified into six types based on their historical advancement and electronic components used, from fourth generation to fifth generation computers. Computers languages are categorized into four types, low level, high-level, user friendly and object oriented language.

Language translators are used to convert are codes of other languages into machine code. Various categories of language translators include Assemblers, compilers and Interpreters.

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## 1.18 KEYWORDS

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- **ALU:** Arithmetic Logic Unit of a computer which is used to perform arithmetic and logic operations.
- **Assembler:** A program which translates an assembly language program to its machine language equivalent.
- **Assembly Language:** A low-level language for programming a computer in which mnemonics are used to code operations and alphanumeric symbols are used for addresses.
- **Cache Memory:** A small high speed memory which is used to temporarily store a portion of a program or data from the main memory. The processor retrieves instructions or data from the cache memory. Instruction and data caching speeds up computation.
- **Chain Printer:** A printer in which the characters to be printed are embossed on a chain or a band. The chain is fashioned as a loop and print heads are activated to print specified characters.
- **Communication Channel:** A medium through which (electric) signal are transmitted and received.
- **Compiler:** A system program to translate a high level language program to machine language.
- **Computer:** This is a machine which executes an algorithm stored in its memory to process data fed to it and produces the required results.
- **Control Bus:** A set of wires used to transmit signals to control the operation of various units of a computer.
- **CPU:** Central processing unit of a computer. It consists of circuits to perform arithmetic and logic and also has circuits to control and co-ordinate the functioning of the memory and I/O units of a computer.
- **Data Entry Unit:** A system which a keyboard to enter data and a magnetic medium such as a floppy disk to store the entered data.
- **Data (Digital Audio Tape):** User 4 mm wide magnetic tape in a cartridge to store around 4 GB of data (1994).
- **Digital Channel:** A communication medium through which information in binary (digital) form is transmitted.
- **Disk Memory:** A back up or peripheral memory in which information is stored as magnetized spots on the surface of disks coated with magnetic material. In hard disks the disks are not flexible. In floppy disks the disks is a circular platter made of flexible magnetic coated plastic sheet.
- **Floppy Disk:** A circular magnetic disk made of flexible plastic sheet coated with magnetic material.

- **Fourth Generation:** Fourth Generation computers:- Computers built between 1975 and now. They use large scale integrated circuits, semiconductor memories and powerful high level languages and operating systems.
- **High Level Languages:** Computer language in which each statement is translated into many machine language statements.
- **IC:** Integrated circuit. An electronic circuit fabricated on a single chip of silicon.
- **Input Unit:** A part of a computer used to feed programs and data.
- **Joy Stick:** A stick mounted on a spherical ball which moves in a socket. Used to move the cursor on the screen of a display device.
- **Laptop:** A portable computer which weighs around 2 kg and runs all PC applications. It used a liquid crystal display and is usable by the person while traveling.
- **Light Pen:** A pen shaped devices which has a lens assembly. It is pointed towards an image displayed on a cathode ray screen. It picks up the image and determines the position of the picture element picked up.
- **Machine Language:** A language which uses numeric codes to represent operations and numeric addresses of operands. Each model of a computer has a unique machine language.
- **Memory:** An organized collection of cells used and programs in a computer.
- **Microcomputer:** A computer which is fabricated using a microprocessor, and other integrated circuits, namely, a ROM, RAM and I/O interface chips.
- **Output Unit:** A unit of a computer used to print or display computed results.
- **Printer:** An output unit to print the results of computation. Line printers print one full line at a time using a character, chain or drum. Character printer print one character at a time serially.
- **Processor:** A unit of a computer which interprets instructions, executes them using arithmetic and logic circuits and controls the operation of all the other units of the computer (also known as CPU).
- **RAM:** Random Access memory. A memory used as the main memory of a computer in which the time to retrieve stored information is independent of the address where it is stored.
- **ROM:** Read only Memory. A memory in which information is permanently written. The information can be read quickly but not change.
- **Second Generation Computer:** Computer built during the period 1956-65 which used transistors in CPU, magnetic core main memories and high level language FORTRAN and COBOL for programming.
- **Software:** Programs for a computer.
- **System Software:** General programs written for a computer. These programs written for a computer. These programs provide the environment to facilitate the writing of application programs.
- **Third-generation Computer-**Computer built between 1966 and 1975 which used integrated circuits in CPU, high speed magnetic core main memories, powerful high level languages and saw the advent of time sharing operating system.
- **VDU:** A Video Display Unit. An I/O device which consists of a television tube for presenting outputs and a keyboard for entering inputs.
- **Volatile Memory:** A memory in which the information stored is lost unless energy is continuously fed to it.

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## 1.19 REVIEW QUESTIONS

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### Unsolved Questions

#### 1. Fill in the blanks:

- (a) Computers can be classified according to \_\_\_\_\_ and \_\_\_\_\_

- (b) \_\_\_\_\_computers incorporate the technology of both analog and digital computers.
- (c) CPU consists of \_\_\_\_\_, \_\_\_\_\_and \_\_\_\_\_.
- (d) \_\_\_\_\_is volatile in nature.
- (e) A plotter is a specialized output device designed to produce high-quality\_\_\_\_\_.
- (f) \_\_\_\_\_is also called as system board.
- (g) Joystick is mainly used in \_\_\_\_\_and \_\_\_\_\_.
- (h) \_\_\_\_\_printers print the characters without striking against the and onto the paper.
- (i) \_\_\_\_\_and \_\_\_\_\_are first program into machine code.
- (j) \_\_\_\_\_translate the entire programs into machine code.

2. **State: True or False:**

- (a) Mainframe computers are the biggest and the fastest computers.
- (b) Registers are small high speed circuits used to store data, instructions and memory addresses.
- (c) CMOS memory is used to store the system configuration, data time and other important data.
- (d) Lightpen is rolled across the desktop to move the pointer on the screen.
- (e) A microfiche is a 4x6 inch film sheet.
- (f) Office automation deals in application of latest technologies in improving the overall proficiency of the office.
- (g) CPU is called the heart of the computer.
- (h) OCR is used for reading bar codes.
- (i) Laser printers look and work like photocopiers .
- (j) High level languages are widely used for applications development.

**Answers (Unsolved Questions)**

- 1. (a) Purpose, technology used, size and capacity. (b) Hybrid (c) ALU, CU, registers (d) RAM (e) graphics (f) motherboard (g) CAD, playing computer games. (h) Non-Impact (i) ENIAC, EDSAC (j) compiler.
- 2. (a) False (b) True (c) True, (d) False (e) True (f) True (g) False (h) False (i) True (j) True.

**Detailed Questions**

- 1. What is the difference between general purpose and special purpose computers?
- 2. What is the difference between analog and digital computers?
- 3. Classify computers on the basic of their technology.
- 4. What do you mean by the term diligence' respect to computers?
- 5. List some application areas of super computers.
- 6. What is the difference between minicomputer and microcomputer?
- 7. Write a short note on personal computer?
- 8. Describe the architectural of computer system.
- 9. State the basic units of computer. Name the submits that make up the CPU, and give the function of each of the units.
- 10. What is the function of memory? What are its measuring units?
- 11. What are the major strengths and weaknesses of computer?

12. What is the difference between RAM and ROM?
13. What is the function of bus in CPU?
14. Define the following:
  - (i) PROM
  - (ii) EPROM
  - (iii) EEPROM
  - (iv) DRAM
  - (v) SRAM
15. What are optical scanners? Give example:
16. Name some devices used to capture data of line.
17. Differentiate between microfilm and Microfiche.
18. Define point-of-sale terminals.
19. Why do we need office automation?
20. Describe various types of office automation system.
21. List some basic hardware components of Micro computer.
22. What are various components of Mother board?
23. Define the following:
  - (i) Mouse
  - (ii) Joystick
  - (iii) Touch screen
  - (iv) Bar code
  - (v) MICR
24. What are voice input devices?
25. What are Monitors? Describe its various types.
26. What are printers? Describe its various types.
27. What is the difference between Impact and non-impact printers?
28. Describe computer output Microfilm.
29. What are storage devices? Give examples.
30. What is function of Video disc.
31. What are computer software? Describe its various types.
32. Name some general purpose application software.
33. What are characteristics of second generation computer?
34. Describe fifth generation computers?
35. What are computer language? Describe its various types.
36. What is the difference compiler and Interpreter?

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## 1.20 FURTHER READINGS

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Peter C. Jurs, *Computer Software Applications in Chemistry*; Wiley-IEEE.

Manoj Kumar, M. Shamir Bhudookan, *Information Technology for 'O' Level*, Editions De L'Ocean Indien.

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# UNIT

## 2

### PC-SOFTWARE PACKAGES

#### L E A R N I N G   O B J E C T I V E S

After studying this unit, you should be able to understand:

- Disk operating system, its internal and external commands.
- Windows, its working and windows accessories.
- MS-Word as a word processor.
- MS-Access a data base management package.
- MS-Excel as a spread sheet package.

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- 2.2 Disk Operating System (DOS)
- 2.3 Windows
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### 2.1 INTRODUCTION

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In this unit, we are discussing all the important software concepts and providing you the latest knowledge of all the software available in the market. Many types of software are available for



various applications. The software development field is so advanced that day by day existing software are becoming outdated and new software are coming in the market. So we must get aware of the latest developments in the software industry.

Here, we discuss following software packages which are required for general and special purpose:

- Disk Operating System
- Windows
- Word Processor
- Database Management Packages
- Spreadsheet Packages

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## **2.2 DISK OPERATING SYSTEM (DOS)**

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An Operating System (OS) is an integrated set of specialized programs that is used to control and manage the resources and overall operation of a computer system. It is a class of software, which controls the execution of other programs.

DOS is the most commonly used operating system. The full form of DOS is Disk Operating System. It is a single user operating system which means that only one application can be made to run at one time. DOS provides a 'Platform' or an 'Environment' which lets the application program to interact with CPU and I/O devices. Many application software requires DOS for running. The common among these are word processors like Wordstar, Professional write; spreadsheet programs like Lotus 123, VP Planner Plus; accounting software like Tally, EX, etc. Each software package has a specific command to get itself running on DOS. For example, in order to run the spreadsheet program, Lotus 123, you will have to enter 123 at the DOS prompt, DOS will run Lotus 123 for you. On any application software shuts down, the control again has to come back to DOS and the DOS prompt can be seen again on the screen. Now, DOS is ready to accept more commands from you.

MS DOS (Microsoft Disk Operating System), a product of Microsoft Corporation of USA, is the most popular operating system for PCs. Another operating system available in the market is the PC DOS, a product of IBM, which is almost similar to MS DOS. Whether you use MS DOS or PC DOS, the basic commands of DOS remains the same.

### **Loading DOS**

The booting happens automatically when the computer is switched on, provided DOS is available to it. DOS can be present on both hard disk as well as the floppy disk. So, when the system is turned on, a search for DOS is done on floppy drive first. If it is not present on the floppy drive, the DOS is searched for on the hard disk. Thus, for booting to happen, the DOS must be present either on the floppy or on the hard disk. So, if DOS is not present on the hard disk, insert the floppy carrying DOS software in the A drive before switching on the system. If the system boots from floppy, the following prompt comes on the screen:

```
A:\>
```

where underscore character '\_' indicates the cursor (blinking mark) of the screen. However, if booting has been done from the hard disk, then the following prompt will come:

```
C:\>
```

C:\> or A:\> is the DOS Prompt. Looking at DOS Prompt, you can easily make out the currently active drive. If you want to switch yourself over to the another drive, then simply type its drive letter after the prompt and hit the <Enter> key as shown below:

```
C:\>A: <Enter>
```

```
A:\>
```

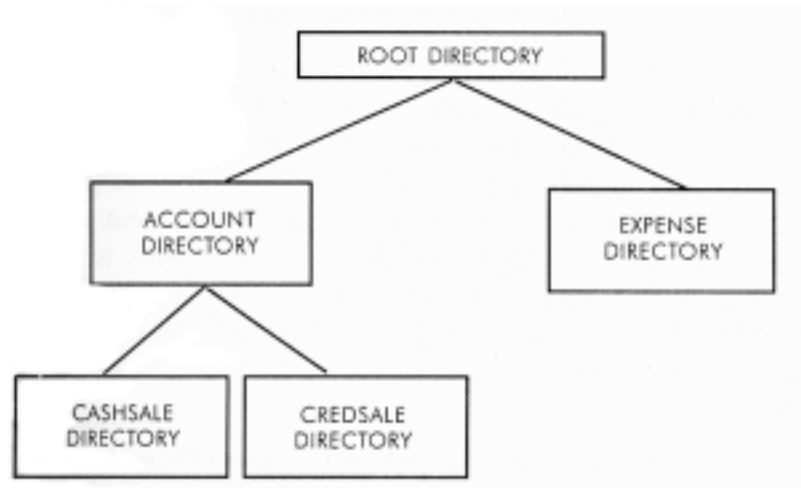
Now again if you want to go back to the C drive, then type in C: and hit the <Enter> key.

## Files and Directories in DOS

File is a collection of related information. Any kind of text, data or program that is entered, is stored in a file. Now, it is very essential to organize your files in an ordered manner. This makes file search easier otherwise, it can really be a difficult and time consuming job to search for a particular file out of the whole lot of files stored on the disk. An example of library can make the explanation of the concept more clear. As you must have already observed, the books in a library are put in big cabinets. Each cabinet is divided into many shelves and sub-shelves. Each shelf or sub-shelf contains books on a particular subject. So, the required book on a particular subject can be found out very easily without wasting much time and effort.

On similar grounds, all the files that are related to each other are clubbed at one place. This is known as a Directory Structure or simply a Directory. A directory structure resembles an inverted tree. The main directory becomes the Root directory. The directories and files become the branches of this directory tree. Any number of files and directories can be added to it thus, making the tree grow big downwards. Let us take an example:

Suppose we wish to store two kinds of files on our disk: ACCOUNT and EXPENSE. Further, we wish to keep two more kinds of files (say CASHSALE and CREDSALE) under ACCOUNT sub-directory. DOS can very much help you in organizing your files through directory structure which is shown in Figure 2.1.



**Figure 2.1: Example of Directory Structure**

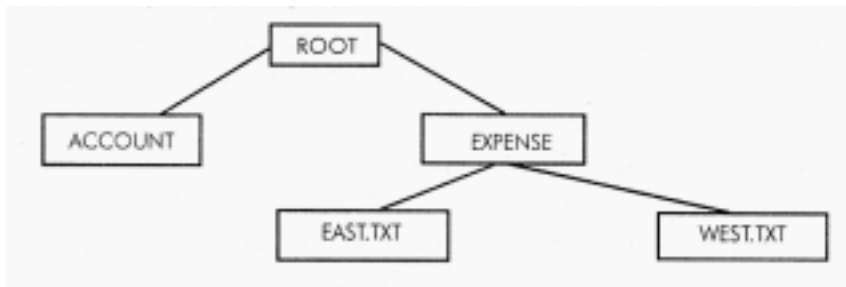
It is clear from the figure that:

1. On the top of the directory structure, there is a Root directory. This directory is always present and is shown by `\\(backslash)` for referencing. Any file or directory that is created is always under the Root directory.
2. EXPENSE is the sub-directory of the Root Directory.
3. ACCOUNT is the parent directory of the directories CASHSALE and CREDSALE. It can also be said that the CASHSALE and CREDSALE are the sub-directories of the ACCOUNT directory. Thus, a directory under a directory is called a sub-directory.

It can be clearly seen that the files relating to a particular subject can be put under a directory. For example, all the files relating to expenses can be put under EXPENSE sub-directory whereas all the files relating to cash sales can be stored under the sub-directory CASHSALE.

### Referencing Files

It's time to learn, as to how to locate a file? The directory structure shown in Figure 2.2 has two sub-directories under the Root directory. The sub-directory EXPENSE has two files under it.



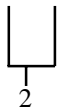
**Figure 2.2: Referencing Files**

DOS allows you to go from one directory to another by following a certain path. In the beginning, the user is always resident in the Root directory. While travelling from one directory to another, certain rules have to be followed. A user cannot go directly from ACCOUNT sub-directory to EXPENSE sub-directory. To go from one sub-directory to another, you have to first go to its parent directory or the Root directory. Thus, for going from ACCOUNT sub-directory to EXPENSE subdirectory, you first have to go to Root directory. Similarly, for going from the file EAST.TXT to WEST.TXT, you have to go to the EXPENSE sub-directory first. Thus, in other words, while moving from one directory to another, you have to go to its parent directory first.

Now, in order to reach out to the file WEST.TXT the following path has to be followed:

C:\>Expense\ West.txt

1 3 4 5



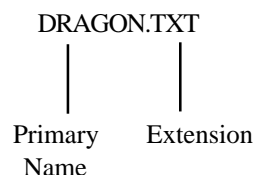
Here,

- 1 is the drive name where the file is resident in;
- 2 is the path which DOS takes to reach for a file;
- 3 is the directory under the Root;
- 4 is the primary name of the file that is to be accessed; and
- 5 is the extension name of the same file.

The backslash (\) has to be used for tracing out the path. The first backslash takes you to the Root directory. The subsequent backslashes separate the directories, sub-directories and the filename that are given in the whole path.

### File Naming Conventions

There are certain rules that have to be followed while giving names to your files. A file name has two parts Primary Name and Extension (Secondary Name). A dot (.) separates a primary name from an extension. Let us see the two parts of the file named DRAGON.TXT.



A primary name cannot have more than eight characters and an extension cannot have more than three characters. A file name having only the primary name and no extension is absolutely valid because it is optional to give an extension to a file name. An extension is generally given by the language or software used. For example, if you are entering a BASIC or PASCAL program, its file name would have extension BAS or PAS respectively. A file name can contain the following characters:

- 1. An Alphabet (A-Z) or (a-z)

2. A number (0-9)
3. Special characters such as: \$, #, &, @, !, %, (, ), -, {, }, " A, etc.  
except \*, ?, full stop (.) and space ( ).

It is a good practice to give meaningful names to your files. However, no two files can have exactly the same name on the disk. Thus, a name given to a file on a disk has to be unique.

A look at a few valid and invalid file names:

VALID	INVALID
MYHUNT	MYBOOK.DOC
Dragon.Txt	B.R. Arora
Uphill.up	S?JAIN.BAS
VIJAYA	EXCELBOOKS
Employee.Emp	ANARAG.**
157.IN	VICKYMEHTA

The rules for naming a directory are the same as that of naming files.

### Student Activity 1

1. What is an operating system?
2. Define MS-DOS.
3. What is booting?
4. What is a file and a directory?
5. Describe the file naming conventions in MS-Dos.

## DOS Commands

DOS offers a variety of commands to perform various functions. With the help of DOS commands, you can display the list of files and directories that are present on the disk, create new files and directories, remove unwanted files and directories and much more. DOS commands can be entered either in uppercase or lowercase letters. The format of a DOS command is called syntax. All DOS commands begin with command name. When DOS carries out the instructions given by you, it is called the execution of DOS command. Let us discuss some of the DOS commands in detail. (The commands which you should issue, are written as bold letters throughout this unit).

### Directory Commands of DOS

The directory commands help you to create new directories and remove existing ones. They also allow you to travel from one directory to another. You can also view the listing of files and directories that are present on the disk.

#### 1. Displaying a List of Files on the Disk: DIR command

This particular DOS command helps you in displaying a list of files or directories that are present on hard disk as well as floppy disk. Thus, to see the contents of your hard disk, issue the following command:

```
C:\>DIR <Enter>
```

The above command displays the primary name, extension and size of files in bytes. It also displays the date and time when the file was created or modified last. If you wish to view the contents of the floppy drive, then you first switch yourself to the floppy drive and then issue the DIR command as shown below:

```
C:\> A: <Enter>
```

```
A:\>DIR <Enter>
```

Figure 2.2 shows two sub-directories ACCOUNT and EXPENSE. If you wish to view the contents of the sub-directory EXPENSE, then issue the following command:

```
C:\>DIR \EXPENSE <Enter>
```

Let us assume that there is one more sub-directory by the name BUSINESS existing under EXPENSE. To view the contents of this sub-directory, issue the following command:

```
C:\>DIR \EXPENSE\BUSINESS <Enter>
```

If you have a large number of files on the disk, then on issuing, DIR command, the screen scrolls up and only a few file names are shown. In such a case, issue the following command:

```
C:\>DIR/P <Enter>
```

The above command will show the contents of the disk pagewise or screenwise. Now, if you are interested only in seeing the file names, then issue the following command:

```
C:\>DIR/W <Enter>
```

The above command shows the names of files and directories widthwise. So, in one line only five names of files and directories are shown. The other details like the size of file, the date and time of each file creation are not shown. The directories are shown in square ([]) brackets.

## 2. Making a Directory: MD Command

In the earlier part of this unit, we discussed that all the related files should be clubbed at one place, called a directory or sub-directory. So, to club all the related files under one head, new directories and sub-directories have to be created. Let us create a new sub-directory by the name INCOME under the Root directory.

The following command can achieve this:

```
C:\>MD INCOME <Enter>
```

where MD stands for Make Directory. Further, let us create another sub-directory by the name HOSPITAL under the sub-directory Income.

```
C:\>MD INCOME\HOSPITAL <Enter>
```

## 3. Removing a Directory: RD command

With time, certain directories grow old and are no more needed. It is better to delete such directories because they can save us many precious bytes on the disk. So, let us delete the sub-directory HOSPITAL with the following command:

```
C:\>RD INCOME\HOSPITAL <Enter>
```

where RD stands for Remove Directory

A directory or a sub-directory has to be essentially empty before removing it. For example, in order to remove the sub-directory HOSPITAL, there should not be any directories and files under it. So, you must first delete all the files and remove all the sub-directories present under the sub-directory HOSPITAL before removing it. We will discuss the method for deleting files in subsequent part of this unit.

## 4. Changing Directory: CD command

Let us again refer to the Figure 2.2. Suppose you are under the EXPENSE sub-directory and you want to access the files or directories in the ACCOUNT sub-directory. This would involve the changing of directory from EXPENSE to ACCOUNT. This will make the ACCOUNT directory active. The task of changing directories can be accomplished with the help of CD command.

Look at the following example:

```
C:\>CD ACCOUNT <Enter>
```

where CD stands for Change Directory

The above command will take you to the sub-directory ACCOUNT as shown by the following prompt:

```
C:\ACCOUNT>
```

If you want to go to the sub-directory CASHSALE straight from the sub-directory EXPENSE, issue the following command:

```
C:\>CD ACCOUNT\CASHSALE <Enter>
```

After the above command, the following prompt will come:

```
C:\ACCOUNT\CASHSALE>
```

The command for going to the root directory from the above prompt is:

```
C:\ACCOUNT\CASHSALE>CD\ <Enter>
```

But, the command for going to the parent or previous directory (whether it is root or sub-directory) is:

```
C:\ACCOUNT\CASHSALE>CD.. <Enter>
```

If you are in the sub-directory CASHSALE, the above command will take you to ACCOUNT sub-directory as shown below:

```
C:\ACCOUNT>
```

## File Commands of DOS

DOS offers a number of file commands for performing various operations on your file like copying, deleting and renaming the files.

### 1. Copying Files: The COPY Command

At times, you may have to work on some other machine. So, this involves copying files from one disk to another. Copying of files can happen from hard disk to floppy or vice-versa. Files can also be copied onto the same disk with a different name. The COPY command helps us to accomplish all these tasks.

The syntax of the copy command is:

```
COPY <Source drive>: (File spec 1) <Target drive>: (File spec 2)
```

Where

Source drive refers to the drive from where the file has to be copied. It can be

A, B or C.

'File Spec 1' refers to the path from where the file that has to be copied.

'Target drive' refers to the drive where the file is going to be copied.

'File Spec 2' refers to the destination where the file is going to be copied.

- (i) **Copying a file to another drive under the same name:** A file can have the same name if it is stored on different disks. Thus, to copy a file by the name SCENE from hard disk to floppy disk, issue the following command:

```
C:\>COPY C:SCENE A:SCENE <Enter>
```

As the file is copied from the active drive, then there is no need to specify the source drive in the above command. On similar grounds, if the file name remains unchanged then there is no need specify it after the target drive. Thus, the above command can also be given in the following way:

```
C:\>COPY SCENE A: <Enter>
```

- (ii) **Copying a file to another disk under a different name:** The name of the file can be changed very easily while copying. The following command copies the file SCENE from the hard disk onto floppy disk by the name SERENE.

```
C:\>COPY SCENE A:SERENE <Enter>
```

- (iii) **Copying a file with a new name on the same disk:** The file can be copied with a different name and stored on the same disk. Proceeding with the above example, let us save the file SCENE with a new name, SERENE and copy it onto the same disk.

```
C:\>COPY SCENE SERENE <Enter>
```

Once this command is executed, we have the same file under two different names, stored on the same disk.

- (iv) **Copying files from one directory to another:** Suppose you have placed all your files under the root directory. Now, at later point of time, you wish to club all the related files at one place. This can be easily done. Create a directory and copy the required files from the root directory to this newly created directory. DOS allows you to copy files from one directory to another.

Let us assume that you have a file by the name NORTH.TXT in the root directory and you wish to copy this file in the newly created Area sub-directory. The following command will do this:

```
C:\>COPY NORTH.TXT\AREA <Enter>
```

Similarly, you can copy files from any directory to any other directory. DOS only needs the specification of full path from you. Let us copy a file OLD.TXT which exists under the sub-directory DATA to the sub-directory INFO which is resident in the floppy disk.

```
C:\>COPY DATA\OLD.TXT A:\INFO <Enter>
```

## 2. Deleting Files: DEL Command

With time, certain files grow old which are no longer required. So, it is desirable to delete such files because unwanted files occupy precious space on the disk. Suppose there is a file on the hard disk by the name TRYPRG which is no longer required. The following command deletes this file:

```
C:\>DEL TRYPRG <Enter>
```

If the file SALE.PRG exists on the floppy disk, first you go to the A: prompt and then delete the file as shown below:

```
C:\>A: <Enter>
```

```
A:\>DEL TRYPRG <Enter>
```

While deleting any file of a sub-directory, its full path should be given as illustrated in the following example. Let us assume that the TRY.PRG file exists under a subdirectory MANAGE on the hard disk. To delete this file-issue one of the following commands:

```
C:\>DEL C:\MANAGE\TRYPRG <Enter>
```

OR

```
C:\>DELMANAGE\TRYPRG <Enter>
```

You can also delete the IMT.PRG file by first changing to that sub-directory and then issuing the DEL command as given below:

```
C:\>CD\MANAGE <Enter> C:\MANAGE>DEL TRY.PRG <Enter>
```

## 3. Renaming Files: REN Command

DOS allows you to give new names to your files. Assume that there is a file by the name OLD.TXT and now you wish to give a new name NEW.TXT to it. Carry out one of the following commands to get your work done.

```
C:\>REN OLD.TXT NEW.TXT <Enter>
```

OR

```
C:\>REN DATA\OLD.TXT NEW.TXT <Enter>
```

The file OLD.TXT which resides under the sub-directory DATA now has a new name NEW.TXT.

## Wildcards

Often you may need to do a similar kind of job on a number of files. If these files have something in common, then we can save the effort of performing repetitive job. So, these files can be referred collectively by using the wildcard facility provided by DOS. The use of wildcards in a DOS command gives greater flexibility when using similar type of file names. DOS offers two wildcards : ? and \*. Each ? can be replaced by exactly one character or none, if it is given at the end of the filename. As and when the ? wildcard is specified in the middle of a filename, it has to necessarily match one character. The \* wildcard can match eight or less characters in the primary name and three or less characters in the extension part.

Let us take an example to make the concept of wildcards clear. Suppose the following files are present onto your disk:

Old.Txt	INCOME.pro	Alpha	Page.in
Go.Exe	OLDI	Dragon.Exe	KOMAL
Expense.prg.	OLD20.bas	Over.prg	Annual.doc
New.doc	Zee.com	Old.doc	Paper.com

The following commands illustrate the concept of wildcards:

- (i) If you wish to see all the files that start with the letter O and any extension, then give the following command:

```
C:\>DIR O *.* <Enter>
```

The above command will list the files OLD.TXT, OLDI, OVER.PRG, OLD20 and OLD.DOC

- (ii) Now, let us copy all the files with any number of characters in the primary name and the extension EXE with the following command.

```
C:\>COPY *.EXE A: <Enter>
```

The above command will copy the files GO.EXE and DRAGON.EXE onto the floppy disk.

- (iii) To delete all the files beginning with OL, having two more characters in the primary name and any extension, issue the following command.

```
C:\>DEL OL??* <Enter>
```

With this command, the files OLD.TXT, OLD.DOC and OLDI are going to be deleted because these are the only files present on the disk which match the given wildcard pattern. The above command will not delete the files OVER.PRG and OLD20, because the former does not start with OL and the latter has 5 characters primary name.

- (iv) Similarly, to copy all files starting with P and an extension comprising of two characters ending with N issue the following command:

```
C:\>DEL P*.*N <Enter>
```

This will delete the file P AGE.IN because this is the only file matching the given wildcard pattern.

- (v) For copying all the files having primary name OLD and any extension from floppy to EXPENSE sub-directory of hard disk, issue the following command:

```
A:\>COPY OLD.* C:\EXPENSE <Enter>
```

The above command will copy only two files OLD.DOC and OLD.TXT.

- (vi) To copy all the files with primary name anything and no extension from EXPENSE sub-directory of hard disk to floppy, issue the following command:

```
C:\>COPY \EXPENSE\*. A: <Enter>
```

The above command will copy the files ALPHA, OLDI and KOMAL.

- (vii) To delete all the files of floppy, issue the following command:

```
A:\>DEL *.* <Enter>
```



After giving the above command, the following message will come on the screen:

Are you Sure (Y /N)? \_

Press 'Y' if you really want to delete all files otherwise press any key. Never try the above command on root directory of hard disk, otherwise your most important DOS file COMMAND. COM will also be deleted and thereafter you will not be able to boot the system from the hard disk. Therefore, wildcards with DEL command should be used with great caution.

### Student Activity 2

1. List some directory commands of DOS.
2. What is the difference between RD and MD command?
3. What is the function of CD Command?
4. How will you copy files in Ms-Dos?
5. How will you rename a file in MS-Dos?
6. What is the advantage of wild cards?

### Some More DOS Commands

You have already been introduced to the directory and file commands of-DOS. Now, let us make ourselves familiar with other commonly used commands.

#### (A) Displaying and/or changing date: The DATE Command

DOS allows you to show as well as change the current date once you are on the DOS prompt. Issue the following command to see or change the today's date:

```
C:\>DATE <Enter>
```

After issuing the above command the following screen appears:

```
Current date is Thu 11-12-
Enter new date (mm-dd-yy):_
```

So, key in the new date in 'month-date-year' format. However if you do not want to change this date simply hit the <Enter> key. The current date will be taken as new date.

#### (B) Displaying and/or changing the current time: The TIME Command

The TIME command is used to display and change the current time.

```
C:\> TIME <Enter>
```

On issuing this command, the following screen appears:

```
Current time is 11:05:10:01
Enter new time:
```

Enter the new time in hours: minutes: seconds format. Hit the <Enter> key if you do not want to change the time. The new time can also be specified along with TIME command.

#### (C) Clearing screen: The CLS Command

In order to clear the cluttered and clumsy screen, issue the CLS command. This will remove the contents shown on your screen thus making it look neater and cleaner. The CLS command is given in the following manner.

```
C:\>CLS <Enter>
```

#### (D) Creation 01 a new file: The COPY CON Command

Text Files can be created by COPY CON command. Look at the following example:

```
C:\>COPY CONHELLO.TXT <Enter>
```

This command tells DOS to copy the information from the keyboard or Console and put it in the file HELLO.TXT. On issuing the command the following screen appears:

```
C:\>COPY CON HELLO.TXT
```

—

You will find a blinking cursor in the second line. Enter the text and terminate : each line by pressing <Enter> key as illustrated below:

```
My first DOS file. The name given to this file is Hello.Txt.<Enter>
```

It is very easy to create files in DOS. <Enter>

Once all the required text is entered, hit the <Ctrl+Z> keys together to mark the end of Text. <Ctrl+Z> keys tell DOS that no more text is going to be entered now. Again hit the <Enter> key.

### **(E) Displaying contents of files: The TYPE Command**

The contents of any file can be viewed very easily by giving the TYPE command followed by the file name. Let us see the contents of file HELLO.TXT that we have just created by issuing the following command.

```
C:\>TYPE HELLO.TXT <Enter>
```

You can also send the output of a file to the printer. The following command starts the printing job provided the printer is on.

```
C:\>TYPE HELLO.TXT >PRN <Enter>
```

### **(F) Displaying a message on the screen: The ECHO Command**

At times, you may require to display a text on the screen while executing a set of commands. The ECHO command helps you to display a meaningful message on the screen. This command is issued as illustrated below:

```
C:\>ECHO Please insert floppy in drive A: <Enter>
```

The ECHO command is a special DOS command used exclusively in batch files (the files containing a set of DOS commands). There is one more form of ECHO command i.e., ECHO OFF as shown below:

```
C:\>ECHO OFF <Enter>
```

The above command tells DOS not to display other commands in the batch file.

### **(G) Displaying the currently logged sub-directory: The PROMPT Command**

Users always prefer to see the prompt for currently logged sub-directory. The PROMPT command tells DOS to include the sub-directory, greater than (>) sign or any text as a part of the prompt. The various forms of PROMPT command are discussed below:

- (i) To display the path designation (e.g., \ACCOUNT\EXPENSE) and the greater than sign as a DOS prompt, issue the following command:

```
C:\> PROMPT $p$g <Enter>
```

After giving the above command, if you are logged to EXPENSE sub-directory of ACCOUNT sub-directory in the root directory, then the following prompt will come on the screen:

```
C: \ACCOUNT\EXPENSE>_
```

- (ii) To display a text “I Love India” along with path designation and greater than prompt, issue the following command:

```
C:\>PROMPT I Love India $p$g <Enter>
```

The above command will display the following prompt:

```
I Love India C: \>_
```

- (iii) To display just greater than sign without path designation, you can give the following command:

```
C:\>PROMPT <Enter>
```

The command will display the following prompt:

```
C >_
```

### (H) Specifying a sub-directory PATH: The PATH Command

By this time, you must be familiar with the directory structure of DOS. Suppose your program (say PRINCE.COM file) lies on the GAME sub-directory of the root directory and you want to execute it from any other sub-directory (say WINDOWS). To execute PRINCE.COM file, first you will have to make GAME as the currently active sub-directory and then issue the following command:

```
C:\GAME>PRINCE <Enter>
```

DOS provides a shortcut way to locate and run the above program from any other sub-directory by specifying the path as illustrated below:

```
C:\WINDOWS>PATH C:\GAME <Enter>
```

The above command tells DOS that GAME sub-directory is in the current search path of DOS. DOS will first search the required program file in the currently logged drive and then GAME sub-directory. Thus, the PRINCE.COM file can be executed directly from WINDOWS or any sub-directory as shown below:

```
C:\WINDOWS>PRINCE <Enter>
```

The PATH command is generally used in batch files.

### Student Activity 3

1. How will you set date and time of system in Ms-Dos?
2. What is the function of CLS command?
3. How will you create a new file in MS-Dos?
4. What is the function of Type command?
5. What is the function of path command?

### Internal and External Commands

All DOS commands can be classified into two categories: Internal Commands and External Commands.

#### Internal Commands

The commands which are a part of the main files of DOS (i.e., COMMAND.COM and two hidden files) are known as Internal Commands. They are loaded in the RAM as soon as the computer is switched on. The important internal commands are: DIR, COPY, DEL, REN, MD, CD, RD, TYPE, COPY CON, DATE, TIME, CLS, ECHO, PROMPT and PATH. We have already discussed all these commands quite in detail. These commands are very frequently used.

#### External Commands

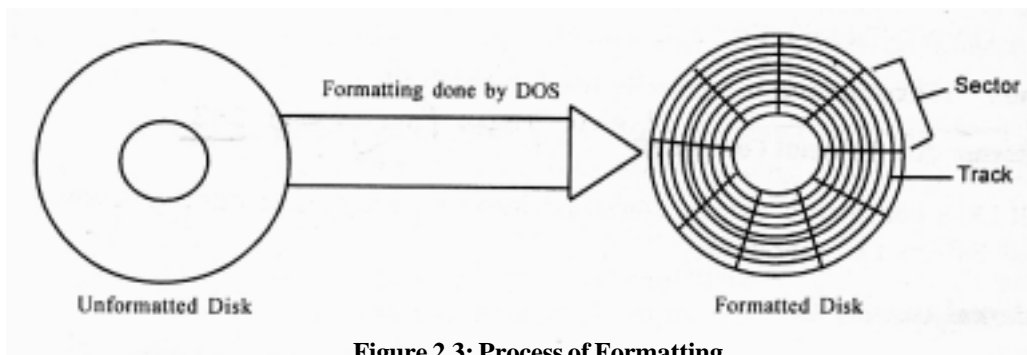
External commands are those commands which are stored on disks as separate program files. These files have the same primary name as the command name. The extension of these files is either COM or EXE. So, at the time of execution of these commands, the corresponding program file should be present in the DOS sub-directory of the harddisk and DOS sub-directory should also be in the path search. The commonly used external commands are: FORMAT, DISKCOPY, CHKDSK, XCOPY and LABEL. Let us learn about these commands.

## 1. Making the disk usable: FORMAT Command

Before discussing the format command in detail, let us first see what is meant by the term 'Formatting'. Generally when you purchase a diskette from the market, it is unformatted. It can be compared with a notebook which has blank pages without any ruler lines. You would prefer to put lines, write page numbers and categories the pages into equal parts so that an index can be made and the required topic can be searched very easily. Similarly, DOS organizes the disk into concentric circles which are called tracks. Tracks are further divided into triangular regions. Each such region is called a sector. The organization of disk into tracks and sectors is called Formatting. The Figure 2.3 makes the formatting concept more clear.

FORMAT command is used for formatting a hard disk or floppy disk. As FORMAT is an external command, a file by the name FORMAT.COM should be present on your disk. In order to format the floppy disk, issue the following command:

```
C:\>FORMAT A: <Enter>
```



**Figure 2.3: Process of Formatting**

Once the above command is executed, the following message appears:

```
Insert new diskette in drive A:  
and strike ENTER when ready
```

Insert a floppy disk in drive A and hit the <Enter> key. When the formatting of the disk is done, the following message appears on the screen.

```
Enter Volume Label (upto 11 characters):_
```

Here, you can give a name to the disk for its easy identification. A label upto 11 characters can be given to the disk after it is formatted. If you don't want that your disk should carry any label, simply press <Enter> key. Now, the following message will come:

```
Format Another (Y/N)?_
```

Now, if you want to format another disk, then hit 'Y' (for Yes) and insert that disk in the drive otherwise type in 'N' (for No) or press any key to end the format program.

New disks should always be formatted for using them. But old disks can also be formatted. Formatting will make the disk blank by erasing all its data. You may require to format an old disk if it has bad sectors and is needed again for usage. However, the FORMAT command should be used with extreme caution. Any disk whether hard disk or floppy disk will lose all data stored on it once the formatting operation is done. Therefore, you should not try the FORMAT command for formatting the hard disk. If you format the hard disk, all the contents stored on it are going to be removed permanently and new tracks and sectors will be created.

FORMAT command also provides a method for making your disk bootable. The following command is used for this purpose:

```
C:\>FORMAT A:/S <Enter>
```

With the help of above command, all the operating system files (COMMAND.COM and two hidden files) are copied from the hard disk to the floppy disk. This floppy can now be used to load

DOS in the computer's memory if you are unable to boot the system from the hard disk. The COPY command cannot serve the above purpose because it cannot copy the two hidden files of DOS in the boot sector.

## 2. Checking a disk: The CHKDSK Command

The command CHKDSK helps to check the status of the disk. After checking the disk, CHKDSK displays several items of information. However to get executed, this command needs the program file CHKDSK.COM. Let's check the status of the disk in drive A through the following command:

```
C:\>CHKDSK A: <Enter>
```

On successfully checking the disk, the following status is shown on the screen:

```
Volume SHEFALL created 12-11-1998 12:03a
1,457,664 bytes total disk space
 2,560 bytes in 1 directories
747,520 bytes in 74 user files
707,584 bytes available on disk

 512 bytes in each allocation unit
2,847 total allocation units on disk
1,382 available allocation units on disk

655,360 total bytes memory
562,048 bytes free
```

If no drive letter is specified with CHKDSK command, then the currently active drive is checked for.

## 3. Giving volume label to disk: The LABEL Command

Although, you have seen that a volume label to the disk is given at the time of formatting the disk, DOS also provides LABEL command to change, delete or give new label. This command needs a program file LABEL.COM. Let us give a label to the floppy disk by the following command:

```
C:\>LABEL A: <Enter>
```

Once the above command is executed the following screen appears:

```
Volume label in drive A has no label
Volume label (11 characters, ENTER for none) _
```

So hit the <Enter>key if you want to delete the volume label without typing in anything. You can also provide volume label directly with the following command.

```
C:\>LABEL A:MANOJ <Enter>
```

## 4. Copying contents of one the floppy disk to another: The DISKCOPY Command

The DISKCOPY command helps you to copy all the contents of one disk onto the other in such a way that both disks become identical. It copies the contents of the floppy disk present in source drive onto the disk present in the destination drive. If you have a single drive on your computer, then the same drive can act as source as well as the destination drive. The command to copy the contents of one floppy onto the other is given here:

```
C:\>DISKCOPY A: A: <Enter>
```

When you issue the above command a screen like the one shown below appears:

```
Insert SOURCE diskette in Drive A
Press any key to continue
```

At this point, insert the diskette whose contents are to be copied and then hit any key. Another message appears on the screen as shown below:

```
Insert TARGET diskette in drive A
Press any key to continue
```

So, after this message appears, insert the diskette into which the files are to be copied. Thereafter, press any key to continue the process. Once the process of copying is completed, the following screen appears:

```
Copy Complete
Copy Another (Y/N)?_
```

Press the 'Y' (for Yes) key if you want to copy the contents of some other diskette. DOS will again prompt you to enter the source diskette. However, if you want to stop the DISKCOPY process, press 'N' (for No). DISKCOPY command first formats the target diskette if it is unformatted and then copies files onto it. So, if any contents exist on the target diskette, they are all going to be removed. The DISKCOPY command needs the program file DISKCOPY.COM for execution.

### 5. Copying files and directories: XCOPY Command

The XCOPY command is used to copy the files present in sub-directories. The command 'COPY \*.\*' copies the files of the currently working directory and DISKCOPY command copies the entire contents from one floppy to another. So, they are not helpful in copying files selectively. The XCOPY command offers three special advantages:

- a) It prompts you to specify the files that you want to copy.
- b) It can also copy directories and other lower level directories.
- c) It can be used to copy files from the hard disk to the floppy disk.

Now, let us explore the XCOPY command. If you wish that DOS should ask for your confirmation for copying a file, then use the /P option along with the XCOPY command. Consider the following example:

```
C:\>XCOPY C:ACCOUNT A:ACCOUNT /P <Enter>
```

If you want to copy the directories and lower level directories, then use the /S option along with the XCOPY command. Look at the following example:

```
C:\>XCOPY C: ACCOUNT A:ACCOUNT /S <Enter>
```

This command will copy the directory and all the sub-directories onto the A disk. However, if the /S option is not specified, then the XCOPY command works within the single directory. You can also use /P and /S option simultaneously with the XCOPY command as shown below:

```
C:\>XCOPY C:ACCOUNT A:ACCOUNT /P/S <Enter>
```

The whole path can be specified with the XCOPY command. This command again needs the program file XCOPY.EXE in order to get executed.

### BATCH Files

Very often, you keep keying in the same sequence of commands to do a repetitive job. For example, everyday, when you start your work on the computer, you first see the listing of files present on the hard disk. Then, you copy all the files with extension EXE and TXT from the floppy disk to hard disk. Thus, for achieving your task, you have to issue the following commands everyday.

```
C:\>DIR/P <Enter>
C:\>COPY A: *.EXE C: <Enter>
C:\>COPY A: *.TXT C: <Enter>
```

DOS can really simplify your task. All the sequence of commands can be put in a file which is called a batch file. This file offers a great advantage. Any number of commands given in a batch file can be executed by just giving a single command at the DOS prompt. DOS executes all these commands one by one. All the batch files can have any primary name but the extension given to these kinds of files is BAT. The method of creating a batch file is exactly similar to that of creating any other file on DOS. Let us see it, through an example:

```
C:\>COPY CON MY.BAT <Enter>
DIR/P <Enter>
COPY A: *.EXE C: <Enter>
COPY A: *.TXT C: <Enter>
<CTRL+Z> <Enter>
```

In the above example, a batch file by the name MY.BAT has been created. If you want to execute this file, simply type in the name of the file at the DOS prompt as shown below:

```
C:\>MY.BAT <Enter>
or C:\>MY <Enter>
```

The commands given in this batch file are going to be executed one by one in the sequence specified.

### The AUTOEXEC. BAT File

The AUTOEXEC.BAT is an autoexecutable batch file. It is a special kind of a batch file. This file is executed as soon as the operating system is loaded in the computer's memory. The AUTOEXEC.BAT file is needed when you want it to be executed automatically each time the system is switched on. Now, as soon as the computer is switched on, DOS searches for the AUTOEXEC.BAT file in the Root directory of the bootable disk. If the system finds this file, then all the commands given in it are executed one by one instantly without even asking for date and time. The AUTOEXEC.BAT file is created like any other batch file. Look at the following example:

```
A:\>COPY CON AUTOEXEC.BAT <Enter>
ECHO OFF <Enter>
CLS <Enter>
ECHO My first Autoexec.bat file successfully executed <Enter>
PROMPT $P$G <Enter>
PATH C:\DOS;C:\WINDOWS <Enter>
<CTRL+Z> <Enter>
```

Enter the above commands on the root directory of bootable floppy disk. Reset your system. You will notice the above created batch file being executed automatically.

### Student Activity 4

1. What are Internal and external DOS commands?
2. What is the function of FORMAT commands?
3. What is the function of CHKDISK command?
4. What is the difference between DISKCOPY and XCOPY?
5. What are batch files?
6. Describe AUTOEXEC.BAT file.

---

## 2.3 WINDOWS

---

Windows is another popular software. Windows 98, a product of Microsoft is the latest upgrade of its earlier versions (Windows 3.0, 3.1, 3.11 and 95). It is a Graphical User Interface (GUI) which has been designed to make your work more intuitive and easy. There is no more need of remembering the exact syntax of commands to get your work done. Everything is provided in the form of pictures and

graphics. Windows 98 is a full fledged operating system. The program files and other resources are generally accessed with the help of mouse. The Windows 98 desktop acts as the primary media for organizing your programs, files and resources.

### Hardware Requirements

The minimum hardware configuration required to run Windows 98 is given below:

- 486 or Pentium CPU
- At least 4 MB of RAM
- 10 MB to 40 MB of free disk space
- SVGA monitor
- Mouse
- Keyboard

### Features of Windows 98

We will briefly discuss some of the features of Windows 98:

1. It provides a graphical operating environment. All the programs and other resources are provided in the form of Icons.
2. It is a full fledged operating system with an in-built copy of DOS. DOS programs can be safely run on Windows 98.
3. It is a multi-threaded and preemptive multi-tasking operating system which means that more than one application can be made to run simultaneously and more smoothly.
4. It supports long file names upto 255 characters, thus, breaking the DOS naming convention where you can give primary file name upto 8 characters.
5. The plug and play feature of Windows 98 automatically adapts itself to the hardware it is running on. It can detect hardware and then install all the proper drivers without taking any help from you.
6. It gets you organize all your work on the desktop or in folders. You can safely click at any folder to open it up.
7. It is more effective in cleaning up after crash of a faulty application. At any time, if a program crashes, you can remove it safely from the tasklist without disturbing other running application. The memory and other resources that the application was using are altogether freed.
8. It contains a disk compression program which can essentially double your hard disk space, thus, preventing you from buying a new hard disk.

### The Windows 98 Desktop

So, as and when you switch on your computer, Windows 98 is loaded in the RAM and a desktop appears on the screen as shown in Figure 2.4. This desktop contains folders, files, applications, taskbar and shortcuts.

The objects labelled 'My Computer', 'My Briefcase' and 'Network Neighbourhood' are examples of folders. A folder is similar to a directory in DOS. A folder can contain other folders and

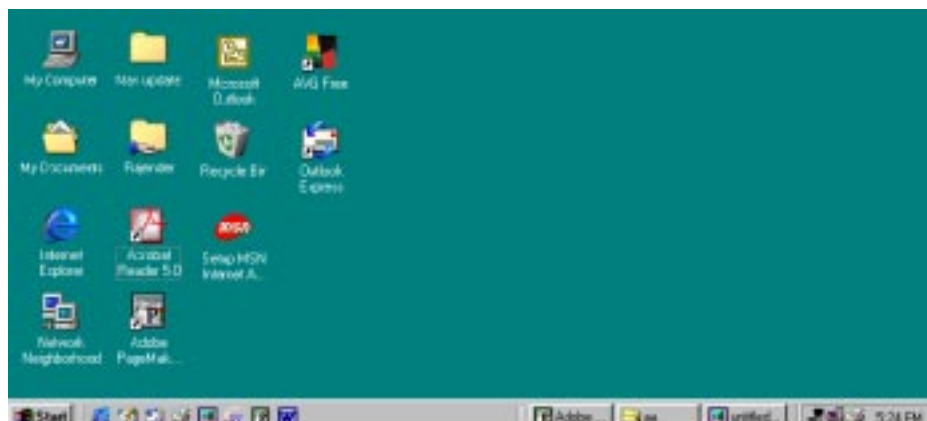


Figure 2.4: The Windows Desktop



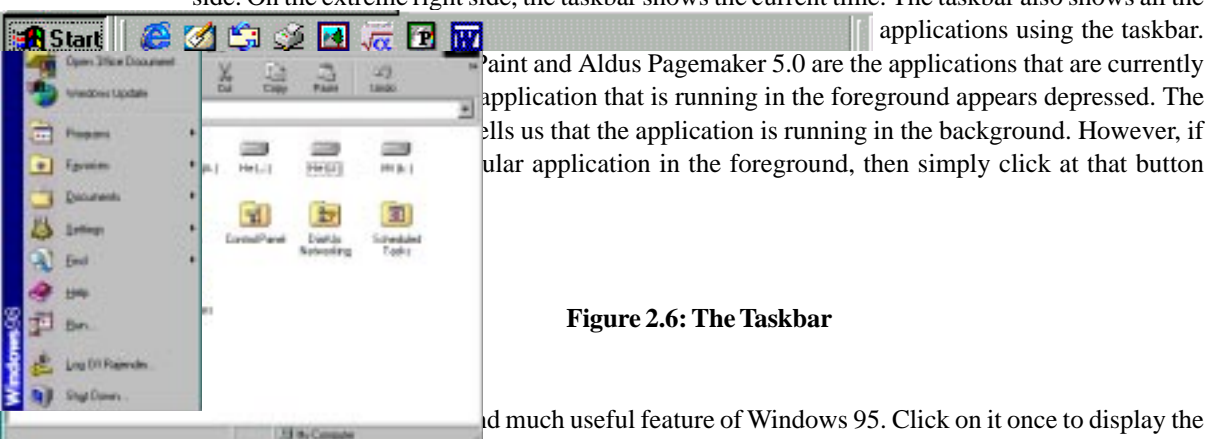
individual files under it. Thus, to open a folder just double-click it. All the files and folders are shown graphically. Looking at the filename icon, you can easily make out the application to which it is associated. In order to open a file within a folder, simply double-click it. It will open the file with the correct application. Multiple objects can be selected by clicking at the object and then holding down the <Ctrl> key on the keyboard and clicking on another object. You can select as many files and folders as you want.

Now, to open the folder 'My Computer' just double-click it. All the resources on your computer are shown in it as can be seen in Figure 2.5. Now, if you want to see the files and folders present on your floppy disk, click the object 3 1/2 Floppy (A:) Icon.

**Figure 2.5: The 'My Computer' Window**

## The Taskbar

Taskbar is located at the bottom of the Windows 95 desktop. It contains a start button on the left side. On the extreme right side, the taskbar shows the current time. The taskbar also shows all the applications using the taskbar.



**Figure 2.6: The Taskbar**

Start menu is one of the most useful features of Windows 95. Click on it once to display the start menu. From the start menu many other menus can be seen. You can select any of the menu options by taking your mouse pointer on that particular menu option as can be seen in Figure 2.7.

**Figure 2.7: The Start Menu**

## **1. The Program Menu**

The program menu of Windows 95 as shown in Figure 2.8 is exactly similar to the program group found in Windows 3.1. It contains program groups and individual programs. Thus, to launch any program, simply take your mouse pointer at that particular program and click it. In order to open 'Accessories' program group, move the mouse pointer to that group and a cascading menu will appear on the screen. It contains Windows 98 accessory programs such as WordPad, Paint, Notepad, etc.

**Figure 2.8: The Accessories Group**

## **2. The Document Menu**

This menu shows you the document that you recently opened or worked upon. This offers a short way of opening a document. It launches the application in which the document was created. The document menu keeps tracks of the latest fifteen documents that you have used and it puts them in an alphabetical order.

## **3. The Setting Menu**

This menu is used for changing the default system setting. You can fiddle with the control panel, printer folder and taskbar setting from here.

## **4. The Find Command**

The Find option of the start menu helps in locating a particular file or a folder. It offers a quick way of finding a file. In the 'Named' box type in the file name you want to search. Accordingly, Windows 98 will return you the full details about the file.

## **5. The Help Command**

Windows 98 has got very smart help to offer. In case you find yourself stuck on any issue simply select the Help option from the Start Menu. Above all, you can type in your query in your own words. Windows 98 will display you the related information.

## **6. The Run Command**

The Run option of the Start Menu helps you to run your file or application straightway. Simply type in the full path and the filename in the 'Open' box and click at 'OK' button. You can also make use of the 'Browse' button in order to locate appropriate files.

## 7. The Shutdown Command

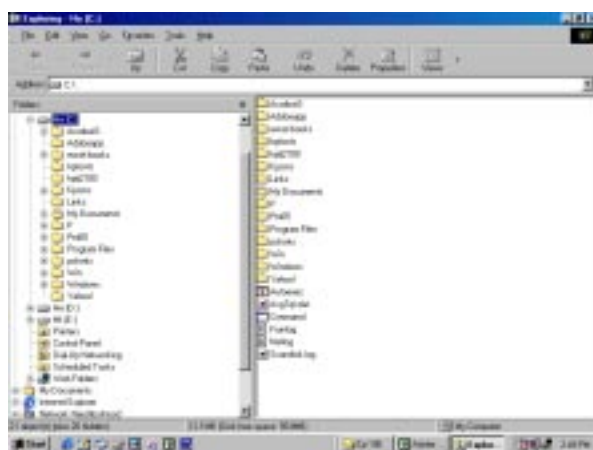
This command is used for shutting down the system. It offers three options. You can shut down your system, restart your system in windows mode itself or you can switch yourself to DOS mode temporarily. Select appropriate option depending upon your requirement.

### Student Activity 5

1. Why is windows called GUI based operating system?
2. What are the minimum hardware requirements to run windows 98?
3. What are the features of windows 98?
4. What is a desktop?
5. What is the taskbar? What does it hold?

## Windows Explorer

The File Manager of Windows 3.x is replaced with Windows 95 explorer. It helps you to manage and organize your files and folders. In order to start explorer click at the start menu. Select Programs and then the Windows Explorer option. The 'Windows Explorer' windows comes up on the screen as shown in Figure 2.9. This screen lets you to explore anything on your desktop. The left part of the explorer screen shows the desktop at the highest level. All the components of the desktop like 'My Computer', 'Network Neighbourhood', 'Recycle Bin', etc., are shown under it. You must have observed that some components of the desktop have a plus sign (+) before them. It shows that there are deeper level of components under it. On clicking at the plus sign, the next level of the hierarchy is shown.



**Figure 2.9: The Windows Explorer**

This layering of components continues as long as there is deeper level of folders or components underneath. The right side of the Explorer Screen shows the contents of the folder or the components that are selected in the left part of the explorer window. In the right part of window only, the major actions are performed. Now, we will learn some of the important functions that are performed frequently.

### (A) Renaming a file or a folder

In order to rename a file or a folder, follow the steps given below:

1. Select the file or the folder that has to be renamed.
2. Right click the mouse button and select the Rename option.
3. Type in the new name that you wish to give to the file.

### (B) Deleting a file or folder

A file or a folder can be safely deleted by following the steps given below:

1. Select the file or folder that has to be deleted.

2. Hit the <Del> key or from the File menu, select the Delete option.
3. Windows 98 will confirm before deleting the file.

#### **(C) Moving a file**

Windows 98 allows you to move files from one place to another. A file can be moved from one folder to another by simply performing the following drag and drop procedure:

1. Select the file that you want to move from the right pane.
2. Click the file or the folder on the left pane and drag it in the new destination.

#### **(D) Copying a file to a floppy**

In order to copy a file to the floppy disk, follow the steps mentioned below:

1. Select the file that has to be copied to the floppy disk.
2. Right click the mouse button and select the Send To option.
3. Select the floppy disk to which the file has to be copied.

#### **(E) Creating a new folder**

A new folder can be created by following the steps given below:

1. Select the parent folder that will contain the new folder.
2. From the File menu, select the New option. From the cascading menu, select the Folder option.
3. Windows 98 will ask you the name that has to be given to the new folder.

#### **(F) Restoring from the Recycle Bin**

In Windows 98, deleting a file is a two step process. Once the file is deleted, it is put in the 'Recycle Bin'. The 'Recycle Bin' appears on the desktop. It is of immense use if you have accidentally deleted your files. The files once deleted can be restored from the 'Recycle Bin'. However, if the file is deleted from the 'Recycle Bin' also, then you cannot in any case recover your file. So, the Recycle Bin helps you to retrieve deleted files. In order to restore a file from the 'Recycle Bin', follow the steps given below:

1. Double Click the 'Recycle Bin' icon available on the desktop. A dialog box opens up as shown in Figure 2.10.
2. This window shows all the files that have been deleted. Select the file that you wish to restore.
3. From the File menu, select Restore option.

### (G) Emptying the Recycle Bin

If you wish to delete all the files from the Recycle Bin also, then follow the steps given below:

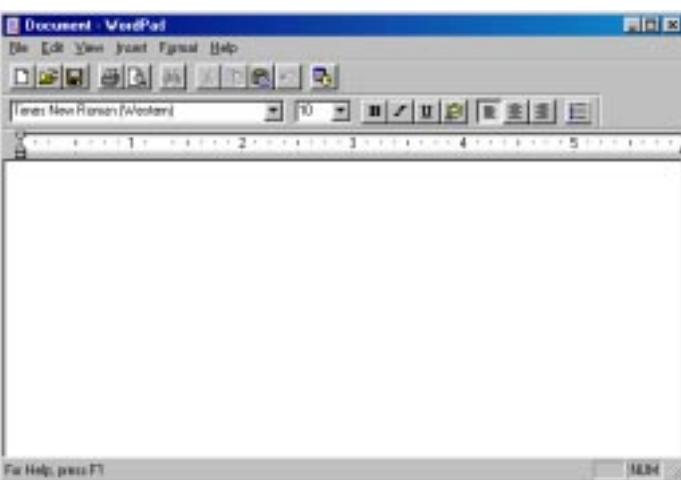
1. Double-click the 'Recycle Bin' icon on the desktop.
2. From the File menu, select the Empty Recycle Bin option.
3. Windows 98 will ask you to confirm before deleting all the files.

### Windows 98 Accessories

Windows 98, like its predecessors, contains several built-in accessories which make your computer easier and more convenient to use. In order to access Windows 98 accessories, click on the Start button, move the mouse cursor to programs and then click at the Accessories option of the cascading menu. We will learn a few of the commonly used built-in accessories of Windows 98.

#### (A) WordPad

Microsoft WordPad for Windows 98 is a very simple word processing program which allows you to create, read and modify simple documents. It is more or less similar to Windows 3.x Notepad program but contains more features and is capable of opening a wider variety of documents. It contains basic file manipulation, editing, viewing and formatting tools that are essential for creating simple documents. It contains standard menu items. The Wordpad can be seen in Figure 2.11.



**WordPad Application Window**

WordPad helps you to send and receive faxes. It can help you on your computer. You can also send documents ever leaving the application e.g., using Word for

Windows, you can use the File menu's Send command to direct the output of that application directly to a fax telephone number rather than a printer.

#### (C) System Tools

Windows 98 contains a number of useful system tools to help you see and configure your system. Let us briefly discuss a few system tools.

**Backup:** This program helps you to perform backups of your computer system.

**Disk Defragmenter:** This system tool reconfigures files on your hard disk so as to speed up disk access times.

**Scan Disk:** This utility is more or less similar to the old DOS chkdsk utility. It scans your disk and gives you the disk status by finding out the used, unused and bad sectors.

**Drive Space:** This utility is a disk compression program that can double up the space on a disk drive. If you need some extra space on your disk, you can use this facility.

**(D) Multimedia**

Windows 98 contains utilities that can control your CD-ROM player and multimedia abilities. You can use it to control various aspects of your multimedia system.

**(E) Calculator**

Windows 98 has a desktop calculator that can perform simple calculations. It contains both the standard as well as the scientific calculator. The calculator has been shown in Figure 2.12.

**Figure 2.12: The Standard Calculator**

**(F) Paint**

If you are a graphics lover, Windows 98 can fulfil your desire. It contains 'Paint' utility which can create simple graphics. You can create, open, view and edit graphics files such as bitmaps, PC Paintbrush files, etc. A typical Paint can be seen in Figure 2.13.

**Student Activity 6**

1. What is the function of windows Explorer?
2. How will you rename a File or a folders?
3. How will you delete a file or folder?
4. How will you copy a file to a floppy in windows?
5. What is the function of Recycle bin?
6. How will you restore a file from recycle bin?
7. List some windows 98 accessories.

---

## **2.4 WORD PROCESSOR**

---

Word processing includes typing in text and manipulating it so as to give a very systematic and organized look to your document, which enables easy reading. The application software or program which helps us in processing the text is called a 'Word Processing Software, or simply a 'Word Processor'. So, you can say that a word processor is nothing but a computer program that helps you to:

- type your text
- correct spelling mistakes and grammatical errors
- align text within margins
- offer a variety of font styles and font sizes
- see a preview of the text that you have typed in.

**Popular Word Processing Packages**

The commonly used word processing packages are:

- MS-WORD
- Word Star
- Word Perfect
- Professional Write

**Uses of Word Processing**

Normally, a word processor can accomplish the following tasks:

- Brochures
- Newsletters
- Reports
- Advertisement
- Resumes and Cover letters
- Books
- Directories
- World Wide Web Pages

There is absolutely no end to what a word processor can do. By now you must have realized that the word processing applications have become much more sophisticated than before.

---

## **2.5 STARTING WORD 2000**

---

To startup Word in Windows 95 or Windows 98, do the following steps:

1. Click at the Start button which lies at the bottom left corner of the screen.



**Figure 2.14: Showing How to Start Word 2000**

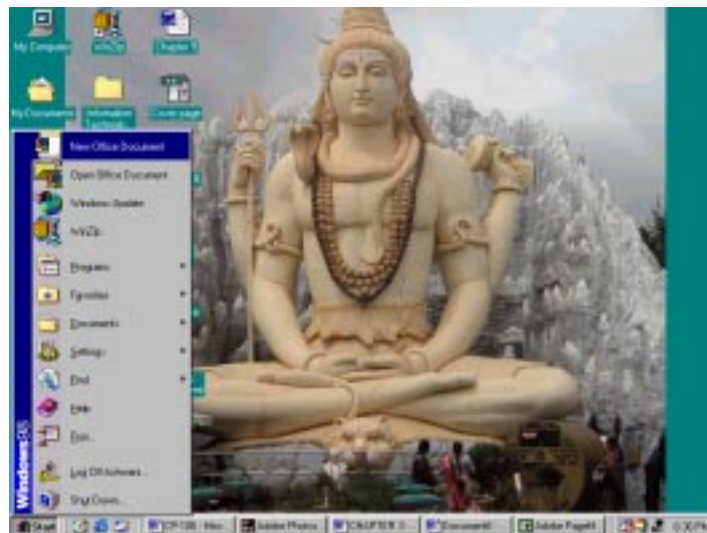
2. Click at the 'Programs' option. A cascading menu appears on the screen.
3. Click at 'Office 2000' option. Again, a cascading menu appears. Select 'Microsoft Word' option of the cascading menu. Word will be loaded in the computer's memory.

You will find that the above menu options are more or less similar to Figure 2.14.

The menu options shown in Figure 2.14 might not exactly resemble with those seen on your computer. So, in that case you might need search where actually MS-Word is installed on your computer.

Alternatively, you can start MS-Word in the steps given below:

1. Click at the START button.
2. Select 'New Office Document' as shown in Figure 2.15.



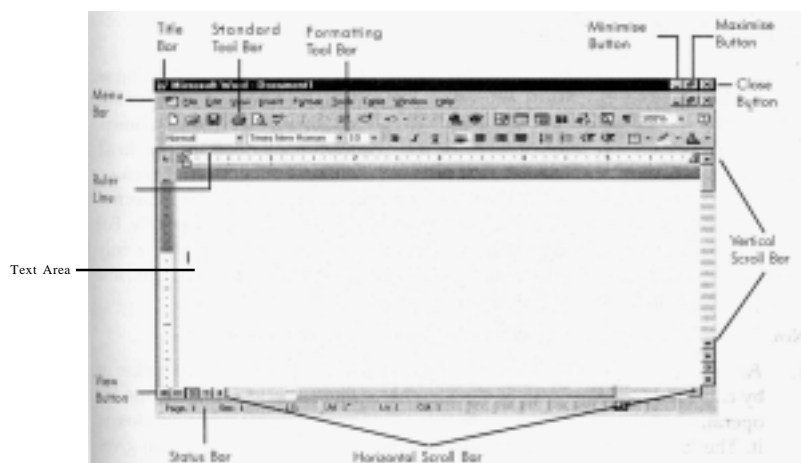
**Figure 2.15: Alternative Method to Start Word 2000**

This would bring up Word with a new document opened up for you. Your computer screen will match closely to the Figure 2.16. This blank page is nothing but an empty file created automatically by WORD. This file by default gets the name - Document 1. The extension given to a Word document is 'doc'.



## Screen Elements

When Word opens up, you will notice two windows on the screen, one nested closely within the other. The larger among these is called the Application Window, which frames the entire screen. The smaller window is called the Document Window, which fits in the application window. Both these windows serve a different purpose. The application window helps the user to communicate with the Word program, whereas, the document window is used for creating as well as modifying the Word documents. So, as you keep typing, the words displayed on the monitor or screen, are actually shown in the document window. The different elements of the screen are shown in Figure 2.16. The different elements of this screen are outlined in Table 2.1.



**Figure 2.16: Screen Elements of Word**

**Table 2.1: Description of Screen Elements**

Screen Element	Description
Title Bar	Located at the top of the screen; it displays the name of the application (here 'Microsoft Word') and the active document name (here 'Document 1').
Menu Bar	It shows menu options of Word and is located under title bar.
Standard Toolbar	Located exactly below the menu bar and gives access to WORD's most frequently used commands and utilities.
Formatting Toolbar	Lies below the standard toolbar; it offers commonly used formatting commands.
Ruler Line	Located below the formatting toolbar and provides ongoing page measurement and quick access to margins, tabs and indents.
Status bar	Located at the bottom of the screen; it displays important and varied information about the currently opened document like page number, column number, line number, etc.
View Buttons	Located towards the left side of the horizontal scroll bars(above status bar); they show the documents in different views like normal view, page layout view, outline view etc.
Horizontal Scroll Bars	Help the user to move in the left or right side of the document.
Vertical Scroll Bars	Help the user to go up or down in the same document.
Maximise Button	Located in the upper right corner of the screen; it controls the size of the application window.
Minimise Button	Located in the upper right corner of the screen, towards left of maximise button; it helps to mini mise the whole application and show it in the reduced form on the taskbar.
Close Button	Located in the upper right corner of the screen, towards right of maxi mise button; it helps to shut down the opened application; it also allows the user to save the opened files before quitting Word.

## Contents of Menu Bar

All the menu pads located on the menu bar can be pulled down by clicking at them or by pressing <Alt + key> where 'key' is the underlined character of the menu name. At one time only one menu pad can be activated and pulled down. From the pull down list, any entry can be selected with the help of mouse. In all the pull down menus, you would find that a few entries are shown in light color. These entries are called 'ghosted' entries and are inaccessible, These ghosted entries become solid only when the features they support become accessible. For example, the cut, copy, paste entries become active from the 'Edit' menu only when some text is selected and is made available on the clipboard. When the text is no more selected, these entries again become inactive.

Now, we will explore the contents of different menu pads briefly.

1. **File:** Pull down the 'File' menu by pressing either <Alt + F> keys together or by clicking it with the help of mouse. This menu is used for performing file operations like creating a new file, opening an existing file and then closing it. The 'Save' options help to save the files. The 'Properties' option gives information about the current document. The 'Page Setup' option allows to set page size, margins and paper orientation etc. Document can be previewed with the 'Print Preview' option. The printing operations can be carried out using 'Print'. 'Exit' option closes the Word application. At the bottom of 'File' menu, the names of all recently saved files are displayed. The 'File' menu has been shown in Figure 2.17.

### Figure 2.17: The File Menu

2. **Edit:** The 'Edit' menu helps you to delete, copy and move chunks of text. The 'Paste Special' option helps you to link your text with other applications. 'Find' option tries to help you by searching a particular word or phrase. In case you want to replace the selected word with some other word or phrase, then use the 'Replace' option. The 'Edit' menu can be seen in Figure 2.18.

3. **View:** The 'View' menu can be used to show your document in a variety of ways like Normal, Outline, Page Layout, Master Document and Full Screen. Through the 'Toolbars' option, you can also decide the toolbars that you want to see on your screen. 'Ruler' option turns on or off the ruler line. Headers and footers are added to the document through 'Header and Footer' option. You can see the 'View' menu in Figure 2.19.

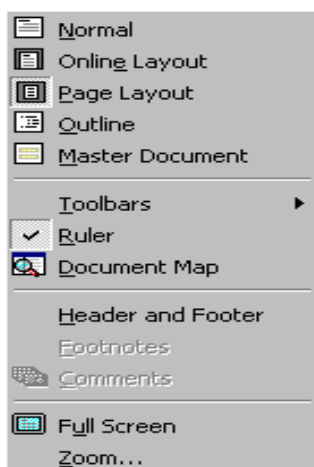


Figure 2.19: The View Menu

4. **Insert:** The 'Insert' menu helps to insert page numbers, the current date and time, symbols, footnotes, cross-references, tables, section-breaks, files, bookmarks, pictures, objects including equations, databases and different varieties of captions. The 'Insert' menu has been shown in Figure 2.20.



Figure 2.20: The Insert Menu

5. **Format:** The 'Format' menu is basically used for enhancing the look of the document. It can make your document's look beautiful by adding a variety of font types and sizes, paragraph formats, tabs, borders and columns, drop caps, bulleted and numbered lists and style settings. The 'Format' menu can be seen in Figure 2.21.



Figure 2.21: The Format Menu

6. **Tools:** The 'Tools' menu can be used to check for spelling and grammatical errors through the 'Spelling and Grammar' option. The 'Word count' option tells you the number of words, characters, lines, etc., in the whole document. Envelopes and labels can be prepared using 'Envelopes and Labels' option. 'Macros' option is used to create and run macros. The 'Tools' menu can be seen in Figure 2.22.

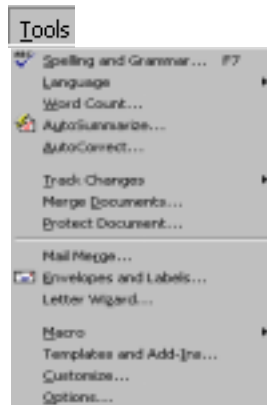


Figure 2.22: The Tools Menu

7. **Table:** The 'Table' menu adds and edits the tables in your document. A row and a column can be safely selected using the 'Select Row' and 'Select Column' options respectively. 'Select Table' option selects the whole table. The table entries can be sorted using the 'Sort' option. 'Gridlines' option turns on or off the gridlines of the table. The 'Table' menu can be seen in Figure 2.23.

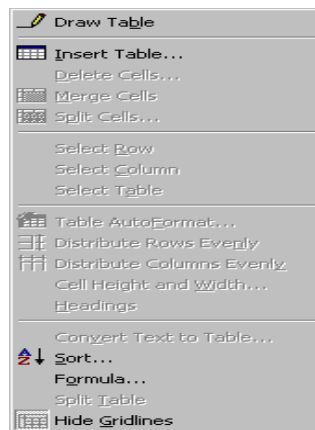


Figure 2.23: The Table Menu

8. **Window:** The 'Window' menu allows you to add, arrange and select document windows in a case where more than one document is open. The 'Window' menu can be seen in Figure 2.24.

Figure 2.24: The Window Menu

9. **Help:** The 'Help' menu can be used to look for specific information. It also gives some knowledge about Microsoft Word itself. If you find yourself in a difficult situation anytime, then do not hesitate taking help from Word through this particular menu. The 'Help' menu has been shown in Figure 2.25.



**Figure 2.25: The Help Menu**

### Student Activity 7

1. List some Windows 98 accessories.
2. What is a word processor? Name some words processing packages.
3. What is the use of word processing?
4. How will you start MS-Word?
5. Describe various screen elements of MS-Word.
6. Describe various menus available on Menu bar.

### Enhancements in Word 2000

Word 2000 has come up in a new loop before us. It has not many new tools and features with which it is fastly gaining popularity among users. Each kind of user can get some new spice of his taste added to the new Word 2000. Let us make ourselves acquainted with some of the new in-things of World 2000.

1. The animated paperclip on the screen always keeps smiling at you as shown in Figure 2.26. Clippit is a new office assistant, which is there on the screen the first time you start Word 2000. It tried to help you in every way whenever and wherever you are stuck, It can also be customized according to your special needs and requirements.
2. Some new dimensions are added to the intelligent features of Word 2000. When you are working in Word, it tries to figure out what it can do more easily and efficiently than you. Many of the intellisense options start with the word 'Auto' like Autocomplete, Autocorrect, Autoformat, Autotext and Autosummary.



**Figure 2.26: Paperclip**

3. Word 2000 offers the facility of 'Document Map' with the help of which you can move easily from one place to another in your document. One clicking at the 'Document Map' icon on the standard toolbar, a sidebar to the left of the screen is seen. It shows major headers in the document. Click at any of headers and Word will take you there instantly.
4. Word 2000 has also made a mark in offering shortcuts to Web Browser such as Microsoft Internet Explorer or Netscape Navigator. With the help of Web Browser, connectivity to the world wide web has been made possible. You can also create your own documents that can be seen on Web. Regular Word documents have to be converted into a format called HTML which is done automatically by Word 2000.
5. The new Word 2000 can be seen with expanded graphic capabilities. It has the ability to act as a full fledged desktop publishing program. Advancements like text rotation tool, special photoshop-type effects, 3D objects etc., have been made to it. Tables can be very easily made with the 'Draw Table' option of Word 2000.

This is not end of the road. The enhancements done to Word 2000 as discussed above are just a small chunk.

## Working with Documents

It's time to familiarize ourselves with the various important concepts like creation of new files, opening existing files, saving and finally closing them.

### Creation of a New Document

At times, you might need create a new document from scratch. So, for creating a new document, click at the 'File' menu and then select the 'New' option as shown in Figure 2.27. Now, Word is ready to accept text as well as other related commands from you.

You can also open a new document by clicking at the 'New' button available on the standard toolbar. Look for the 'New' icon in Figure 2.29 shown on the next page. Remember to save your document before quitting. ('Saving a Document' is being discussed in the subsequent part).

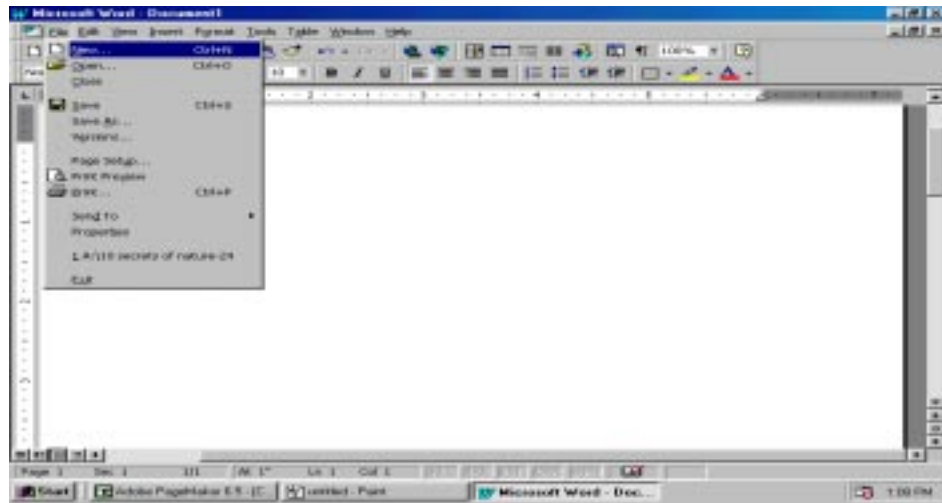


Figure 2.27: The 'New' Option of File Menu

### Opening a Document

If your document is stored on any of the storage devices like hard disk or floppy disk, then it becomes possible to retrieve that document and the user can manipulate it the way he/she wants. Word offers a variety of ways to open your document which are discussed below:

#### Method 1: Opening a document from desktop

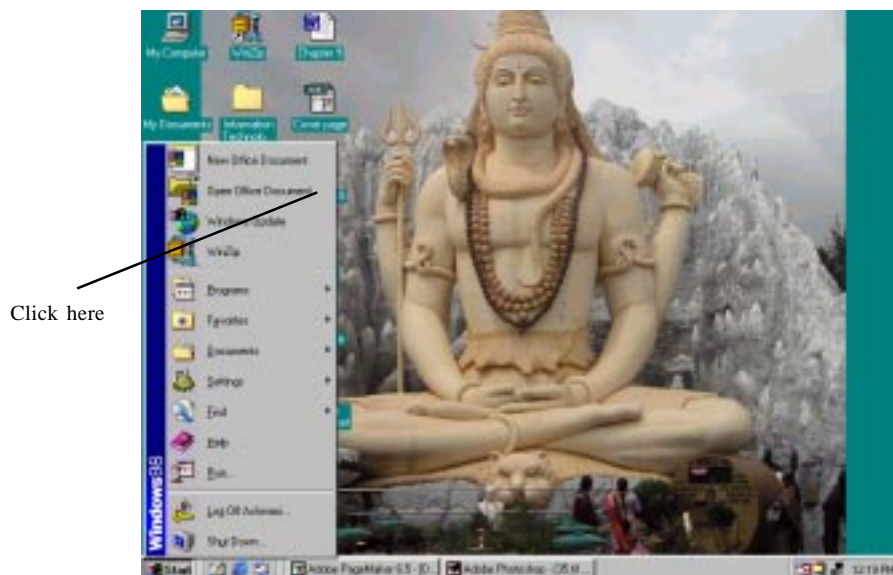


Figure 2.28: The 'Open Office Document' Option of Start Menu

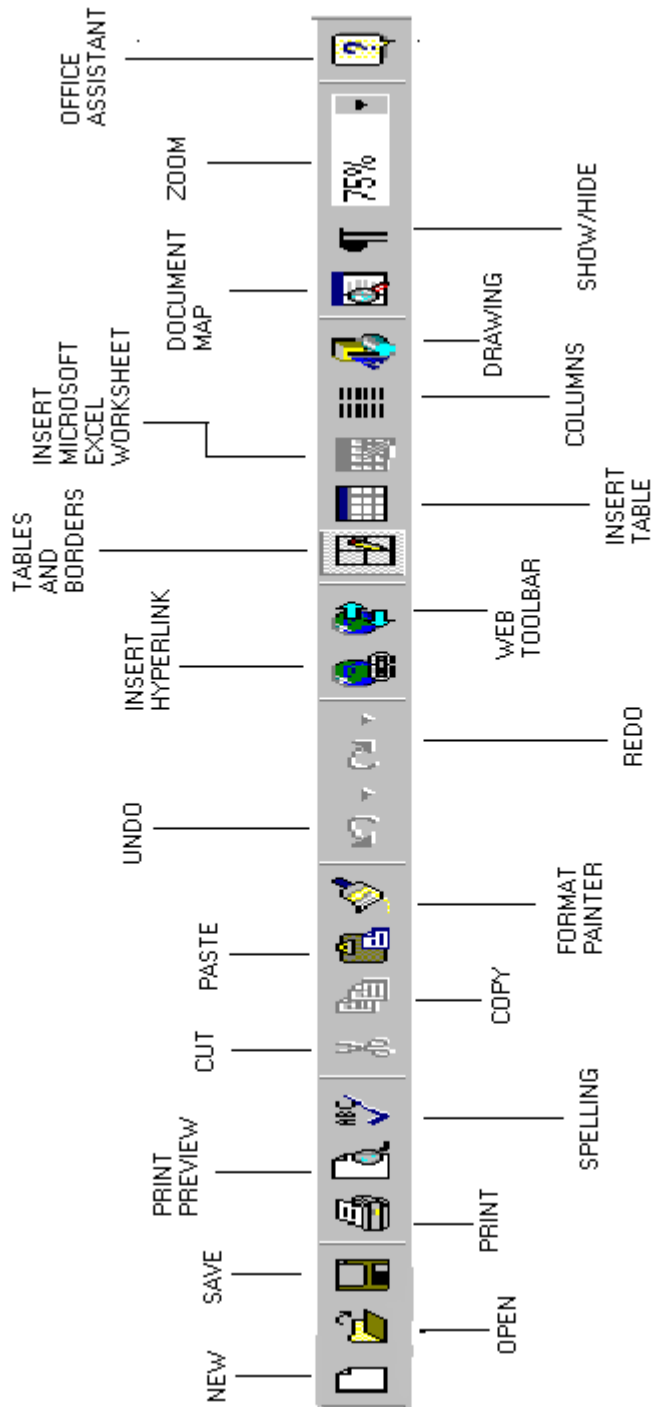


Figure 2.29: The Standard Toolbar

Click at the Start button. Point at 'Open Office Document' and click it as can be seen in Figure 2.28. Alternatively, click at the option 'Open Office Document' of the Office shortcut bar available on the desktop.

### Method 2: Opening a document from Word's startup screen

Click at the 'File' menu and select the option 'Open' as can be seen in Figure 2.30.

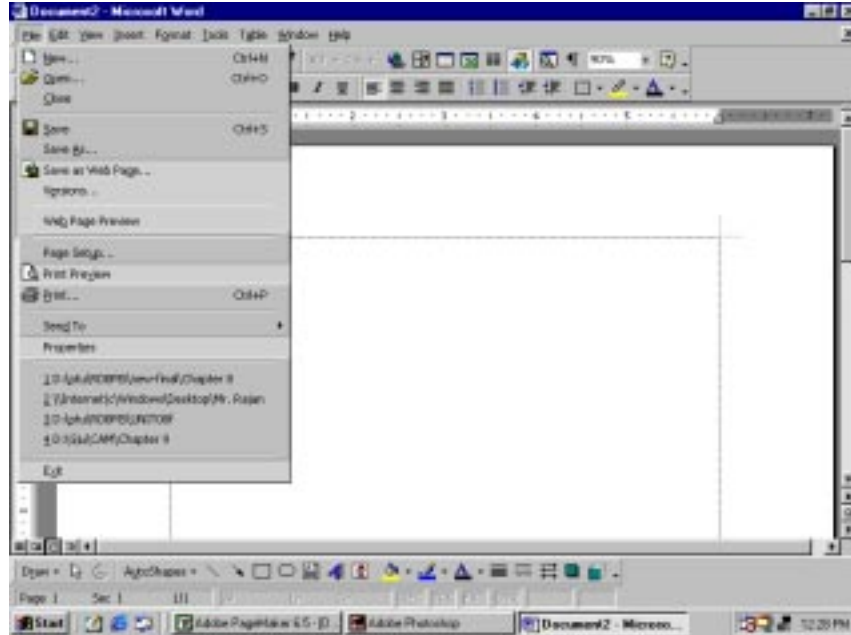


Figure 2.30: The 'Open' Option of the File Menu

Alternatively, for opening a document, just doubleclick at the 'Open' button from the standard toolbar. This icon looks exactly similar to a file folder and has been shown in Figure 2.30.

One very important thing to observe here is that - an 'Open' dialog box appears on the screen after employing any of the above mentioned methods of opening a document. The 'Open' dialog box has been shown in Figure 2.31. In this 'Open' dialog box you would notice a 'look in' box which is used for selecting the drive as well as the folder where your required document is resident in. Then, there is 'Files of Type' box which helps you to select the kind of file that you want to open. Suppose you want that only the Word documents should be shown in the file list, then click at the pull down arrow and from the drop down list, select 'Word Documents' option. In case you want to see all the files in the selected drive, then select 'All Files' option from the drop down list. Finally click the filename in the file list and click at the <Open> button or double click the filename to open up the file.

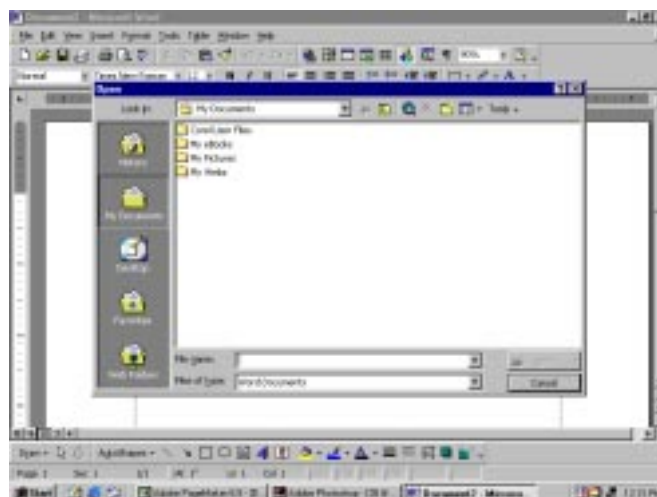


Figure 2.31: The 'Open' Dialog Box



## Saving a Document

For future retrieval of the document, it needs to be saved on hard disk or floppy disk. Once all the text is entered, save the document with any of the following methods:

### Method 1

Click at the 'File' menu and then select 'Save' option. You would notice a screen that looks like the Figure 2.32. When the file is being saved for the very first time, the 'Save as' dialog box comes up because Word needs some additional information from you.

First, Word wants you to give a name to your file. This has to be given in the 'Filename' box. Secondly, the kind of file you are trying to save, should be given in the 'Save as type' box. Thirdly, the place where you want to save your document should be given in the 'Save in' box. After giving all this information, click at the <Save> button. Your file is finally saved onto the disk.

The 'Save as' dialog box is displayed only once till the time you don't give a name to your document. Once the document has a name, next time if you try to save your file after making a few changes in it, then the 'Save as' dialog box will not appear on the screen.

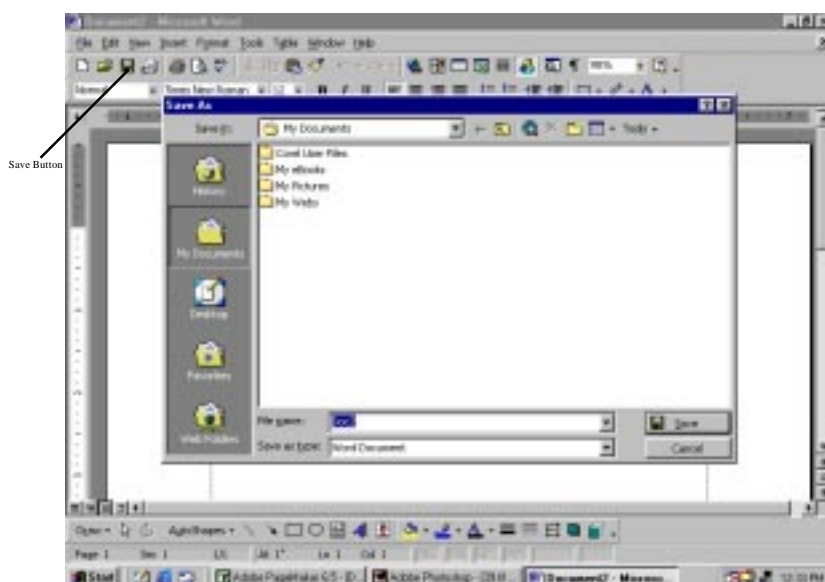


Figure 2.32: The 'Save As' Dialog Box

### Method 2

The other way of saving your files is by clicking at the 'Save' button available on the standard toolbar. You can see the 'Save' button in Figure 2.32.

It's a good idea to keep saving your documents after every few minutes. The reason is if the computer goes down or a power failure occurs, then the chances of recovering some contents in the document are high. Unsaved new documents are the most vulnerable.

## Closing a Document

Word offers a very handy method of closing documents. Like, you would prefer to close and remove the office files that are no more required on your table, in the similar manner you may want to close Word documents too. So, for closing a file, click at the 'File' menu and select the 'Close' option as shown in Figure 2.33. This will close the file that is recently opened. As many documents are opened in WORD, you are required to issue 'File - Close' commands for those many times to close all the files one by one.

Word will also prompt you to save your files before closing them as shown in Figure 2.34. If you want that your file should be saved before it is closed, then click at <Yes> button otherwise hit the <No> button. A case may arise when you want to continue working in the same document after

issuing 'File Close' command. Select the <Cancel> button. It will allow you to work again in your document thus cancelling the issued command.

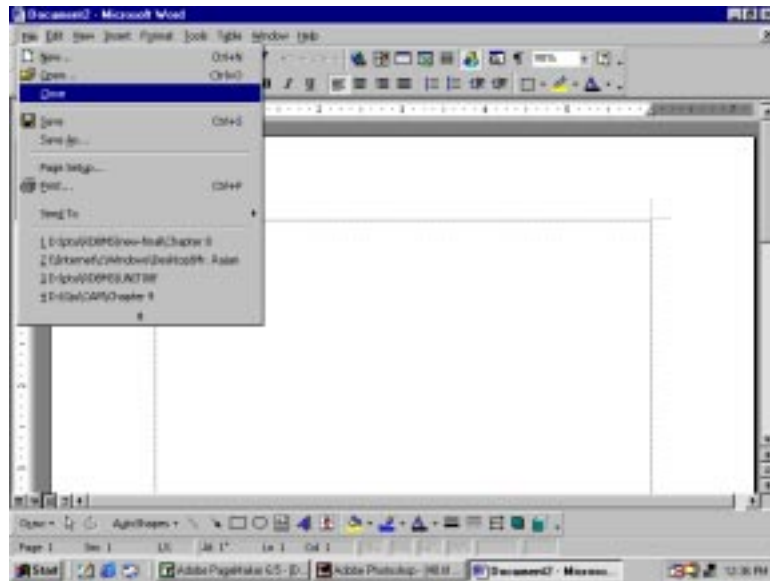


Figure 2.33: The 'Close' Option of File Menu

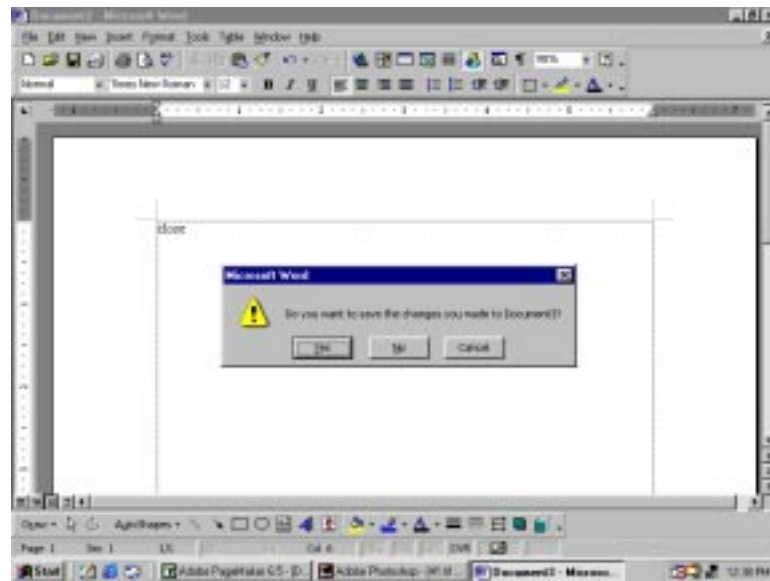


Figure 2.34: Word Prompts to Save Files before Closing them

### Exiting Word 2000

To quit Word or to close the Word application program, click at 'File\Exit' options as shown in Figure 2.35. With this command, all the currently opened documents are also closed automatically. Word will again prompt you to save your files before quitting.

### Student Activity 8

1. How will you create a new document in MS-Word?
2. How will you open a pre-existing file in MS-Word?
3. How will you save a document in MS-Word?
4. How will you exit from MS-Word?

Editing means modifying or making changes in your document. It would involve:

- Inserting new text
- Copying text from one part of the document to another part
- Moving text from one part of the document to another part
- Deleting unwanted text.

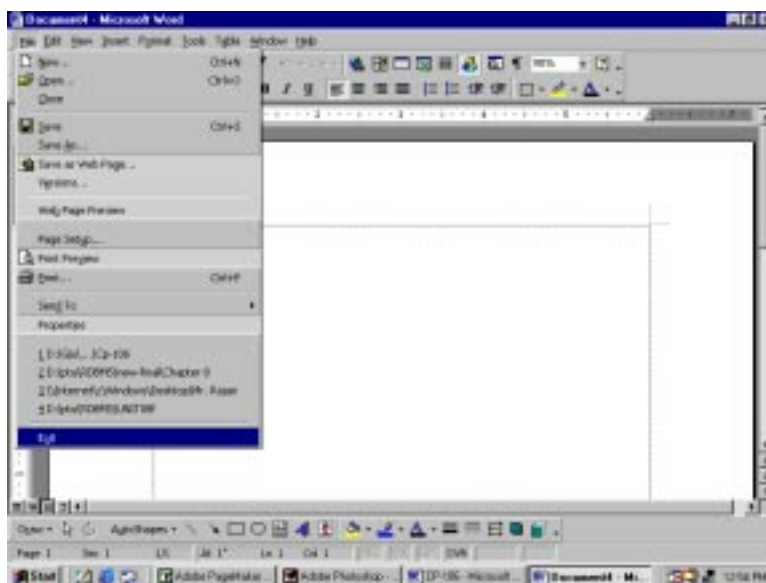


Figure 2.35: The 'Exit' Option of File Menu

Before exploring all these editing features of Word 2000 in detail let us discuss the word-wrapping feature first. Incomplete words or the words that exceed right margin look very clumsy. With the help of word wrap feature, Word automatically wraps around the word in next line, when the cursor reaches the right margin. So, every time when you reach at the end of line, you don't need take care of hitting the <Enter> key. The only time, you need press the <Enter> key is, when you want to end a paragraph or insert a blank line.

### Selecting Text

Text needs be selected for performing various block operations (like Copying/ Moving/ Deleting) on it and for easing our work. Selection of text can be done both by mouse as well as by keyboard.

#### Selecting Text by Mouse

First of all, let's learn how to select text using a mouse. The various methods of selecting text by mouse are discussed below:

1. Hold your mouse button from where you want your selection to start and drag the mouse either rightwards or downwards. Release the mouse button at the place where you want your selection to end up.
2. If you want to select a single word, then take your mouse pointer at that word and double click it.
3. Paragraphs can be very easily selected by triple clicking anywhere within the paragraph.

#### Selecting Text by Keyboard

Keyboard can also be used to select text. The method of selecting text by keyboard is discussed below:

1. Take the cursor at a place where you want your selection to start.

2. Hold down the <Shift> key and move the cursor with arrow keys in the direction required. Release the keys at a place where you want your selection to end up. In this way, your text would be highlighted.

### **Inserting Text**

Generally, when you startup WORD, it is in the Insert Mode, which means as text is typed in, the following text is pushed towards the right side. So, wherever you need put in new text in your document, take your cursor at that particular location and start typing in. The method is exactly the same for inserting either a single character, word, line or a couple of lines.

At times, you also might need overwrite the pre-written text. For that matter, press the <INS> key from the keyboard once. This would put Word in overwrite mode and the word 'OVR' will be displayed on the status bar at the bottom of the screen. Now, when the new text is typed in, the existing contents at the current cursor location are going to be overwritten by the new text. If you want to put yourself back in the insert mode, press the <INS> key once again.

### **Copying Text**

Copying means duplicating the contents of the document at some other desired place. The procedure for copying text is almost the same as that of moving text with a little difference which is being discussed in the following steps:

1. Select the text that has to be copied.
2. Press <Ctrl + C> keys. Alternatively, select the 'Copy' option from the 'Edit' menu.
3. Take the cursor wherever you want the text to be pasted.
4. Hit <Ctrl + V> keys. Alternatively select the 'Paste' option from the 'Edit' menu.

You can also use the 'Copy' and 'Paste' button (shown in Figure 2.29) available on the standard toolbar for copying and pasting text. With the above procedure, you would notice the same text appearing at two places in the same document.

### **Moving Text**

Moving text means removing text from one portion of the document and placing it at some other location. For moving text, do the following steps:

1. First, select the text that you want to move.
2. Then, click at the 'Edit' menu and select the 'Cut' option. Alternatively you can also cut the selected text by pressing <Ctrl + x> keys. Once the text is cut, you will notice that the marked text disappears from the screen. Don't feel worried, your text is put on the windows clipboard (temporary portion, of memory) from where it can be pasted anywhere.
3. Look for the place, where you want your text to be placed. Take the cursor at that location and hit the <Ctrl + v> keys or alternatively select the 'Paste' option from the Edit menu.

You can also make use of the 'Cut' and 'Paste' button (shown in Figure 2.29) from the standard toolbar for cutting and pasting the selected text respectively.

### **Deleting Text**

A passage of text can be very easily erased off by selecting it and pressing <Del> key on the keyboard. A single character can also be deleted very easily by positioning the cursor at that particular character and hitting the <Del> key.

If you want to scrap off only a single word from your document, select the word by double clicking it and hit the <DEL> key. You can also delete words by following commands:

- Press <Ctrl + Del> keys to delete next word
- Press <Ctrl + Backspace> keys to delete previous word.

**Student Activity 9**

1. What do you mean by editing a document?
2. How will you insert text in a document?
3. How will you make the duplicate of some portion of text in a document?
4. How will you delete text in a document?

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## 2.7 FORMATTING DOCUMENTS

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Each one of us has a hidden desire that the reader should feel interested in whatever we are trying to convey. So, for achieving this, a special effort on our front is required. We must give a refined look to the document. The formatting features like fonts, bullets and numbering, font type etc. can be used very intelligently to create the whole impact. Now, let us proceed further learning about these special features smartly.

### Defining Font Type and Size of Text

A font can be defined as a set of letters that has a common or the same typeface. Different font types and sizes can be applied using the formatting toolbar or the Format menu. Let's discuss them one by one.

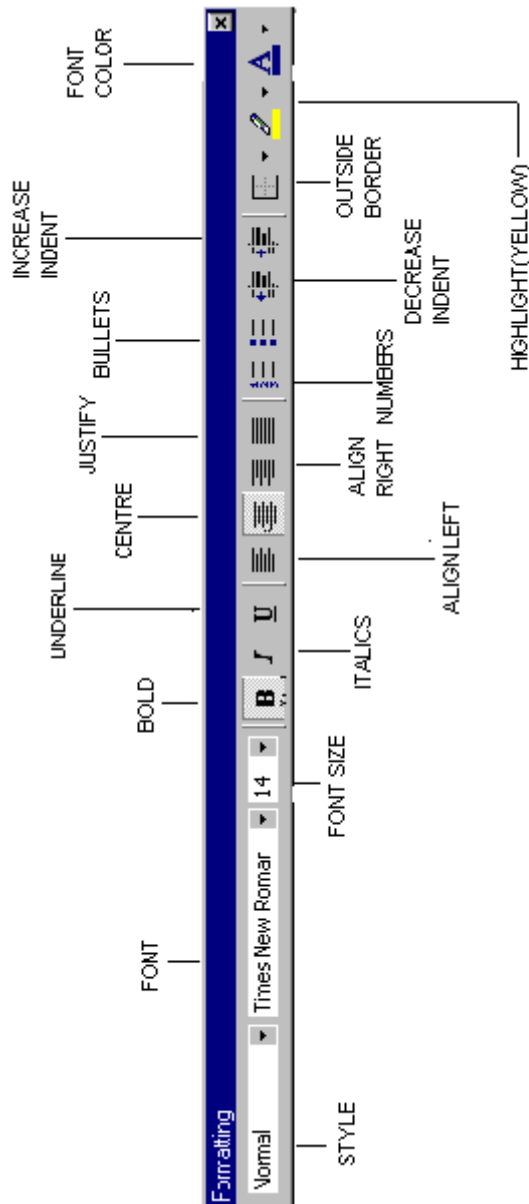


Figure 2.36: The Formatting toolbar

## Using Formatting Toolbar

The formatting toolbar is designed very artistically as shown in Figure 2.36. It contains most of tools that need be used to give a complete and wholesome look to your document. The toolbar also shows you the font type and size as applied to your text. It also displays the effects (Bold, Italic or Underline) as given to the text. For applying a font type and size to your text, use the formatting toolbar in following steps:

1. Select the text.
2. Click at the arrow beside the font type box and select a font type of your choice from the drop down list.
3. Again, click at the arrow beside the font size box and select an appropriate font size from the drop down list.

## Using Format Menu

The required font type and size can also be applied to the text by using 'Format' menu as described in following steps:

1. Select the text.
2. From the 'Format' menu, select the 'Font' option. The 'Font' dialog box appears on the screen as shown in Figure 2.37.
3. Choose appropriate font type from the 'Font' box. You can move up or down in the 'Font' box with the help of up and down arrow keys.
4. Similarly, choose the required font style and size for your text from the 'Font style' and 'Size' boxes respectively.

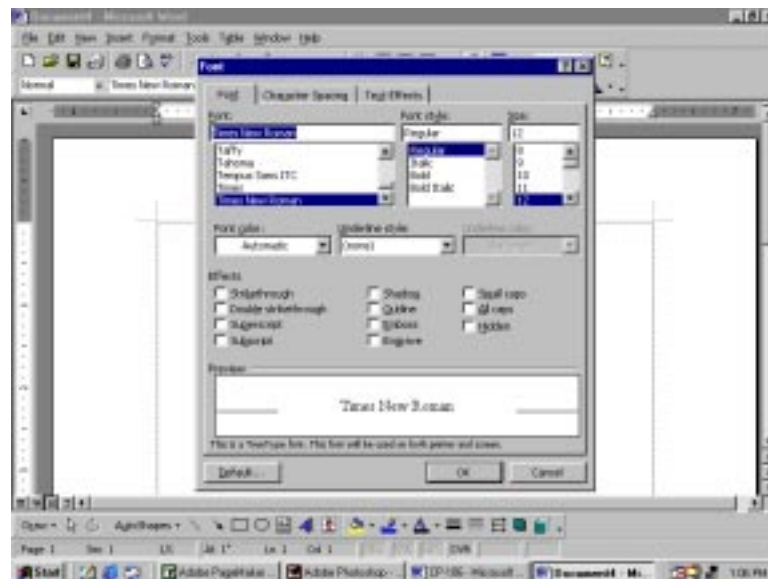


Figure 2.37: The 'Font' Dialog Box

5. The preview of the selected text can be seen in the 'Preview' window with the applied formatting features.
6. Click <OK> button.

You will find the look of your text changing with the application of new font type, style and size.

## Making Text Bold, Italic and Underlined

### Using Formatting Toolbar

If you have given a keen look at the formatting toolbar: then you must have observed three buttons showing the letters B, I and U. The letter 'B' stands for Bold, 'I' for Italic and 'U' for

Underline (Refer Figure 2.36). In order to make your text look a bit darker than the rest of the document, concentrate on the following steps:

1. Select the text.
2. Click at the 'B' button.

On carrying out these steps, the 'B' button becomes depressed or lightened. If you do not want the text to be bold select the text again and click at the 'B' button. This button on the toolbar again becomes prominent and your text is not bold anymore.

At times you would like to see your text in italics or would like to underline it. To do this, do the following steps:

1. Select the text.
2. Click at 'U' button to underline and 'I' button to italicise it.

### Using Format Menu

Alternatively, the same work can also be done using the 'Format' menu by following steps:

1. Select the text.
2. Click at the 'Font' option of the 'Format' menu.
3. In the 'Font' dialog box, activate the 'Bold' option or 'Italic' option from the 'Font style' box to show your text in bold or italics. (Refer Figure 2.37)
4. In order to underline the text, select the required option from the 'Underline' box drop down list.

If you are a keyboard person, you can also use one or more of the following key sequences to achieve the same, after selecting the text:

- Press <Ctrl + B> keys to bold the text
- Press <Ctrl + I> keys to italics the text
- Press <Ctrl + U> keys to underline the text

### Changing Case of Text

Word offers a quick and handy way to change the case of your text. Lowercase characters can easily be changed to uppercase by hitting <Shift + F3> keys. To achieve the contrary effect, press the <Shift + F3> keys again. This would convert uppercase characters to lowercase.

### Alignment of Text

Text alignment means placement of text between the margins. Your text can be left, right, centre aligned or it can be justified within the margins. Left alignment of text would mean the arrangement of text evenly in a straight line at the left side of the document but with uneven edges on the right side. Right aligned text is just the opposite of left aligned text with text evenly arranged at the right edge of the document but uneven from the left side. Justified text would involve even edges of text along both margins. Centre aligned text means that the text is placed exactly in the centre of the page. Centre aligned text is most suitable for giving titles, headings etc. Generally and most frequently the text is left aligned because then the text becomes easily readable and understandable. Now, let us find out how text can be aligned using the formatting toolbar.

1. Select the text (it could be a single line or a paragraph or the whole document).
2. Click at any of the alignment buttons from the formatting toolbar to get the desired result. (Refer Figure 2.36).

If you are more in the habit of using keyboard, then give the following keyboard shortcuts after selecting the text:

- Press <Ctrl + L> keys to left align the text
- Press <Ctrl + R> keys to right align the text

- Press <Ctrl + J> keys to justify the text
- Press <Ctrl + E> keys to show the text in the centre

## Formatting Paragraphs

Formatting means deciding alignment of the paragraph. It also includes the spacing that is to be put in between the lines. In order to carry out formatting on Paragraph, it needs be selected first. Then go to the 'Format' menu and do the following steps:

1. From the 'Format' menu, select 'Paragraph' option. A 'Paragraph' dialog box shoots up on the screen as shown in Figure 2.38.

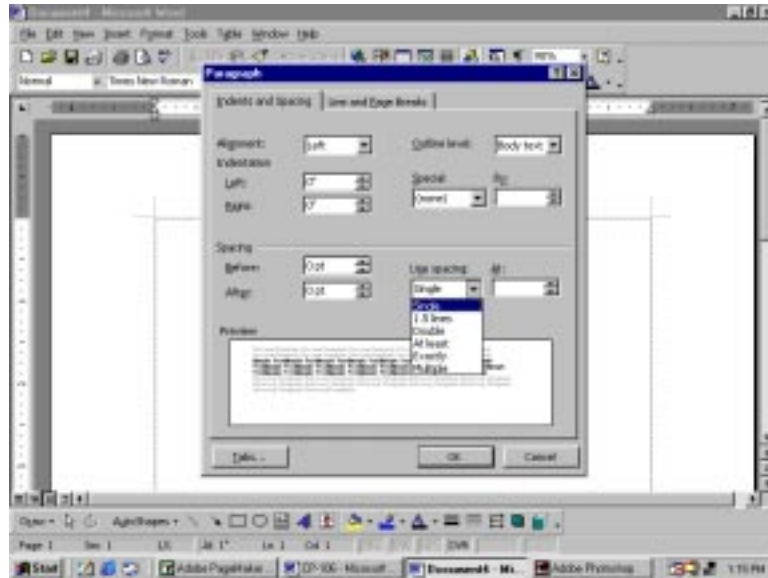


Figure 2.38: The 'Paragraph' Dialog Box

2. You can set the alignment i.e. decide the placement of text on the screen by clicking on the dropdown arrow of the 'Alignment' box. Your whole of the paragraph can be left, right or centre aligned.
3. Go to the 'Line Spacing' box and click at the drop down arrow to make a choice. Finally click at the <OK> button. In the 'Line Spacing' box there are many options that need a bit of elaboration. Let us find them. For the options 'At least', 'Exactly' and 'Multiple', a number has to be given in the 'At' box. In these cases, the space is measured (between the lines) in terms of print size. The 'At least' option uses the space as given in point size but it can also use some extra space in a case where it needs accommodate some text. 'Exactly' option gives exactly the same space as defined in the 'At' box. If word needs extra space to adjust some more text, then it cannot get it. 'Multiple' option allows you to specify the line spacing of your own choice. If you want the lines to be triple spaced, then type '3' in the 'At' box.

## Bullets and Numbering

It is always advisable to put the text entries which are separated by commas in the bulleted or the numbered form. Adding bullets to the text makes it easy to read and understand. Major points can be very well emphasized through this technique. Points put in the order of preference are long remembered by the reader. Moreover, in our day to day life, we prefer to make our daily list in the numbered manner rather than putting it in a paragraph. The only idea is that the chances of forgetting are turned low and visibility of important points is clearer. You can put bullets or numbers in an existing list by using either the formatting toolbar or the 'Format' menu.



## Using Formatting Toolbar

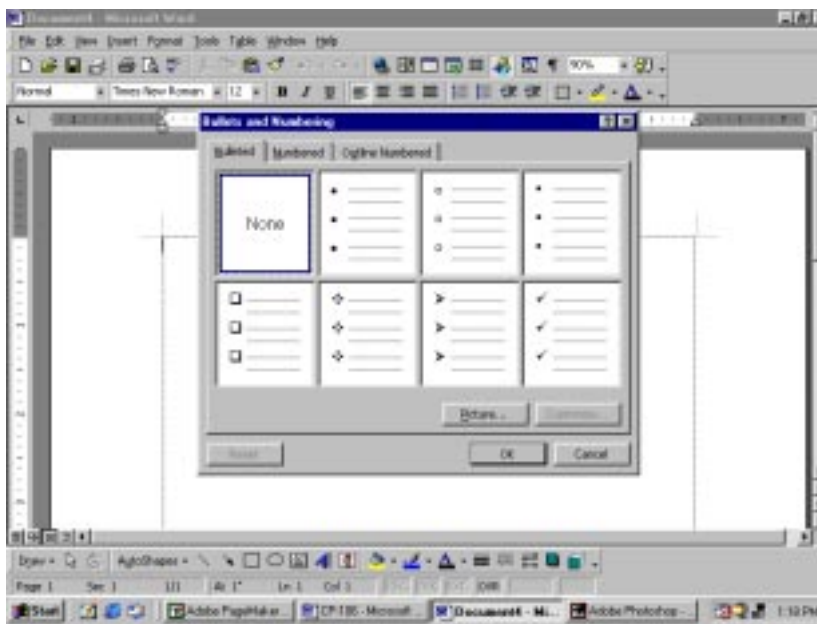
1. Select the text.
2. Click at either the 'Bullets' button or the 'Numbers' button on the formatting toolbar. (Refer Figure 2.36).

In case you decide that you don't require 'numbers' or 'bullets', you can very easily put them off by repeating the above steps.

## Using Format Menu

This method perhaps offers a wider choice of symbols other than the typical black circle. Let us discuss this method:

1. Select the text.
2. Select the 'Format Bullets and Numbering' option.



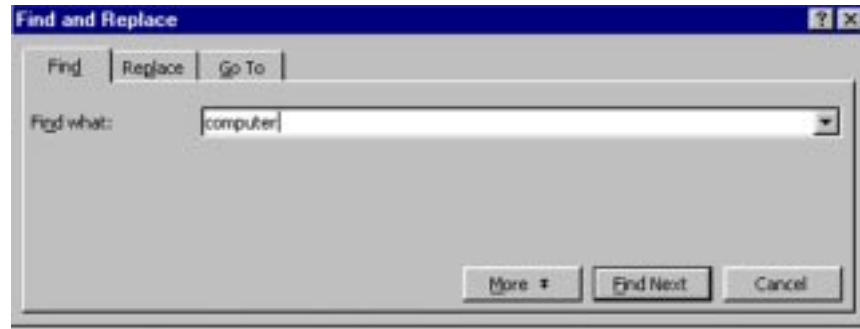
**Figure 2.39: The 'Bullets and Numbering' Dialog Box**

A 'Bullets and Numbering' dialog box appears on the screen as shown in Figure 2.39. Select the 'Bulleted' tab in case you want bullets in your document. If you wish to put numbers then select the 'Numbered' tab. Choose any of the bullets or numbers and apply it onto your document by clicking <OK> button. You see how easy it is to place bullets and numbers in your document.

## Find and Replace Commands

'Find' and 'Replace' commands have been presented in a new and different look in Word 97. 'Find' and 'Replace' do not have their own separate dialog boxes. Instead they have been presented in the tab form in the same window. On finding a word, you can replace it with some other word using 'Replace' straightaway. Carry out the following steps for finding a word or group of words:

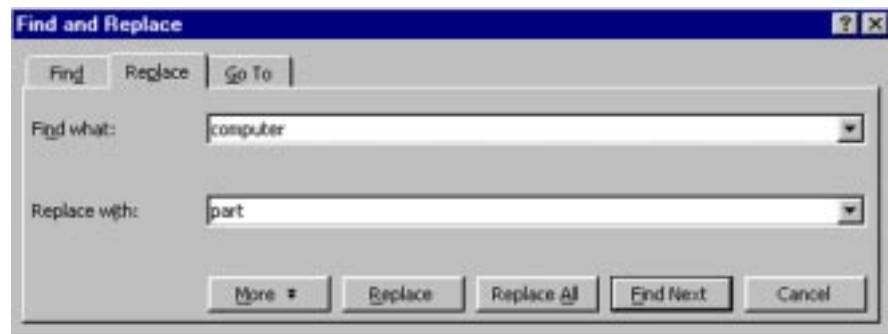
1. From the 'Edit' menu, select the 'Find' option. A 'Find and Replace' dialog box appears on the screen as shown in Figure 2.40.
2. Enter the word or phrase you want to search for in the 'Find what' box.
3. Click at 'Find Next' button. It will show you the first appearance of word or phrase. Keep hitting the 'Find Next' button until you find the required word or phrase in your document.



**Figure 2.40: The 'Find and Replace' Dialog Box**

Once your word is located, you may want to replace it with some other suitable word. At times, global replacements of a word in the whole document has to be carried out. For example, you have entered a word 'component' many a times in your document. Now at later point of time, you may want to change it to 'part'. Replace can help you in making the required changes by carrying out the following steps:

1. Select 'Edit - Replace' option. A 'Find and Replace' dialog box comes on the screen as shown in Figure 2.41.
2. Enter the word 'component' in the 'Find what' box.
3. Enter 'part' in the 'Replace with' box.
4. Click 'Find Next' if you want to see the first occurrence of the word. Click the 'Replace' button if you want to change it. In case you do not want to make the change, then click 'Find Next' again to locate for the next appearance of the word.
5. The 'Replace All' button will change all the occurrences of the word 'component' to 'part' in the whole document in a single command.

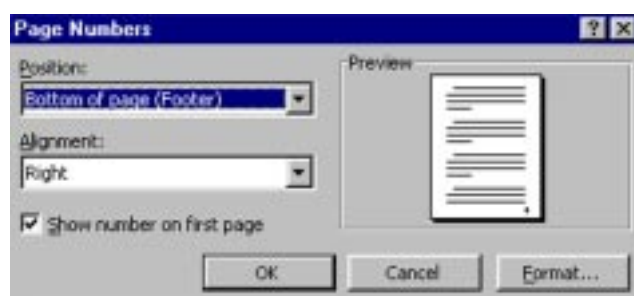


**Figure 2.41: The 'Find and Replace' Dialog Box**

## Numbering Pages

A long document certainly needs proper page numbering done for easy and quick reference. Adding numbers to each and every page manually cannot only become tedious but also confusing and time consuming work. Word can really automate your task. To add numbers to your document, follow the steps given below:

1. Click at the 'Page Numbers' option of the 'Insert' menu. A 'Page Numbers' dialog box appears on the screen. This dialog box resembles Figure 2.42.



**Figure 2.42: The 'Page Numbers' Dialog Box**

2. In the 'Position' box, click at down arrow and select the desired position where you want your page number to appear. It can come either at the top or bottom of the page.
3. From the 'Alignment' box, decide the alignment of the page number. You can place your page number either on the left, right or in the centre of the page.
4. If you want that the page number should be shown on the first page also then check the box on. In case you check the box off, then the page number is only going to be hidden but is certainly counted as 1.
5. Click at the 'Format' button. A 'Page Number Format' dialog box appears on the screen as shown in Figure 2.43. Select the style of page numbers that you want for your document from the 'Number Format' drop down list.
6. If you want to start your page number from some digit other than 1,2,3..., then you can very well specify it in the 'Start at' button, Click at the 'Start at' radio button and type in the desired number in the following box from where you want your, numbering to start.
7. Click <OK> button to apply the desired format. Again click at <OK> button to save the changes and come out of the 'Page Number' dialog box.



Figure 2.43: The 'Page Number Format' Dialog Box

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## 2.8 CLIP GALLERY

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Word 2000 has come up before us with enhanced graphic capabilities. There are many new clips put in this latest version of WORD. Moreover, added multimedia effects such as sound and videos in Word 2000 are getting a very friendly welcome from the users. Our old clipart gallery has also got a new name in Word 2000. Now, it is called Clip Gallery.

### Inserting Clips

To place clips in your document, go about performing the following steps:

1. Select Insert/Picture/Clipart'. A dialog box by the name 'Microsoft Clipart Gallery' is shown on the screen as shown in Figure 2.44. Now, from this dialog box, select the 'Clipart' tab. You will notice that your clipart gallery is indexed on major keywords. If you scroll down in the window under the head 'All categories', you would find a fairly long list of clips. So, in order to make our search easier, select any particular category in the category list. In the adjoining window, you would find all the clips relating to that category together.
2. Search through the clips and decide an appropriate clip for your document. Select anyone desired clip and click at the <Insert> button. You will find that particular picture placed in your document at the current cursor position.



Figure 2.44: The 'Clip' Dialog Box

### Resizing Clips

The clip that you have successfully placed in your document might not be of the exact size that you want. It can either be too small or too big. So, to resize it:

1. Select the clip by clicking anywhere on it. Eight sizing handles appear on the boundary of the clip as shown in Figure 2.45.



Figure 2.45: Resizing Clips

2. Take your pointer at any of these handles. The pointer will change into a double headed arrow.
3. Click and drag the handle in the direction desired to make your clip big or small.
4. Release the mouse pointer when the required size of your clip is achieved.

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## 2.9 PAGE SETTING

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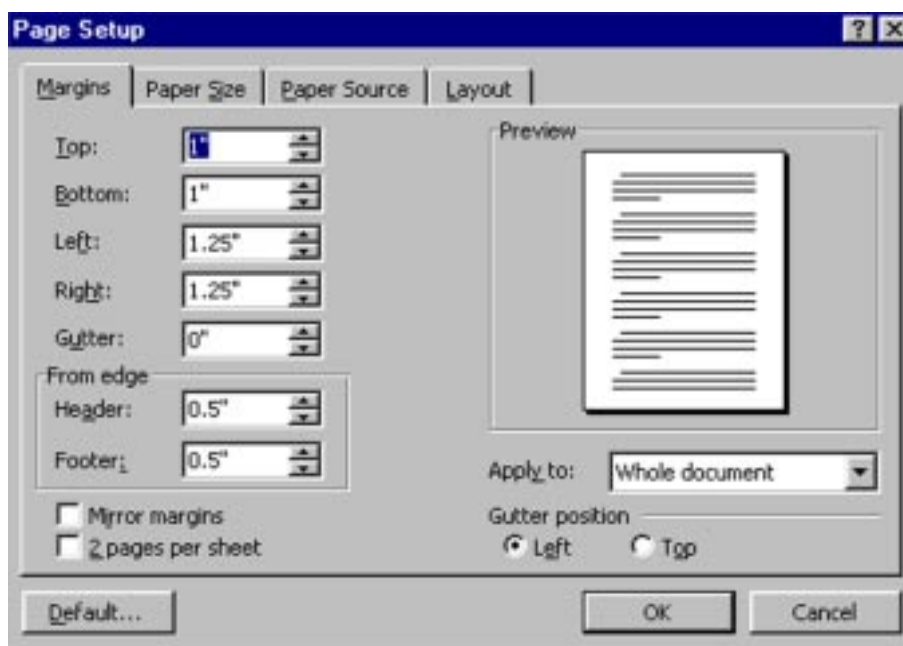
Page setting includes putting your text neatly between margins. Margins are nothing but an invisible frame within which the whole text appears. When a blank new document is opened, a default margin is always there. This margin is laid for sides, top and bottom of the page. You can

always fiddle with the default settings of Word according to your demand and requirements. We will learn to set margins by two methods:

## Margin Setting through File/Page Setup

The default setting of the top and bottom margin is 1 inch and in the sides, it is 1.25 inches. To modify the default margin setting, follow the steps given below:

1. Select 'Page setup' option of 'File' menu. A 'Page Setup' dialog box appears on the screen as shown in Figure 2.46.
2. Click in the 'Top' box and erase off the current setting by using either the <Del> key or the <Backspace> key from the keyboard. Type in the desired number. Alternatively, you can use the top arrow to increase the margin and down arrow to decrease it.



**Figure 2.46: The 'Page Set up' Dialog Box**

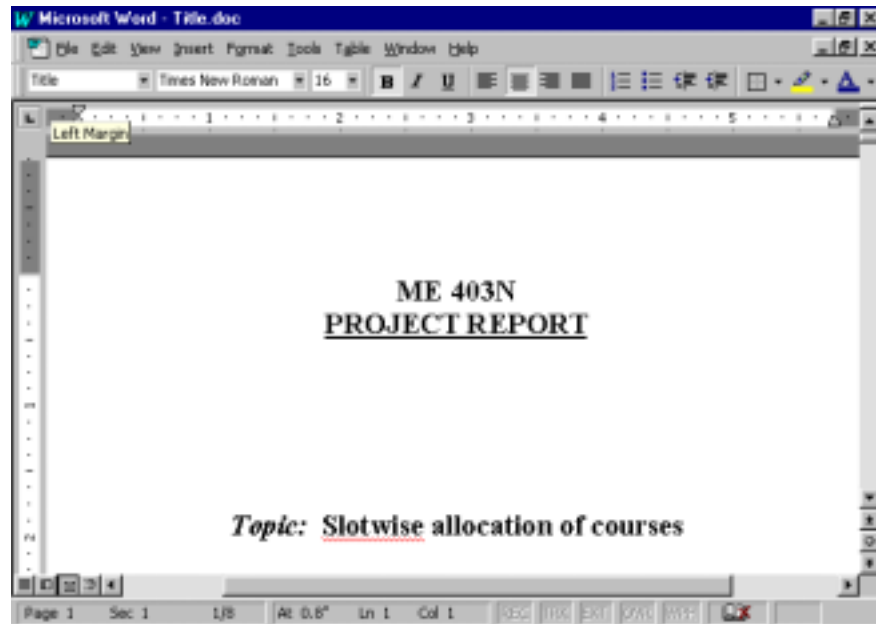
3. Similarly, change the settings in the Bottom, Left and Right boxes as well.

At times, you might want that the changes that have been made recently should apply to the current document only, then click at <OK> button. But in case, you want that the current document as well as any other new document that you open should have these page settings, then click at the <Default> button. The next step would be to click at the <Yes> button in which case Word is trying to seek your permission in changing the default settings for page setup.

## Setting Margins using Ruler line

Ruler line is very frequently used to change margins. It is a quick and easy way to set margins but needs some amount of practice also. To set margin using the ruler line, carry out the steps discussed below:

1. Place your mouse pointer on the left side of the horizontal ruler line. Slowly, move the mouse pointer towards your right side till the place where your mouse pointer acquires the shape of a double-headed arrow. A 'Left Margin' tool tip appears on the screen as can be clearly seen in Figure 2.47.
2. Click at that location and drag the mouse towards right side to increase the margin or on the left side to reduce it.
3. Release the mouse button when suitable margin is attained.



**Figure 2.47: Figure Showing 'Left Margin Tool'**

In order to set right margin, the method is just the same as discussed in the above three steps. If you observe closely, you will find a thin gray line above the 'Right Indent' button which is in the extreme right of the Ruler Line. This is the Right Margin Line. Place the mouse pointer at this line and click on it. Drag the pointer in either direction to increase or decrease the right margin. Finally, release your mouse button.

Now, let us learn how to set the top and bottom margins using the vertical ruler line. This vertical ruler line appears only in the Page Layout view. So, in a case if your vertical ruler line is not apparent on the screen, then first switch yourself to Page Layout view by selecting 'Page Layout' option from the 'View' menu. To set the top margin:

1. Take your mouse pointer on the thin gray line that appears between the darkened and white areas on the top side of the vertical ruler line.
2. As soon as your mouse pointer takes the shape of a double headed arrow, click and drag it either upwards or downwards to attain the desired top margin.
3. Release the mouse button.

When you are trying to play with the margins, a line is shown across the page which keeps moving up or down according to the movement of your mouse pointer. This gives you the exact location of your margin on the page.

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## **2.10 APPLICATION OF A WORD PROCESSOR IN CORPORATE SECTOR**

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A word processor finds immense usage in the corporate sector. This is a software that is specially designed to help the managers to design and prepare typed documents. It offers very handy tools for managers to work upon. For instance, MS-Word offers many pre-designed professional letters which can be used with little or no modification at all. Moreover, the overall impact of the document can be enhanced by using the advanced features provided by MS-WORD.

### **Student Activity 10**

1. What do you mean by formatting text?
2. How will you make the text bold and Italic?
3. What do you mean by text alignment? What are the various types of alignments available in MS-word?

4. When do we use bullets and numbering feature of MS-Word?
5. How will you find a group of words in MS-Word? How will you replace them with some other words?
6. How will you give numbers to you pages?
7. How will you insert clip-art in MS-word?
8. How will you set margins using ruler?
9. What is the application of MS-word in corporate sector?

## **2.11 DATABASE MANAGEMENT PACKAGES**

Business processes are always associated with a huge amount of data. To store, manipulate and processes such data, some software packages are needed, which are collectively known as Database Management Packages/Software/Systems (DBMS). DBMS is defined as a software that organizes and maintains the data in a database for providing the information.

Microsoft Access is a Windows based Relational Database Management System (RDBMS). It has received huge acceptance by users because of its versatility and easy to use interface. MS-Access is best suited for maintaining any type of information. It can keep huge records of data ranging from keeping an address book to inventory details. Access finds its immense usage in registering telephone numbers, expense details, store or warehouse information. Whatever data is entered, it can be viewed from different angles using forms. Data can also be sieved and extracted based on certain conditions using queries. Reports help in analyzing the data and help you to come at certain meaningful inferences. The very frequently used operations can be automated by creating and saving macros.

### **What is a Database**

A database is a collection of related information. An example of a typical database is a private telephone directory. It contains related information about each person like his name, address and telephone number. Other examples of a database include list of customers and suppliers, maintenance of stock in warehouses, collection of tapes in libraries, maintenance of members in a country club, etc.

### **Components of a Database**

All the information stored in an Access database is kept in tables as illustrated in Table 2.2.

**Table:** A table is a collection of some specific kind of data. It is the basic element of the database. Data put in a table is organized in rows and columns.

**Record:** Each row is called a record and it contains the complete information about one particular item, e.g., in a telephone directory all the essential details about a single person like his name, address and city form one record.

**Column:** Each column is called a field. It holds information about a certain type for all records. A field could be a name, address, telephone number, etc.

**Table 2.2: An Example of a Typical Table**

S.No.	Name	Address	City	Phone
1.	Monoj Bansal	160, A-2, Sector-3, Rohini,	Delhi	5418765
2.	Shaveta Verma	GP-42, Vasant Enclave,	Delhi	7117653
3.	Dinesh Kumar	K-4, Adhyapak Nagar,	Delhi	5165433
4.	Monika Bansal	F-179, Moti Nagar,	Delhi	5419876
5.	Vicky Mehta	WZ-143/4C New Mahavir Nagar,	Delhi	5153148

Diagram labels: An arrow labeled "RECORD" points to the entire table. An arrow labeled "FIELD" points to the "Address" column.

In the example shown in Table 2.2, the table contains four records and five fields. Thus, each record contains a complete and wholesome information about one item. Each column contains the same type of information for all the records like S.No., Name, Address, etc. The field 'Name' contains the information related to 'Name' for all records. So, you can have any number of records as well as fields in your table. You can add more records to your table. In the similar manner, you can also expand the field list. Your database can have any number of tables. The 'Relational' concept allows to build relations between different tables.

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## **2.12 STARTING ACCESS 2000**

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In order to startup Access in Windows 98, follow the steps given below:

1. Click at the Start button. Select the Programs option.
2. Select Microsoft Access option from the cascading menu. Access will be loaded in the computer's memory. By default, the name given to an Access database is 'dbl'. The extension given to a database in Access is 'mdb'.

**Figure 2.48: Starting Access**

### **Opening a Database**

In order to access any table form or report created in a database, it has to be opened first. A database can be opened by the following methods:

Follow the steps given below:

1. Select the 'Open an Existing Database' option from the opening Microsoft Access dialog box as shown in Figure 2.49. Choose a database from the existing databases and click at the <OK> button.



## The Access Window

The different parts of an Access Window are shown in Figure 2.50. You are already familiar with most of the components of this window. You have already been introduced to title bar, minimize button, maximize button, close button, control menu button, menu bar, toolbars and status line. The term 'Database Window' has been brought up for the very first time before us.

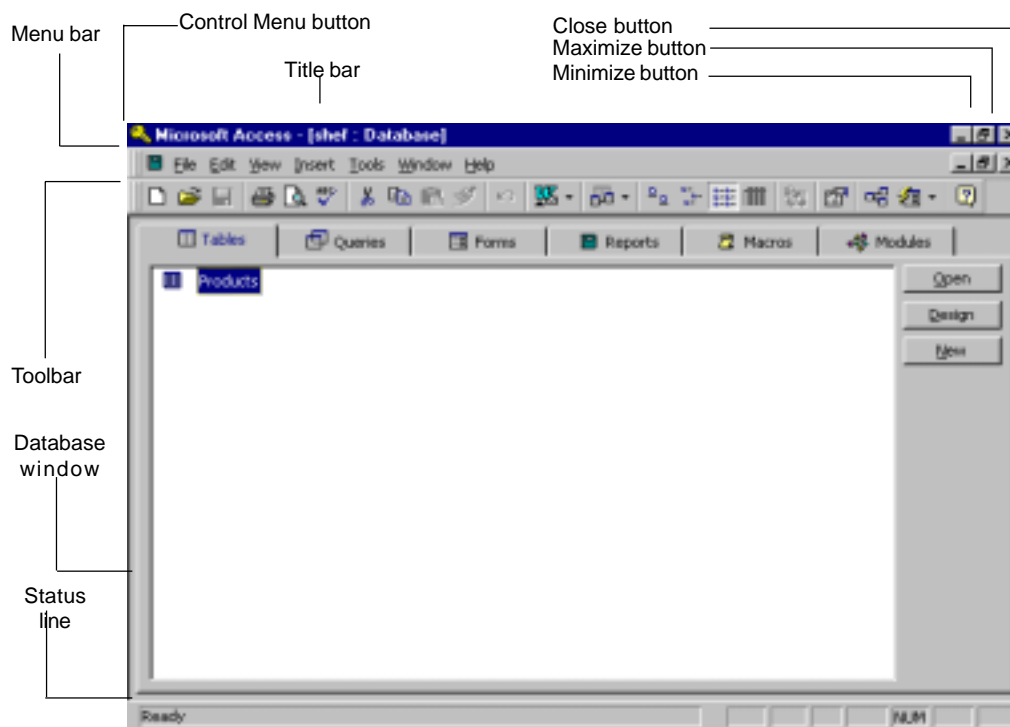


Figure 2.50: Different Parts of Access Window

## The Database Window

The elements of an Access database are brought together in the database window. Everytime a database is opened, the database window displays information about the database and all the objects it contains. The database window comprises of three parts. You will find six object tabs at the top of the horizontal bar. Each of these tabs help you select any particular object that has to be worked with. By default, the table tab is always selected when the database window is opened. It shows all the tables that have been created in that particular database. You can select any object by taking your mouse pointer at that particular tab and clicking it. Then, you will find the command buttons towards the right side of the window, These command buttons help you to place the database object in a different view, The <Open> button helps you to open up and see the selected object. The <Design> button shows the selected object with all the properties set for that object. The <New> button helps you to create a new object from scratch. This newly created object becomes a part of the current database. The features of a database window are as follows:

**Table:** It shows the list of all the tables created in the current database. You can create new tables and modify the existing tables.

**Queries:** It shows a list of all the queries in the current database. A query is nothing but a question about the data stored in the table. A query can be opened, modified as well as created from here. A query is used to extract certain information from a database.

**Forms:** It displays the names of all the forms created in the current database. A form is used for entering data in the table. Forms can show data in more meaningful and structured manner.

**Reports:** It shows the reports that have been created in the current database. A report is used for showing the data put in the table in an organized manner.

**Macros:** A macro is a written set of instructions that does your work automatically. It helps to automate repetitive tasks.

**Modules:** A module is a collection of programs which is written by the user.

## Creating a Database

As we have already discussed, a database contains a large number of tables. The very first step for working in Access is the creation of database. So, as and when Access is loaded in the computer's memory, Figure 2.51 appears on the screen.



Figure 2.51: Database Creation Window

1. Click at the Blank Database option to create a new database. Finally, click at the <Ok> button. The Figure 2.52 appears on the screen.



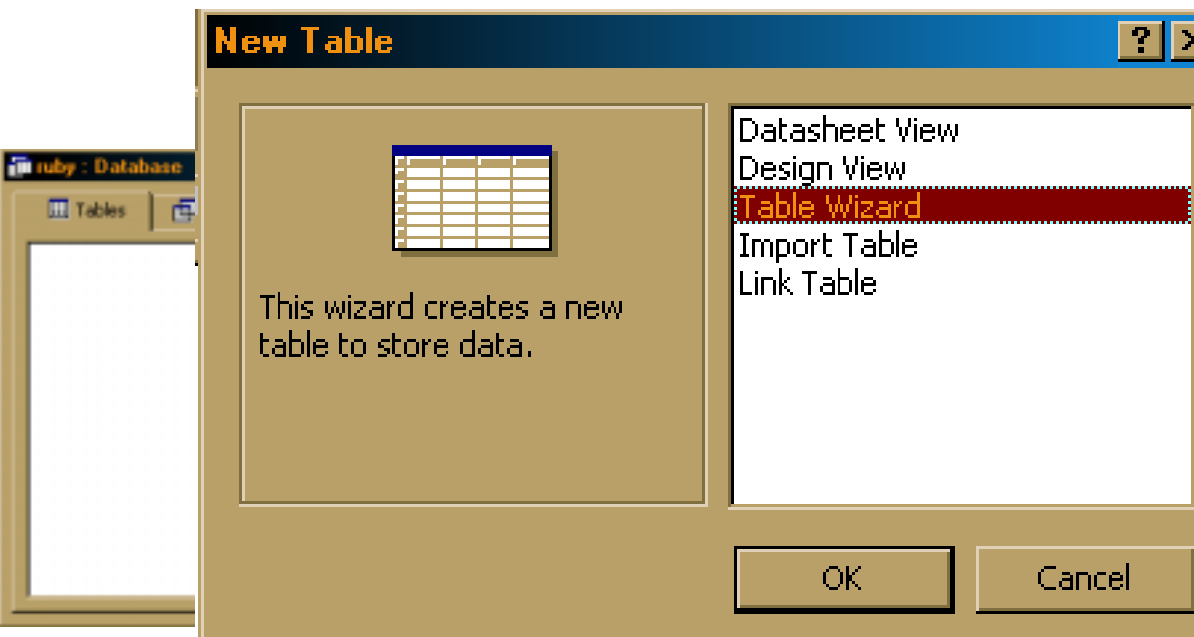
Figure 2.52: 'File New Database' Dialog Box

2. Access wants you to give a name to your database. So, in the 'Filename' box, type in the name of the database. Here, the name given to an Access database is 'Ruby'. Then, click at the <Create> button. Now, the Figure 2.53 appears on the screen.

**Figure 2.53: The Database Window**

### Creating a New Table

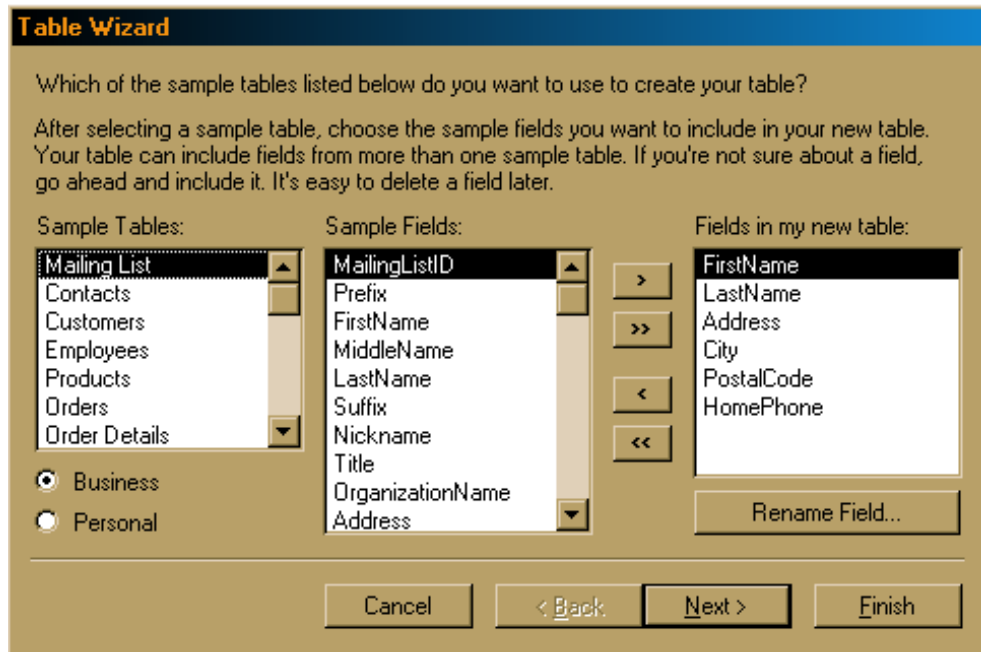
A table contains all the necessary information. We will learn how to create a table using a wizard. A wizard takes you through a series of steps to accomplish your work. Thus, in order to create a table, click at the <Table> tab and then at the <New> button as shown in Figure 2.53. Figure 2.54 appears on the screen. After clicking at the 'Table Wizard' option, click at the <Ok> button.



**Figure 2.54: The 'New Table' Dialog Box**

The 'Table Wizard' contains some sample tables as shown in Figure 2.55. Select the table in the 'Sample Tables' window according to your requirement. The corresponding fields of the table are shown in the adjacent window. You can put all the fields from the sample table. You can also decide and put a few fields in your table from the fieldlist. So, for putting the fields selectively, select the field and click at the single arrow pointing towards the right side. However, if you wish to put all the fields from the sample table into your table, click at the double arrow pointing towards the right side. In case, if you have accidentally put a wrong field into your table, then select that field and click at the single arrow pointing towards the left side. This will clear the field

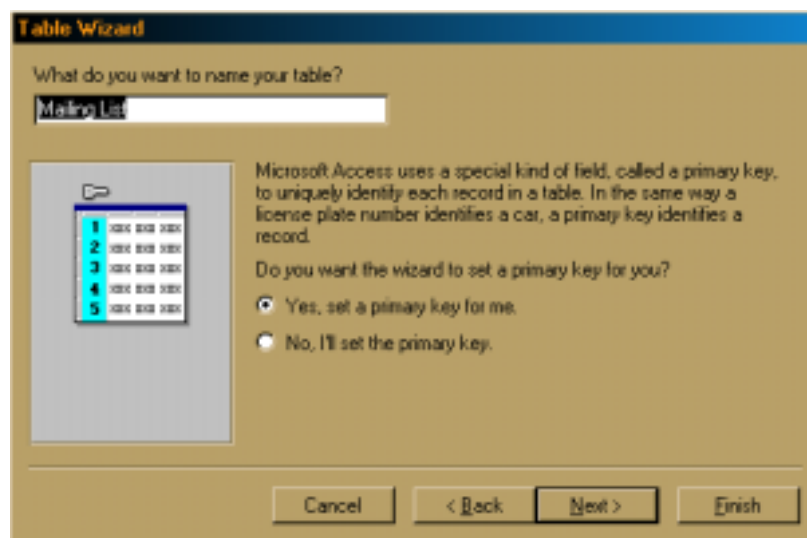
from your table. The double arrow facing towards the left side will remove all the fields from your table. However, if you wish to give a new name to your field, then click at the <Rename> button. A 'Rename' dialog box comes up on the screen. Simply, type in the new name. Finally, click at the <Next> button.



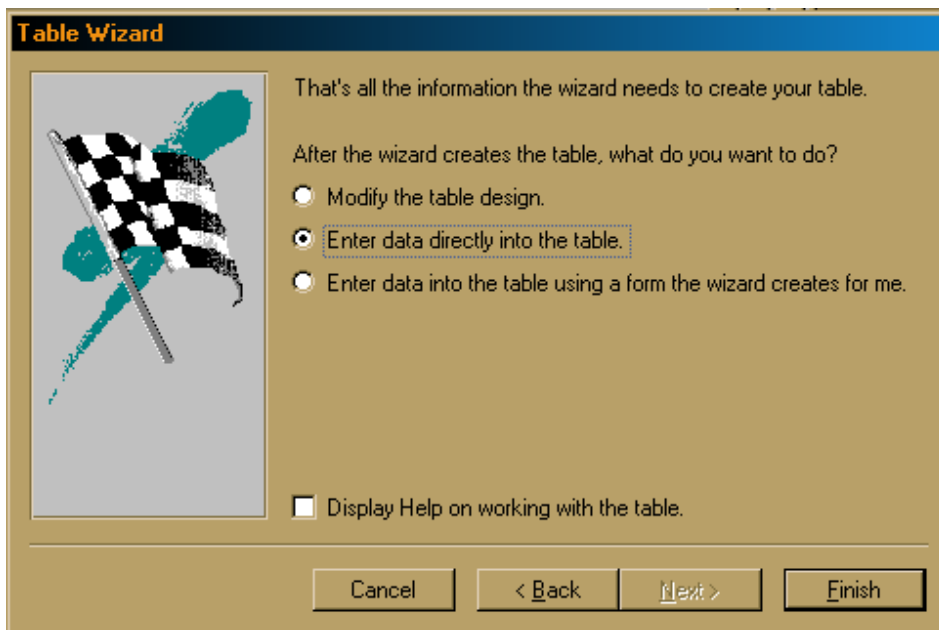
**Figure 2.55: The 'Table Wizard' Dialog Box**

The Figure 2.56 appears on the screen. The 'Table Wizard' appears on the screen. You can give a name to your table. The name given to the table in the example is 'Mailing List'.

Click at the <Next> button. Figure 2.57 appears on the screen. Access allows you to create a temporary form for entering data through the 'Enter data directly into the table' option. However, if you wish that the form should also be saved for future use, then click at the option <Enter data directly into the table> using a form the wizard creates for me'. In the latter case, the wizard will automatically create a new form for you according to the fields that you have decided to put in your table. Finally, click at the <Finish> button. Figure 2.58 appears on the screen.

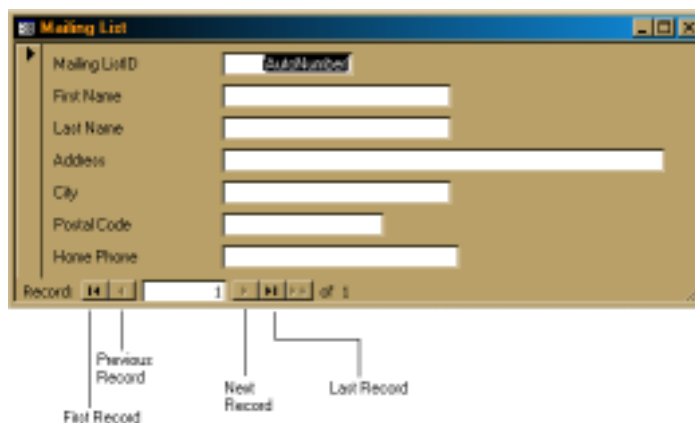


**Figure 2.56: Figure Showing the Name given to a Table**



**Figure 2.57: Create a Form for Data Entry**

Click in the <First Name> box and enter the first name of the person. In a similar manner type in the rest of the appropriate details by clicking in respective box. Once all the details of a single record are entered, click at the <Next Record> button. It will take you to the next record and there you can type in the details of the second record. The 'Next Record' button is also used for seeing the contents of the next record of the table. The 'Last Record' button shows you the details of the last record. The <Previous Record> button will take you to the previous record. The very first record of the table can be seen with the help of the 'First Record' button. Once all the records are entered, click at the Save As option of the File menu to save the form and give an appropriate name. Click at the <Close> button appearing on the extreme right of the screen to get back to the Database Window.



**Figure 2.58: Form for Entering Data in the Table**

### Viewing the Contents of the Table

The contents of the table can be seen by going back to the 'Database Window'. Click at the <Forms> tab and select the form name whose contents are to be seen. Lastly, click at the <Open> button. You can navigate between different records to see their details.

### Closing and Saving a Database

In order to close a database, click at the 'Close' option of the File menu. Alternatively, click every <Close> button of the database window. It would automatically save your database and update the changes done to it.

## Exiting ACCESS

To quit Access, click at the Exit option of the File menu.

### Student Activity 11

1. Define DBMS.
2. What are the various components of a database?
3. How will you start MS-Access?
4. What are the features of a database window?
5. How will you create a table in MS-Access?
6. How will you view the contents of the table?
7. How will you exit from MS-Access?

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## 2.13 WORKING WITH TABLES

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We have already seen how to create a table. A table contains the basic data stored on a database. A database can contain a single table as well as multiple tables. In order to open a table, go to Database window and select the table tab by clicking it with the help of mouse pointer. Now, you have to decide whether you want to see the table in the Datasheet view or the Design view. The Datasheet view shows you all the data and records present in the table. The Design view, however, shows you the properties that have been set for each field of the table.

### Opening a Table in Datasheet View

To open the table 'Products' in the Datasheet view, click at the <Open> button. Figure 2.59 appears on the screen. It shows you the field names of the table at the top and the corresponding data below it. Each horizontal line of the window forms a single record. So, as many lines are there in the window, there are going to be those many records in it.

In order to move around the datasheet, you can make use of either the keyboard or the mouse. You can select any data element by clicking it with the help of mouse pointer. Using the keyboard, press the <Shift + Tab> keys together to move from one field to another. Once you have reached the last field in the current row, press the <Tab> key again to go to the first field of the next record. However, if you are in the first field, pressing the <Shift + Tab> keys will take you to the last field of the preceding record. You can also use the up and down arrow keys to move from one record to another. In order to select the entire record, click in the left most column of that particular record's row.

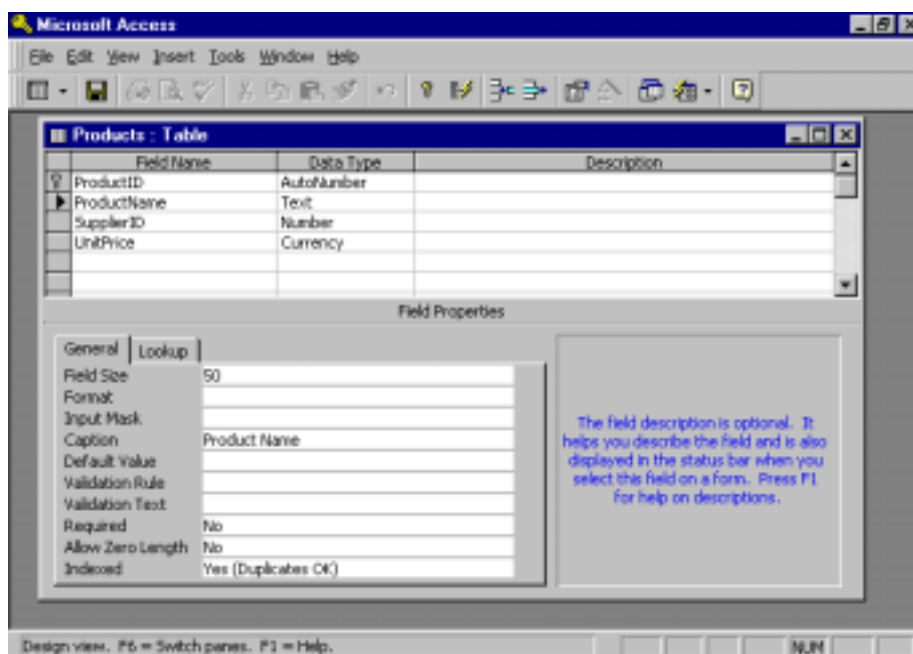
Product ID	Product Name	Supplier ID	Unit Price
1	Trousers	5	\$350.00
2	Shirts	3	\$250.00
3	Blazers	2	\$600.00
4	Neck Tie	7	\$150.00

Figure 2.59: The Products Table in Datasheet View

If you want to add a new record in your table, just click in the last row of the datasheet and type in your data. However, you can also edit the data of the table. Simply, click in the cell (with the help of mouse pointer) which has to be edited and then type in your contents.

## Opening a Table in Design View

A table can be opened in a Design view by first of all selecting the table in the Database window and then clicking at the <Design> button. Figure 2.60 shows the 'Product' table in the Design view.



**Figure 2.60: The Products Table in Design View**

A table is opened in the Design view in order to examine its structure. It shows the fields present in the table as well as the data type and properties for each field.

The grid at the top of the Design view window shows all the fields, their data types and some description about the field. The lower part of the window shows the other properties of the field that has been selected in the upper grid. At one time, the properties of only one field that is selected is shown in the lower window.

You can very easily view the details of another field by simply clicking anywhere in the grid row on which it appears. The information in the lower window changes to match the properties for the newly selected field. Access shows the currently selected field by putting an arrow on the row in the left most column of the upper window.

If the left most column of the grid displays a key icon, then that field is being used as the primary key for the table. This means that this particular field is being used as a unique field. This field can never contain repetitive entry. All the data for this field is uniquely identifiable. Therefore, this field is said to be the 'primary key' of the table. Now, let us study the basic structure of a table in detail.

1. **Field Name:** The Field name column present in the upper window specifies a name for the field. No two fields in the table can carry the same name. You can provide any name to your field. However, the Field name cannot have more than 64 characters. It can contain any combination of letters, numbers, spaces and special characters except periods, exclamation marks or square brackets. Field names can never start with a space.
2. **Data Types:** The Data Type column is present next to the Field name column. It signifies the type of information stored in the field. The edit box for this column is a drop-down list box

which contains all the available data types. Let us briefly explore all the available data types:

- (a) **Text:** It stores the alphanumeric data which contains a string of characters.
  - (b) **Number:** Any kind of numeric data is held by this data type.
  - (c) **Date/Time:** It stores the date and time.
  - (d) **Currency:** It is a special numeric data type used for holding monetary values.
  - (e) **Autonumber:** This kind of data type is mostly used for primary key fields. Fields of this data type are read only. Access automatically inserts the next number in the sequence.
  - (f) **Yes/No:** This data type can hold only one of the two values such as Yes/No or True/False.
  - (g) **Memo:** This data type is used for storing long text fields upto a limit of 64,000 characters. This data type is used, to store long comments or notes.
3. **Description:** The Description column is present adjacent to the Data type column. This is used to give a short description about the field. The Description column provides complete explanation of the purpose the field serves.
4. **Properties:** Each field has got its own set of properties. It further defines the fields and how it is used in the database. So, as you move from one field to another in the upper window, the corresponding properties in the lower window also change. Now, let us look at some of these properties:
- (a) **Field Size:** The Field size property appears only for the Text and Number data types. This property specifies the maximum number of characters that can be stored in the field for a single record for a text value. For Number fields, field size specifies the type of number that will be stored in the field. The available choices are Byte (a. number from 0 to 255, whole numbers only), Integer (-32,768 to 32, 767, whole numbers only), Long Integer (-21, 47, 483, 648 to 2147, 483, 647, whole numbers only), Single (can hold a very large number and fractional numbers) and Double (stores numbers larger than single). The choice made here does affect the amount of space Access uses to store the field. Therefore, you should be very careful in deciding the field size.
  - (b) **Caption:** The Caption property specifies a string that has to be displayed as the column heading whenever the field is displayed in the Datasheet view.
  - (c) **Default Value:** The Default value specifies a value that will be put into the field if it is not given by the operator at the time of entering the record.
  - (d) **Validation Rule and Validation Text:** The Validation rule property specifies a test that is performed on any data that is entered into the field. If the data does not pass the rule, then a message is shown on the screen. However, if any message is typed in the Validation text property, then that message is displayed, otherwise some system error message is shown on the screen. For example, for a price field if you specify the validation rule as '>100', then any data below 100 will not be accepted and the computer will prompt you to re-enter.
  - (e) **Required:** The Required property forces you to enter a value if it has been set to 'Yes'. You cannot leave that particular field empty at the time of entering record in your table.

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## 2.14 WORKING WITH FORMS

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All the data in your database is stored in tables. You can view as well as edit data in a table but forms provide a much easier and flexible interface to view and edit data. Forms allow you that view all or just a few record at once while also showing the field names. Forms provide an easy way to enter, change and delete records.



## Opening a Form

First of all, open the database that contains the required form. Now, in the database window, click at the forms tab. All the forms of the currently active database are shown in the window. Select the Form name with the help of the mouse pointer and finally click at the <Open> button. Figure 2.61 appears on the screen. Using the arrow keys, you can view the other records of the table.

## Creating a Form

A form can be very easily created using the Form wizard. The form wizard is the quickest and the easiest way to create a form that is bound to a table. You can use the form immediately or you can make changes to get the form look exactly the way you want. Thus, in order to create a form using the form wizard, first of all, select the Forms tab in the Database window. Finally, click at the <New> button. A 'New form' dialog box appears on the screen as shown in Figure 2.62.

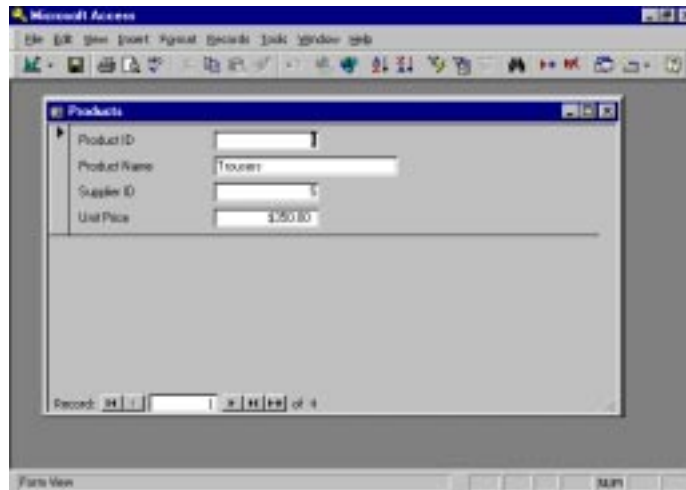


Figure 2.61: An Open Form

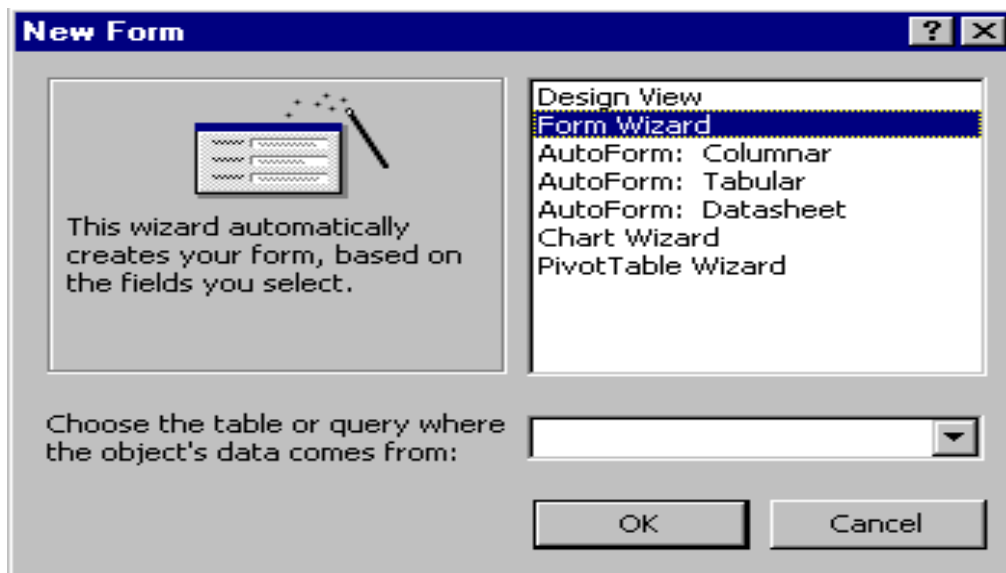
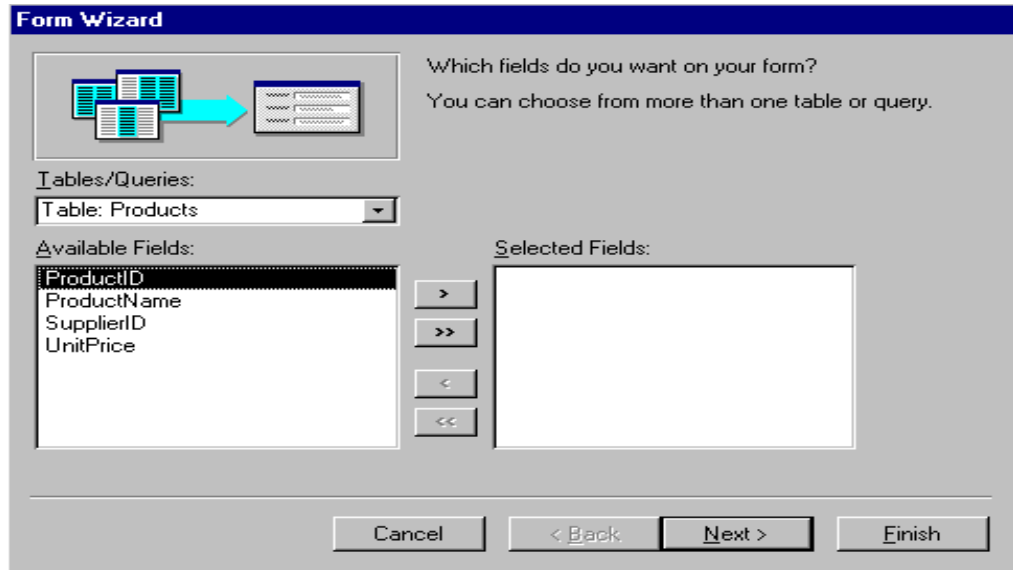


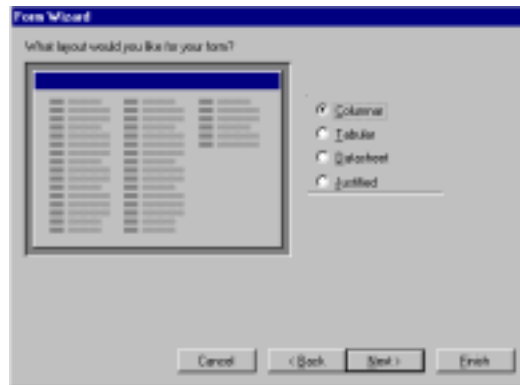
Figure 2.62: The New Form Dialog Box

From the 'New Form' dialog box, select the Form wizard option. Then select the table from which the information has to be displayed on the form. Click <OK> button to start the Form wizard. We will create a form on the 'Products' table. So, select the Products table to create a form on it and click at the <OK> button. You will see Figure 2.63 coming up on the screen.



**Figure 2.63: The First Step of Form Wizard**

This Form wizard dialog box wants you to select the fields from the table that need be added to the form. By clicking the single arrow pointing towards the right side, you can add fields one by one to your form. You can add all the fields into your form by clicking at the double-arrow pointing towards the right side. After you have decided and put the fields, click at the <Next> button. You will find Figure 2.64 coming up on the screen.



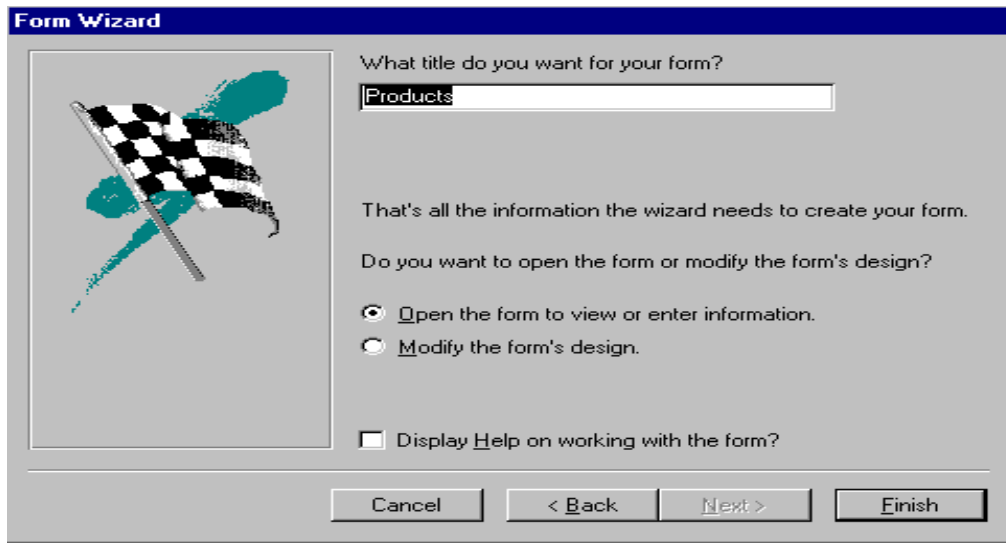
**Figure 2.64: The Second Step of Form Wizard**

This dialog box asks you to decide and to choose the layout in which you want to see your new form. By default, the layout of the form is columnar. Whichever form layout you choose, the left side of the window shows the arrangement of fields on the table. Choose the layout and click at the <Next> button. Figure 2.65 appears on the screen.



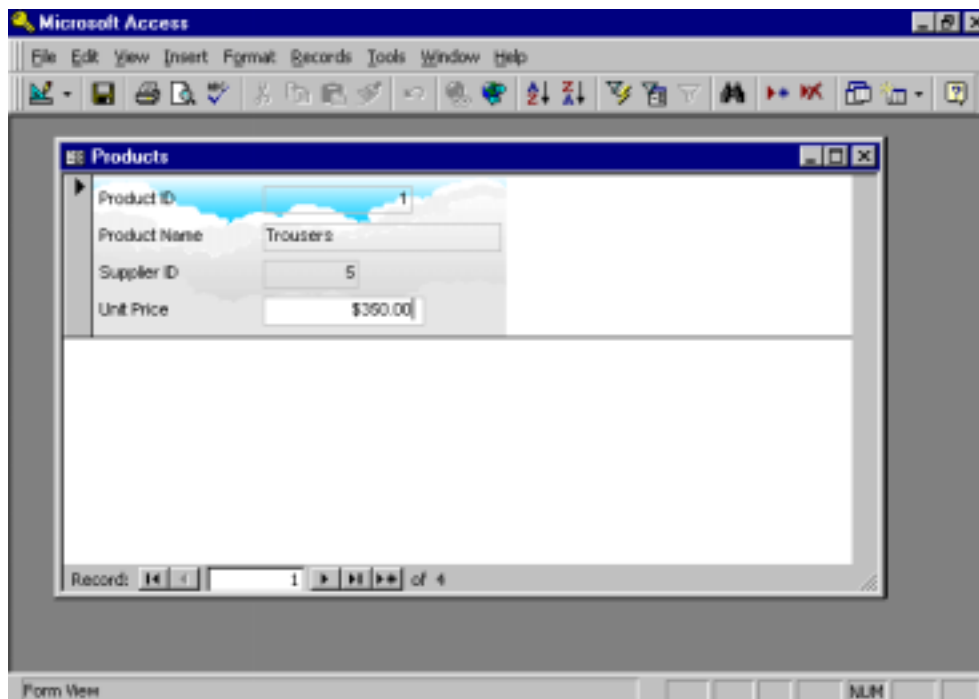
**Figure 2.65: The Third Step of Form Wizard**

The next dialog box of the form wizard enables you to choose the style of your form. The style controls the color and the font of the data that is to be displayed on the form. It also takes care of the background color and picture of the form. By default, the 'clouds' option is active, choose the style and click at the <Next> button. You will find Figure 2.66 coming up before you.



**Figure 2.66: The Four Step of Wizard**

This is the last dialog box of the form wizard. Here, you are required to give a name to your form. You can straight away start entering data into your form or you can modify the form design. Hence, give a name to your form and open it up for viewing and entering data in it. Finally click at the <Finish> button. Now, you can see your form already on the screen as shown in Figure 2.67.



**Figure 2.67: The Form on Products Table**

### Adding and Editing Records in a Form

To add a new record, click at the <New Record> button available in the form that you have created. To edit or modify any of the field data, you are simply required to click that field with the help of mouse pointer and then type in the new data. You can make use of the <Tab> key from the keyboard to move around the form and then edit any field by simply typing in.

## Deleting Records in a Form

It is very easy to delete records. You can delete information in fields by selecting that field with the help of mouse pointer and pressing the <Delete> key from the keyboard.

## Saving and Closing Forms

Access, automatically saves each record as you move ahead. To close the form and return to the Database window, choose File/Close option or Click the <close> box available in the upper right corner of your screen.

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## 2.15 WORKING WITH REPORTS

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Reports provide information in a very systematic, organized and compact way. You can view and print this information in any format and style. Reports help in taking managerial decisions effectively and efficiently.

### Opening and Viewing Reports

Opening a Report is very much similar to opening forms. First of all, go to the database window and select the Reports tab. All the reports contained in the database will be shown on the screen. Select the report that has to be opened and click at the <Preview> button. Figure 2.68 shows a sample report formed on the Products table.

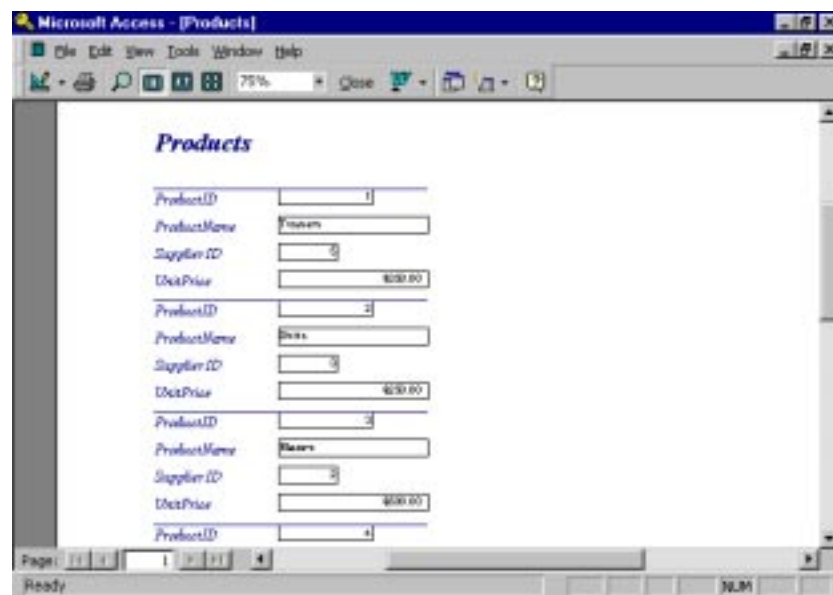


Figure 2.68: The Products Report

### Creating a Report

A simple report can be created using the 'Auto Report' feature of Access. 'Auto Report' creates a report automatically containing all the fields and records from the selected table. Each field on the report appears in a single line carrying a label on the left side of the page. You can create a report by first going to the main window and then clicking at the Reports tab. Click at the <New> button present on the main database window. Finally, click at the 'Auto Report' option. 'Auto Report' creates a single-column or tabular reports. 'Auto Report' is the quickest and the easiest way of creating reports.

### Printing a Report

Most of the times, a hard copy of the report is taken out and put in record file. It helps in taking very useful and quick decisions. To print a report select it from the Report tab in the main database window and then choose 'File/Print' option from the Database window. A 'Print' dialog box appears on the screen. Use this dialog box to choose the printer that will print the report, which pages to print, what range of pages to print, how many copies and other print properties.

## **Saving and Closing Reports**

A report can be saved by choosing the File/Save option. When the report is being saved for the very first time, a dialog box appears before you which asks you the name of the report. By default, the name 'Report 1' is given to your report. In order to close a report, click at the Close box available at the right corner of the screen.

## **Application of a Database in Corporate Sector**

The software packages called Database Management Systems provide a very high level language interface which can be learned very easily by an end-user. The manager need not learn the programming techniques at all. Moreover, small business information systems can be easily implemented in a few days using this package.

Moreover, it becomes very handy for a manager to maintain data and prepare reports based on these data. A variety of reports can be generated depending upon the precise and specific requirements of the managers. It also allows you to create queries and provides you an answer to the manager's most difficult decision oriented questions.

### **Student Activity 12**

1. What is the difference between design view and datasheet view?
2. What is a form? How will you create a form?
3. How will you edit records in a form?
4. What is a report? How will you open and view reports in MS-Access?
5. How will you print a report?
6. What are the application of a database in corporate sector?

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## **2.16 SPREADSHEET PACKAGES**

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Business applications require a lot of calculation work. In manual system, it is done on a sheet of paper with rows and columns, which is called a 'spreadsheet'. Spreadsheet packages use the concept of an electronic spreadsheet. An electronic spreadsheet (or worksheet) is a very big sheet consisting of thousands of rows and columns, which is used to store information in the memory of a computer. Like databases, electronic spreadsheets have now become an essential tool in developing a computerised management information system. Income statements, annual reports, balance sheet, cost analysis and budgets are some of the applications where worksheets are typically used.

EXCEL 97 is a very powerful and easy to use spreadsheet package which is being commonly used these days. It is basically an end user application package. It works very well with numbers and their complex calculations. EXCEL 97 helps to put and prepare your data in an organized, orderly and meaningful fashion. EXCEL 97 finds its major contribution in creating reports, using formulas and performing calculations. It is best suited for scientific and statistical analysis. EXCEL 97 can also be used to prepare Profit and Loss accounts, Balance Sheet and other Tax statements. It works well for both simple and complicated numbers. EXCEL 97 can do anything for you. Your imagination can be the only limit. It can be used for preparing analytical reports including statistical analysis, forecasting and regression analysis. Good looking and attractive charts can be created which depict data in clearer and meaningful fashion. EXCEL 97 can also be used to create relationships between different types of data. EXCEL 97 can do all the work of a full fledged word-processor but it lacks the advanced features of desktop publishing. It also supports the high level features of object linking and embedding which means data from Word can be safely and easily put and linked with data in EXCEL and vice versa is also true.

### **What is an Electronic Spreadsheet**

An Electronic Spreadsheet is a network of rows and columns. Each row is given a unique number whereas each column is identified by a unique alphabet or pair of alphabets. So, it can be stated that an electronic spreadsheet is a grid that contains cells.

## Popular Spreadsheet Packages

The popularly used spreadsheet packages are:

- MS-EXCEL
- Lotus 123
- Supercalc
- Framework
- VP Planner Plus

## Uses of Electronic Spreadsheets

Electronic Spreadsheets satisfy the needs of a large number of users and meet with their varied requirements. Some of the things that can be easily done with the help of an Electronic Spreadsheet are mentioned below:

- Arithmetic and Statistical Calculations
- Preparation of Profit and Loss Account
- Preparation of Income Statements
- Preparation of Tax Statements
- Reports
- Charts
- Regression Analysis
- Forecasting

An Electronic Spreadsheet can do a great job with mind crunching numbers. Any kind of complex calculation can be done in a matter of few seconds.

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## 2.17 STARTING EXCEL 2000

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The biggest advantage offered by Microsoft Office products is the great similarity between its applications with respect to the overall working, toolbars and menus. Since, we have already made ourselves familiar with Word 2000, learning EXCEL 2000 will become easy and less time consuming for us.

To startup EXCEL in Windows 98, the steps given below can be followed:

1. Click on the Start button at windows taskbar.
2. Select Programs option
3. Select Microsoft Excel option.

You will find that the given menu options are very much similar to Figure 2.69. As stated in the previous lesson also, the menu options shown to find out in this figure might not exactly resemble those seen on your computer. So, you need do a bit of exploring job where actually MS-EXCEL is installed on your computer.

Alternatively, MS-EXCEL can also be started up through the following steps:

1. Click at the Start button.
2. Select 'New Office Document'. A 'New Office Document' dialog box appears on the screen. Double-click at the blank workbook option or select one of the other tabs, such as spreadsheet to start EXCEL 2000.

Once EXCEL 2000 is loaded in the computer's memory, a blank workbook shoots up on the screen. A typical name given to a file in EXCEL is Workbook. The terms Excel Document, Excel Workbook and Excel File carry the same meaning and can be used interchangeably. This blank file by default gets the name - Book 1. The extension given to a file in Excel is 'XLS'. A typical Excel screen resembles Figure 2.70.

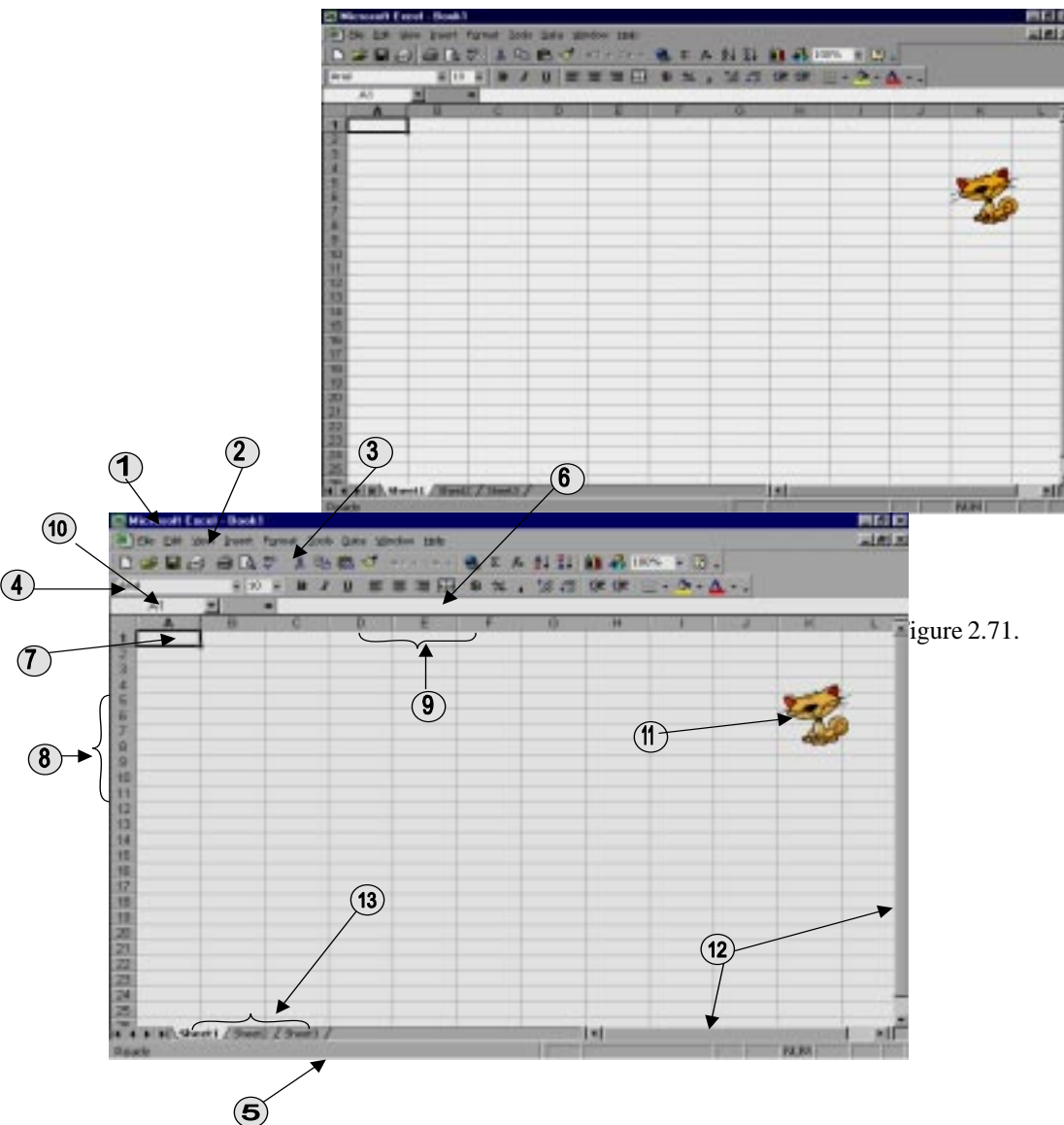


Figure 2.71.

Figure 2.71: Screen Elements of Excel

**Table 2.3: Description of Screen Elements**

Screen Element	Description
Title Bar	Located at the top of the screen. It displays the name of the application (here 'Microsoft Excel') and the active document name (here 'Book1').
Main Menu Bar	It is located under title bar. It shows menu options of EXCEL like File, Edit, View.....Help. Each menu option has a corresponding pull down menu.
Standard Toolbar	Located exactly below the menu bar. It has got icons like New, Open, Save, Print, etc.
Formatting Toolbar	Lies below the standard toolbar. It has got options for controlling different fonts and other formatting features.
Status Bar	It is situated at the bottom of the screen. The status bar gives information like 'Ready' or 'Edit' depending upon the data present in the currently active cell.
Cell	An intersection of row and column. It is used to store data, letters, numbers, values, etc.
Rows	They are horizontal and are numbered as 1,2,3.... A workbook can have a maximum of 65536 rows.
Columns	They are vertical and labelled as A,B,C...,AA,AB,AC...BA,BB,BC..A workbook can have a maximum of 256 columns.
Range	It is a group of continuous cells. For example, the range D7:E9 includes the cells D7,D8,D9,E7,E8 and E9.
Name Box	This box shows the address of the currently active cell.

A workbook has got three worksheets in it by default. New worksheets can be added to it. It is a good idea to keep all the related work in different worksheets of the single workbook. So, it can be safely said that a workbook is a binder and the worksheets are its sheets. A worksheet can be moved from one workbook to another.

### Student Activity 13

1. What is an electronic spreadsheet?
2. Name some popular spreadsheet packages.
3. How will you start MS-Excel?
4. Describe various screen elements of MS-Excel.
5. Differentiate between a workbook and a worksheet.

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## 2.18 WORKING WITH DOCUMENTS

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In order to work in EXCEL, you have to either open an existing file or create a new one. So let us find out how to create, open, save and finally close files.

### Creation of a New Workbook

EXCEL offers a variety of ways by which new workbooks can be created. So, for creating a new workbook, you can follow anyone of the methods discussed below:

1. A new workbook can be created by clicking at the 'File' menu and then selecting the 'New' option.
2. You can also open a new workbook by clicking at the 'New' button available on the standard toolbar.
3. If you are a keyboard person, then don't feel disappointed. Pressing <Alt+F+N> keys together will also achieve your work of creating a new workbook.

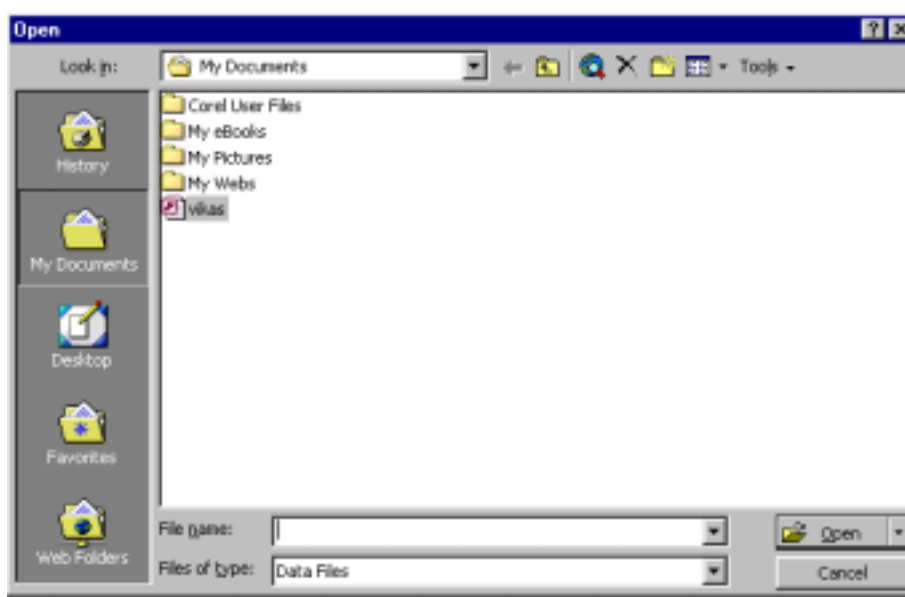


## Opening a Workbook

If your document is stored on any of the storage device like hard disk or floppy disk, then it becomes possible to retrieve that document. EXCEL offers a number of ways to open your document which are discussed below:

1. Click at the 'File' menu and select the option 'Open'.
2. Alternatively, for opening a document, just double click at the 'Open' button available on the standard toolbar.

An 'Open' dialog box appears on the screen as shown in Figure 2.72. In this 'Open' dialog box you would notice a 'Look in' box which is used for selecting the drive as well as the folder where your workbook has been stored. Double-click the folder to see the workbooks under it. From the 'Files of type' box, select the kind of file that you want to open. Suppose you want that only the EXCEL documents should be shown in the file list then click at the pull down arrow and from the drop down list, select 'Microsoft Excel Files' option. Finally click the workbook name in the file list and click at the <Open> button or double click the workbook name to open it up.



**Figure 2.72: The 'Open' Dialog Box**

## Saving a Workbook

A workbook should be saved properly before closing it or quitting EXCEL for its future retrieval. Once all the text is entered, save the document with any of the following methods:

1. Click at the 'File' menu and then select 'Save' option.
2. The other way of saving your files is by clicking at the 'Save' button available on the standard toolbar.

When the workbook is being saved for the very first time, the 'Save as' dialog box comes up because EXCEL needs some additional information from you. EXCEL wants you to give a name to your workbook. If you want to save your workbook with a name that is already given by EXCEL, simply click at the <Save> button. However, if you want to give some other name, then erase off the existing name from the 'Filename' box and give a new name to the workbook.

The 'Save as' dialog box is displayed only once till the time you don't give a name to your workbook. Once the workbook has a name, next time if you try to save your file after making a few changes in it, then the 'Save as' dialog box will not appear on the screen. So, if you intentionally want to change the name of your workbook, select the 'Save as' option from the 'File' menu. Replace the name of the workbook with a new name in the 'Filename' box. It will create two copies of the same workbook—one with an old name and the other with a new name that you have just given. It's a good idea to keep saving your workbooks after every few minutes. The reason is if the

computer goes down or a power failure occurs, then the chances of recovering something in the document are high. Unsaved new documents are the most vulnerable.

### **Closing a Workbook**

It is extremely easy to close workbooks in EXCEL. So, for closing a workbook, click at the File 'menu and select the Close' option. If you have made any changes in your workbook after saving it, then EXCEL prompts you to save your workbook before closing it. Thus, if you want that your workbook should be saved before it is closed, then click at <Yes> button otherwise hit the <No> button in the dialog box that appears next. A case may arise when you want to continue working in the same document after issuing 'File\Close' command. Select the <Cancel> button. It will allow you to work again in your document thus cancelling the issued command.

### **Exiting Excel**

EXCEL offers a large number of methods for shutting itself down. You can follow any of the below mentioned approaches:

1. Click at 'Close' button present in the upper right corner of the title bar.
2. Select 'Exit' option from the 'File' menu.
3. Press <Ctrl + W> keys together.

EXCEL will close all the currently opened workbooks on its own. EXCEL wants you to play a safe game. It will again prompt you to save your files before quitting like it did while closing your workbook.

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## **2.19 DATA ENTRY AND EDITING**

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A cell contains the data entered by you. At any time, one cell is always highlighted which is called the currently active cell. The address of this currently active cell is shown in the 'Name' box which lies in the upper left corner of the screen, exactly above the column letter A. You can place your data in any portion of the worksheet. Take your cell pointer at a place wherever you want to put your data with the help of either the mouse pointer or arrow keys. Enter the data. Once you have finished typing in the current cell, press <Enter> key. Now, to go to the next cell, either click it with the help of mouse pointer or move to that particular cell with the help of arrow keys. Similarly, in order to select a group of continuous cells, take your mouse pointer at the cell from where you want your range to start. Click at that cell and then drag your mouse pointer diagonally to the opposite corner. Release the mouse pointer when the desired range is made. All the cells in the range become highlighted.

### **Inserting Text**

Generally, when you startup EXCEL, it is in the Insert Mode, which means as text is typed in, the following text is pushed towards the right side. So, if you are only interested in putting new text in the cell then, take your cursor at that particular location of the cell and start typing in.

Sometimes, old text has to be replaced with new text. Take your cursor at a place wherever any change has to be effected. Type in the new contents and erase off the existing contents with the help of <Del> key. However, if the EXCEL is in the 'Typeover' mode, then the old contents are automatically replaced with the new contents. If you want to put yourself back to the insert mode, press the <INS> key once from the keyboard.

### **Editing the Cell Entry**

Many a times, the contents entered in a cell have to be modified and new contents are required to be put in it. So, for making changes in the cell entry, first take your cell pointer to that particular cell. Then, hit the <F2> key or double-click at that cell with the help of mouse pointer. Make the necessary changes and press the <Enter> key again.

## Moving and Copying Text

The contents of a cell or range of cells can be moved as well as copied to some other location in the worksheet. Copying cells mean duplicating the contents of a cell or range of cells at some other desired place. Moving text means removing text from one portion of the worksheet and placing it at some other location. The procedure for copying and moving text is almost the same with a little difference. For copying cell contents, follow the steps given below:

1. Select a cell or range of cells.
2. Press <Ctrl + C> keys. Alternatively, select the 'Copy' option from the 'Edit' menu.
3. Take the cursor to the cell wherever you want the text to be pasted.
4. Hit <Ctrl + V> keys. Alternatively, select the 'Paste' option from the 'Edit' menu.

You can also use the 'Copy' and 'Paste' button available on the standard toolbar for copying and pasting text. On similar grounds, for moving the cell contents, select the 'Cut' option instead of 'Copy' from the 'Edit' menu. Rest of the steps are the same as that of copying cell contents.

## Deleting Text

A passage of text can be very easily erased by selecting it and pressing <Del> key from the keyboard. You can also delete a single character by positioning the cursor at that particular character and hitting the <Del> key.

If you want to scrap off only a single word from your document, select the word by double clicking it and hit the <Del> key. You can also delete words by following commands:

1. Press <Ctrl + Del> keys to delete next word.
1. Press <Ctrl + Backspace> keys to delete previous word.

## Inserting a Row

In order to insert a new, blank row in between two rows, follow the steps given below:

1. Take the cursor where a new row has to be inserted.
2. Select 'Rows' option from the 'Insert' menu. A blank row will be inserted above the current row.

## Inserting a Column

To insert a blank column, the steps given below can be followed:

1. Take the cursor where a new column has to be inserted.
2. Select 'Columns' option from the Insert menu. You will find a new blank column inserted to the left of the current column.

## Deleting a Cell or Group of Cells

In order to delete a single cell or group of cells, follow the steps given below:

1. Select the cell or range of cells that is to be deleted.
2. Right click your mouse button.
3. Choose the 'Delete' option from the menu that appears.

## Clearing the Contents of a Cell or Group of Cells

To clear or erase off the contents of a single cell or group of cells, carry out the steps given below:

1. Select the desired cell or range of cells from which the contents are required to be cleared.
2. Right click the mouse button.
3. Choose the 'Clear Contents' option from the popup menu that appears on the screen.

Clearing the contents of a single cell or range of cells is different from deleting them. When you clear a cell or range of cells, the contents are erased, leaving the cells blank. However, when a cell or cell range is deleted, the other cells re-adjust themselves to fill in the empty space created by deleting them.

### **Changing the Row Height**

You can change the overall look of the whole workbook. You may require to change the height of a row for adjusting text in case a larger font size than default is applied onto it. So, if the font size is made larger than the cell height, then some part of the text might be hidden. Now, to change the height of rows, the steps given below can be applied:

1. Select the row whose height has to be changed. This can be done by either clicking in any cell of that particular row or by clicking at the row header.
2. From the 'Format' menu, select the 'Row' option. Then, choose 'Height'.
3. Enter the height of the cell that you want to achieve.

In order to change the height of a group of rows, select all those rows. From the 'Format' menu, select the 'Rows' and then the 'Height' option. Key in the desired row height. All the selected rows will have the same row size.

### **Changing the Column Width**

On similar grounds, the width of a column can also be altered. Column width can be re-adjusted according to your own special requirements. Thus, for changing the column width, carry out the steps given below:

1. Select the whole column either by clicking at the column header or by clicking at any cell of that particular column.
2. From the 'Format' menu, choose the 'Column' option. It will display a 'Column' Width dialog box on the screen.
3. Type in the new column width. Finally, click at the <OK> button.

---

## **2.20 TYPES OF CELL ENTRIES**

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EXCEL can very smartly make out the type of data as you type in. You can key in values and formulae from the keyboard. Values can contain text, numbers or special characters. The formulae can perform calculations based on the values present in other cells. You can apply any font type, size and alignment pattern on these values. Let us discuss the different types of cell entries in detail:

### **Text Values**

We can put both text and numbers in a cell. Any entry that contains text, numbers or any special character is recognized as a text entry. A text purely in alphabets is mostly used for giving titles and identifying information such as Salesman Name; Sales (pieces); etc. Generally, a text entry is given at the top and left side of the worksheet. A number entry can be formatted to text in a case when no mathematical calculation is required on it. By default, a text entry is left aligned. Looking at the alignment of the entry, you can easily make out the category in which EXCEL has placed your data. In order to apply any particular type of format on your data, select the cells and activate "Cells" option from the "Format" menu. Choose any of the formats to apply it on the selected text.

### **Numeric Values**

Any entry is treated as a numeric value if the first character entered, is a number or a mathematical operator such as + or -. Numbers are typed directly. A numeric value can contain any of the following characters:

0 1 2 3 4 5 6 7 8 9 + - ( ) , / \$ % . E e

By default numeric values are right aligned. These numbers can also be formatted depending upon the kind of presentation you require. EXCEL has some pre-defined formats for each kind of numeric value.

## Formulae

EXCEL offers a very powerful tool to use existing data values to calculate new values. Formulae establish relationship between two or more cells. It performs a mathematical or arithmetical operation on these data values. The formula can contain numbers as well as cell addresses and can be created using the arithmetic operators like + (addition), - (subtraction), \*(multiplication), / (division) and ^ (exponent). The formula entry can be made by beginning the entry with a +, @ or = sign. While entering a formula, key in an opening bracket followed by cell address. It must end with a closing bracket.

Let us now create a simple worksheet and learn how to put labels, values and formulae in it. Follow the steps given below:

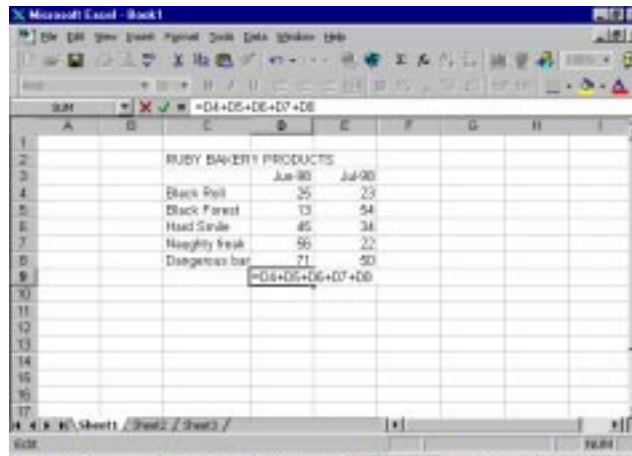
1. Take your mouse pointer to the cell C2 and type in "RUBY BAKERY PRODUCTS". Then, press the <Enter> key.
2. Go to the cell D3 either with the help of arrow keys or by clicking it with the mouse pointer. Thereafter, enter "Jun-98". Press the <Enter> key. Similarly, type in "Jul-98" in the cell E3 and again hit the <Enter> key.
3. Similarly, enter all the data as shown in Figure 2.73.
4. Now, we want to find out the total sale for the month of Jun-98. This requires the entering of a formula in the cell D9. So, take your cell pointer to the cell D9. The formula entry shall begin with a + sign or an opening parenthesis.

The screenshot shows an Excel 5.0 window with a worksheet containing the following data:

	A	B	C	D	E	F	G	H	I	J	K
1											
2			RUBY BAKERY PRODUCTS								
3				Jun-98	Jul-98						
4			Black Roll	25	23						
5			Black Forest	13	54						
6			Hard Brioche	45	34						
7			Naughty Frank	58	22						
8			Dragonroll Bag	71	50						
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											

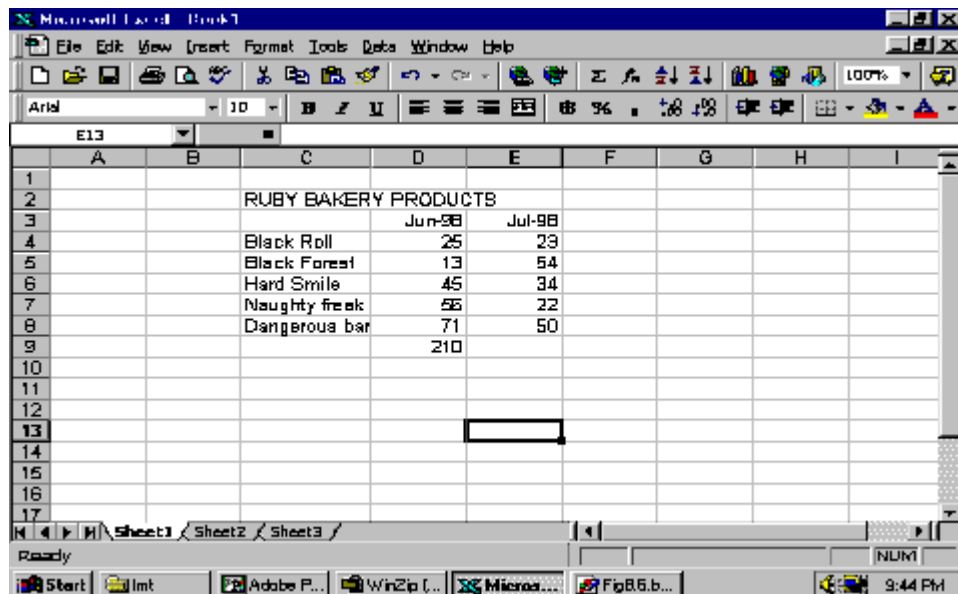
Figure 2.73: An Example of a Single Worksheet

5. The formula can be entered by two methods:
  - (a) The first approach is to type in the cell addresses in the cell where you want to see the result of the formula (like +D4+D5+D6+D7+D8) as shown in Figure 2.74 and then press the <Enter> key. You will find the result of the formula at the cell address D9.



**Figure 2.74: Figure Showing the use of a Formula**

- b) The second way of entering a formula is by Pointing method. In this method, first of all, enter a + sign in the cell where the formula is required (here, in our example the cell address is D9). Then, move the cell pointer to the cell D4. You will find this cell address appearing automatically at the cell D9. Thereafter, type in the + sign again. Move the cell pointer to the next cell. Keep repeating it till the complete formula is keyed in. Finally, hit the <Enter> key. Now, you will find the result of this formula at the cell D9 as shown in Figure 2.75.



**Figure 2.75: Figure Showing the Result of a Formula**

## 2.21 COMMONLY USED FUNCTIONS

EXCEL offers a variety of in-built functions which are very easy to use. These functions simplify operations like finding out sum, average, maximum, minimum, count and so on. All these functions start with the @ sign. The syntax of a function is given below:

@FUNCTION-NAME<RANGE OF CELLS>

where,

FUNCTION-NAME is the name of the standard in-built function as offered by EXCEL and <range of cells> specifies the cell range on which the action of the function has to be performed. Let us discuss some of these functions one by one. We will take the example of the workbook as shown in Figure 2.76 in explaining these functions.

**The @SUM( < range of cells> Function**

This function adds the values of the cells specified in the range. For example:

@SUM(D4:D8)

It would show the added up value of the cells D4,D5,D6,D7 and D8 as 210.

**The @AVG( <range of cells> Function**

The @AVG function finds out the average value of the cells given in the range of cells. For example:

@AVG(D4:D8)

It would display the average value of the cells D4 through D8 as 42.

**The @MAX( <range of cells> ) Function**

The @MAX function determines the greatest value out of the specified range of cells. For example:

@MAX(D4:D8)

It shows the highest value, 71, contained in cells D4 through D8.

**The @MIN( <range of cells> Function**

The @MIN function ascertains the smallest value amongst the range of cells provided to it. For example:

@MIN(D4:D8)

It will give the result 13 because this is the smallest value contained in cells D4 through D8.

**The @COUNT( < range of cells> ) Function**

The @COUNT function counts the number of entries in the given range of cells. For example:

@COUNT(D4:D8)

It will give back the answer as 5 since there are five entries in the above specified range. This function can be useful if you want to find out the number of entries made in a particular range especially when the worksheet is very big.

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**2.22 ABSOLUTE AND RELATIVE CELL REFERENCING**

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You can very well copy formulas in EXCEL. As and when a formula is copied, the cell references in the new formula are changed. The new formula corresponds to the position it was in relative to the original formula cell. Let us once again concentrate ourselves on the Figure 2.74. Now, if we try to copy the formula given in the cell address D9 to D10, then the formula is going to become =E4+E5+E6+E7+E8. This is called Relative Referencing. In this case, since the references are relative, the formula automatically adjusts with the new value. However, sometimes you may require to make the reference absolute or fixed. This means that when the formula is copied to some other destination, then the formula should not change. This is called Absolute Referencing. Absolute Referencing can be enforced 'by preceding the row or the, column letter with a (\$) dollar sign like \$D\$5. Now, when you try to copy this reference (\$D\$5) to any place in your workbook, then the reference is not going to change. An absolute reference works well for a constant that can be used in a formula stored in a cell. If the row letter is preceded with a dollar sign, then only the row is fixed e.g., D\$5. When D\$5 is copied to some other location then, the column letter is going to take the new reference address but the row number would still remain 5. In the similar

manner, column letter can also be preceded with a dollar sign e.g. \$D5. This will make the column fixed while copying but row is going to take the new reference.

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## **2.23 NUMBER FORMAT**

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EXCEL has got some pre-defined formats that can be applied to numbers. These number formats differ in terms of number alignment, placement and other accompanying symbols with it. When the number format is applied to cells, the numbers are rounded off to the specified number of decimal places. As and when the numbers are rounded off the change is reflected only on the screen. However, in memory the actual form is stored. At the time of performing calculations, the actual number stored in memory is used. For example, if you round off two numbers 5.6 and 3.2 in two different cells, the display on the screen will be 6 and 3. However, if you try adding up these two numbers, the sum that will be shown on the screen is 9. The Table 2.4 shows the different types of formats that can be applied to numbers.

**Table 2.4: Pre-defined Number Formats**

Any of the above mentioned formats can be applied to either a single cell or range of cells before or after typing in the value. In case, any specific format is applied to blank cells, then any entry that is typed in those cells will be automatically converted to the selected format. Let us proceed further and learn how to apply a few formats. In order to format numbers, follow the steps given below:

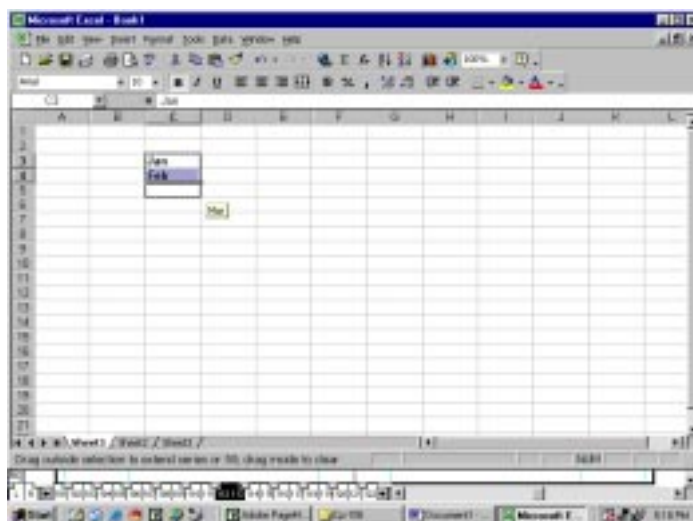
1. Select the cells that need be formatted.
2. From the 'Format' menu, choose cells option. A 'Format Cells' dialog box appears on the screen.
3. Click at the 'Number' tab.
4. Select the format that you want to apply.
5. Finally, click at the <OK> button.

### **Autofill**

Autofill tool offered by EXCEL helps you to repeat a cell entry. It looks at the series entered by you in adjacent cells and tries to complete it for you. For example, if you want to enter the labels for all the twelve months of a year simply, type in first two entries, i.e., Jan. and Feb. in two adjacent cells. Then, highlight both the cells by selecting them. Take your mouse pointer at the bottom right corner of the selected cells. Your mouse pointer is going to take the shape of a + (plus) sign. This plus sign is called Autofill handle. Drag your mouse pointer either across or downwards for those many cells till you wish to continue the series. Autofill keeps filling the series till the time the mouse pointer is dragged. So, you are saved the effort of keying in the labels

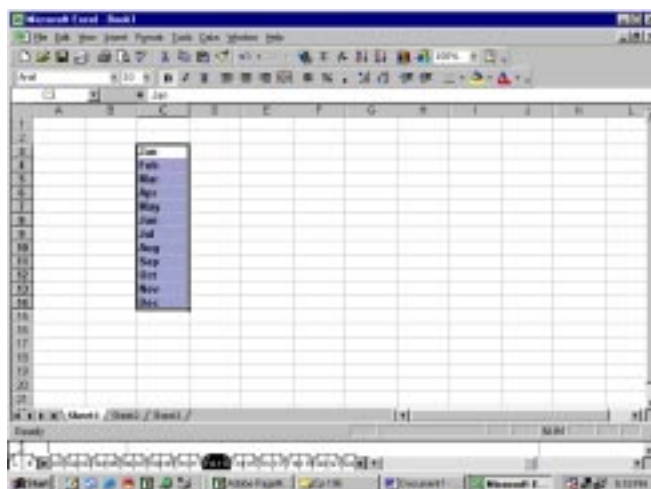


of the rest of the months. The output given by Autofill is shown in Figure 2.77. While using Autofill, you can drag the mouse pointer up, down, right or left. Look at some of the examples of sequences that the Autofill feature can identify:



**Figure 2.76: The 'Autofill' Handle**

- (i) Monday, Tuesday.....
- (ii) 10, 20, 30.....
- (iii) 1, 2, 3.....
- (iv) A1, A2, A3....
- (v) 5:10, 5:20....



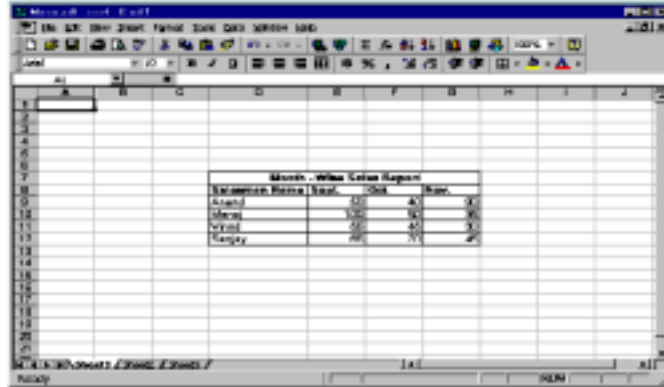
**Figure 2.77: Figure Showing the Output given by 'Autofill' Handle**

#### Student Activity 14

1. How will you create a new workbook in MS-Excel?
2. How will you save a workbook in MS-Excel?
3. How will you edit a cell entry?
4. How will you delete text from a cell?
5. How will you insert a row or a column in a worksheet?
6. Describe various types of cell entries.
7. List some commonly used functions in MS-Excel.
8. Describe absolute and relative cell referencing.
9. What is the function of Auto fill option in MS-Excel?

## 2.24 CHARTING WITH EXCEL

As the common saying goes 'A picture is worth a thousand words' is found true by almost all of us. Any kind of message can be best said and understood through its representation in pictorial form. A chart or a picture gives a bird's eyeview of the entire scenario in a single look. So, let us see how we can utilize the EXCEL's power of making charts. EXCEL supports many different kinds of charts according to the vast and varied needs of the user. EXCEL also allows you to link your charts with your data. So, as and when some changes are made to the data, these are automatically reflected in your chart.



**Figure 2.78: Figure Giving an Example of a Worksheet**

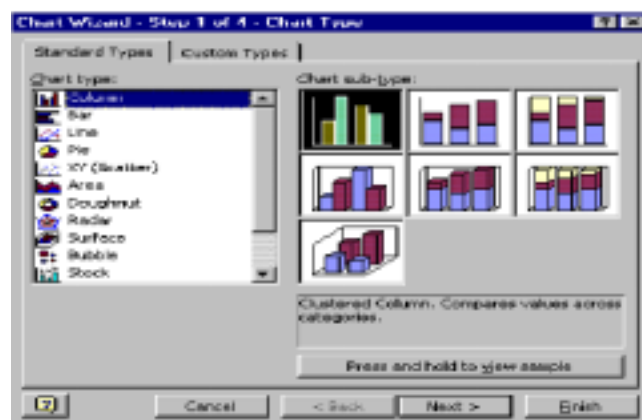
A typical worksheet showing data arranged in rows and columns can be safely used for creating charts. Thus, enter data in a tabular form with proper row and column headings. EXCEL is very good at figuring out an appropriate chart on its own.

Let us first of all create a worksheet with the data given in Figure 2.78. This figure gives the number of sales made by each salesman in a particular month.

To create a chart, select one of the cells in the table and press F11 key. EXCEL would automatically create a chart for you as shown in Figure 2.78. This is the easiest way of creating a chart.

Let us find out how to create charts using Chart Wizard. A wizard is a tool offered by EXCEL which takes you through a series of steps to complete a particular process. So, while working through a wizard, it shows a dialog box which asks for more information. You can either accept the default settings or you can give in your own information according to your requirement. Thus, to create a chart using the data given in Figure 2.78, let us begin by selecting a cell within the table.

### Step 1 of the Chart Wizard



**Figure 2.79: Step 1 of the Chart Wizard**

A chart can be put in the worksheet by two methods. One is to click at the 'Chart' button available on the standard toolbar. The second approach is to select the 'Chart' option from the Insert menu. A dialog box shown in Figure 2.79 appears on the screen.

Select the 'Standard Types' tab. Now, select the kind and type of chart into which the data has to be converted from the 'Chart Type' box. Then, select the chart sub-type from the adjacent window. Finally, click at <Next> button.

## Step 2 of the Chart Wizard

A dialog box as shown in Figure 2.80 appears on the screen. This dialog box gives you an opportunity to decide the data orientation (i.e., which data label has to be shown on the bottom axis of the chart). In our sample data, we have two labels 'Salesman Name' and 'Sale'. If you want that the 'Salesman Name' should come along the bottom axis and the 'Sales' along the left axis, then click at 'Columns' radio button. However, if you want to change the orientation, click at the 'Rows,' radio button. This will make 'Sales' come along the bottom axis and the 'Salesman Name' along the left axis.

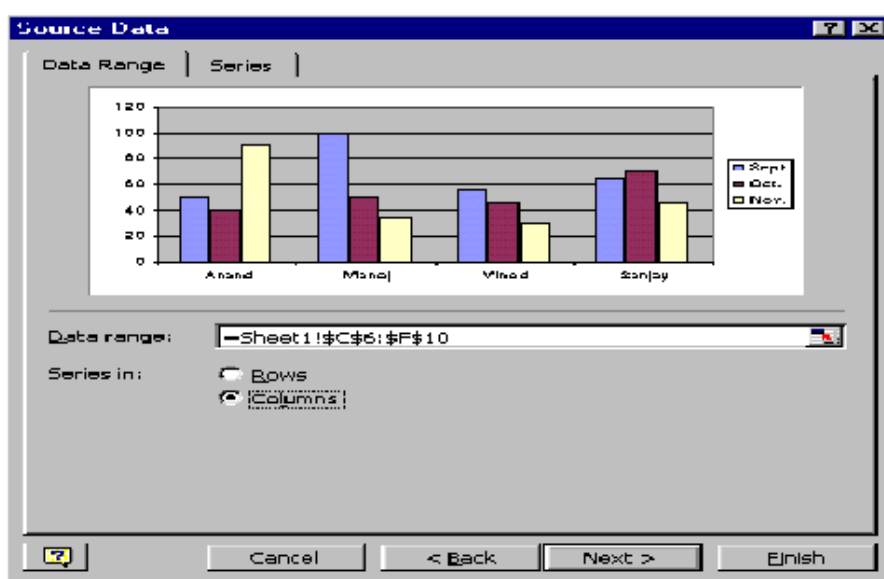


Figure 2.80: The 'Source Data' Dialog Box

Data range included in the chart can be changed very easily. Click at the 'Collapse' dialog icon which appears at the end of the 'Data Range' text box. A collapsed dialog box appears on the screen as shown in Figure 2.81. This will make your worksheet apparent again. The data that has been selected for creating a chart is shown by dashed lines. In case, you want to use a different data range, then you can select that particular data from here. Click at the 'Expand' dialog icon which is located at the right corner of the collapsed dialog box to go back. Now, you have the desired range and orientation. Click at the <Next> button.



Figure 2.81: Step 2 of the Chart Wizard

## Step 3 of the Chart Wizard

A dialog box as shown in Figure 2.82 appears on the screen. Click at the 'Titles' Tab. It will label your chart and its axis. In the 'Chart Title' box, give any label. In our example, the appropriate label

that can be given to our chart is 'Month-Wise Sales Report'. In the Category (X) axis, provide a label for the X-axis. In the similar manner, issue a label for the Y-axis in the Value (Y) axis text box.

You can change the overall look of the chart by making other changes in the default settings. Hit the 'Axes' tab to control the labels for the value on the axes. The 'Gridlines' tab can be used to get rid of gridlines entirely. This will make your chart free from any gridlines. You can make the grid look finer or show it in any one direction. The 'Legend' tab can help you in deciding the placement of legend box on the screen. With the 'Data Labels' tab, you can decide whether the actual data numbers (in our example Sept, Oct, Nov, ) and the corresponding data labels (like Salesman Name) are to be displayed or not. The 'Data Table' tab helps you to specify whether or not a formatted table of the data is to be included along with the actual chart or not. Finally, click at the <Next> button after making all those desired changes.

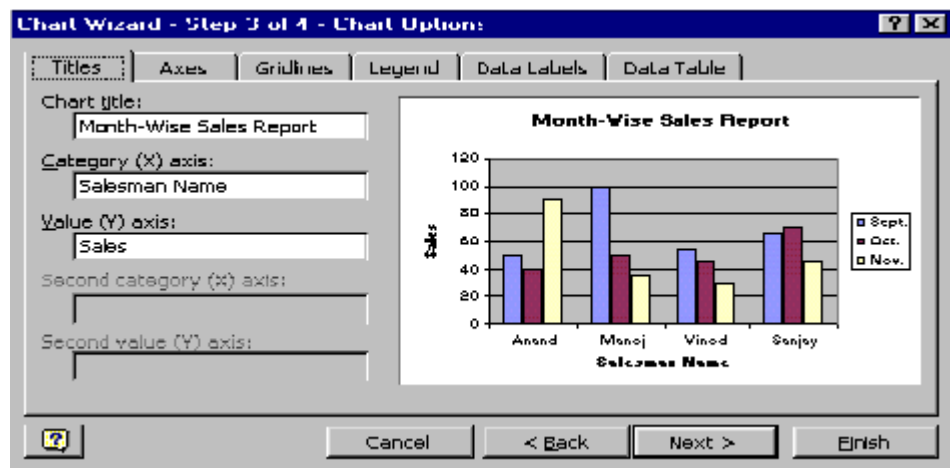


Figure 2.82: Step 3 of the Chart Wizard

### Step 4 of the Chart Wizard

This is the last step in the process of chart creation. All the necessary details required by the chart are given in Step 1 through Step 3. The fourth and the final step asks you whether the chart is going to be displayed in the worksheet where the data is located or in a separate worksheet. So, in this last step as shown in Figure 2.83, you have to decide whether the chart is to be embedded as an object in a worksheet or it is to be placed in a separate worksheet. Let us find out the difference between these two types of charts:

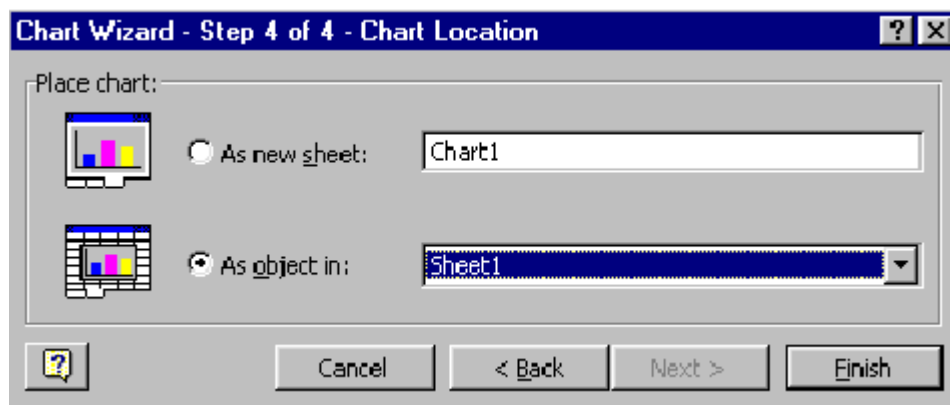


Figure 2.83: Step 4 of the Chart Wizard

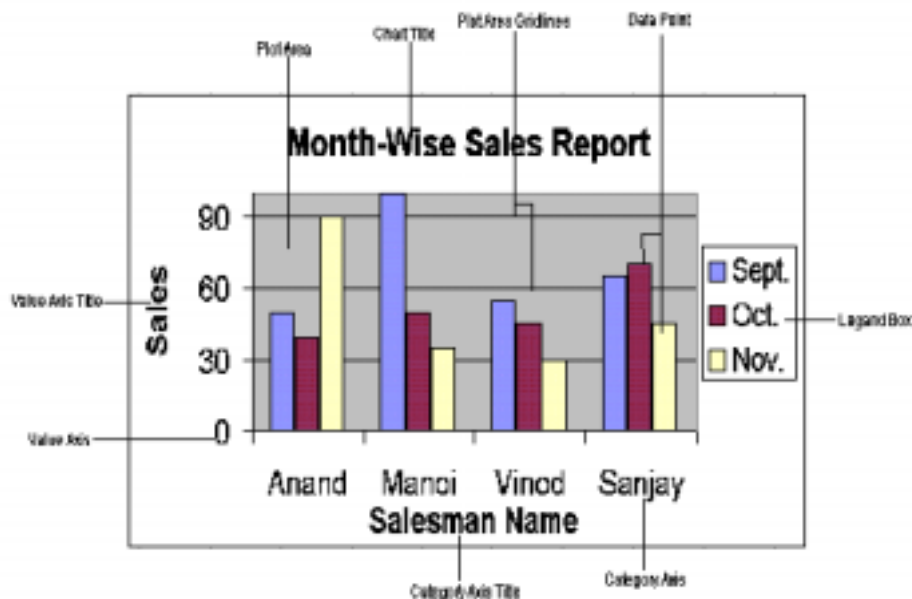


Figure 2.84: Different Components of a Chart

1. **Embedded Charts:** These charts can be linked to the data based on which the chart is created. So, if any changes are made to the data, the corresponding chart also changes.
2. **Chart Sheets:** These charts can also be linked to the data. The only difference is that these charts are placed in separate worksheets. The chart is put in the middle of the new worksheet. It leaves very little scope of moving the chart.

Finally, click at the Finish.

The different components of a chart are shown in Figure 2.84.

## 2.25 MACROS

The very word 'Macro' gives the impression of a huge big giant. Macro is not the hero of a horror movie but a small program that carries out pre-defined and prerecorded series of steps by giving a few keyboard shortcuts. So, we can state that a macro is like a recorded movie which can be run any number of times. Macro is just a way of doing your work in a series of steps which it carries out automatically once it is triggered. It can be very easily said that a macro is like a batch file created in DOS. It contains a series of commands. So, as and when a macro is called and run, the instructions given in it are executed one by one.

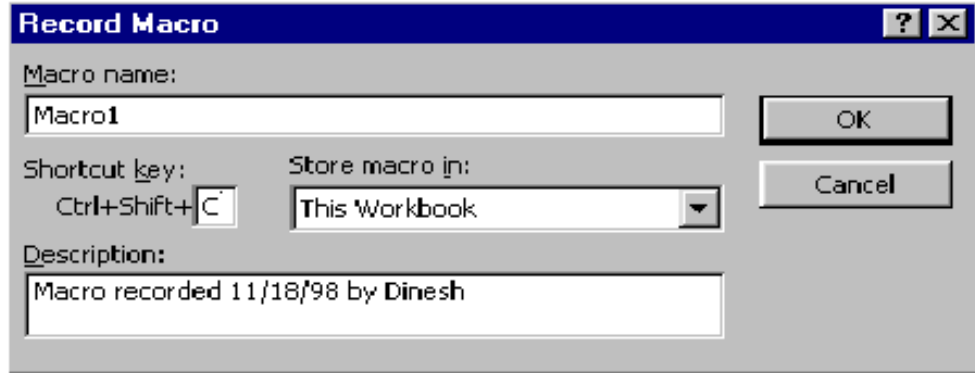
A macro automates your tasks, thus saving a lot of your precious time. 'Macro' can just do anything for you. Your imagination can be the only limitation to it. EXCEL offers macros in two languages, Excel Visual Basic and Excel 4.0 Macro language. You can use either language to create macros but Excel Visual basic is more difficult to use. Moreover, you also need know Excel Visual Basic language itself. So, throughout our session, we would concentrate on learning how to create macros using Excel 4.0 macro language.

### Creating and Naming a Macro

A macro is very easy to create. Before proceeding further, first decide the steps that your macro is supposed to carry out. Suppose you want to write a macro that would cut a range of cells and paste it at some other location. Thus, in order to create a macro, carry out the following steps:

1. Select 'Tools\Macro' option from the main menu.
2. Select 'Record New Macro' option from the cascading menu. It would display 'Record Macro' dialog box as seen in Figure 2.85.

3. Name the macro under which you want to save it. Name to a macro can be given in 'Macro Name' box. A long name upto 255 characters can be given to a macro. However, you cannot include spaces in your macro name. Your macro name can have only numbers, letters and underscore character. But There is one limitation to it. The macro name cannot start with a number or an underscore character.



**Figure 2.85: The 'Record Macro' Dialog Box**

4. After assigning a name, you are required to give a keyboard shortcut to it. Giving a keyboard shortcut is absolutely at the discretion of the user. A keyboard shortcut is assigned only if the user wants to execute the macro using a keyboard. However, if any lowercase alphabet is given in the 'Shortcut key' box, then the macro can be executed by pressing the <Ctrl + 'alphabet'> keys together. However, if an uppercase alphabet is used, then you need press <Shift + Ctrl + 'alphabet'> keys together. Suppose you give the alphabet 'C' in the 'Shortcut key' box, then this macro can be activated by pressing <Shift Ctrl+C> keys together. On the contrary, only if 'c' in the 'Shortcut key' box is given, then in that case, the macro can be activated by pressing <Ctrl + C> keys only.
5. Now, we proceed on to the 'Store Macro in' box. If you want to use the macro that you are now trying to create in the current workbook only, then select the option 'This Workbook' from the drop-down list. However, if you want to make your macro available to other workbook, then select 'New Workbook' option from the drop down list.
6. In the 'Description' box, give some relevant and important details about your macro like the date on which macro was recorded, the owner of the macro, the purpose for which the macro has been created, etc. Thus, any kind of descriptive text can be given in this box. It enables you to remember all the important things about your macro.
7. Now, as and when all the relevant details are filled in the 'Record Macro' dialog box, click at the <OK> button. A very small 'Stop Recording' toolbar will appear on the screen. Till this point of time, we have only told Excel that we want to create a macro. It is actually now when the process of recording starts.

## **Recording the Macro**

You can now proceed on to record your macro. Just perform all the essential steps to complete your particular task. For this example, in which we have to cut a range of cells and paste at some other location, do the following steps to record them in your macro:

1. Select the range of cells that has to be cut.
2. From the Edit menu, select the 'Cut' option.
3. Take your cursor at a location where you want to paste this range of cells.
4. Again, from the 'Edit' menu, select the 'Paste' option.
5. Click at the 'Stop Recording' button available on the 'Stop Recording' toolbar.

The macro is now ready to be executed. This macro is by default made available to all the worksheets of the current workbook. However, if you want this macro in other workbook, then select 'New workbook' option in the 'Record Macro' dialog box. Don't forget to click at the 'Stop Recording' button once all the necessary steps to be included in the macro are over. Otherwise your macro is going to become unnecessarily big with unwanted steps in it.

### **Saving the Macro**

The macro that we have just created in our previous example is made available only to the current workbook. But, if you want that this particular macro should be made available to other workbook, then choose 'New Workbook' option in the 'Record Macro' dialog box. EXCEL will then ask you the name of the new workbook in which the macro has to be saved.

### **Using a Macro**

Till this time, we were on our path of creating a new macro. Now, let us learn how to run or execute a macro. You can run your macro in any of the following ways:

1. If a shortcut key has been assigned to your macro, then it can be activated by pressing <Ctrl+'key'> or <Shift+Ctrl+'key'> depending upon the case of the 'key'.
2. A macro can also be run by selecting 'Tools\Macros\Macros' from the main menu. Then, click at the macro name that you want to execute. Once the macro starts running, you can stop it abruptly in between by pressing the 'Esc' key.

### **Deleting a Macro**

If a macro is no longer needed, then it is advisable to delete it. In order to delete a macro, click at the 'Tools\Macro\Macros' option from the main menu. A 'Macro' dialog box appears on the screen. Select the macro that has to be deleted. Finally, click at the <Delete> button to complete the process.

### **Editing Macro Options**

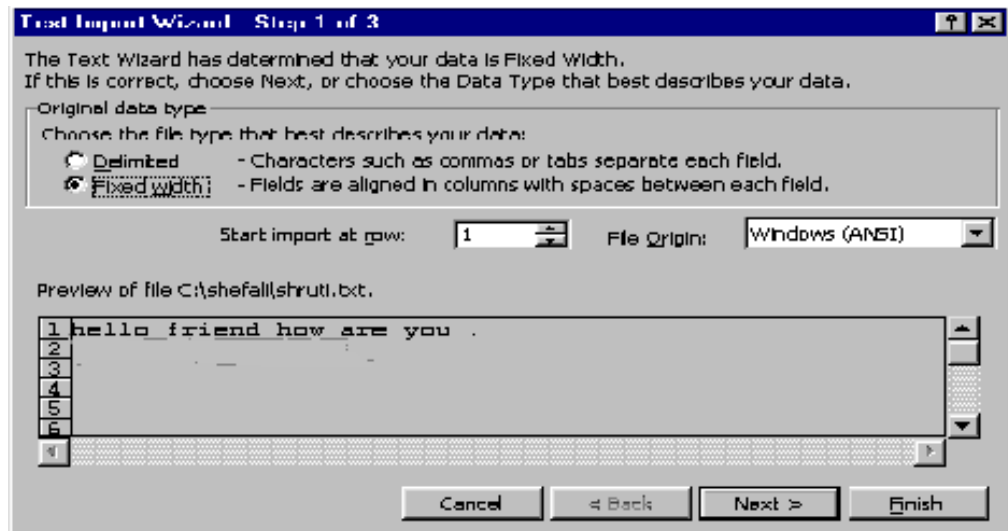
Many a times, a macro requires some changes to be made to it. You can change the shortcut key or description that has been given to the macro. Thus, in order to make changes to your macro, click at the 'Tools\Macros \Macro' option of the main menu. A 'Macro' dialog box appears on the screen. Click at the <Options> button to show the 'Macro Options' dialog box. Make all the necessary changes and finally click at the <OK> button.

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## **2.26 IMPORTING AND EXPORTING FILES**

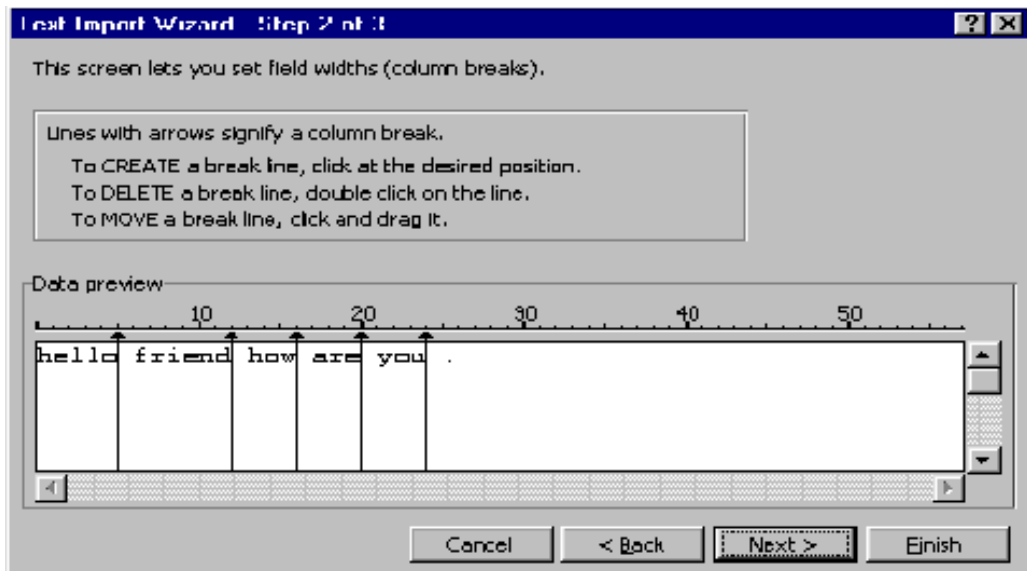
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EXCEL allows you to import data from databases created by other programs such as Lotus 123 and dBase. So, this makes reading from and writing into files created by other spreadsheet and database programs possible. It can help you in sharing information with other spreadsheet programs like Lotus 123, Quattro Pro or Multiplan. EXCEL takes all the responsibility of converting files from other worksheet database programs automatically as and when the file is either saved or opened. The 'File\Open' command reads the file extension of the files created by other programs. In the similar manner, when you try to save files, the 'File \save as' option helps you to save your file in other types also. Files can be exported by clicking at the desired file and then selecting a required file type in the 'Save as' dialog box. Files can also be imported which are created by various versions of dBASE and Lotus 123. You simply have to pick the file using "File\Open" option. EXCEL can also open plain ASCII text files. Let us import the file 'Shruti.Txt'. Start the EXCEL program first and display a blank workbook.



**Figure 2.86: Step 1 of Text Import Wizard**

1. Open the file 'Shruti.txt' by selecting 'Open' option from the 'File' menu. Figure 2.86 appears on the screen.
2. Click at the <Next> button.
3. A dialog box by the name 'Text Import Wizard Step 2 of 3' appears on the screen. It guesses where the columns should be put as shown in Figure 2.87.



**Figure 2.87: Step 2 of Text Import Wizard**

4. In case you want the columns to appear at some other place, then move the line by clicking it and then dragging it. You can also remove a line in case you do not require it by double-clicking at that particular line. Then, click at the <Next> button.
5. A 'Text Import Wizard Step 3 of 3' is shown on the screen as can be seen in Figure 2.88. This dialog box allows you to set the Data Format for each column. You can also leave the data as it is without changing the data format. Finally, click at the <Finish> button.



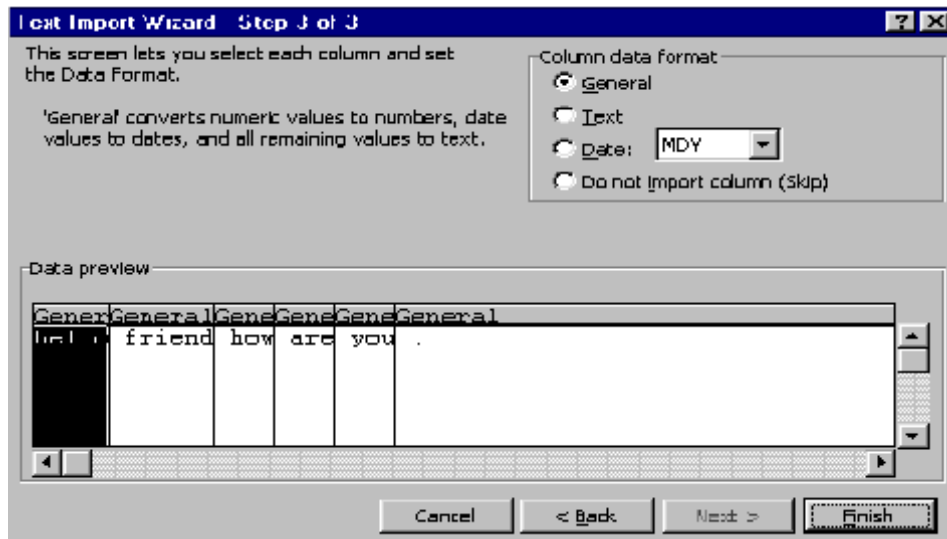


Figure 2.88: Step 3 of Text Import Wizard

## 2.27 PRINTING A WORKBOOK

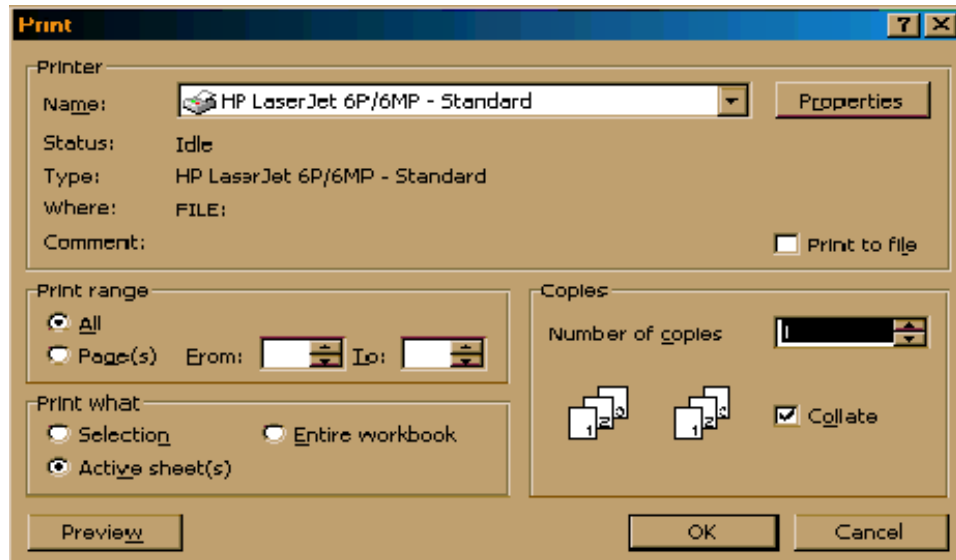
There could be a number of reasons for taking a printout of the workbook that you have just created. You may be required to give the yearly status of the overall working of the company to your boss or you may want to keep a copy of the workbook for your own future reference. EXCEL offers a very easy way of printing the workbook. You can very well control the overall look of the whole printout and modify it to suit your own special requirements. You can preview your document before taking a final printout. It will give the overall look of how your printout is actually going to look on paper. So, for previewing the workbook, activate the 'Print Preview' option of the 'File' menu. The Figure 2.89 shows a preview of a worksheet. Now, after previewing the worksheet, you are ready to take a printout. So, proceed with the steps given below:



Figure 2.89: Figure Showing Preview of a Worksheet

1. Open the file whose printout has to be taken.
2. From the 'File' menu select the 'Print' option. A 'Print' dialog box appears on the screen as shown in Figure 2.90.
3. Choose the printer that you want to use out of all the installed printers on your system from the 'Name' drop down list.

4. You can select the pages of the workbook you want to print. Through the 'Print range' option of the 'Print' dialog box. For example, if you want to take a printout of all the pages of the current workbook, then click at the 'All' radio button. But sometimes, you require only selective pages to be printed. For that matter, click at the 'Pages' radio button and type in the starting number of the page in the 'From' box. Similarly, enter the page number till which the printout has to be taken in the 'To' box.
5. Enter the number of copies you want to print in the 'Number of Copies' box.



**Figure 2.90: The 'Print' Dialog Box**

6. The 'Print What' option lets you to decide in printing, either the selected portion of the worksheet or the whole workbook or just the active sheet(s).
7. You can also see the preview of the workbook by clicking at the 'Preview' button.

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## 2.28 APPLICATION OF A SPREADSHEET IN CORPORATE SECTOR

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Electronic spreadsheets contribute a lot in the day-to-day working of corporate sector. All the managerial reports, price lists, etc., are prepared with the help of electronic spreadsheets. It helps the management to take quick decisions. It is able to answer the important 'what if' questions of the managers based on which they can design and develop various marketing and sales strategies. These days almost all the managers make use of spreadsheets extensively.

### Student Activity 15

1. What is a chart?
2. How will you create a chart using chart wizard?
3. What is a chart sheet?
4. What are embedded charts?
5. What are MACROS?
6. How will you create and record a macro?
7. How will you import an access file in a worksheet?
8. How will you print a workbook?
9. How will you save a micro?
10. What are the applications of a spread sheet in corporate sector?

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## 2.29 SUMMARY

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An operating system is an integrated set of specialized programs that is used to control and manage the resources and overall operation of a computer system.

DOS is the most commonly used operating system. Loading of DOS into the main memory is known as booting. DOS commands are of mainly two types: internal and external. Internal commands are directly interpreted by the command processor, `command.com`. External commands are interpreted with help of external files (with extensions `.com` or `.Exe`)

Storage areas on a disk are known as directories. A directory may contain files and/or sub-directories inside it. The full name of a file or a directory (including path) is called *pathname*.

Wildcards special characters carrying special meaning. Two MS-DOS wildcards are '?' and '\*'. The '?' can replace exactly one or none characters in a name. The '\*' can replace number of characters in a name.

Some DOS internal commands are `copy`, `DEL/ERASE`, `REN`, `TYPE`, `DIR`, `CHDIR/CD`, `MK`, `DIR/MD`, `RMDIR/RD`, `BREAK`, `CLS`, `DATE`, `PATH`, `TIME`, `PROMPT`, etc. Some external commands are `DISK COMP`, `DISKCOPY`, `FORMAT`, `LABEL`, `PRINT`, `XCOPY`, etc.

Batches of MS-DOS command stored under a filename with extension. `BAT` are known as Batch files. The batch files with the name `AUTOEXEC.BAT` is automatically executed by MS-DOS at the time of booting.

MS-windows is a GUI based operating system. In windows operating system, multiple applications can be simultaneously run in different windows. In MS-windows, the screen upon which icons, windows, etc., are displayed is known as desktop.

You can explore you computer through *start button* and *taskbar*, *my computer* and *window Explorer*. The *taskbar* is a bar, which is usually located at the bottom of the screen. The start button is located at taskbar. By clicking at *start* button, start menu appears wherefrom you can start program, open document, customize you system, get help, search for items on your computer and more.

Windows Explorer is another way of seeing what is on your computer. Windows explorer shows the computer's contents as a hierarchy. The programs available under *Programs* section of start menu can be started by clicking at *start*, then at *programs* and then at the desired *program* or *group*. To quit an open program, just check at *close* button (X). A folder is a location in which you can store files and other folders.

To create new folders *start*→*find*→*folder* commands are clicked in my computer window. To find files or folders, *start*→*find*→*files* or *folder* commands are clicked. To rename a file, firstly the file icon or name is selected and then *file-Rename* commands are clicked. To move a file, the file icon or name is firstly selected, then *edit*→*cut* commands are clicked. Then the destination folder is opened in a My computer windows and there *Edit*→*paste* commands are clicked.

To copy a file, firstly, the file icon or name is selected, then *Edit*→*Copy* Command is clicked the destination folder is opened in a *My computer* window, and there *Edit*→*paste* commands are clicked. To delete a file, a folder, firstly select the file icon or name and then either click *Delete* key or click *File*→*Delete* commands. To create a shortcut to a file, firstly select the file or folder, whose shortcut is to be created. Then drag the file icon through right mouse button to desired location where shortcut is to be placed. And then select *create shortcut*. To shut down the computer, *Start*→*Shut down* commands are clicked.

A database refers to the collection of interrelated data and database management systems (DBMS) is a computer program that manager a database effectively and efficiently. MS-Access offers many features like tables, forms, queries, reports and data access pages to manage data, A new database can be created either through wizard or by clicking *File*→*New* command or *New* button or by pressing `ctrl+N`. While designing tables, you have to decide about *field names*, *field types*, *field size*, *field properties* and *primary key*.

At field level these validation techniques maybe used: Input mask, validation Rule and Text, Default Value, Allow Zero Length, Required and Lookup values. The input Mask property specifies and controls how data is entered and displayed.

A word processor is a package that processes textual matter and creates organized and flawless documents. The word processor offers very useful features like speed, powerful editing and formatting features, permanent storage, Graphics, object linking and embedding spell check and mail merge etc.

Tables can be inserted in a word document through *Table button* of *Standard toolbar* and can be manipulated through the *Table* drop down menu. Also word provides quite many drawing features that can be used to include the desired graphics in the document.

A spreadsheet is a software tool that lets one enter, calculate, manipulate, and analyze set of numbers. A worksheet is a grid of cells made up of horizontal rows and vertical columns. A workbook is a group of worksheets. Three types of data can be entered in a Worksheet (i) Number (ii) Text, (iii) Formulas, charts are the pictorial representation of worksheets data. Various chart types in MS-Excel are: areas chart, column chart, bar chart, line chart, pie chart, XY (scatter) chart.

Chart in MS-Excel are saved in two ways: (i) embedded chart (ii) Chart sheet. Embedded chart is a chart object that is placed on a worksheet and saved with that worksheet. Chart sheet is a sheet in a worksheet that contains only a chart.

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## 2.30 KEYWORDS

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**Alignment:** It refers to the way the right and left edges of a paragraph line up along the right and left margins of your document.

**Autocorrect:** It is a feature of the MS-Office package that corrects automatically when a word is typed with wrong or nearly wrong spellings. The correction is made according to the list of correct and incorrect words is provided.

**Bullet:** A paragraph marker, usually indented to list paragraphs point wise.

**Clipboard:** Space in the memory where an MS-Office application stores data, objects etc., originating from cut and/or paste actions.

**Cursor:** Cursor is a pointer, which tells where on the document the action will appear or affect. The cursor can be moved and placed anywhere on the document using pointing device like mouse.

**Font:** It is a set of a typeface and its style.

**Indentation:** It is the space left within the margin of a page.

**Scroll Bars:** They are sliding narrow bars with arrows at the ends and a slider in between, used to scroll through an active pane of a window. Two types available, according to their orientation - Horizontal Scrollbar and Vertical Scrollbar.

**Status Bar:** It displays the positioning of the cursor, displays the status of some important keys of keyboard, shows the messages for the toolbar mouse points to it, displays messages for menu option when a menu option is selected or pointed out by a user.

**Style:** It is a set of formatting characteristics that can be applied to text in document to quickly change its appearance.

**Title Bar:** Title bar shows the name of the document and is situated in the top of the window application.

**Toolbar:** Toolbar is a container of various tool buttons.

**View Buttons:** View buttons are shortcuts of various views in the View Menu, placed adjacent to the horizontal scroll bar. These buttons select different ways the document can be viewed.

## MS-Word 2000

**Block:** It is a selected piece of text, graphics and other objects to be treated as a unit.

## MS-Excel 2000

**Absolute Reference:** Address of a cell or a range of cells with no reference to other cell in terms of row and column addresses.

**Cell:** A Cell is a box at the intersection of a row and a column in a worksheet where data is stored. There are  $65536 \times 256 = 16777216$  cells in a single worksheet.

**Column:** Columns are combination of all the vertical cells joined together in a single vertical line.

**Fill Handle:** The small black square in the corner of the selection of a cell or range, which changes to a black cross pointer when placed at the corner of selection.

**Formula Bar:** Formula bar shows the formula instead of the result, if there is one present in the current cell.

**Formula:** It is an expression that performs operations on worksheet data. Formulas can perform mathematical operations, such as addition and multiplication.

**Full Screen View:** A view in which the entire desktop space is occupied by the current worksheet.

**Headers and Footers:** They are text, page numbers, date, document's title or file name, or the author's name that are usually printed at the top and bottom of each page in a worksheet respectively. A header is printed in the top margin, footer is printed in the bottom margin.

**Name Box:** This box shows the name or the address of the currently active cell.

**Normal View:** A view of a worksheet in which no reference to pagination is displayed and print area is not specified.

**Range:** A group of cells, optionally having a name taken as one unit of cells.

**Relative Reference:** It is address of a cell or range of cell with respect to a given cell.

**Row:** Rows are combination of all the horizontal cells joined together in a single horizontal line.

**Workbook:** It is a group of worksheets, which can be stored as a unit. A workbook is stored on the disk in form of a file with extension .xls.

**Worksheet:** It is the working area of MS-Excel. Each worksheet of a single workbook has its own identity and is separate from other worksheets.

**Workspace:** It is the working area of MS-Excel where workbooks, worksheets and other related objects may be opened and manipulated.

## MS-Access 2000

**Action Query:** It is used to perform an action on records that meet the criteria specified in the query object.

**Application Programmers:** Computer professionals who interact with the system through Data Manipulation Language calls, which are embedded in a program written in a host language (for example, COBOL, PL/I, PASCAL, C). The programs are referred to as application programs.

**Attribute:** Piece of information describing a particular entity. These are mainly distinguishing characteristics of the individual entity.

**Auto Number Data:** A data type that stores an integer that is incremented or decremented automatically as records are added and/or deleted.

**Built-in Functions:** Small programs that perform simple calculations or data formatting by taking optional arguments. These functions are already created for the users and they do not have to create them.

**Currency Data:** A data type that stores monetary data.

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## 2.31 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks:**

- (a) A——structure in DOS resembles on inverted tree.
- (b) ——command is used for formatting a hard disk or floppy disk.
- (c) ——is a special kind of batch file which is executed as soon as the operating system is loaded in the computer’s memory.
- (d) Windows supports file names upto——characters.
- (e) The find option of the start menu help in ——a particular file or a folder.
- (f) The files once deleted in windows can be restored from the——.
- (g) Word processing included——and——text to give organized look to the document.
- (h) ——menu is used for enhancing the look of the document.
- (i) Copying means——the contexts of the document while moving means——text from one portion of the document and placing it at some other location.
- (j) A——is a collection of related information.
- (k) A——is a written set of instructions that automate repetitive tasks.
- (l) These are ——rows and——columns in an excel worksheet.
- (m) The formula entry in excel can be made by beginning the entry with a ——, —— or sign.

2. **State: True or False:**

- (a) A file name with no extension is invalid in DOS.
- (b) RD command removes all the files and sub-directories under the current directory.
- (c) MD command is used to create a new file.
- (d) XCOPY command is used to copy the files present in sub-directories.
- (e) Windows contains a disk compression program which can essentially double the hard disk space.
- (f) Scan disk reconfigures files on the hard disk
- (g) Page setting includes putting your text neatly between margins.
- (h) A report is used for showing the data put in the table in an organized manner.
- (i) You have to save the records, you enter after certain internals in Access.
- (j) Excel allows to import data from databases created by other programmers.

### Answers (Unsolved Questions)

- 1. (a) director (b) FORMAT (c) AUTOEXE. BAT (d) 255 (e) locating (f) Recycle bin (g) typing, manipulating (h) FORMAT (i) duplicating, removing (j) database (k)Macro (l) 65536, 256 (m) +, @, =
- 2. (a) False (b) False (c) False (d) True (e) True (f) False (g)True (h) True (i) False (j) True.

### Detailed Questions

- 1. What do you mean by booting up?
- 2. What is the full form of ROM-BIOS?

3. What do you mean by default drive?
4. How many parts are there in a file name under MS-Dos? What are file naming conventions?
5. What are volume labels? How many characters can a volume label contain?
6. What are wild cards? What is the use of '?' and '\*' wild card in MS-DOS?
7. What is the purpose of copy command?
8. To view a directory listing width wise, which command is used?
9. Which commands lets you create directories? Give example.
10. What is the use of switch /w in DIR command?
11. How is X COPY a better copy command than COPY?
12. What are batch files? What is the significance of AUTOEXEC.BAT file?
13. Give some of the advanced features of window 98.
14. What is the difference between copying and moving files and folders?
15. When a folders is copied to another place, do the sub-folders in the folder also get copied?
16. What is windows Explorer and give some of its functions?
17. Differentiate between notepad and WordPad.
18. What do you mean by dialog box? Also discuss its various components.
19. What is the start Group? What are the different functions that can be done through this?
20. Discuss some advance features of windows 98.
21. (i) Give procedure to create a new folder in windows 98.  
(ii) Give procedure for closing down the windows 98.
22. What is the function of taskbar and recycle bin?
23. Describe the functions of the Control Panel.
24. What are the advantages of a word processor over typewriters?
25. What is meant by text alignment? In how many ways can you align you text?
26. What is meant by page margins? Which option will you choose to set the margins of your document?
27. What are the advantages of find or replace features of word processor?
28. Write your Bio-Data in MS-Word.
29. Prepare a business letter to you customer promising to attend to his complaint immediately. Use page setup, formatting features, etc.
30. Prepare a table in which the budget comparison of three years is made.
31. What is data and why is it required?
32. What is information and how it differs from data?
33. Differentiate between a query and a report.
34. Differentiate between a form and the datasheet view.
35. Describe various ways of creating a table in access. Differentiable between a formula and a function.
36. Differentiate between a formula and a function.
37. Differentiate between a table and a query.
38. What are the purposes of forms in Access 2000? Explain with appropriate examples.
39. Can an Excel chart be inserted into an Access report? How?
40. How many rows and columns are there in MS-Excel Worksheet?
41. What do you mean by range of cells?

42. What do you mean by cell referencing and what are different types of referencing?
43. Why is formatting necessary?
44. What are the different types of data that can be entered in MS-Excel?
45. What is the difference between copying and moving a range?
46. What are the different components of a chart? Explain.
47. Define an embedded chart.
48. Define a chart sheet.
49. Explain various types of charts available in MS-Excel.
50. Which types of files can be imported and exported from MS-Excel?

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## **2.32 FURTHER READINGS**

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Sanjeev Gupta and Shameena Gupta, *Computer Aided Management (Using MS-Office 2003 Tools)*, Excel Books.

Manoj Kumar, M. Shamir Bhudookan, *Information Technology for 'O' Level*, Editions De L'Océan Indien



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# UNIT

## 3

### DATA PROCESSING

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#### L E A R N I N G   O B J E C T I V E S

After studying this unit, you should be able to understand:

- Various modes of data processing.
- Basic functions carried out in data processing.
- Data hierarchy and data structure.
- Application portfolio of business organization.
- Computerized financial accounting system, inventory control system payroll system and invoicing system.

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#### U N I T   S T R U C T U R E

- 3.1 Introduction
- 3.2 Modes of Data Processing
- 3.3 Basic of Data Processing
- 3.4 Data Hierarchy
- 3.5 Data Structure
- 3.6 Application Portfolio Development
- 3.7 Management of Data Processing Systems in Business Organizations
- 3.8 Computerised Financial Accounting System (FAS)
- 3.9 Computerised Inventory Control System
- 3.10 Computerised Payroll System
- 3.11 Computerised Invoicing System
- 3.12 Summary
- 3.13 Keywords
- 3.14 Review Questions
- 3.15 Further Readings

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### 3.1 INTRODUCTION

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The computer processes the data to give information. Processing of data is done by the CPU in various ways. In this unit we will discuss various types of data processing techniques, their functions, data hierarchy and structure, At last some computerized system models are discussed for your ready reference.

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### 3.2 MODES OF DATA PROCESSING

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Organizations generally follow the following types of data processing systems with the aim of optimizing efficiency. The systems are:

#### **Batch Processing**

Also referred as serial or off-line or sequential processing.

This type of processing requires the data to be initially grouped (as a batch) before it is processed serially, and the results obtained periodically.

The batch might be a group of sales orders or purchase orders, etc., collected off-line.

The batch is processed at definite period of time in stipulated frequency, and each transaction in batch is processed in serial order.

The method of batch processing reduces the idle time of a computer system because transition from one job to another does not require operator intervention.

It is the most appropriate method of processing for many types of applications, such as payroll or preparation of customer statements, where it is not necessary to update information (records) on daily basis.

Batch processing suffers from several disadvantages which are as follows:

- 1 Reduces timeliness in some cases.
- 1 It makes each job wait in line at each step and often increases its turnaround time.
- 1 It is difficult to provide the desired priority scheduling.

### **On-line Processing**

On-line processing is that type of processing where the result of data processing transaction is available immediately.

It permits transaction data to be fed under CPU control directly into secondary on-line storage devices from the point of origin without sorting it first.

It also permits users to enter into a conversation with the computer to send and receive messages, within a fraction of a second after the enquiry message has been transmitted.

This conversation permits the user to process transactions one after the another with greater assurance that the actions taken by the computer are correct. This type of processing also provides a satisfaction to the users that they are able to command the machine. However, this type of processing can not be used in all circumstances as otherwise the processing time will increase. Examples of online applications include:

Banking, stock exchanges, stock control, work progress control in plants, inventory status, etc.

### **Real Time Processing**

Real time system is defined as a data processing system in which the time interval required to process and respond to inputs is so small that the response itself is useful for controlling the physical activity of a process. Real time processing provides immediate (not periodic, as in batch processing) transaction input capability from all input originating stations.

The essential requirements of a real time processing system include:

- 1 direct connection (on-line) between input/output devices and the central processor, and
- 1 fairly fast response time, allowing two-way communication.

The characteristic of real time data processing that truly distinguishes it from the more common batch and on-line processing systems is the immediacy of its response on receipt of a message.

Thus, all on-line systems are not necessarily real time data processing systems. The application areas of real time systems are:

- 1 Enquiries about customer's account status can be answered in seconds.
- 1 Credit appraisal can be carried out immediately.
- 1 Sales analysis master file can be updated on-line. This file provides a ready information to the sales manager regarding sales trends, etc.

Real time system also finds extensive application in airlines booking, banking system, air and ground traffic control, automatic radar connected defence and space programs.

## Distributed Data Processing

Distributed processing, broadly speaking, involves a computer system linked by a communication network where processing is performed by separate computers.

Often, each computer in the system is chosen to handle a specific workload with the network supporting the system as a whole. When distributed processing is used, it requires that databases be located at different sites for efficient functioning.

The database is broken up into logical cooperating parts and situated at a different location. User can access data from any location, easily accessing the local as well as the remote databases.

Distributed Database Systems (DDBS) forms the backbone of distributed computing.

This form is most convenient for organizations with many branch offices located over great distances. Each branch stores data elements relating to its daily operations at its own site. A major part of processing can be taken care of at the local level.

A typical application is in banks where all the branches have intelligent terminals linked to a big computer at the head office. Data from the branches is sent to the master where it is processed.

### Student Activity 1

1. What is the aim of any processing system?
2. Define Batch processing system.
3. What are the disadvantages of batch processing system.
4. Define on-line processing.
5. What are the essential requirements of a real time processing system?
6. Describe distributed data processing.

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## 3.3 BASIC FUNCTIONS OF DATA PROCESSING

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Data Processing is the restructuring, manipulation or recording of data by people or machine, to increase their usefulness and value for some particular purpose.

Following are the basic functions carried out in any data processing:

### Origination

The first function involved in the processing of data is the origination of the data to be processed.

Specifically, the nature, type and origin of the source documents must be determined, such as sales orders, purchase orders, etc.

### Data Capture

Data must be recorded or captured in some form or the other before they can be processed. What data are important and should be collected for input and processing depends upon the organization and the system.

Data maybe captured in paper forms using source documents and in paperless forms through:

1. Keyboards
1. Automated teller machines
1. Other direct input devices that accept input data in machine readable form

## Sorting

Normally, it is easier to work with data if they are arranged in a logical sequence. e.g., First to last time sequence.

Biggest to smallest.

Oldest to newest, etc.

Arranging classified data in such a sequence is called "sorting".

## Merging

This function allows multiple files to be put together in a sequence, provided the files are already in sorted order.

e.g.: A file of a new customer could be merged into an existing customer master file that is stored on a magnetic disk in customer number sequence.

## Calculating

The arithmetic manipulation of data to create meaningful results is known as calculating, and is a common data processing task.

This process is usually the most significant part of the manipulation operation because the results are generally provided as part of the output.

## Summarizing

Reducing masses of data to a more concise and usable form is called summarizing. Generally, the data is summarized into the form desired for output.

e.g.: Pie charts

Bar charts

Other graphs

These are the few of the many of computer generated graphics that are used to view data at a glance.

## Managing Output Results

Once data have been captured and manipulated, one or more of the following operations maybe needed:

### Output

After the various operations on the data have been completed, the delivery or communication of the information or results must be carried out by:

- (a) Reporting, which is the format presentation and distribution of processed data.
- (b) Issuance of documents, such as cheques, invoices, and reports.
- (c) Retrieval, which is the fetching of a specific item or items of stored information at the request of a user.
- (d) Analysis, which encompasses all of the ways in which the receivers utilize output, i.e., use the information provided by the system.
- (e) Communicating and reproducing (transmission).

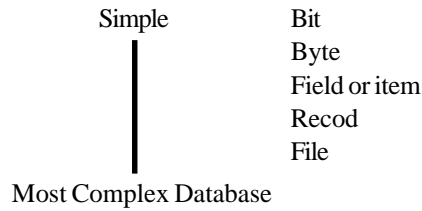
Transferring data from one location or operation to another, for use or further processing, is data transmission, a process that continues until information in a usable form reaches the final user. Sometimes, of course, it is necessary to copy or duplicate output documents.

## Storage

Finally, the results of the processing of data must be retained for future use of reference. This function is called storage.

## 3.4 DATA HIERARCHY

Listed below are the components of the data hierarchy in the ascending order of complexity:



This is called a data hierarchy because databases are composed of files, files are composed of records, and so on.

### Bit

The term bit is short for binary digit. It can assume either of the two states, representing numeric value 0 or 1.

### Byte

In a computer system, basic unit of information is called a byte. A byte of information is generally stored by using 8 bits in a specified combination.

### Field or Item

A field or item of data is one or more bytes that contain data about attributes of an entity.

### Record

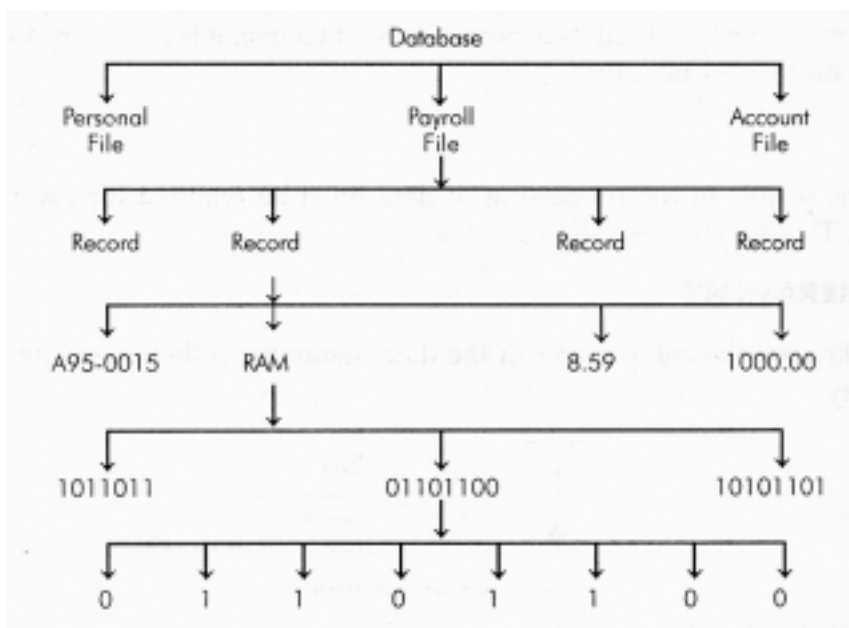
A record is a collection of fields relating to a specific entity.

### File

A file is a collection of related records. The concept of a computer file is very similar to the manual file in a filing cabinet.

### Database

A database consists of all the files of an organization, structured and integrated to facilitate updation. of files and retrieval of information from them.



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## **3.5 DATA STRUCTURE**

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Data maybe organized in various ways; the logical or mathematical model of a particular situation using data is called a data structure.

A data structure is a class of data that can be characterized by its organization and the operations that are defined on it.

Data structures are also called abstract data types.

### **Student Activity 2**

1. What are the basic functions of data processing?
2. What is the difference between data capturing and data merging?
3. What are various ways to summarize data.
4. Describe data hierarchy.
5. What is a data structure?

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## **3.6 APPLICATION PORTFOLIO DEVELOPMENT**

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An application portfolio of a business organization is a compilation of information about the organization's investments in its IT-based application infrastructure. The information is organised to show how these investments support the organization's mission and programs and to demonstrate the relationships among current and planned investments. The portfolio enhances the ability of key decision-makers to assess the probable impact of investments on the organization's programs and infrastructure, as well as on the overall IT infrastructure. These decision-makers include organization executives, managers etc.

Portfolio-based application management is intended to guide the stewardship of vital assets of the organization. It is central to plans of the organization to improve the overall performance. The portfolio approach recognizes the maturing capabilities of the organization. It also recognizes the continuous advance of technology and the need for the organization to see new initiatives in the context of their total operations, including their IT application investments. The portfolio provides a process for co-ordinating new projects in the context of a business plan and with consideration of the larger IT application portfolio.

The approach has its origin to 1996 Washington State Strategic Plan and includes the foundational policies, procedures, and processes necessary to make informed decisions about IT alternatives and achieve a very high rate of project success.

The application portfolio:

1. Discloses links among organization strategies and business plans and investments in applications;
1. Facilitates analysis of the risks associated with investments made in applications and helps ensure that appropriate risk mitigation strategies are adopted;
1. Provides a baseline for organization-level performance reporting; and
1. Helps ensure that the organization IT infrastructure as a whole is effectively integrated.

### **Characteristic of Portfolio-based IT Management**

Portfolio-based IT application management refines the oversight process used to shepherd a number of complex projects through the development process. Those experiences, coupled with extensive consultations with key stakeholders, made clear the need redress shortcomings of the existing process.

The portfolio concept is grounded in the management principle that any significant investment requires careful monitoring to maximize its value and insulate it from threats to its integrity. This

principle is well understood with respect to traditional investment categories real property, commercial paper, and equity investments all of which are commonly managed in portfolios. These portfolios allow decision-makers to view the range of investments as a whole but also consider discrete investments in context.

The need for an application portfolio is less well understood with respect to investments but no less important. Organization investments on applications involve significant taxpayer funds; are often mission-critical; and are increasingly interrelated in a digital, networked environment. Investments in applications can be leveraged with great effect if the portfolio is sufficiently flexible to adapt to changing business and service needs. Their value, on the other hand, can be undermined by rigid design, unsubstantiated claims about capabilities or performance, and neglect.

Portfolio-based application management is a coordinated approach to the stewardship of the full range of technology investments. It ensures that new initiatives are seen both in the context of the organization wide infrastructure and the respective department-specific application portfolios.

It establishes a framework within which:

- 1 Comprehensive information about the context of an organization's overall operations is readily available for decision-making.
- 1 The development and deployment of application is driven by the clearly defined business needs of an organization in serving citizens and fulfilling its legislative mandate.
- 1 Department heads bring executive focus to application investments and will have new management tools for meeting statutory responsibilities for the stewardship of these investments in their respective departments.
- 1 A formal, objective process exists to evaluate whether a project should be initiated and by which to determine the most appropriate form of oversight based on a comprehensive risk analysis.
- 1 Large projects are broken into smaller, more easily managed projects with each phase adding value on its own without committing funding authorities to subsequent phases.

Portfolio-based IT management organizes information about all IT resources into the perspective of an investment portfolio. The portfolio is responsive to the needs of a variety of decision-makers, including agency executives, agency technical managers, agency program managers and the like. Information is structured to facilitate recognition of trends, analysis of problems and opportunities, and the evaluation of alternatives within the context of an organization's overall investment.

Included in the application portfolio is information about an organization's:

- 1 Mission, strategies, programs, and business processes
- 1 Installed hardware, software, and networks and physical facilities
- 1 Technical management and staff capabilities
- 1 Applications that support organization programs and business processes
- 1 Partnerships or interfaces with other organizations
- 1 Current and planned projects
- 1 Cost and benefits of current and planned investments
- 1 Problems and opportunities involving the applications.

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### **3.7 MANAGEMENT OF DATA PROCESSING SYSTEMS IN BUSINESS ORGANIZATIONS**

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In a typical business organization the data processing system maybe fairly complex. Managing the system is the key factor that determines the success of the organization as a whole. The

structure of the management depends on the size and complexity of the system. There may be systems simple enough to be managed by a single manager, while in some cases an entire department maybe involved. In a typical scenario the organization of the data processing system consists of:

1. EDP (Electronic Data Processing) Manager
2. System Programmers
3. Application Programmers
4. Auditors
5. Maintenance Engineers
6. Database Administrators etc.

In general, following are the responsibilities of the data processing manager:

1. Identifying the need of acquisition of new technology including hardware and software.
2. Evaluating the same.
3. Procuring the approved technology.
4. Providing the EDP services to all the users in the organization according to their needs.
5. Adding new features of processing and removing obsolete ones.
6. Incorporating new business rules and providing required interfaces to the users.
7. Accounting for the usage of the resources.
8. Ensuring the availability of the system by scrutinising and by taking corrective measures in case of any breakdown.

### **Student Activity 3**

1. What do you mean by application portfolio?
2. What are the characteristics of portfolio-based IT management?
3. What information is included in the application portfolio of an organization?
4. Who belong to the organization of the data processing system?
5. List the responsibilities of the data processing manger.

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## **3.8 COMPUTERISED FINANCIAL ACCOUNTING SYSTEM (FAS)**

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The financial accounting system is the heart of the overall distribution system. Its functions as a traffic cop to route financial information in the correct file or account.

Financial accounting is an art of recording and processing all transactions within an organization with outsiders and includes events affecting the financial position of the organization. It results in preparation of the annual profit and loss account as well as balance sheet for the organization.

### **Why Computerized FAS?**

The control of funds coming into and going out of the firm is obviously very important and the use of computers should make such control more effective.

A great volume of accounting data is numerical and is always processed with the same method. This makes computerization relatively easy.

Calculations should be more accurate.

Reports can be supplied faster and frequently.



## 3.9 COMPUTERISED INVENTORY CONTROL SYSTEM

### What is Inventory?

- 1 Inventory refers to buffer stock of items of use being maintained by the organization to prevent losses resulting from non-availability of materials.
- 1 Different levels of stocks of different items will be maintained depending upon their consumption level, cost, and other characteristics.

### Why Control Inventory?

- 1 Inventories account for 50-70% of the total cost of operation in most organizations.
- 1 While keeping inventory is unavoidable, it must be remembered that inventory is an idle resource and it adds to the cost. Excessive inventories will reduce organization's profitability. Therefore, inventories must be closely monitored and controlled.

### Objectives of Inventory Control

- 1 To minimize the loss of business due to non-availability of required materials.
- 1 To minimize the total cost of materials including procurement, storage, and handling costs consistent with required service levels.

### Scope of Inventory Control Function

- 1 Materials planning
- 1 Materials requisitioning
- 1 Materials receipt and inspection
- 1 Materials storage
- 1 Materials issues, returns, and adjustments.

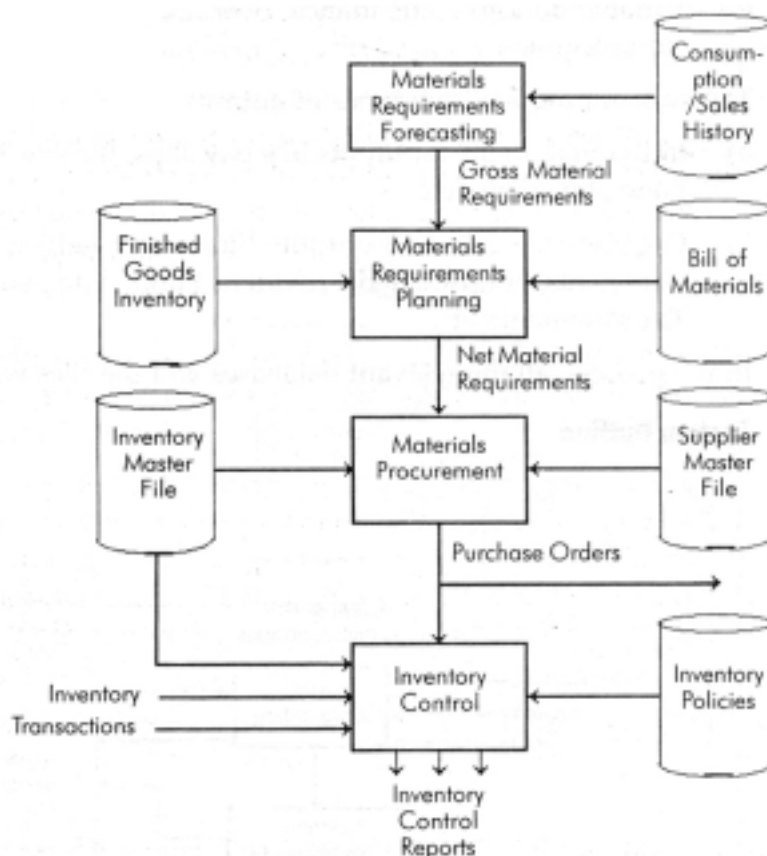


Figure 3.1: An Overview of Inventory Control/Material Management

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### 3.10 COMPUTERISED PAYROLL SYSTEM

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Payroll system is concerned with accurate and timely computation of compensation to each individual employee.

In addition, the payroll system generates relevant information inputs to budgetary control and financial accounting systems.

The objective of the payroll system is wages calculations and associated record keeping.

#### Description

Each organization has an employee compensation/wage policy. In addition, employee compensation is also subject to certain statutory provisions like Income Tax regulations. The processing logic of the payroll system has to take into account all relevant provisions.

The system uses two types of data:

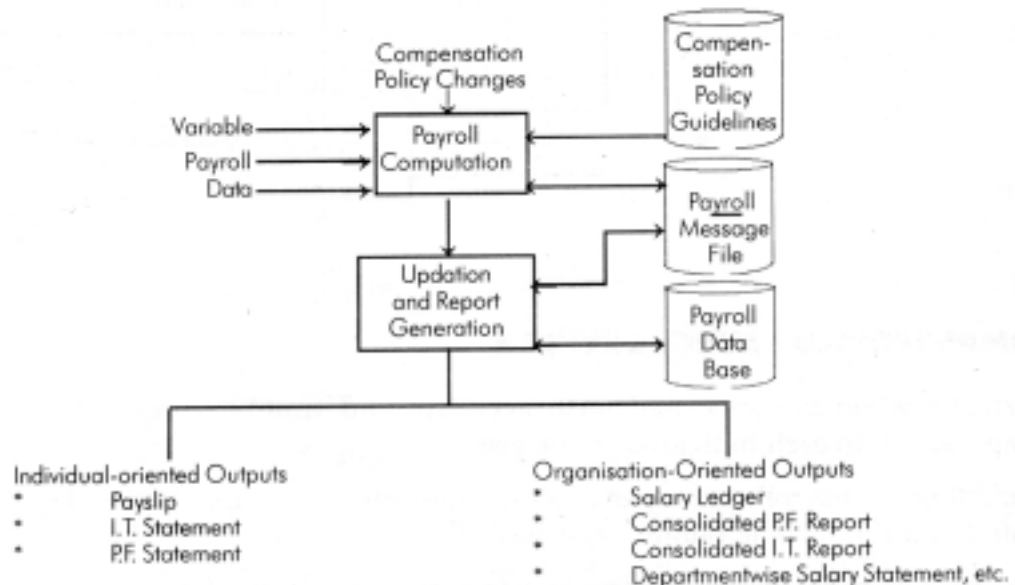
- a) Fixed data like employee name, address, etc., which is stored in the database and can be retrieved from there.
- b) Variable data like attendance, overtime, deductions, etc., which has to be fed as inputs.

The system produces two types of outputs:

- a) Individual oriented outputs like pay slips, income tax statement, provident fund statements etc.
- b) Organization oriented outputs like salary ledger, department-wise salary statements, consolidated provident fund statements, consolidated income tax statements etc.

In the process, all the relevant databases and the files will also be updated.

#### System Outline



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### 3.11 COMPUTERISED INVOICING SYSTEM

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Invoicing is part of a larger system, namely, sales order processing and invoicing system.

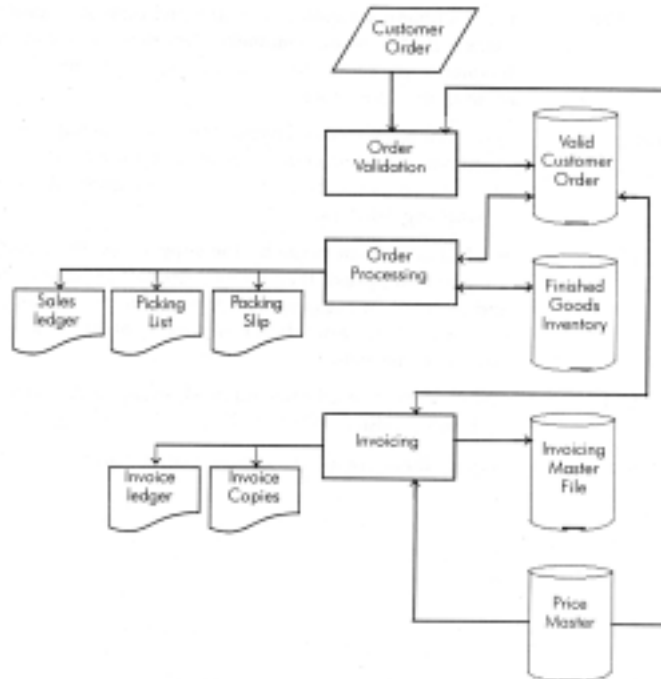
The system is concerned with:

- 1 Receipt of customer order
- 1 Validation of customer order

- 1 Processing of customer order
- 1 Invoice Generation

Once the invoice is generated, accounts receivable system takes over. File containing newly generated invoices becomes an input to the accounts receivable system.

## System Outline



## Processing Steps

Sales orders from customers received in variety of ways in the form of order form, through fax, over phone are entered into the computer system.

Orders are validated through checking of item prices and customer credit rating. Valid orders are stored in the Order File.

Orders are processed after checking the availability of items from the finished goods inventory file. This step generates three outputs, namely, Picking List, Packing Slip, and Sales Ledger.

Once the order has been processed, corresponding invoice is prepared by referring to price master file. In this step, the required number of invoice copies are generated and an invoice ledger is produced. Newly generated invoices are copied to the invoice master file.

## System Outputs

**Packing List:** is a document generated to help warehouse staff assemble all items included in one customer order quickly and conveniently. It contains the Order No., Item No., Quantity and the location of an item in the store.

**Packing Slip:** is a document accompanying the order consignment to the customer. It contains customer order number and the list and quantity of items in a particular consignment along with forwarding address.

**Invoice:** is a bill or a claim made by the supplier on the customer for the goods supplied. It contains customer order reference, list and quantity of items supplied, prices, total amount payable, payment date, and discounts as applicable along with payment instructions.

**Sales Ledger:** is daily listing of all sales made showing sales order number and order value.

**Invoice Ledger:** is daily listing of all invoices prepared during the day.

#### Student Activity 4

1. Why does an organization need computerized FAS?
2. What is Inventory? What are its objectives?
3. What is a payroll system?
4. What is invoicing system? Describe its processing step.
5. What are the various outputs of a system?

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### 3.12 SUMMARY

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Various types of data processing systems followed by the organization to optimize their efficiency are batch processing, online processing, real time processing and distributed data processing.

The basic functions carried out in any data processing include the origination of the data to be processed, capturing of data before processing, sorting the data, merging the multiple files, performing calculations and summarizing it. Then the results of processing of data are stored for future reference.

The smallest unit of data is *bit*. 8 bits form one *byte*. One or more bytes that contain data about attributes of an entity is a *field*. A collection of fields relating to a specific entity forms a *record*, collection of related records forms a file and the collection of all files of an organization form a database.

An application portfolio of a business organization is a compilation of information about the organizations investments in its IT-based application infrastructure. The portfolio approach recognizes the maturing capabilities of the organizations. The portfolio concept is grounded in the management principle that any significant investment requires careful monitoring to maximize its value and insulate it from threats to its integrity. The portfolio is responsive to the need of a variety of decision-makers, including agency executives, agency technical managers, agency program managers and the like.

Financial accounting is an art of recording and processing all transactions within an organization with outsiders and includes events affecting the financial position of the organization. This system is computerized to do more accurate calculations and faster and frequent supply of reports.

Some other systems that can be computerized in an organization include inventory control system, payroll system, Invoicing system, etc. The outputs of the system includes packing list, packing slip, Invoice, sales ledger and Invoice ledger.

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### 3.13 KEYWORDS

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**Batch Processing:** Processing that requires the data to be initially grouped (as a batch) before it is processed serially, and the results obtained periodically.

**Online Processing:** Processing where the result of data processing transaction is available immediately.

**Real Time Processing:** Data processing system in which the time interval required to process and respond to input is so small that the response itself is useful for controlling the physical activity of a process.

**Distributed Data Processing:** Data processing which involves a computer system linked by a communication network where processing is performed by separate computers.

**Sorting:** Arranging the data in a local sequence.

**Bit:** Representing numeric value 0 to 1.

**Byte:** Basic unit of information, generally stored by using 8 bits.

**Field:** One or more bytes that contain data about attributes of an entity.

**Record:** A collection of fields relating to a specific entity.

**File:** A collection of related records.

**Database:** Collection of all files of an organization.

**Data Structure:** A class of data that can be characterized by its organization and the operations that are defined on it.

**Application Portfolio:** A compilation of information about the organization's investment in its IT-based application infrastructure.

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## 3.14 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks:**
  - (a) In—processing the result of data processing translation is available immediately.
  - (b) ——forms the backbone of distributed computing.
  - (c) Data must be ——or——before they can be processed.
  - (d) Basic unit of information is a computer system is called a ——
  - (e) A datastructure can be characterized by its —and —that are defined unit.
  - (f) The ——approach recognizes the maturing capabilities of the organization.
2. **State: True or False:**
  - (a) The method of batch processing reduces the idle time of a computer system.
  - (b) The first function involved in the processing of data is the capturing of data.
  - (c) The data is summarized into the form desired for output.
  - (d) A database is a collection of related records.
  - (e) Payroll system is concerned with accurate and timely computation of compensation of each individual employee.

### Answers (Unsolved Questions)

1. (a) Online (b) Distributed Database systems (c) recorded, Captured (d) byte (e) organization, operations (f) portfolio
2. (a) True (b) False (c) True (d) False (e) True

### Detailed Questions

1. Describe various modes of data processing system.
2. What is the difference between on-line processing and Real-time processing?
3. What do you mean by the terms merging and summarizing of data?
4. How does the information communicated?
5. Why is storage of information required?
6. Describe the hierarchy of data.
7. Describe computerized pay roll system. Also draw its system model.
8. Describe the objective and scope of Inventory control system.
9. Describe various system outputs of an organization in its Invoicing system.

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## 3.15 FURTHER READINGS

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Ramesh Bangia, *Business Systems*, Laxmi Publication.

Robert J Thierauf, *Data Processing for Business and Management*, John Wiley & Sons.

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## UNIT

# 4

## SOFTWARE DEVELOPMENT

### LEARNING OBJECTIVES

After studying this unit, you should be able to:

- Describe software development process.
- Understand various phases of software development.

### UNIT STRUCTURE

- 4.1 Introduction
- 4.2 Computer Software Systems
- 4.3 Software Development Process
- 4.4 Summary
- 4.5 Keywords
- 4.6 Review Questions
- 4.7 Further Readings

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## 4.1 INTRODUCTION

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Computer software has become a driving force. It is the engine that drives business decision making. It is a key factor that differentiates modern products and services. Software is virtually inescapable in a modern world.

The software development process has been the focus of considerable attention over the last decade. It is a frame work for the tasks that are required to blind high-quality software.

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## 4.2 COMPUTER SOFTWARE SYSTEMS

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A commercial organization performs various activities. The important ones among them include financial accounting, inventory control, and payroll. Most of these activities are carried out manually. As the dimensions of these activities increase, the organization may prefer to mechanize the activities to operate smoothly. Computer manufacturers have come to the rescue of business organizations. They have developed packages/programs, for carrying out the activities like payroll preparation, inventory control, invoicing system, and financial accounting. This chapter discusses these four important computerized applications in detail.

When we consider the payroll problem, it is obligatory on the part of every employer to pay the wages to employees within a prescribed time limit. When the number of employees is large, it is preferred to have a computerized system of preparing the pay bills rather than manual ones. A computer software package on payroll thus becomes an integral part of a large business organization.

Similarly, financial accounting is another field where computerization can play an important role. The financial accounting package is one which helps the organization in preparing various financial reports, ledgers, and journals of monetary transactions.

In a large production-oriented organization, it is essential to have a control over the investment in inventory of raw materials. A computerized inventory control system can reduce considerable amount of time in processing the data which is necessary to control inventory.

## 4.3 SOFTWARE DEVELOPMENT PROCESS

Software development for business applications is not an easy task. In developing a large software (e.g., MIS), many people are involved and many months or even years are spent. However, a small application (e.g., Payroll) can be developed in few weeks or months by a single or few programmers. For such small systems, software development activities maybe done implicitly without proper documentation. But, for large systems, these activities must be done explicitly with proper planning and documentation. Whether a system is small or large, software development revolves around a life cycle that begins with the recognition of users' needs and understanding their problem. A plan is made for solving the problem and then a sequence of activities are performed step by step. The basic activities or phases, that are performed for developing a software are:

1. **Feasibility Study:** Feasibility study is the first phase in development of a new system (candidate system). This phase starts when the user faces a problem in the current system (manual or already computerized) and submits a formal request to the EDP department or an outside software development company either for a new system or for modifying the current system. After receiving the request, the overall incharge of software development team, Systems Analyst, begins the preliminary investigations to determine whether the system requested is feasible to develop or not.

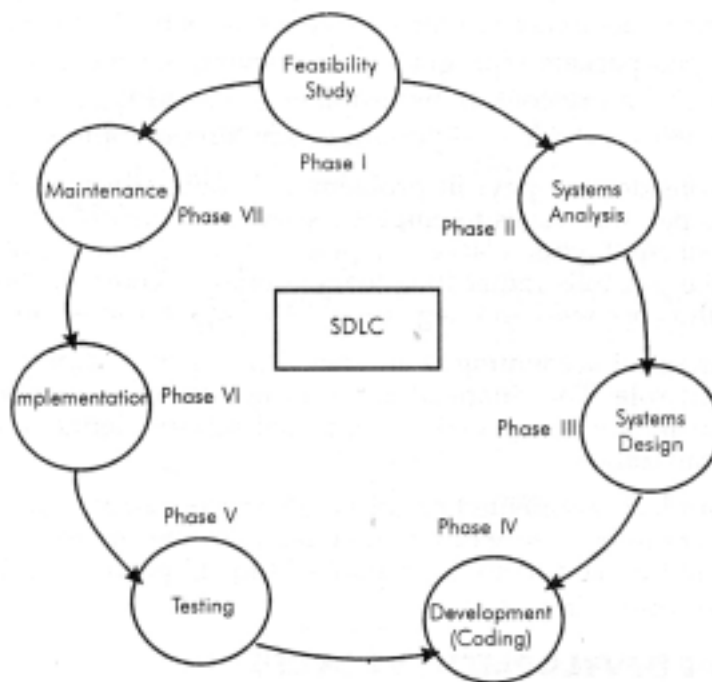


Figure 4.1: Seven Phases of Software Development Life Cycle

2. **Systems Analysis:** When the systems analyst decides that the requested system is feasible and the management agrees to continue the development process, the next phase of SDLC is determination of systems requirements. This phase includes studying of existing system in details and collecting data in order to find out the requirements of the users.
3. **Systems Design:** After collecting and studying user's requirements, the system is designed. This phase involves identification of inputs data, output reports and the procedures to process the data.
4. **Development of Software:** When the design (properly documented) is accepted by the requested department, the programmers start designing of data structures and writing of program. The programmers test their individual programs and integrate them into a single system.
5. **Systems Testing:** Testing is the most vital phase of SDLC. In this phase, the system as a whole is tested with different techniques to ensure that the software is bug free.

6. **Implementation:** The tested system is installed at the user's place and implemented. This is generally considered the last phase of SDLC. However, the systems development work continues until the users of requested department accepts the candidate system.
7. **Maintenance:** After implementation, the systems need be maintained in order to adapt the changing business needs. Maintenance is sometimes not considered as a phase of SDLC, but it is an essential part of a software project that never ends.

The different phases of Software Development Life Cycle (SDLC) are illustrated in Figure 4.1.

It maybe possible that the candidate system fails due to any major mistake occurred in any of the development phase. In that case, any or all of the phases are needed be reviewed again, so that the system is completely accepted by the requested department. This is the reason, why 'life cycle' term is used in software development phases. We will discuss about each phase in detail in subsequent sections.

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## 4.4 SUMMARY

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For development a large a software for any business application, many people are involved and many months or even years are spent. Whether a system is small or large, software development revolves around a life cycle that with the recognition of user's needs and understanding their problem. The various phases involved include feasibility study, system analysis, system design, development of software, system testing, Implementation and maintenance. If the candidate system fails due to any major mistake occurred in any of the development phase, any or all of the phases are needed be reviewed again, so that the system is completely accepted by the requested department.

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## 4.5 KEYWORDS

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**System Analysis:** Study of existing system in detail and collecting data in order to find out the requirements of the users.

**System Design:** Identification of input, output and procedures to process the data.

**System Testing:** Testing of the whole system with different techniques to ensure that the software is bug free.

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## 4.6 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks**
  - (a) \_\_\_\_ is the first phase in development a new system.
  - (b) The system analyst decides that the requested system is \_\_\_\_ and the management agrees continue the \_\_\_\_ process.
  - (c) \_\_\_\_ phase involves identification of inputs data, output reports and the procedures to process the data.
  - (d) \_\_\_\_ is sometimes not considered as a phase of SDLC.
2. **State: True or False:**
  - (a) Few people can easily develop a large software in very short duration of time.
  - (b) Feasibility study begins when the user faces a problem in the current system.
  - (c) The programmers can design data structures before the actual acceptance of the design by the requested department.
  - (d) Implementation is generally considered as the last phase of SDLC.



**Answers (Unsolved Questions)**

1. (a) Feasibility study (b) Feasible, development, (c) System design (d) Maintenance.
2. (a) False (b) True (c) False (d) True.

**Detailed Questions**

1. What is a computer software system?
2. Describe the various phases of software development process.
3. What are the seven phases of SDLC? Draw diagram?
4. What is system testing? Why is it required?
5. What will happen if a system fails?

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**4.7 FURTHER READINGS**

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N.D.Birrell, M.A.Ould, *A Practical Handbook for Software Development*, Cambridge University Press.

Pankaj Jalote, *An Integrated Approach to Software Engineering*, Springer.

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## UNIT

# 5

## FILE SYSTEM AND DATABASE

### LEARNING OBJECTIVES

After studying this unit, you should be able to understand:

- Various types of files.
- Various file organizations.
- Master and transaction file.
- File design.
- Designing and generating reports.
- Relevance of database management system.

### UNIT STRUCTURE

- 5.1 Introduction
- 5.2 Various Types of Files
- 5.3 Files Organization
- 5.4 Master File
- 5.5 Transaction File
- 5.6 File Design
- 5.7 Designing Reports
- 5.8 Relevance of Database Management Systems
- 5.9 Integration of Application
- 5.10 Introduction to a Micro Database Manager
- 5.11 Summary
- 5.12 Keywords
- 5.13 Review Questions
- 5.14 Further Readings

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### 5.1 INTRODUCTION

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Files and database have become an essential component of everyday life in modern society. In the course of a day, most of us encounter several activities that involve some interaction with a database, like in banks to deposit and withdraw funds; if we make a hotel or airline reservation; if we access computerized library catalog; or if we order a magazine subscription from a publisher, chances are that our activities will involve someone accessing a database.

To understand the basics of database, we must start with files and its various types and organization which together form the database.

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### 5.2 VARIOUS TYPES OF FILES

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Depending upon the type of content, a file can be categorized as:

1. Data file
2. Program file
3. Object code file

4. Executable file
5. Text file (unformatted file)
6. Formatted file

## Data Files

- 1 A data file is used to store the data records. These data files are well defined data structures that contain related data organized in convenient groupings (records) of data items.
- 1 Each data file has two additional types of records: Header record, and types record.
- 1 Header records contain file identification information and keep apart different groups of records in a file.
- 1 Trailer records contain codes to mark the end of a set of data records. These also record file usage information.
- 1 Categories of data files:  
Depending upon the nature of data, data files can be categorized as:
  1. Master file
  2. Transaction file
  3. Work file
  4. Audit file
  5. Backup file
- 1 File organization:  
Data in files can be organized in different ways. These data records can be organized in anyone of the following ways:
  1. Serial
  2. Sequential
  3. Indexed Sequential
  4. Directly Accessible/Random

## Program Files

Program files are used to store programs in different languages provided by different software vendors. These files have different extensions depending on the language used to write a program.

- e.g.:
1. A program file written in 'C' language has extension. C.
  2. A program file written is C++ language has extension. CPP.

## Object Code Files

These files store compiled programs written in a language. These files contain the machine code.

e.g.: After compilation, C compiler creates a file having extension.OBJ

## Executable Files

These files store ready to execute programs. These files may have extension.EXE.COM or .BAT. These programs can be directly executed from the command prompt.

## Unformatted Text Files

- 1 These files are simple files containing simple text.
- 1 Text files can be created using any text editor or line editor.

e.g.: Text files can be created using MS-DOS Edit editor or Notepad editor provided by MS-Windows.

### **Formatted Text Files**

These files contain formatted text. These also contain some commands and symbols to format the text. These files can be created using any word processor.

e.g.:MS-WORD creates a formatted text file having extension .DOC.

#### **Student Activity 1**

1. What are the various types of files depending on the type of content?
2. What are data files? What are its various categories?
3. What is a program file?
4. Which files are said to be executable files?
5. What is the difference between unformatted and formatted text files?

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## **5.3 FILES ORGANIZATION**

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File organization refers to the relationship of the key of the record to the physical location of that record in the computer file.

The two main objectives of computer based file organization are:

1. ease of file creation and maintenance, and
1. providing an efficient means of storing and retrieving information.

The four file organization methods that are commonly used in business data processing applications are:

1. Serial
2. Sequential
3. Direct or Random
4. Indexed Sequential

The selection of a particular file organization depends upon factors like, the type of application, the method of processing for updating files, size of file, etc.

### **Serial File Organization**

In serial file organization records are stored without any consideration of their order or sequence.

Records have to be accessed in the serial fashion only.

Examples are: memory dumps, archival files, records of events, transaction files.

Each record is written after the last record in the current file. The order of records in the serial file is according to the time when the data was generated.

### **Sequential File Organization**

In a sequential file, records are arranged in the ascending or descending order or chronological order of a key field.

To access these records, the computer must read the file in sequence from the beginning.

The retrieval search ends only when the desired key matches with the key field or the currently read record.

On an average, about half the file has to be searched to retrieve the desired record from a sequential file.

Sequentially organized files are normally created and maintained on storage media such as magnetic tape, cartridge tape, magnetic disks, etc.

### Advantages

1. Easy to organize, maintain, and understand.
2. There is no overhead in address generation locating a particular record requiring only the specification of the key field.
3. Relatively inexpensive I/O media and devices can be used.
4. It is the most economical and efficient file organization where the *activity ratio* (the ratio of the total number of records in transaction file and the total number of records in master file) is very high. That is why this file organization is most suitable for transaction files.

### Disadvantages

1. It proves to be very inefficient and uneconomical for applications in which the activity ratio is very low.
2. Since an entire sequential file may need be read to retrieve and update few records, accumulation of transactions into batches is required.
3. Transactions must be stored and placed in sequence prior to processing.
4. Timeliness of data in the file deteriorates while batches are being accumulated.
5. Data redundancy is typically high since the same data maybe stored in several files, sequenced on different keys.
6. Random enquiries are virtually impossible to handle.

### Applications

Payroll System

Billing and customer statement preparation

Bank cheque processing

Financial accounting

### Direct or Random File Organization

A direct file (also referred to as a relative or random organization) consists of records organized in such a way that it is possible for the computer to directly locate the desired record without having to search through any other records first.

A record is stored by its key field.

For mapping the key fields to the locations, an arithmetic procedure called hashing algorithm is frequently used.

This address generating function is selected in such a manner that the generated addresses should be distributed uniformly over the entire range of the file area and a unique address must be generated for each record key.

A Direct Access Storage Device (DASD) such as drum, disk, etc., are essential for storing a direct file.

### Advantages

1. The access to and retrieval of a record is quick and direct (within a fraction of a second).
2. Transactions need not be sorted and placed in sequence prior to processing.

3. Accumulation of transactions into batches is not required before processing them. They may be processed as and when generated.
4. It can also provide up-to-the minute information in response to enquiries from simultaneously usable on-line stations.
5. If required, it is also possible to process direct file records sequentially in a record key sequence.
6. A direct file organization is most suitable for interactive on-line applications.

### **Disadvantages**

1. These files must be stored on a direct access storage device. Hence, relatively expensive hardware and software resources are required.
2. File updation (addition and deletion of records) is more difficult as compared to sequential files.
3. Address generation overhead is involved for accessing each record due to hashing function.
4. May be less efficient in the use of storage space than sequentially organized file.
5. Special security measures are necessary for on-line direct files that are accessible from several stations.
6. System design around it, is complex and costly.

### **Applications**

A direct file organization is most suitable for interactive on-line applications such as:

1. Airline/Railway reservation systems
2. Teller facility in banking applications

### **Indexed Sequential File Organization**

Basic principle "having index (directory)"

e.g.: A directory (index) in a large multistoried building that helps one to locate a particular person's room within a building instead of searching door by door.

The contents (which serve as an index) help us to locate (page of the desired topic) so that one can turn directly to that page to begin reading instead of searching each page.

Indexed sequential files use exactly the same principle.

In an indexed sequential file, records are stored sequentially on a direct access device (i.e., magnetic disk) and data is accessible either randomly or sequentially.

The sequential access of data occurs as one record at a time until the desired item of data is found.

The records of the file can be stored in random sequence but the index table is in sorted sequence on the key value.

This technique is known as Indexed Sequential Access Method (ISAM).

### **Advantages**

1. Permits the efficient and economical use of sequential processing techniques when the activity ratio is high.
2. Permits direct access processing of records in a relatively efficient way when the activity ratio is low.

### **Disadvantages**

1. These files must be stored on a direct access storage device. Hence, relatively expensive hardware and software resources are required.
2. Less efficient in the use of storage space than some other alternatives.

## Applications

This file organization is a compromise approach that combines some of the advantages of both the sequential and direct approaches, and therefore used in almost all the applications, like Material A/C, Banking Industry, etc.

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### 5.4 MASTER FILE

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Master files are files of a fairly permanent nature, e.g., inventory, payroll, etc. They include some information which is of a permanent nature and also data which is continuously updated by recent transactions.

e.g.: The master file could contain records having the following fields:

Emp No.	Emp Name	Emp Address	Date of Joining
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These attributes about an employee change less frequently.

#### Updation of Master File

The normal means of updating a master file is by:

1. Addition of data/records
2. Deletion of data/records
3. Amending of data/values

#### Types of Master Files

1. Static master files (or reference files)
  1. Permanent or semi-permanent nature.
  1. Example of some business entities are products, suppliers, customers, employee, etc.
  1. These are subject to occasional revision.
2. Dynamic master files (or table files)
  1. Transitory nature
  1. Example of some business entities are customer orders, works orders, price lists etc.

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### 5.5 TRANSACTION FILE

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Transaction files are files in which the data relating to business events is recorded, prior to a further stage of processing and are created from source documents used for recording events or transactions.

e.g.: Customer's orders for product  
Purchase orders, job cards, invoice, despatch notes, etc.

A transaction file is a temporary file containing all relevant data about all transactions of one type.

e.g.: Daily sale transaction file  
Daily stores issue file

A transaction file normally has two purposes:

1. To accumulate data about relevant events as they occur.
2. To update master files to reflect the results of most recent transactions.

## Student Activity 2

1. What do you mean by file organization? What are the various methods of file organization?
2. What are the advantages of sequential file organization?
3. List some application of direct file organization.
4. What is index sequential file organization?
5. Define master file and transaction file.

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## 5.6 FILE DESIGN

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File design refers to the relationship of the key of the record to the physical location of that record in the computer file.

The two main objectives of design are:

1. ease of file creation and maintenance, and
1. providing an efficient means of storing and retrieving information.

To design a file, there are four methods that are commonly used in business data processing applications. They are:

1. Serial
2. Sequential
3. Direct or Random
4. Indexed Sequential

The selection of a particular file organization depends upon factors like, the type of application, the method of processing for updating files, size of file, etc.

### Serial File

In serial file, records are stored without any consideration of their order or sequence.

Records have to be accessed in the serial fashion only.

Examples are: memory dumps, archival files, records of events, transaction files.

Each record is written after the last record in the current file. The order of records in the serial file is according to the time when the data was generated.

### Sequential File

In a sequential file, records are arranged in the ascending or descending order or chronological order of a key field.

To access these records, the computer must read the file in sequence from the beginning.

The retrieval search ends only when the desired key matches with the key field or the currently read record.

On an average, about half the file has to be searched to retrieve the desired record from a sequential file.

Sequentially organized files are normally created and maintained on storage media such as magnetic tape cartridge tape, magnetic disks, etc.

### Advantage

1. Easy to organize, maintain, and understand.
2. There is no overhead in address generation locating a particular record requiring only the specification of the key field.
3. Relatively inexpensive I/O media and devices can be used.



4. It is the most economical and efficient file organization where the activity ratio (the ratio of the total number of records in transaction file and the total number of records in master file) is very high. That is why this file organization is most suitable for transaction files.

### **Disadvantages**

1. It proves to be very inefficient and uneconomical for applications in which the activity ratio is very low.
2. Since an entire sequential file may need be read to retrieve and update few records, accumulation of transactions into batches is required.
3. Transactions must be stored and placed in sequence prior to processing.
4. Timeliness of data in the file deteriorates while batches are being accumulated.
5. Data redundancy is typically high since the same data maybe stored in several files, sequenced on different keys.
6. Random enquiries are virtually impossible to handle.

### **Applications**

Payroll system  
 Billing and customer statement preparation  
 Bank cheque processing  
 Financial accounting

### **Direct or Random File**

A direct file (also referred to as a relative or random organization) consists of records in such a way that it is possible for the computer to directly locate the. desired record without having to search through any other records first.

A record is stored by its key field.

For mapping the key fields to the locations, an arithmetic procedure called hashing algorithm is frequently used.

This address generating function is selected in such a manner that the generated addresses should be distributed uniformly over the entire range of the file area and a unique address must be generated for each record key.

A Direct Access Storage Device (DASD) such as drum, disk, etc., are essential for storing a direct file.

### **Advantages**

1. The access to and retrieval of a record is quick and direct (within a fraction of a second).
2. Transactions need not be sorted and placed in sequence prior to processing.
3. Accumulation of transactions into batches is not required before processing them. They maybe processed as and when generated.
4. It can also provide up-to-the minute information in response to enquiries from simultaneously usable on-line stations.
5. If required, it is also possible to process direct file records sequentially in a record key sequence.
6. A direct file organization is most suitable for interactive on-line applications.

### **Disadvantages**

1. These files must be stored on a direct access storage device. Hence, relatively expensive hardware and software resources are required.

2. File updation (addition and deletion of records) is more difficult as compared to sequential files.
3. Address generation overhead is involved for accessing each record due to hashing function.
4. Maybe less efficient in the use of storage space than sequentially organized file.
5. Special security measures are necessary for on-line direct files that are accessible from several stations.
6. System design around it, is complex and costly.

### **Applications**

A direct file organization is most suitable for interactive on-line applications such as:

1. Airline/Railway reservation systems
2. Teller facility in banking applications

### **Indexed Sequential File**

Basic principle "having index (directory)"

e.g.: A directory (index) in a large multistoried building that helps one to locate a particular person's room within a building instead of searching door by door.

The contents (which serve as an index) help us to locate (page of the desired topic) so that one can turn directly to that page to begin reading instead of searching each page.

Indexed sequential files use exactly the same principle.

In an indexed sequential file, records are stored sequentially on a direct access device (i.e., magnetic disk) and data is accessible either randomly or sequentially.

The sequential access of data occurs as one record at a time until the desired item of data is found.

The records of the file can be stored in random sequence but the index table is in sorted sequence on the key value.

This technique is known as Indexed Sequential Access Method (ISAM).

### **Advantages**

1. Permits the efficient and economical use of sequential processing techniques when the activity ratio is high.
2. Permits direct access processing of records in a relatively efficient way when the activity ratio is low.

### **Disadvantages**

1. These files must be stored on a direct access storage device. Hence, relatively expensive hardware and software resources are required.
2. Less efficient in the use of storage space than some other alternatives.

### **Applications**

This file organization is a compromise approach that combines some of the advantages of both the sequential and direct approaches, and therefore used in almost all the applications, like Material A/C, Banking Industry, etc.

### **Student Activity 3**

1. What do you mean by file design? What are the objectives of file design?
2. Differentiate between serial file and sequential file.
3. What is a direct file?
4. What are the disadvantages of an Indexed sequential file?

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## 5.7 DESIGNING REPORTS

---

Systems analysts specify reports when they need a record of data or a report of information, or circulate a large volume of information to several persons simultaneously.

Only those reports whose printing is absolutely necessary should be printed. One well designed report may sometimes replace several poorly designed ones. Providing unnecessary details assists no one, so analysts should be alert to avoid producing extraneous data.

### Printed Reports

Printed reports vary in size, although analysts often use these standard sizes:

- 1 9 1/2 by 11 inches
- 1 11 by 14.7/8 inches
- 1 8 by 14.7/8 inches

These sizes are for continuous forms (sometimes called pin-fed or fan-fold forms)—connected sheets of papers that feed into the printer one after the other.

All the features of printed output are available in microfilm and microfiche, the two film output methods. Film output reduces output cost by approximately one-third. After developing in the microfiche machine, film can be stored and retrieved when needed. For reference data used only sporadically, such as private saving account balance that changes infrequently and can have interest pasted every three months, microfilm could be a useful output option.

A page of output takes so little space when stored on microfilm. One square inch of a film can store as much information as several pages of paper report. A 3.5 inch card stores the equivalent of hundreds of pages.

The time taken to locate the film reel or card containing the information wanted the user must maintain an index and to load the film into a microfilm or microfiche reader for viewing is a real disadvantage.

### Special Forms

Reports could be printed on simple paper. But usually, when an organization sends a report to its customer, the logo and the name of the organization is also printed on it. Sometimes, the report is printed on a paper which is "pre-printed". Recall your high school marksheets. The name of the board, the year and logo of the board as well as the name of examination passed were printed on the paper. The marks, name, school name, date of birth, etc., were printed afterwards. Another example is your electricity bill. The titles of various labels are preprinted. The values against them are printed by the information system.

### Layout of a Printed Report

An output layout is the arrangement of items on the output medium. When analysts design an output layout, they are building a mock up of the actual report or document as it will appear after the system is in operation. The layout should show the location and position of the following:

- 1 All variable information
  - Item details
  - Summaries and totals
  - Control breaks
  - Separators



## Report Generation

Commercial outputs need formatted output. These formatted outputs are known as reports. A formatted report may have the following:

1. Report heading
2. Page heading
3. Page numbering
4. Footers
5. Some remarks
6. Date, month, and year of printing

Commercial outputs may also extend over multiple pages. In that case, one will have to keep a provision in his program so that certain details get printed on every page.

e.g.: One may have to print page headings on every page.

Report maybe of

1. Single page
2. Multiple page

Languages provide different picture templates for these purposes.

### Multiple Page Report

Multiple page reports in general may consist of following parts:

1. Report heading
2. Report sub heading
3. Page heading
4. Page footer
5. Report detail

#### Report Heading

It represents the title of the report and appears, only on the first page of the report.

#### Report Sub Heading

It is printed as and when required on each page.

#### Page Heading

It is printed on the top of each page.

#### Page Footer

It is printed at the bottom of each page. It is generally the total number of records on the page, sum of the numeric data, etc.

#### Report Detail

This constitutes the main body of report. The output details or the information of the main consequence are listed in this group.

### Reports with Control Break

The most important objective of a program is reporting. We need summarized information for decision making. For presenting the summarized information one can use the concept of control break.

In control break report, one need group information based on some common criterion.

Example:

Indian Office Automation Products New Delhi			
Date :		Page No :	
Region Wise Sales Report			
Salesman Name	Region of Sales	Product	Sales
Rishabh Surya	Mumbai	Fax	60,000
	Mumbai	Telex	50,000
Sales of Mumbai Region :			110,000
Atul Raghav	Delhi	PC	45,000
	Delhi	Telex	50,000
Sale of Delhi Region:			95,000

In this report control break is on the region.

Analysis of report shows the following points:

1. Records of a particular region are grouped together and printed at one place.
2. When the control break occurs, certain procedures are followed. Such as total sales of that region.
3. It maybe necessary that performance of each region is printed on each page, i.e., when the control break occurs the report is printed on a fresh page.
4. At the end of the report, it maybe necessary to calculate and print the grand totals.

### Label Generation

Creating Labels means to generate address slip in computer. Creating mailing labels is a two step process:

- (1) Designing Label Form
- (2) Production of Labels

### Designing Label Form

In this step, we design labels. We select the label layout and then place the fields, text and pictures and other objects on it. After designing label, don't forget to save it.

### Production of Labels

When you have designed and label form you want, you can print the labels at any time. At this time, label is ready to use.

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## 5.8 RELEVANCE OF DATABASE MANAGEMENT SYSTEMS

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Database Management System (DBMS) in very important for an organization. One of the main advantages of using a database system is that the organization can exert, via the DBA, centralized management and control over the data. The database administrator is the focus of the centralized control. Following are the important features of DBMS:

- (a) **Reduction of Redundancies:** DBA avoids unnecessary duplication of data and effectively reduces the total amount of data storage required. It also eliminates the extra processing

necessary to trace the required data in a large mass of data. Another advantage of avoiding duplication is the elimination of the inconsistencies that tend to be present in redundant data files. Any redundancies that exist in the DBMS are controlled and the system ensures that these multiple copies are consistent.

- (b) **Shared Data:** A database allows the share of data under its control by any number of application programs or users.
- (c) **Integrity:** Data integrity means that the data contained in the database is both accurate and consistent. Therefore, data values being entered for storage could be checked to ensure that they fall within a specified range and are of the correct format. Centralized control can also ensure that adequate checks are incorporated in the DBMS to provide data integrity.
- (d) **Security:** Data is of vital importance to an organization and maybe confidential. Such confidential data must be accessed by unauthorized persons. The DBA who has the ultimate responsibility for the data in the DBMS can ensure that proper access procedures are followed, including proper authentication schemes for access to the DBMS and additional checks before permitting access to sensitive data. Different levels of security could be implemented for various types of data and operations.
- (e) **Conflict Resolution:** Since the database is under the control of the DBS, therefore, he should resolve the conflicting requirements of various users and applications. In short, DBA chooses the best file structure and access method to get optimal performance for the response critical applications, while permitting less critical applications to continue to use the database, albeit with a relatively slower response.
- (f) **Data Independence:** Data independence is usually considered from two points of view, physical data independence and logical data independence. Physical data independence allows changes in the physical storage devices or organization of the files to be made without requiring changes in the conceptual view or any of the external views and hence in application programs using the database.

Logical data independence implies that application programs need not be changed if fields are added to an existing record nor do they have to be changed if fields not used by application programs are deleted.

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## 5.9 INTEGRATION OF APPLICATION

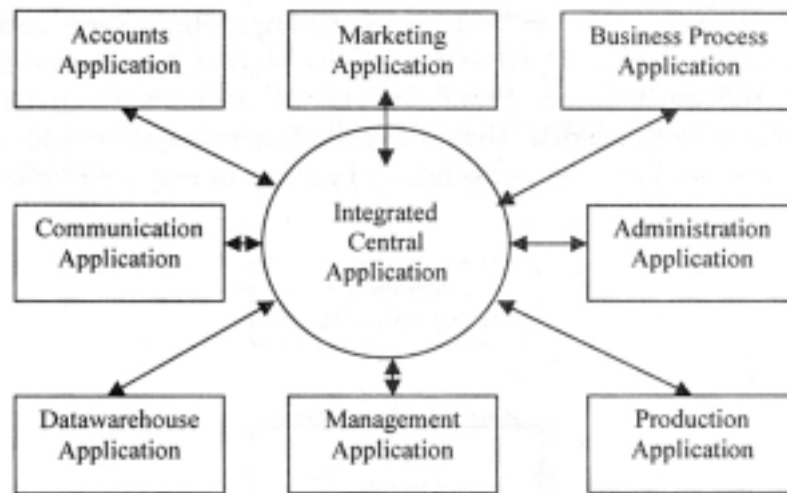
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In a typical business organization several applications work in tandem to realize its business objectives. However, when implemented and managed separately the applications neither achieve a cost effective solution nor they are easily manageable. The application availability and sharing can be greatly enhanced by integrating the existing applications in one single unit. The management control and security concerns make application integration mandatory. Therefore, these individual applications need to be integrated into not department-wide but enterprise-wide application. Many solutions have come to foray like ERP (Enterprise Resource Planning).

According to a recent survey, a typical global company has 30 to 50 enterprise applications and spends 25 to 40 per cent of its Information Technology (IT) budget on application integration. And integration requirements are intensifying with the current wave of acquisitions and mergers. Custom point-to-point solutions and other e-band-aids can solve pieces of the problem in the short term, but they are typically expensive to produce and difficult to maintain. Application integration aims at creating a cost-effective integration architecture and infrastructure to promote interoperability among applications. And interoperability is the key to agility for the accelerating change that rules today's global marketplace.

Cross-functional business processes through integration enable the open flow of information between systems, across organizations, between enterprises and among trading partners. Several technologies are available to integrate web-based applications, front-and-back-office systems,

ERP systems, and package software applications. Some of the most popular application integration solutions are PeopleSoft, Oracle, SAP, and other leading ERP systems, as well as all leading database management systems (DBMSs). A typical application integration looks similar to the one depicted in the figure given below:



There are several issues related to integration of applications such as:

1. **Cost:** Cost is by and large the most important issue in application integration. The cost of integration must justify the overall improvement achieved.
2. **Compatibility:** Generally, the applications are developed and implemented in isolation with little or no consideration with other applications. This fact gives rise to compatibility problems among the component applications.
3. **Legacy applications:** Some applications may exist in the organization which is probably very old (say implemented in very old technology) and yet cannot be thrown off. Such systems are called legacy systems. Integration of these systems sometimes is very challenging.
4. **Migration:** The database and/ or process maybe required to be implemented in new technology from existing old ones. Many a time the source code does exist only an executable form of the process maybe available. In such cases, reverse engineering exercise maybe needed.
5. **Operational control:** Once an application is integrated with another one, there is in general a shift in the control from one entity to another. There may also be a sharing of control on the application. Therefore, a redesigning of the control and authority is often required.
6. **Security:** Application integration exposes the system to more security threats than when they are stand-alone. The vulnerability of the system to security threats must be considered very seriously.
7. **User training:** Along with the integration there maybe significant change in the way, users have been interacting with the system hitherto. Therefore, user training in the new environment must also be considered carefully.

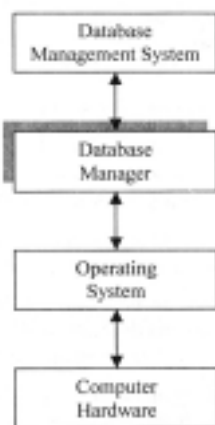
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## 5.10 INTRODUCTION TO A MICRO DATABASE MANAGER

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The database manager is a program module which provides the interface between the low-level data stored in the database and the application programs and queries submitted to the system. Databases typically require lots of storage space (in gigabytes). This must be stored on disks. Data is moved between disk and main memory as and when needed. The goal of the database system is to simplify and facilitate access to data. The performance in terms of response time, is also very important.





The database manager module is responsible for all these tasks in the following way:

1. **Interface with the file manager:** Database manager interacts with the file manager of the operating system by storing raw data on disk using the file system usually provided by a conventional operating system. The database manager would translate a DML (Data Manipulation Language) statement into sequence of low-level file system commands for storing, retrieving and updating data in the database.
2. **Integrity enforcement:** It enforces integrity by checking that updates in the database do not violate consistency constraints. For example, in a bank database, it is the task of the database manager to see that no bank account balance is below Rs. 1000 as otherwise it would violate consistency constraint.
3. **Security enforcement:** By defining security checks and constraints, the database manager ensures that the database is safe. The database manager is endowed with the power of letting the users use the database and also deny it. It is the sole responsible person to provide access rights to a user like - read only, read-write etc.
4. **Backup and recovery:** Database is such a valuable asset that the database manager must ensure that it is not damaged or lost. Therefore, it regularly takes backup of the database. In case of any failure it initiates suitable recovery procedure to resurrect the database. It must also do it in the least amount of time.

#### Student Activity 4

1. What is a printed report? Describe its layout.
2. Give the necessary guidelines to design a printed report.
3. What are labels? How you generate them?
4. What are the features of DBMS?
5. List some issues related to integration of application.
6. What is a micro database manager?

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## 5.11 SUMMARY

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- 1 A file is a collection of related records.
- 1 A file is made up of record, which are made up of fields, which in turn are made up of characters.
- 1 Fields within logical records are normally called "data items".
- 1 A record is recognized or identified by the record KEY.
- 1 Data files can be broadly classified as master files, transaction files, and references files.
- 1 The physical nature of the storage device will have a direct bearing on the way files are organised on it and also on the method of access.
- 1 There are three main types of file design: sequential, indexed sequential and direct access.
- 1 System analysts specify reports when they need a record of data or a report of information.

- 1 Printed reports vary in sizes. Its all the features are available in microfilm and microfiche.
- 1 The layout is a blueprint that will guide the construction of programmes later in the development process.
- 1 A formatted report may have Report heading, Page heading, Page numbering, Footers, some remarks, date, month and year of printing.
- 1 In control break report, one need group information bared on some common criterion.
- 1 DBMS reduces data-redundancy, allows to share data, assures data integrity and security, resolves the conflicts among various users and supports data independence.
- 1 The database manager module is responsible for managing interface with the file manager, integrity enforcement, security enforcement, and backup and recovery of data.

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## 5.12 KEYWORDS

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**File:** A collection of related records.

**Data File:** Well defined data structures that contain related data organized in convenient groupings of records.

**Program Files:** Files used to store programs.

**Executable Files:** Files which store ready to execute programs.

**Direct File:** A file which consists of records that can be directly located without having to search through any other records.

**Index Sequential Access Method (ISAM):** The technique where the records of the file can be stored in random sequence but the index table is in sorted sequence on the key value.

**Master Files:** Files which include some information of permanent nature and are updated by recent transactions.

**Transaction Files:** Files in which the data relating to business events recorded, prior to further stage of processing and are created from source documents used for recording events or transactions.

**Serial File:** File where records are stored without any consideration of their order or sequence.

**Sequential File:** File where records are arranged in ascending or descending order or chronological order of a key field.

**Redundancy:** Duplication of data.

**Data Integrity:** Implies that the data contained in the database in both accurate and consistent.

**Database Manager:** A program module which provides the interface between the low level data stored in the database and the application programs and queries submitted to the system.

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## 5.13 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks:**
  - (a) A——is used to store the data records.
  - (b) Data in files can be organized——,——,—or——.
  - (c) ——is the most economical and efficient file organization.
  - (d) A——is essential for storing a direct file.
  - (e) System design around random file organization is——and——.

- (f) \_\_\_\_\_are files of a fairly permanent nature.
- (g) Commercial outputs need\_\_\_\_\_output called\_\_\_\_\_.

2. **State : True or False:**

- (a) A transaction file is a temporary file containing all relevant data about all transactions of one type.
- (b) In a serial file, records are stored without any consideration of their order or sequence.
- (c) A direct file organization is most suitable for airline/railway reservation systems.
- (d) Reports and documents have to be designed to be read from left to right and from top to bottom.
- (e) A database does not provide data sharing and data security.

**Answers (Unsolved Questions)**

1. (a) Data file (b) serially sequentially, index sequentially, randomly (c) sequential file organization (d) direct access storage device. (e) complex, costly (f) Master files (g) formatted, reports
2. (a) True (b) False (c) True (d) True (e) False

**Detailed Questions**

1. What is the difference between a data file and an executable file?
2. What is the difference between a program file and an object code file?
3. What is a formatted text file?
4. Describe various types of file organizations.
5. Compare sequential and Index sequential file organization?
6. What are the advantages and disadvantages of random file organization?
7. What is a master file? Describe its various types.
8. What is the purpose of having a transaction file.
9. Describe various file design methods.
10. List some applications of sequential file.
11. Why do we require printed report?
12. Describe the layout of a printed report?
13. What should a formatted report contain?
14. Describe the reports with control break?
15. What do you mean by data redundancy and Integrity?
16. How does DBMS support security of data?
17. What are the issues related to integration of an application ?
18. What are the responsibilities of a database manager module?

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**5.14 FURTHER READINGS**

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Sanjeev Gupta, Shameena Gupta, *Computer Aided Management (Using MS-Office 2003 Tools)*, Excel Books.

Manoj Kumar, M. Shamir Bhudookan, *Information Technology for 'O' Level*, Editions De L'Ocean Indien.

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# UNIT

# 6

## PROGRAM AND DEVELOPMENT

### L E A R N I N G   O B J E C T I V E S

After studying this unit, you should be able to understand:

- How to define a program.
- Various steps in program development.
- Characteristics of a good program.
- Flow charts and rules for drawing flow charts.
- Input-process-output analysis.

### U N I T   S T R U C T U R E

- 6.1 Introduction
- 6.2 Program Definition
- 6.3 Steps in Program Development
- 6.4 Characteristics of a Good Program
- 6.5 Data Handling and Declaration
- 6.6 Introduction to Flow Charts
- 6.7 Input Process Output Analysis
- 6.8 Summary
- 6.9 Keywords
- 6.10 Review Questions
- 6.11 Further Readings

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### 6.1 INTRODUCTION

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A program is a series of instructions that perform a particular task and is recorded in some form on a computer disk. Simply, program is an abstract collection of instructions for computers to perform specific tasks. It is variously known as a program or software program.

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### 6.2 PROGRAM DEFINITION

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In order to solve a computation problem, its solution must be specified in terms of a sequence of computational steps, each of which may be effectively performed by a human agent or by a digital computer.

Systematic notations for the specification of such sequences of computation steps are referred to as programming languages.

A sequence of statements (instructions) in order to carry out a defined task is referred to as program.

The task of developing programs for the solution of computation problems is referred to as programming.

A person engaged in the activity of programming is referred to as programmer.

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## 6.3 STEPS IN PROGRAM DEVELOPMENT

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The following basic steps are involved in writing computer programs:

1. Problem identification
2. Task analysis and data analysis
3. Output identification
4. Designing the solution
5. Data validation
6. Implementation and debugging
7. Final documentation and maintenance

Ideally, these steps are generally performed in sequence. But in practice, the development goes through a spiral process.

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## 6.4 CHARACTERISTICS OF A GOOD PROGRAM

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A "good" program has the characteristics mentioned below:

Accuracy	:	The program must do what it is supposed to do, and meet the criteria laid down in its specification.
Reliability	:	The program must ALWAYS do what it is supposed to do, and never crash.
Efficiency	:	The program must use the available store space and resources in such a way that the system's speed is not wasted.
Robustness	:	The program should cope with invalid data without stopping with no indication as to the cause and without creating errors.
Usability	:	The program must be easy to use and well documented.
Maintainability	:	The program must be easy to amend, having good structuring and documentation.
Readability	:	The code in the program must be well laid out and explained with comments.

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## 6.5 DATA HANDLING AND DECLARATION

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The main function of a computer program is data processing. A program:

- Accepts data from outside the computer as its input.
- Carries out a set of processes on the data.
- Stores the data for future use.
- Presents the results of this processing as its output.  
e.g.: Details of an order from a client maybe input and invoice maybe output in a case.
- In context of a computer program, data is a sequence of 0's and 1's, in coded form.

Almost all program languages expect the program to start by declaring any data item used by it. This means listing the name given to each item of data, and stating what kind of data it is?

Special translating program turns these instructions in form which gives the correct interpretation to each label. This will ensure the program treats a number as a number and not as a character.

### Types of Data

#### Constants

- Data which is predetermined before a program is used is known as constants. Values remain unchanged during the execution of a program.

- Have a fixed range in computer applications.
- Types            integer / fixed point            (e.g., 0, 303, + 155)  
                      real/floating point            (e.g., 24.567, -123.5, 0.546)  
                      character / string            (e.g., 'MICROSOFT', '10, Lenin Road')

### Variables

- Data which may change or be assigned different values as the program runs is known as variables.
- Limitations imposed by language on maximum number of characters used to form variable names.

### Variable Types

Each type occupies different storage in RAM and contains values within limits specified for constants of the same type.

- Integer or fixed point
- Real or floating point
- Character or string

### Student Activity 1

1. What is a program?
2. What are the various steps involved in development of a program?
3. What are the characteristics of a good program?
4. What are the various data types involved in a program?

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## 6.6 INTRODUCTION TO FLOW CHARTS

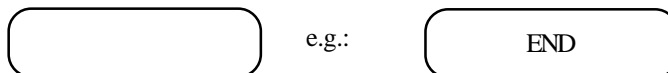
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- Pictorial description of program logic.
- Clarifies step by step logic of the program.
- Symbolic representation of each input, output and processing logic.
- Establishes a link between the programmer and the user.
- Helps understanding, error corrections, and changing of programs.
- Independent of program coding activity in any language like COBOL, C, or PASCAL.
- Part of program documentation.

### Flow Chart Symbols

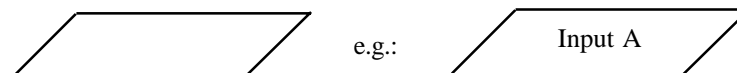
#### Terminal Box

The beginning, end of a point of interruption in a program, is represented by the terminal box.



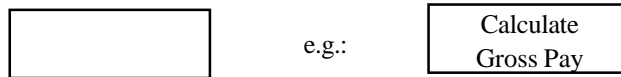
#### Input/Output Box

Any function of an input/output device (marking information available for processing, recording, processing information, etc.) is represented by input/ output box.



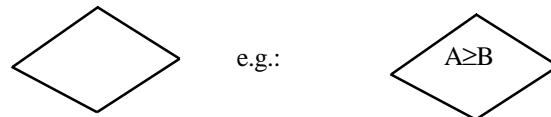
**Processing Symbol**

A group of program instructions that perform a processing function of the program is represented by this symbol.



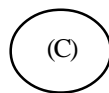
**Decision Box**

This box is used to document points in the program where a branch to alternate paths is possible based upon variable conditions.



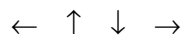
**Connector**

An entry to, or an exit from another part of the program flow chart is represented by this symbol.



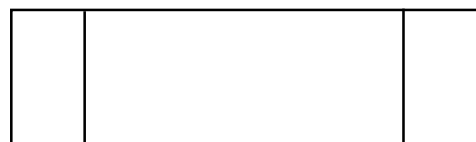
**Flow Lines**

Flow lines connect symbols to show the sequence of logical setups.



**Predefined Box**

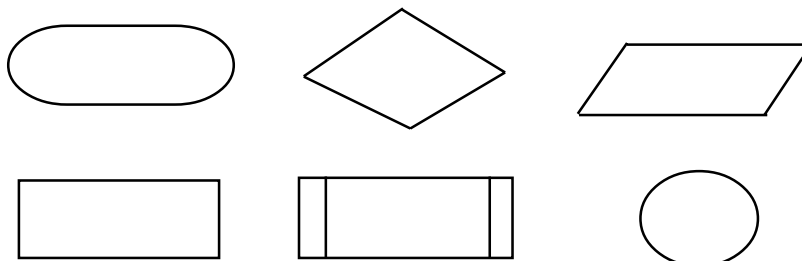
A group of operations not detailed in the particular set of flow charts are represented by the predefined box.



**Rules for Drawing Flow Charts**

**Rule 1**

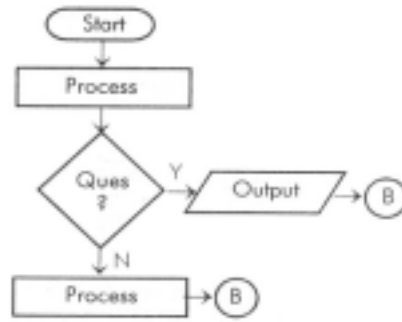
Program flow charts should use conventional symbols.



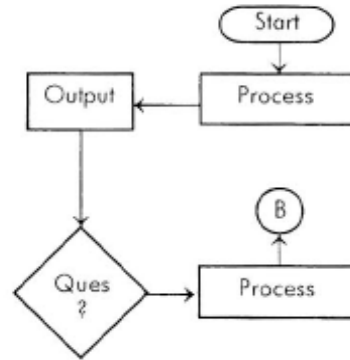
**Rule 2**

The logic of a program flow chart should flow from top to bottom and from left to right.

**Good Logic**

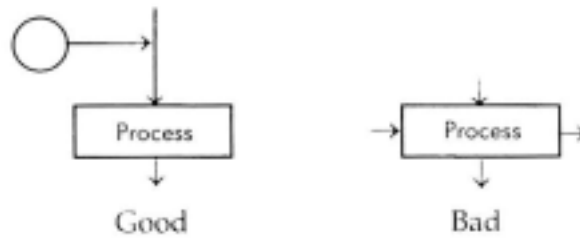


**Bad Logic**



**Rule 3**

Each symbol should have one entry point and one exit point.



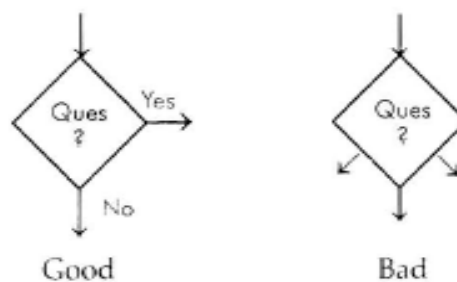
**Rule 4**

Instructions within symbols should be in language.



**Rule 5**

Clearly label the exits of a decision symbol.





## Advantages of Flow Charts

Flow charts are used for a broad variety of applications in different types of work. These give a clear graphical/pictorial representation of the various paths that must be followed to perform the acts to accomplish the goals of the program.

Flow charts are invaluable at the time when modifications must be made to the original program to perform additional services not planned originally.

Flow charts are language independent. Flow charts are a visual representation, and hence provide a convenient alternative to the usual narrative description for a program of system.

Flow charts offer a controllable level or detail. They are usable from the most summary systems level to the most detailed programming level.

## Drawbacks of Flow Charts

Flow charts are something new and strange to work with for beginners. When modifications are made in the original program, corresponding changes must be made in the flow charts of the program in the documentation.

Flow charts may not reveal significant steps to be followed in actual coding. Flow charts are often cumbersome to use and costly to produce. Flow charts do not constitute a programming language, they are person-to-person means of communication, not person-to-computer. Flow charts are difficult to produce at a summary level.

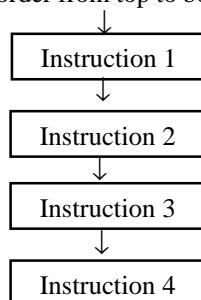
## Logical Constructs used in Flow Charts

The three types of logical constructs are:

- Sequential logic
- Selective logic
- Iterative logic

### Sequential Logic

The instructions are executed in order from top to bottom.

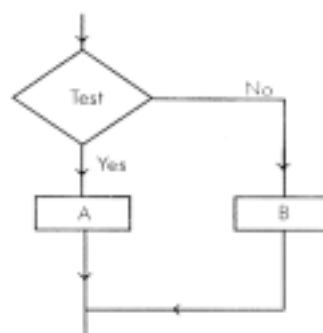


### Selectional Logic

This employs a number of structures called if structures, each of which is essentially a selection of one, out of several alternatives. This is equivalent to the code:

```

IF test
    THEN A;
ELSE B;
end if
  
```

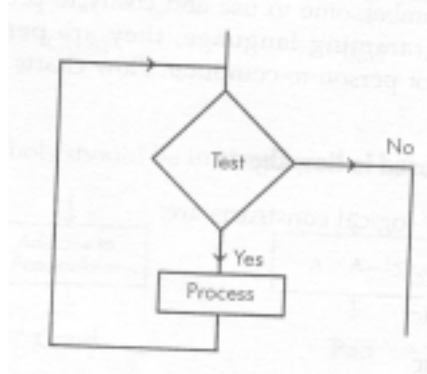


### Iterative Logic

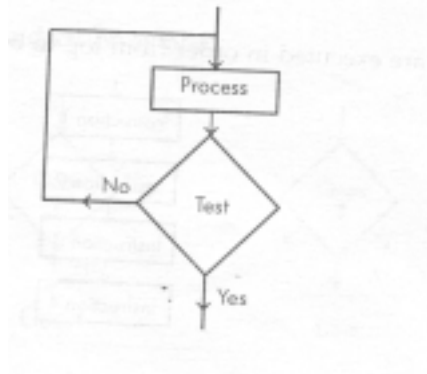
This involves the structures involving loops. Iterative construct is further categorized as: Do While-End do, Repeat-Until, and For-Next loops.

While test

```
do process;  
end do;
```

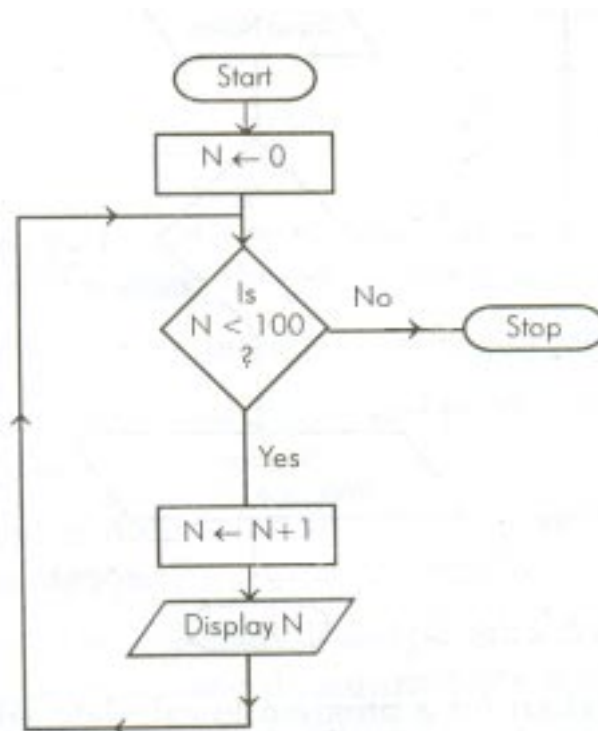


```
repeat process;  
until test;
```

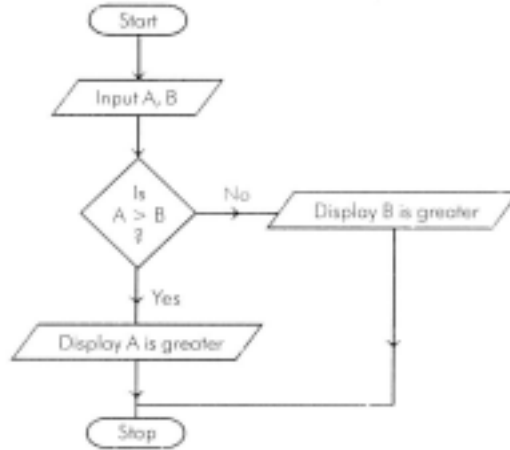


### Flow Chart Examples

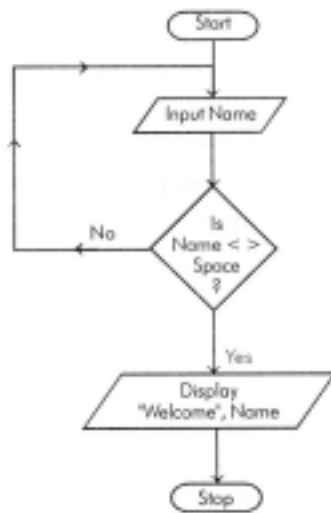
**Example 1.** Draw a flow chart to print first 100 numbers using Do While-End do logic.



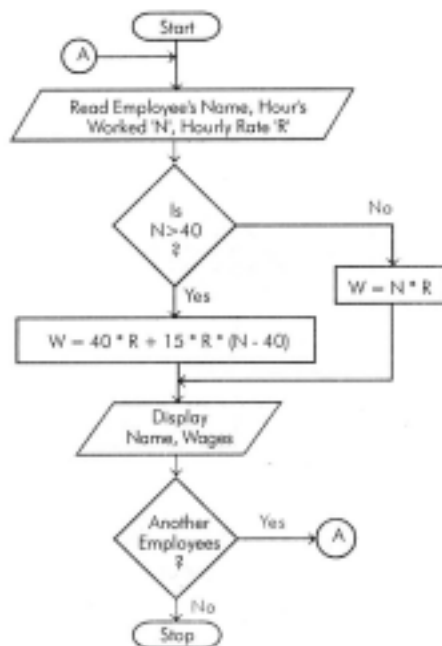
**Example 2.** Draw a flow chart to print the greater among two numbers.



**Example 3.** Draw a flow chart to allow the user to enter a non-blank name and display a welcome message for the user on the screen.



**Example 4.** Flow chart for a program to calculate salary.



## Types of Flow Charts

The two major varieties of flow charts used presently in practice are:

- System flow charts
- Program flow charts

### System Flow Chart

- In system flow charts, the unit of data transformation is usually an operation, i.e., it usually shows the work done by an entire computer program.  
e.g.: Sorting a file of data, Inverting a matrix, Producing a report.
- System charts stress on what data is used and produced at various points in a sequence of operations.
- It represents the flow of documents, the operation or activities performed, the persons or work station.
- It is an important tool of system analysis and plays a key role in the evaluation of existing system, designing, and documentations of new systems.
- System flow charts are usually prepared as an aid to the management and systems analysts.

### Program Flow Charts

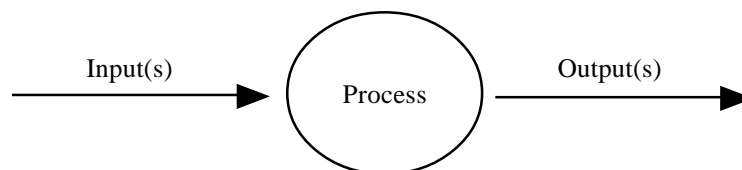
- In program flow charts the unit of data transformation is usually an operation or short sequence of operations that a computer performs.
- Program flow charts stress on how data is transformed.
- Such a diagram provides complete and detailed sequence of logical operations, to be performed in the central processing unit of the computer for executing the program.
- Generally, the programmer will use these flow charts to translate the elementary steps of a procedure into a program of coded instructions.

---

## 6.7 INPUT PROCESS OUTPUT ANALYSIS

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Every process can be thought of as an agent that takes some input(s) and transforms it (them) into output(s) as shown below:



The input-process-output analysis of a system is vital to understand, characterize and design a system. Therefore, it is extensively used in the system analysis and design. Under this approach, the entire system is broken down into small processes. For each process the set of inputs and outputs are identified. The same is expressed using DFD (Data Flow Diagrams). If a process is complex to interpret it maybe further broken down into simpler processes repeatedly until each process is simple enough to be handled separately.

### Student Activity 2

1. What is a flow chart?
2. Describe various flow chart symbols.
3. Describe the rules for drawing flow charts.
4. What are the draw backs of flow charts?
5. Describe the logical constructs used in flow charts.

6. Describe various types of flow charts.
7. Write a short note on Input-process-output analysis.

---

## 6.8 SUMMARY

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A program is a series of instruction that perform a particular task. The task of developing programs for the solution of computation problems is referred to as programming. The steps involved in writing computer programs are problem identification, task and data analysis, output identification, designing the solution data validation, Implementation, debugging final documentation and maintenance. A good program should be accurate, reliable, efficient, robust, reusable, maintainable and readable. The main function of a computer program is data processing. Various types of data include constants and variables.

Flow charts are the pictorial description of program logic. The symbols used in a flow chart include terminal box-to represent the beginning and end of a program; Input/output box-to represent any function of an input/output device; processing symbol-to represent instructions that perform a processing function; decision box-to document those points where a branch to alternate paths is shown; connectors-to represent an entry to, or an exit from another part of the program flow chart; flow lines-to connect the sequence of logical setups; and predefined box-to show a group of operations not detailed in the particular set of flow charts. Flow charts offer a controllable level of detail but still are something strange to work with for beginners. The logical constructs used in flow charts include sequential logic, selective logic and iterative logic. The two major varieties of flow charts are system flow charts and program flow charts.

Every process takes some input (s) and transforms it (them ) into output (s). The input-process-output analysis of a system is vital to understand, characterize and design a system.

---

## 6.9 KEYWORDS

---

**Program:** A series of instructions that perform a particular task and is recorded in some form on a computer disk.

**Programming:** The task of developing programs for the solution of computation problems.

**Programmer:** A person engaged in the activity of programming.

**Constant:** Data which is predetermined before a program is used.

**Variable:** Data which may change or be assignment different values as the program runs.

**Flowchart:** Pictorial representation of program logic.

---

## 6.10 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks:**
  - (a) A sequence of instructions in order to carry out defined task is referred to as\_\_\_\_\_
  - (b) Data which is predetermined before a program is used is known as\_\_\_\_\_
  - (c) \_\_\_\_\_is the pictorial description of program logic.
  - (d) The \_\_\_\_\_analysis of a system is vital to understand, characterize and design a system.
2. **State: True or False:**
  - (a) A good program must do what it is supposed to do.
  - (b) The code in the program must be well laid out and explained with comments.
  - (c) Each variable type occupies same storage in RAM.

- (d) Flow charts are not a parts of program documentation.
- (e) The logic of a program flow chart should flow from top to bottom and from left to right.

### **Answers (Unsolved Questions)**

1. (a) Program (b) Constants (c) Flow chart (d) Input process output
2. (a) True (b) True (c) False (d) False (e) True

### **Detailed Questions**

1. Define a program, programming and programmer.
2. What do you mean by data declaration?
3. What is a flow chart? Describe its various types.
4. What is the used of predefined box in a flowchart?
5. Describe the function of a connector in the flow chart.
6. What are the advantages of flow charts.
7. Describe various logical constructs used in flow charts.
8. Draw a flow chart to print prime numbers between 1 and 100.
9. Draw a flow chart to calculate amount using formula  $A = P(1+r/100)^n$ .

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## **6.11 FURTHER READINGS**

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Richard Holowczak, *Programming Concepts - A Brief Tutorial for New Programmers*, <http://cisnet.baruch.cuny.edu/holowczak/classes/programming>.

Manoj Kumar, M. Shamir Bhudookan, *Information Technology for 'O' Level*, Editions De L'Ocean Indien.

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# UNIT

# 7

## PROGRAMMING CONCEPTS

### LEARNING OBJECTIVES

After studying this unit, you should be able to understand:

- Various techniques of program design.
- Linear and structured programming.
- Basic constructs of structured programming.
- The modular design of programs and communication between modules design.
- The requirements of module design.

### UNIT STRUCTURE

- 7.1 Introduction
- 7.2 Program Design Techniques
- 7.3 Programming Techniques
- 7.4 Modular Design of Programs
- 7.5 Module Design Requirements
- 7.6 Summary
- 7.7 Keywords
- 7.8 Review Questions
- 7.9 Further Readings

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## 7.1 INTRODUCTION

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A set of program design concepts has evolved over the past three decades. Although the degree of interest in each concept has varied over the years, each has stood the test of time. Each provides the program designer with a foundation from which more sophisticated design methods can be applied. In this chapter we will discuss various techniques of program design. The concept of modularity will also be discussed.

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## 7.2 PROGRAM DESIGN TECHNIQUES

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### Top Down Design

The top down design approach is based on the fact that large problems become more manageable if they are divided into a number of smaller and simpler tasks which can be tackled separately. What is really required is that each of these parts have the properties of a module.

Top down design approach is performed in a special way. The main program is written first. It is tested before sub-programs are written. To do this, the actual sub-programs are replaced with stubs. The stubs simply test to see if the data is passed correctly.

After the main program is written and checked, each module is written and tested in turn. This should first be done without the main program in order to isolate a stub if an error occurs.

A simple main program is written to test the sub programs. If the modules run properly, then it is tested with the main program.

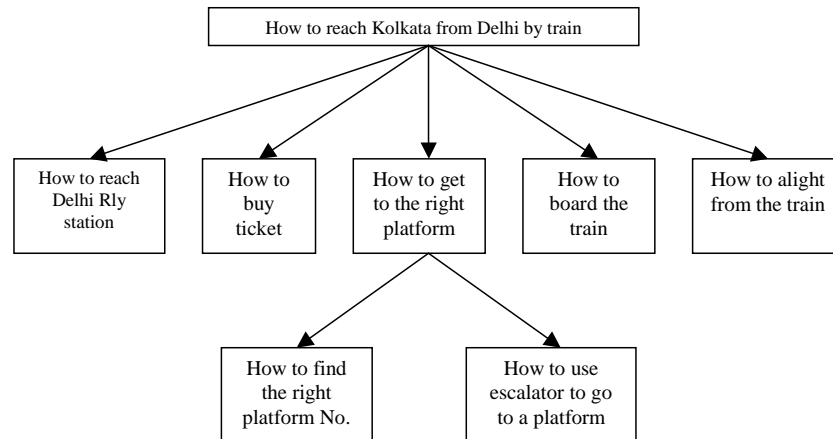
If the module and the main program run properly then the next module is written and checked and so on.

To describe the program at its highest level, we use something called the "universal program", and then by a process of "stepwise refinement" work out the details of each part of the program.

### Example 1

**Problem:** How to reach Kolkata from Delhi by train?

Let us apply top-down design approach on this problem. Break this problem into smaller problem as follows:



**Figure 7.1: Top-down Design**

The problem (whole) has been broken into smaller problems each easily manageable and solvable. If need be, these smaller tasks may be further broken into still smaller tasks. These smaller tasks - viz. how to buy a ticket, can be solved easily than the whole problem at a time.

### Advantages

1. At each stage, the sub programs are tested by themselves and then the main program is tested. Whenever modules are added, they are tested with the main program so if any error occurs it will probably be in a module only and this will be easy to debug.
2. It is desirable for modules to be kept small in general. As far as possible a module should be less than 100 statement lines long.

### Top Down Implementation

1. Start with a very simple and short statement of what the program does. This is the top level in the design.
2. Go to the next level of details for the whole program, try to describe the program as sequence, selection or repetition of main tasks. Each of these tasks should be complete in itself but will be described in greater detail at the next level of program development. These tasks are called module. A module should have just one entry point and just one exit point.
3. This process is repeated step by step, and at each step all the modules at that level are refined or developed to the next level of details. This is called step-wise-refinement. The step-wise-refinement stops when there are sufficient details for the procedure to be written in a programming language.
4. At the intermediate steps in the refinement, pseudo code or flowcharts are used to represent the procedure.
5. At every stage unnecessary details are left out.
6. It is important that at each stage the individual modules are checked to make sure that they perform the correct actions on the appropriate data.

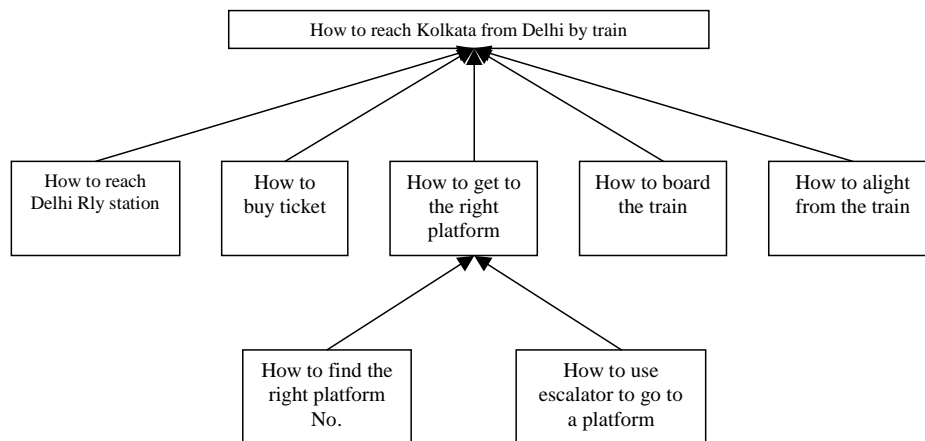


## Bottom Up Design

A bottom up approach would be to write the most basic subroutines in the hierarchy first and then use them to make more sophisticated subroutines.

### Example 2

**Problem:** How to reach Delhi to Kolkata by train?



**Figure 7.2: Bottom-up Approach**

The pure bottom up approach is generally not recommended because it is difficult to anticipate which low level subroutines will be needed for any particular program. It can often be a useful first step to produce a library of basic functions and procedures before embarking on a major project.

In the bottom up approach it is usually assumed that the basic routines created will be general enough to be used more than once.

Using the subroutines, to construct a program, save yourself repeating the same lines of code by reusing it.

A routine that is used many times has a very difficult status to those higher in the hierarchy. It is more like a basic instruction in the programming language than a large scale program component.

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## 7.3 PROGRAMMING TECHNIQUES

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### Linear Programming

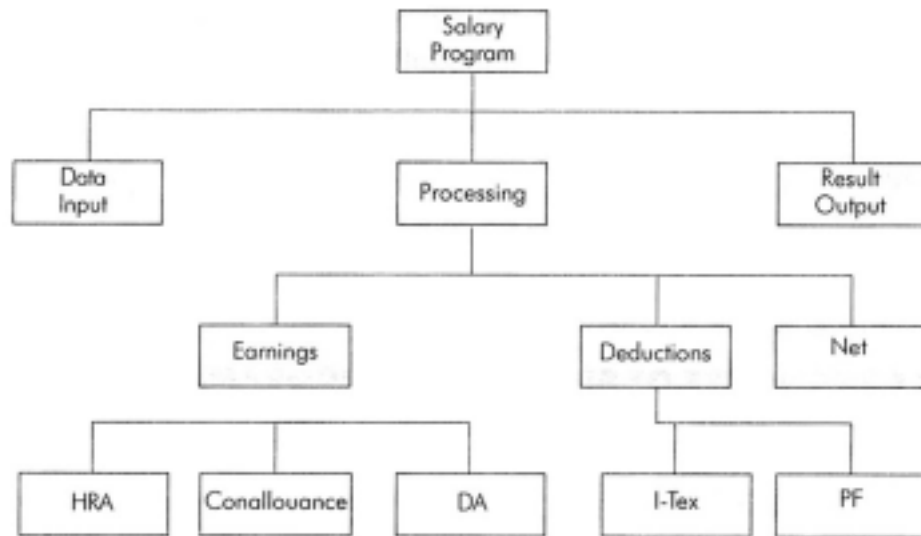
Linear program is a method for straight forward programming in a sequential manner. This type of programming does not involve any decision making. A general model of these linear programs is:

1. Read a data value
2. Compute an intermediate result
3. Use the intermediate result to compute the desired answer
4. Print the answer
5. Stop.

### Structured Programming

Structured programs are the ones that are divided into functional modules and arranged in an hierarchical order instead of programs written in a sequence.

One of the most versatile properties of a digital computer is that it can make a "decision", thus creating a branching point. There are also times when it becomes necessary for a program to "Look Back" over a set of statements, a number of times. If branching and looping can be used, then much more complex iterative algorithms can be written, which in turn results in more complex programs.



There are procedures that can be used for writing these complex programs that make them much less error prone and much easier to debug. The technique for writing such programs are referred to as Structured programming.

Structured programming refers to the process in which we break the overall job down into separate piece of modules. The above figure shows, that how a salary program is broken down into number of small modules.

These modules, in turn, are broken down into smaller pieces which can also be further subdivided. Modules must be chosen in such a way that we can specify how they have to interact. In effect, there is a contact between each pair of modules.

This contact specifies two things:

1. What the module will do?
2. What assumptions is it making about the behavior of the other modules? In particular, we must specify explicitly what inputs a particular module is to receive from the various other modules and what outputs it is to provide for them.

#### **Advantages to Structured Programming**

1. Decreases the complexity of the program by breaking it down into smaller logical units.
2. Allows several programmers to perform coding simultaneously.
3. Allows common functions to be written once and then use in all the programs needing it.
4. Decreases debugging time, because modules make it easier to isolate errors.
5. Amendments to single modules do not affect the rest of the program.
6. It saves time to use modular structures rather than using self made structure. If a job can be done well by using what is already available and known to be well tried and tested then trying out something new for sake of it, is a waste of effort.
7. Standard method; so, less time is required in writing programs.
8. It is easier to name modules in such a way that they are easy to find in the documentation, and consistent.

## Basic Constructs of Structured Programming

There are three program constructs used normally in structured programs. They are:

1. Sequence
2. Selection
3. Repetition (Iteration Logic)

### Sequence

Structure consists of the action followed by another till the desired result is obtained.

Statement 1

Statement 2

-----

-----

Statement n

### Selection

- This construct indicates a decision one way, two way or multi-way selection.  
In conditional execution there is a need carry out a logical test and then take some particular action which depends upon the result of that test.
- Selection is a special kind of conditional execution in which a particular group of statements is chosen from several available groups.  
If (condition is true) then  
    sequence of statements  
else  
    another sequence of statements  
end if
- The selection structure consists of a test for a condition followed by two alternative paths for the program to follow. The program selects one of the program-control paths depending on the outcome of the test condition. After performing one of two paths, the program control returns to a single point. This pattern can be termed as if ... else because of its logic.

### Iteration

- In most cases programs require that a group of consecutive instructions be executed repeatedly until some logical condition has been satisfied. Generally, the required number of repetitions are not known in advance. This type of repetition is known as conditional looping.
- Another type of repetition is unconditional looping. In this, the execution of a group of consecutive instructions is repeated for some specified number of times, this is done by for loop.
- The repetitive structure can also be called loop and represents an iterative process. Iterative logic refers to structure involving loops of which, there are two types:
  1. do while (condition is true)  
    a sequence of statements  
    end do
  2. repeat  
    a sequence of statements  
    until (condition is true)

These three coding structures allow a program to be read from top to bottom, making the logic of the program more visible for checking and maintenance.

These control structures are easy to use because:

1. They are easy to recognize when looking for solutions to programming problems.
2. They are simple to deal with because they have just one entry point and just one exit point.
3. They are free of the complications of any particular programming language.

### **Student Activity 1**

1. List various program design techniques.
2. Describe top down design technique.
3. Describe bottom-up design technique.
4. Define linear program and structured program.
5. What are the basic constructs of structured programming?

---

## **7.4 MODULAR DESIGN OF PROGRAMS**

---

One of the key concepts in the application of programming discipline is the design of a program as a set of units referred to as blocks or modules.

A program module is defined as the part of a program that performs a separate function, e.g., input, input validation, processing of one type of input.

A program module maybe quite large, so that it maybe further divided into logical sub modules. The process of subdivision continues until all modules are of manageable size in terms of complexity of logic and numbers of instructions.

Programs can be logically separated into the following functional modules:

1. Initialization
2. Input
3. Input data validation
4. Processing
5. Output
6. Error handling
7. Closing procedure

The modules reflect a logical flow for a computer program. After initialization, processing proceeds logically with input, input validation, various processing modules and output. Error handling maybe required during execution of any module.

### **Basic Attributes**

A module is a collection of program statements with five basic attributes.

- An input
- An output
- A function
- A mechanism
- Internal data

## Control Relationship between Modules

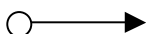
- The structure charts show the interrelationships of modules by arranging them at different levels and connecting modules in those levels by arrows. An arrow between two modules means the program control is passed from one module to the other at execution time. The first module is said to call or invoke the lower level modules.
- There are three rules for controlling the relationship between modules:
  - There is only one module at the top of the structure. This is called the root or boss module.
  - The root passes control down the structure chart to the lower level modules. However, control is always returned to the invoking module and a finished module should always terminate at the root.
  - There can be no more than one control relationship between any two modules on the structure chart, thus, if module a invokes module b, then b cannot invoke module a.

## Communication between Modules

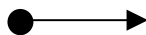
Two types of informations are passed between modules:

- Data
- Control

Data is shown by an arrow with an empty circle at its tail.



Control items are used to direct program control and show error or end of file conditions. This control couple is shown by a filled-in circle on the tail of arrow.




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## 7.5 MODULE DESIGN REQUIREMENTS

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A hierarchical structure should present many advantages in management, development, testing and maintenance. However, such advantages will only occur if the module design reflects certain particular qualities like independence and strength.

- **Coupling:** Coupling means the strength of relations between modules. Modules should have little dependence on other modules in a system so that any change in one module has limited effect on any other modules. It means that coupling should be minimized.
- **Cohesion:** Cohesion means strength of relations within a module. Modules should carry out a single processing function, i.e., cohesion should be maximized.
- **Span of:** It means number of modules subordinate to a calling module. Modules should interact with and manage the functions of a limited number of lower level modules. Limit of span of control is 5 to 7 modules.
- **Size:** The number of instructions contained in a module should be limited so that module size is generally small.
- **Shared Use:** Functions should not be duplicated in separated modules, but established in a single module that can be invoked by any other module when needed.

### Student Activity 2

1. What is a program module?
2. What are the functional modules of a program?
3. What are the basic attributes of a program model?
4. Describe the rules for controlling relationship between various modules of a program.
5. Describe various requirements of module design.

---

## 7.6 SUMMARY

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In the top down design technique, the main program is written and tested before sub programs are written, then each module is written and tested in turn. A bottom-up approach would be to write the most basic subroutines in the hierarchy first and then use them to make more sophisticated-subroutines. Linear program is a method for straight forward programming in a sequential manner. Structured programs are the ones that are divided into functional modules and arranged in a hierarchical order. Branching and looping allows much more complex iterative algorithms to be written, which in turn results in more complex programs. Structured programming decreases the complexity of program by breaking-down into smaller logical units, reduces debugging and program writing time. The three program constructs used in structured programs are sequence, selection and repetition (iteration) logic.

A program module is the part of a program that performs a separate function. The structure charts show the interrelationships of modules by arranging them at different levels. Two types of informations are passed between modules: Data and control.

The qualities reflected by the module design include coupling, cohesion, span of, size and shared use.

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## 7.7 KEYWORDS

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**Universal Program:** The program at its highest level.

**Linear Program:** A method for straight forward programming in a sequential manner which does not involve any decision making.

**Structural Program:** programs that are divided into functional modules and arranged in an hierarchical order.

**Structured Programming:** The process of breaking the overall job into separate pieces of modules.

**Program Module:** The part of program that performs a separate function.

**Coupling:** Strength of relations between modules.

**Cohesion:** Strength of relations within a module.

---

## 7.8 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks:**

- (a) In\_\_\_\_\_ approach, a simple main program is written first to test the sub programs.
- (b) In top down design, modules should be kept\_\_\_\_\_
- (c) Using the\_\_\_\_\_, to construct a program, save yourself repeating the same lines of code by reusing it.
- (d) \_\_\_\_\_are divided into functional modules and arranged in an hierarchical order.
- (e) \_\_\_\_\_means the strength of relations between modules and \_\_\_\_\_means the strength of relations with a module.

2. **State : True or False:**

- (a) A bottom up approach would be to write the most basic subroutines in the hierarchy first and then use them to make more sophisticated subroutines.
- (b) Linear programming also involve decision making.

- (c) Branching and looping can be used to write more complex programs.
- (d) The iteration structure is a special kind of conditional execution of a group of statements.
- (e) Functions may be duplicated in separated modules.

### Answers (Unsolved Questions)

1. (a) top down design (b) small (c) Subroutines (d) Structured programs (e) Coupling, Cohesion.
2. (a) True (b) False (c) True (d) False (e) False.

### Detailed Questions

1. What is the difference between top down and bottom-up design approach?
2. What are the advantages of top down design?
3. Describe the top-down Implementation.
4. Give a general model of linear programs
5. Define structural programming.
6. What is a program module.
7. Define conditional looping.
8. What is Iterative logics?
9. How does two modules communicate?
10. Differentiate between coupling and cohesion.

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## 7.9 FURTHER READINGS

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Peter Van Roy and Seif Haridi, *Concepts, Techniques, and Models of Computer Programming*, MIT Press.

Richard Holowczak, *Programming Concepts - A Brief Tutorial for New Programmers*, <http://cisnet.baruch.cuny.edu/holowczak/classes/programming>.

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# UNIT

# 8

## PRESENTATION GRAPHICS

### LEARNING OBJECTIVES

After studying this unit, you should be able to understand:

- How to create a presentation on PC using wizard or template. Or a blank presentation?
- Components of power point screen.
- Auto content wizard.
- Different views available in power point.
- Displaying the slides.
- Saving a presentation.

### UNIT STRUCTURE

- 8.1 Introduction
- 8.2 Creating a Presentation on PC
- 8.3 Creating a New Presentation
- 8.4 PowerPoint Views
- 8.5 Creating a Presentation Using a Template
- 8.6 Creating a Blank Presentation
- 8.7 Opening an Existing Presentation
- 8.8 Displaying the Slides
- 8.9 Saving a Presentation
- 8.10 Closing a Presentation
- 8.11 Summary
- 8.12 Keywords
- 8.13 Review Questions
- 8.14 Further Readings

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## 8.1 INTRODUCTION

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PowerPoint is a presentation software package included in Microsoft Office suite. It is used to create professional quality presentations. A presentation is a structured delivery of information. Presentation can be reproduced on transparency, paper or on-screen. PowerPoint features can be used to work on slides, organize presentation contents with outlines and generate speaker notes and audience handouts. Teachers, professors, politicians and sales representatives make presentations to sell their concepts. Some other notable presentation software packages are Harvard Graphics and Lotus Freelance.

PowerPoint 2000 helps you structure the ideas and information that you may want to convey to your audience. It lets you create the contents of your presentation by typing/inserting text, pictures, sounds and animations. With it, you can add visual images, supporting documents and audio recordings to enhance your presentation. PowerPoint makes the creation of any presentation simple by providing built-in professional designs called AutoLayouts and templates. You can also create different versions of a presentation for different audiences and build your contents in either a text-based outline view or a design based slide view.

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## 8.2 CREATING A PRESENTATION ON PC

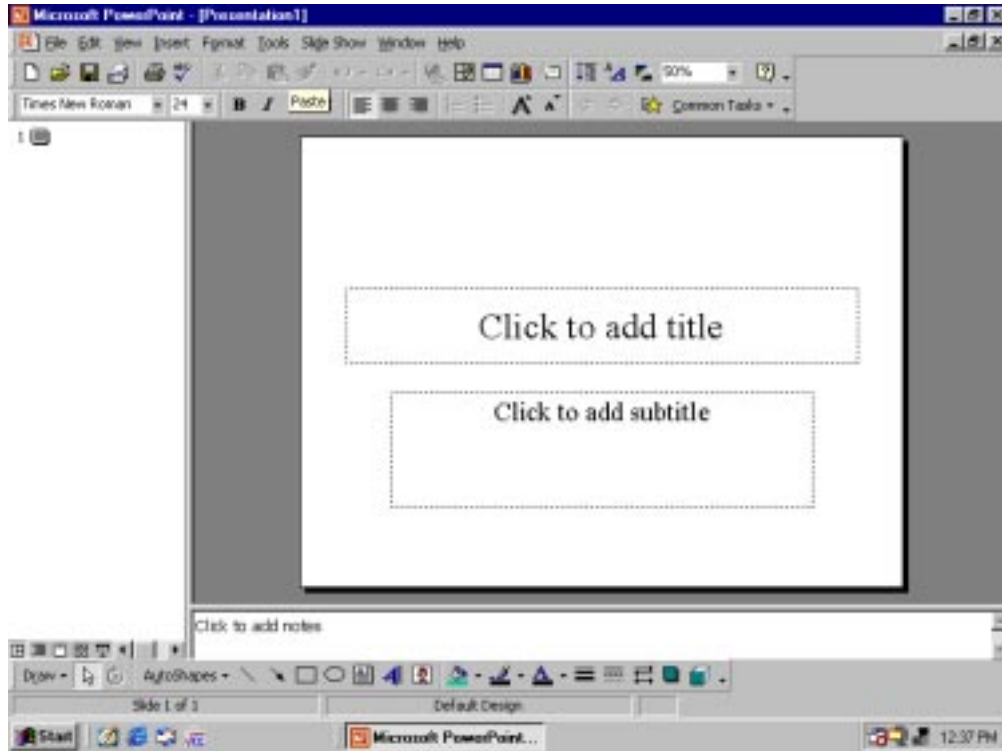
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Before you start creating presentations, you need understand the layout of the PowerPoint screen. The PowerPoint screen displays several toolbars and other basic screen elements (refer to the Figure on next page).



The components of a PowerPoint screen are:

- **Menu Bar:** It is similar to the menu bar in other Microsoft Office applications having File, Edit, View, Insert, Format, Tools, Window, Help menus.
- **Toolbars:** Toolbars are collections of buttons that you can click and activate some of the most common commands in PowerPoint. These commands can also be activated through menus.



- **Status Bar:** It is located at the bottom of the PowerPoint screen. It displays the number of the current slide and the name of the template on which the presentation is based.
- **Vertical Scroll Bar:** It helps you to scroll through the slides in a presentation.
- **Slide Buttons:** They are located at the bottom of the vertical scroll bar and help you to display the previous and next slides.

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## 8.3 CREATING A NEW PRESENTATION

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PowerPoint offers a variety of ways to create a new presentation. You can create a presentation by using wizard or a template. You can also create a blank presentation.

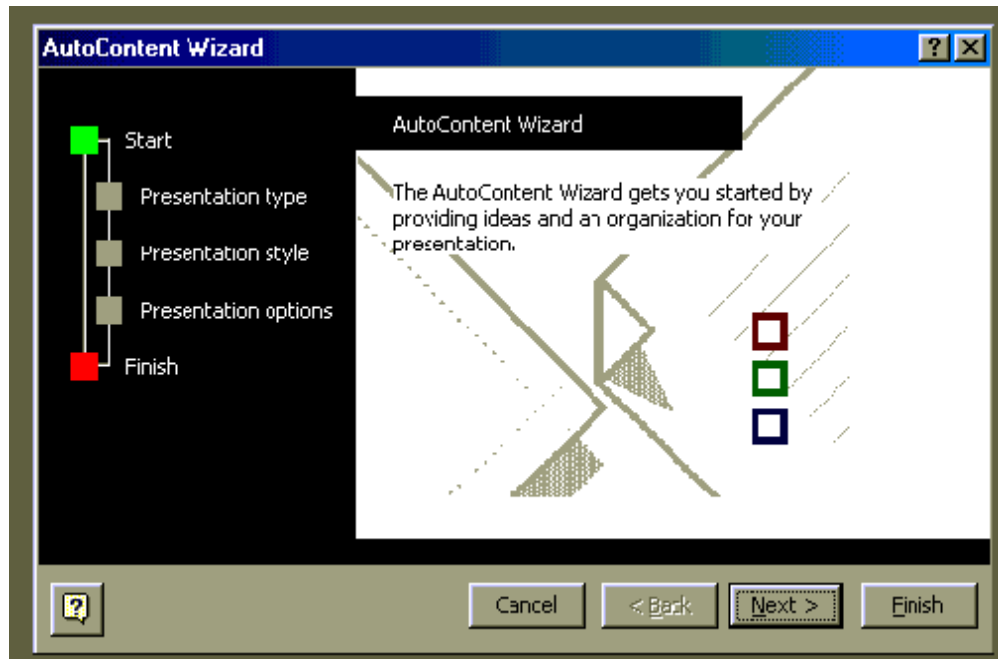
### Starting AutoContent Wizard

Everytime you start PowerPoint 2000, the PowerPoint dialog box is displayed which offers methods of starting the session. You can use it to choose the method for starting your PowerPoint 2000 session. The main choices are Creating Blank Presentation or Opening an Existing Presentation.

The first option in the PowerPoint dialog box under **Create a new presentation using** is the AutoContent Wizard. The AutoContent wizard is a guide composed of several screens that help you to create a professional presentation quickly and easily. It basically takes you through series of questions. You can choose options to create a good presentation.

The steps to create a presentation using the AutoContent Wizard are:

1. Select the AutoContent Wizard option from the PowerPoint dialog box.  
A dialog box as shown in the figure is displayed.



The AutoContent Wizard can create 8 to 12 slides with suggested content that you can change.

2. Click on the Next Button.

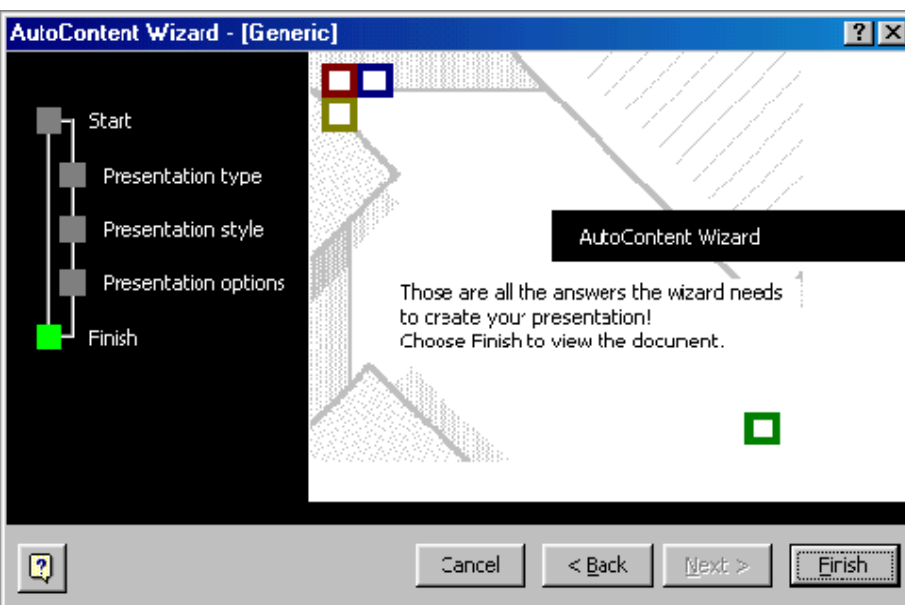
A dialog box as shown in the figure is displayed.

Press a category button for the type of presentation you are going to create and then select the presentation that best suits your need.

3. Select the Presentation style in the Next screen as shown:

The given screen shown on next page helps choose the type of output you will be using and the wizard will select the best color scheme for your presentation. You can change the look of your presentation by applying other color schemes available in the format menu.

4. Enter data into each text box and click on the Next Button.



n by the wizard for you. You

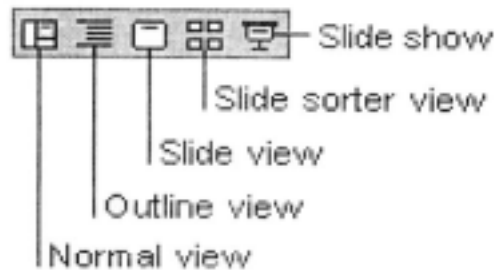
n your presentation will be

The Presentation Created by the wizard for you will be seen in the Normal view as displayed in the figure below.



## 8.4 POWERPOINT VIEWS

Microsoft Power Point comes with different views to help you while you are creating a presentation. The two main views you can use in PowerPoint are normal view and slide sorter view. To easily switch between views, you click the buttons at the lower left of the PowerPoint window.



### Normal View

Normal view contains three panes: the outline pane, the slide pane, and the notes pane. These panes let you work on all aspects of your presentation in one place. You can adjust the size of different panes by dragging the pane borders.

—Outline pane

—Presentation in  
normal view

—Notes pane

**Outline Pane:** Use the outline pane to organize and develop the content of your presentation. You can type all of the text of your presentation and rearrange bullet points, paragraphs, and slides in this pane.

**Slide Pane:** In the slide pane, you can see how your text looks on each slide. You can add graphics, movies, and sounds, create hyperlinks, and add animations to individual slides.

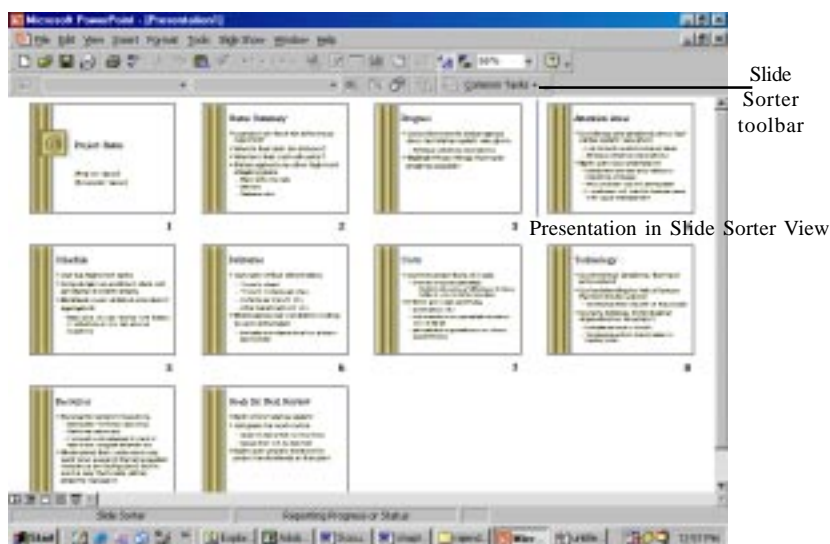
**Notes Pane:** The notes pane lets you add your speaker notes or information you want to share with the audience. If you want to insert graphics in your notes, you must add the notes in notes page view.

These three panes are also displayed when you save your presentation as a Web page. The only difference is that the outline pane displays a table of contents so that you can navigate through your presentation.

## Slide Sorter View

In slide sorter view, you can see all the slides in your presentation on screen at the same time, displayed in miniature. This makes it easy to add, delete, and move slides, add timings, and select animated transitions for moving from slide to slide. You can also preview animations on multiple slides by selecting the slides you want to preview and then clicking **Animation Preview** on the **Slide Show** menu.

At any time while you are creating your presentation, you can start your slide show and preview your presentation by clicking Slide Show.



## Change the Size to the Panes in Normal View

Do one of the following:

1. To change the size of a pane in normal view, drag the right border of the outline pane or the top border of the notes pane.
2. At the lower left of the PowerPoint window, click Outline View to enlarge the outline pane or click Slide View to enlarge the slide pane.

## What Happen to Slide View and Outline View?

Slide view and outline view have been combined in normal view.

If you would like to use the old slide or outline view, you can add the command to a menu or toolbar.

1. On the **Tools** menu, click **Customize**, and then click the **Commands** tab.
2. In the **Categories** box, click View.

3. Drag the **Outline** or **Slide** command from the **Commands** box to the menu or toolbar you want to add it to.

If you are adding the command to a menu, when the menu displays a list of commands, point to where you want the command to appear, and then release the mouse.

### Student Activity 1

1. What is power point?
2. Describe various components of a power point screen.
3. How will you create a presentation using Auto content wizard?
4. Describe various views available in power point.

---

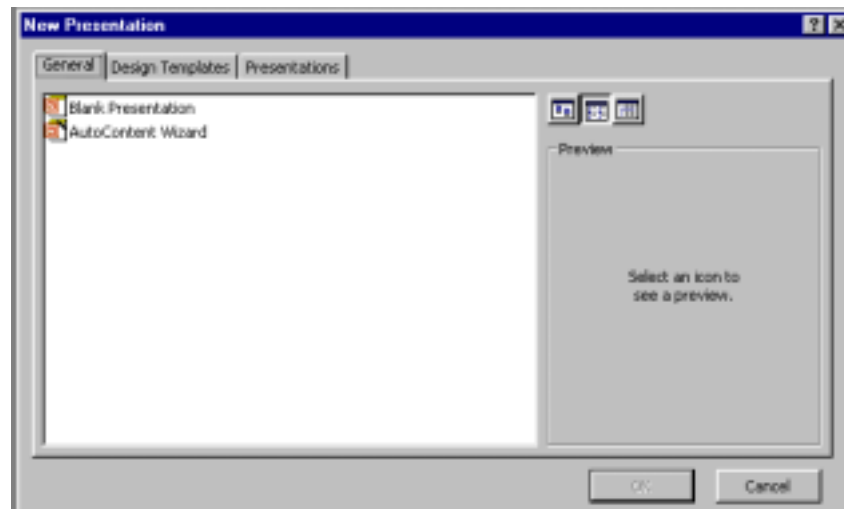
## 8.5 CREATING A PRESENTATION USING A TEMPLATE

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A presentation template is a saved presentation file that contains predefined slide and title masters, color schemes and graphic elements. The presentation templates also includes masters with pre-formatted fonts and styles.

The steps to apply a template to a new presentation are:

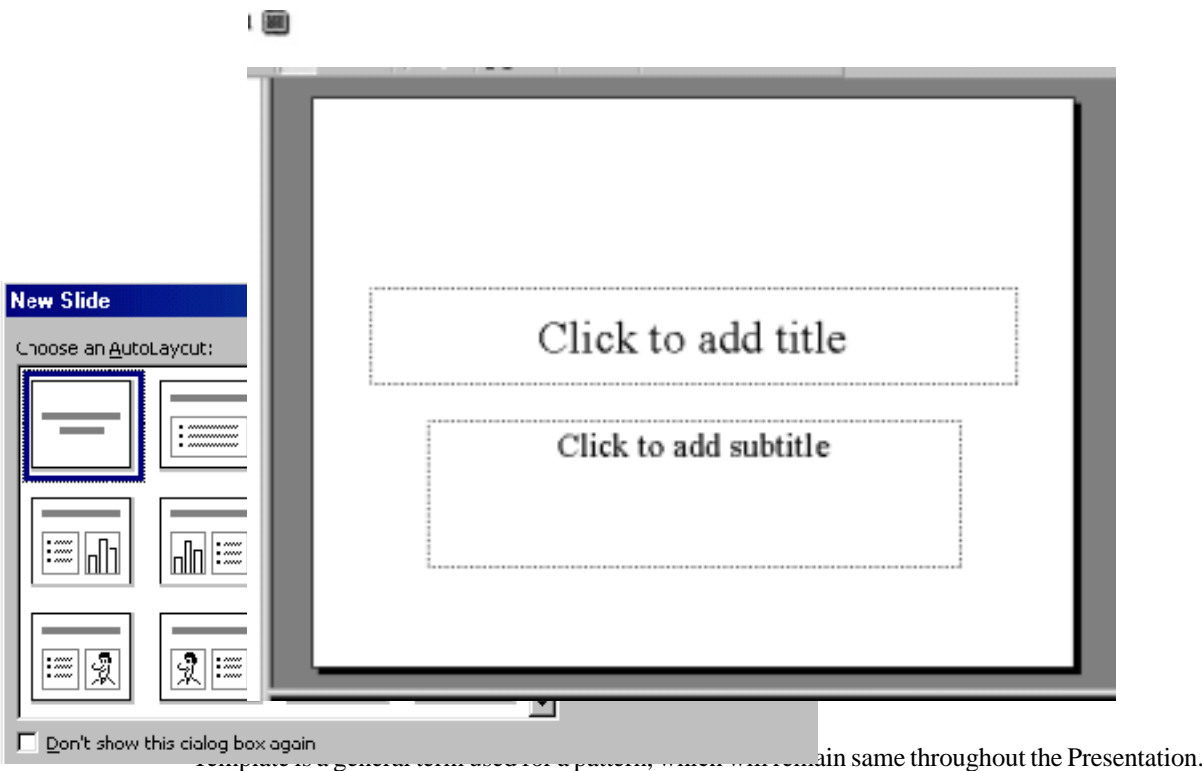
1. Select the Template option from the PowerPoint opening dialog box. The following screen appears.



2. Click on the Design Template tab to display various design templates.

3. Select the template and click on the OK button to activate the template. The New Slide box is displayed as shown in the figure below.

4. Select the layout from the New Slide dialog box and click OK button.  
A slide as shown in the figure below will be displayed



template is a general template used for a pattern, which will remain same throughout the Presentation. All the slides will have the same background as selected by you.

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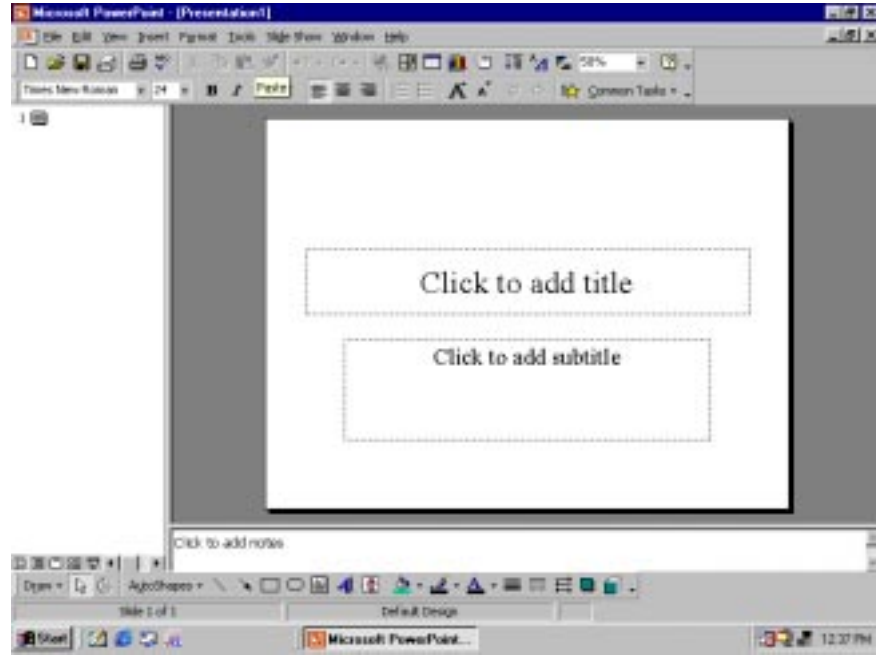
## 8.6 CREATING A BLANK PRESENTATION

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The third option in the PowerPoint dialog box is creating a blank presentation. The steps in creating a blank presentation are as follows:

1. Select the New option from the File menu. The New Presentation dialog box is displayed.
2. Select the General tab and double - click on the **Blank Presentation icon**. The New slide dialog box is displayed.
3. Select the suitable layout and click on the **OK button**.

A slide as shown in the figure will be displayed.



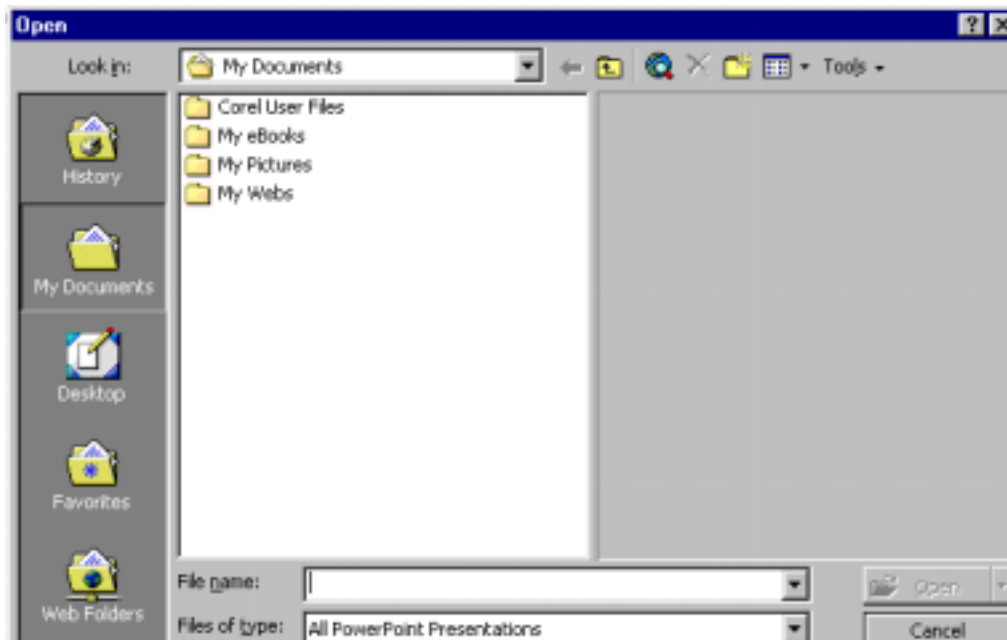
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## 8.7 OPENING AN EXISTING PRESENTATION

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The steps to open an existing presentation are:

1. Select the Open an existing presentation from the PowerPoint dialog box. The list given below activates. You can select from the list provided to you or you can select from the Open dialog box as shown below.



2. Select the appropriate drive and folder.
3. Type the name of PowerPoint file to be opened in the File name text box or select a file name from the list.
4. Click on the Open button.



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## 8.8 DISPLAYING THE SLIDES

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There are several ways to navigate from slide to slide when you are editing your presentation. The method you choose depends on what view is currently active. The Keyboard or the Mouse can be used to navigate through the slides whichever you find easy to use.

### Using the Keyboard

To navigate through the slides in your presentation, employ the shortcut keys listed in the Table 8.1.

### Using the Mouse

You can also use the mouse to scroll through your presentation. In the **Normal**, **Slide**, and **Note page** views, the vertical scrollbar also contains **Previous Slides** and **Next Slide** buttons. You can click the buttons to move to the previous or next slide.

**Table 8.1**

Key Combination	Movement
Page Up	Positions you back one slide at a time
Page Down	Positions you Forward one slide at a time
Ctrl + Home	Positions you at the beginning of the presentation
Ctrl + End	Positions you at the end of the presentation

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## 8.9 SAVING A PRESENTATION

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You can save the presentation you're working on - whether it's new or you've saved it before - and you can also save a copy of it with a different name or at a different location. You can save any presentation in HTML format so that it can be viewed on the Internet. You can also save a presentation so that whenever you open it, it always starts as a slide show.

The steps to save a presentation are:

1. Select **Save** from the **File** menu.

or

press Ctrl + S

The Save dialog box is displayed as shown in figure below.



2. Enter the File name when the **Save** button gets activated.
3. Click the **Save** button.

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## 8.10 CLOSING A PRESENTATION

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To close a presentation, select the Close option from the file menu. If the current file is unsaved, Power Point will display a dialog box with Yes/No options. Select Yes if you want to save the file, No if you do not want to save the file or Cancel to return to your file without saving it.

### Student Activity 2

1. Write a step wise procedure to create a presentation using a template.
2. Write a step wise procedure to create a blank presentation.
3. How will you open an existing presentation?
4. How will display the slides of a presentation?
5. How will you save a presentation?
6. How will you close a presentation?

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## 8.11 SUMMARY

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The application software that can professional looking visual aids is called presentation. Graphics software. MS-Power point can be started by clicking at start→programs→Microsoft power point. A slide can contain one or more of these component: Titles, Graphs, Drawing objects, clipart and pictures. The slide components that are used for reference are: Handouts note, on lines. A new presentation can be created through one of these methods: (i) Auto content Wizard (ii) Blank presentation. A new slide can be added by either clicking at common tasks option of formatting toolbar, and then selecting new slide option, by clicking at insert menu's new slide option. A presentation in power point can be viewed in any of these views. Normal, outline slide, slide sorter, slide shows and notes page views.

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## 8.12 KEYWORDS

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**Design Template:** A set containing graphics design and color scheme of a presentation.

**Handouts:** Compressed versions of the slides in a presentation.

**Outlines:** Summarized version of slides, that contain only tiles and main text.

**Presentation Graphics Software:** A software that lets one create professional electronic presentation.

**Slide:** An electronic page in electronic presentation

**Slide Show:** Electronic presentation that can run on computer screen or a protection device.

**Speakers' Notes:** Small images of slides along with explanatory notes.

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## 8.13 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks:**
  - (a) Power point is a \_\_\_\_ software.
  - (b) The \_\_\_\_ is a guide that help you to create a professional presentation quickly and easily.
  - (c) The normal view contains three panes: \_\_\_\_, \_\_\_\_ and \_\_\_\_.
  - (d) \_\_\_\_ view allows you to see all the slides in you presentation on screen at the same time.
  - (e) \_\_\_\_ is a pattern which will remain some throughout the presentation.

**2. State : True or False:**

- (a) The two main views of power point are normal view and slides sorter view.
- (b) You can preview you presentation by clicking slide show.
- (c) The presentation templates does not include masters with pre-formatted fonts and styles.
- (d) The keyboard and the mouse can be used to navigate through the slides.
- (e) Slide view and outline view have been combined slide-sorter view.

**Unsolved Answers**

- 1. (a) Presentation (b) Auto content wizard (c) The outline pane, the slide pane, the notes pane (d) Slide sorter (e) Template
- 2. (a) True (b) True (c) False (d) True (e) False

**Detailed Questions**

- 1. What is a slide?
- 2. What is a slide show?
- 3. What is an outline view of slide?
- 4. Describe various panes of slide in normal view.
- 5. How will you open an existing presentation?
- 6. What are the basic components of a slide?
- 7. What is the use of slide sorter view in power point?
- 8. In which pane can you insert speakers notes.

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**8.14 FURTHER READINGS**

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K.K. Shahjahan, *MS-Office*, Excel Books.

Sanjeev Gupta, Shameena Gupta, *Computer Aided Management (Using MS-Office 2003 Tools)*, Excel Books.

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## UNIT

# 9

## DATA COMMUNICATION AND NETWORKING

### LEARNING OBJECTIVES

After studying this unit, you should be able to understand:

- How to describe data communication and its various types.
- Approaches and modes of data transmission.
- Working of modem/fax modem.
- Multiplexing.
- Components and types of computer network.
- Network topology and cables.
- OSI model of network.
- LAN and its popular types.
- Client /server and peer to peer networking.
- Network operating system and network environment.

### UNIT STRUCTURE

- 9.1 Introduction
- 9.2 Data Communication
- 9.3 Multiplexing
- 9.4 Components of Computer Network
- 9.5 Local Area Network (LAN)
- 9.6 Uses of a Network
- 9.7 Topology
- 9.8 Networking Cables
- 9.9 OSI Layout and IEEE
- 9.10 Popular Types of LAN
- 9.11 Inter Networking
- 9.12 Public Networks
- 9.13 Client/Server vs. Peer to Peer Networking
- 9.14 Network Operating Systems
- 9.15 Network Management
- 9.16 LAN in Business Environments
- 9.17 Summary
- 9.18 Keywords
- 9.19 Review Questions
- 9.20 Further Readings

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## 9.1 INTRODUCTION

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Today world is often referred to as global village. All thanks to today's revolutionary technology. Because of today's technology, we can communicate to any portion ion any corner of the world from anywhere in the world. And the credit for all this goes to the communication revolution that has happened in this century, especially in the last thirty years. Advances in the communication technology, have made possible nearly everything we dreamt of.

It is basically communication that makes you take advantage of massive mainframe processing power if you turn your PC into a terminal of a mainframe. It is communication that lets you chat with different people across the globe through an on-line services. It is again communication that

allows you to access huge servers of information on virtually any subject via networks of computers. And that is why this chapter is dedicated to this fascinating combination of communication, computer and networking.

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## 9.2 DATA COMMUNICATION

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Flow of information for purpose of efficient management and business process control requires effective use of computer systems and networking technologies. Even for a simple important exercise of printing any information from a computer by an attached printer to a computer, there is a requirement for error free data transmission from the computer to the printer. The whole concept of data communication is based upon principles of sending data, checking and confirming its receipt following error correction technique to ensure accurate data transmission.

This communication is possible with the approach known as protocols. The data flows between two devices as sequential bits (0 and 1) across a transmission medium say copper wire. These bits are grouped to form a character. A character may be a number, an alphabet or a symbol. As a standard, generally 8 bits form a byte or a character. Each bit (0 or 1) is represented as a voltage level on a transmission medium. As a standard, bit 0 represents a positive voltage and bit 1 represents a negative voltage. These signalling conventions are followed by most of the communicating devices. The most common interface standards are RS232c or V5, X.21 etc. In RS232c signalling standard, voltage level between +5V to +15V represents bit 0 and voltage level between -5 to -15V represents bit 1. During an idle state while the data is not being transmitted, only the electric current flows through a transmission medium (wire). At the instance of data transmission the current in the wireline is intercepted in a particular way to superimpose data that is representable as the voltage levels to traverse towards receiving device.

### Asynchronous Transmission

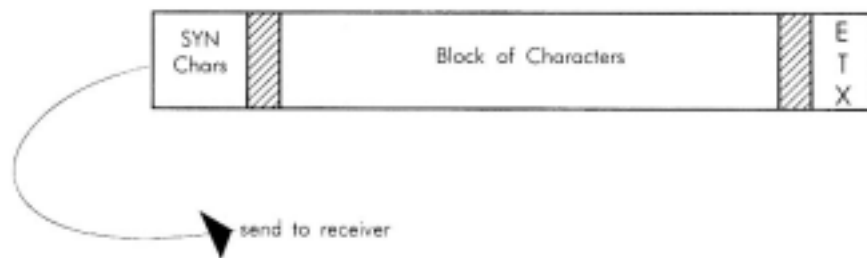
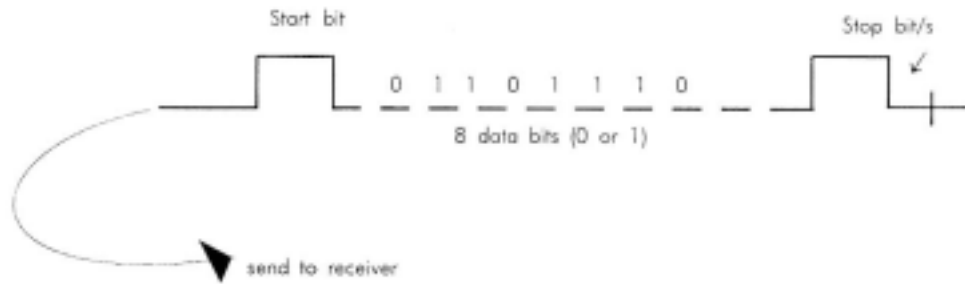
In asynchronous mode of data transmission each character (byte) is transmitted one at a time. Each character is preceded by a start bit. The purpose of start bit is to inform the receiving device that a character transmission has begun. The transmitted character ends with a stop bit. The stop bit suggests that a character has been transmitted. Each bit represents a voltage level for a specific length of time to enable the receiving device to recognize and record the incoming signal accurately. This specific length of time determines the rate of data transfer that may be measurable in bits per second. In asynchronous mode of transmission there is no indication of the speed at which the character is being transmitted. Therefore, there is no perceptible method for the receiving device to sample the incoming signal precisely to recover the transmitted data. For this lack of synchronization of transmission this mode of transmission is called asynchronous transmission. This anomaly of non synchronization is overcome by providing internal clocks at each end, transmitting as well as receiving. Both internal clocks work at the same rate such that on the receipt of start bit the receiver device starts its internal clock to instruct receiver's interface to sample the incoming signal.

**Notes:** Some systems may require more than one stop bit as a character terminator. This is generally for slower devices typically with slow mechanical components. Other important point to note is that there are several kinds of bit representations of a character. Most commonly used are ASCII (American Standard Code for Information Interchange) and EBCDIC (Extended Binary Coded Decimal Information Code). In widely used ASCII representation 7 bits uniquely represent a character. The 8th bit is called parity bit and used primarily for identification of success or failure of a character transmission device to sample the frame of information appropriately at correct signalling rate.

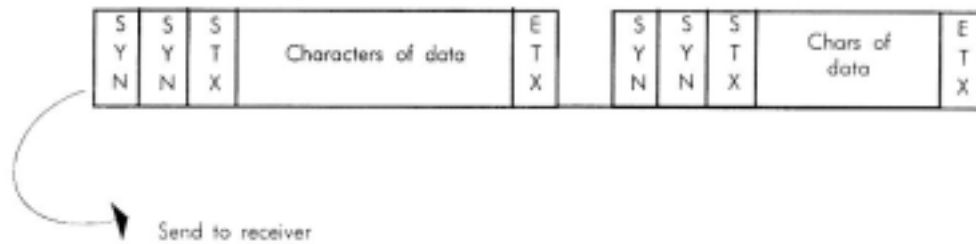
### Synchronous Transmission

In synchronous mode of data transmission a block of characters is transmitted one at a time. Each block of characters is preceded with a few synchronization (SYN) characters. These SYN characters contain the timing information which is used by the receiving device clock onto the sending device's signal. Since, in this mode of data transfer the block contains the timing information using SYN characters that allows automatic synchronization, this process is known as synchronous transmission. The size of blocks of characters may vary therefore there exist the ASCII control characters termed as STX (start of text) and ETX (end of text) that are used as delimiters. The synchronous mode of data transmission is advantageous when there exists large volume of data

to be transmitted at a higher data transfer rate. The efficiency of synchronous transmission varies according to the block size and dependent upon the protocol. If the block size is too small the overheads of protocol is more due to additional SYN characters and delimiters in header although the probability of error in transmission reduces. In case the block size is too large the general efficiency for large data transfer may improve in terms of data transfer rate but the probability of error in transmission increases. Therefore, for a reliable error free data transfer over a long distance requires that a maximum block size be fixed. Frequently used block size standard in most of the protocol is 512 bytes. Generally the level of efficiency in the synchronous mode of transmission is higher than in the asynchronous mode of transmission. (Refer Figure 9.1)



**Figure 9.2 (a): Synchronous Transmission**



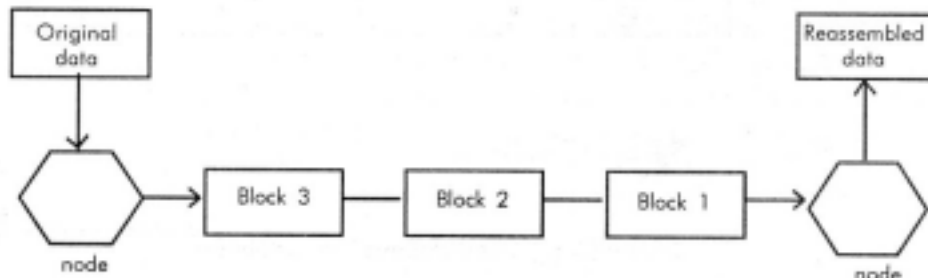
**Figure 9.2 (b): Synchronous Transmission of Variable Block Sizes**

**Notes:** A block of data is also referred as a packet. A sequence of blocks that is transmitted from a sending device needs to be reassembled at the receiving device. Each packet contains a packet or block identity number and routing address for destination for accurate reassembly as the original data. In case of identification of error on receipt of a packet, a request is sent to the sending device for retransmission of that packet again. (Refer Figure 9.2)

### Error Management in Data Transmission

In synchronous transmission, the most common approach of error detection in data transmission is CRC (Cyclic Redundancy Check) or check sum. This is adopted as a CCITT standard. CCITT (Consultive Committee for International Telephony and Telegraphy) is an international committee of telecom standards based in France. A checksum that is a remainder of data is divided by a fixed polynomial or a bit pattern is appended to the data bits before transmission. At the receiving device the data is verified against the checksum. For recovery of erroneous data packets in general and an error free data transfer in particular, generally it is implicit for the receiving device

to send a copy of data back to the sending device as a means of acknowledging correct or incorrect receipt. In the case of a satellite link connection a technique known as FEC (Forward Error Correction) is followed primarily for memory access and also for data transmission and recovery. This approach deters response back to the sending device by incorporating some additional information embedded in the data. The receiving device makes the necessary correction automatically by the identification of these codes in the embedded data. These codes are also referred to as Hamming codes.(Refer Figure 9.3)



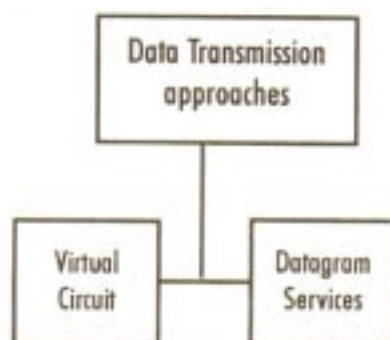
**Figure 9.3: Packet Switching**

**Notes:** Issues of Interoperability

- The structure of the unit of data sent should be recognized at the receiving end;
- The representation of data (ASCII/EBCDIC) should be the same on both sides of data communications;
- There should be a method of introducing checkpoints for recovery during large data transfer in the event of failure;
- There should be adequate security measures;
- There should be end to end protocol in both communicating hosts to recover from errors in a similar fashion;
- Both communicating hosts should use similar addressing techniques. Approaches for Data Transmission

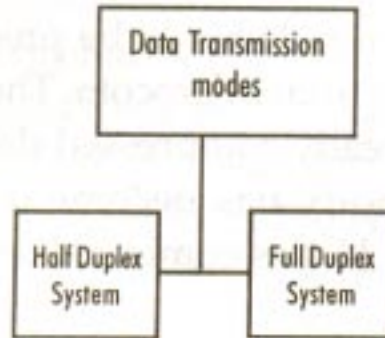
**Approaches for Data Transmission**

In a network of communicating devices there are two popular approaches for data transmission. First approach is to open a connection across the network and let the data pass through that connection. At this connection, the routing information is established and route numbers are assigned to blocks of data. This connection is also referred as a virtual circuit. Another approach is a connectionless approach. In this approach all packets carry full address of its destination and sequence identity. Each packet takes routes independently without a preestablished route and reassemble and re-sequence at the receiving device. This approach is also referred to as a datagram service.



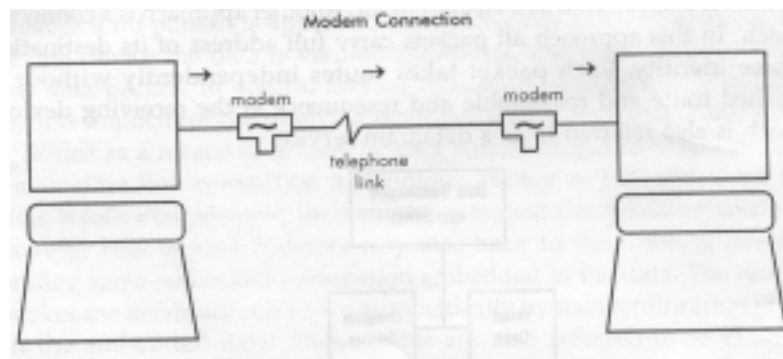
## Modes of Data Transmission

In the simplest form of data transmission data flows in one direction. In a half duplex system of data transmission data flows in the forward and backward directions to the receiving and the sending devices but not simultaneously. Most common example of a half duplex system is a radio link or a wireless set. In a full duplex system of data transmission data flows in both directions simultaneously. A typical example of a full duplex data transmission is the RS232c interface. RS232c interface is typically designed to connect any digital equipment to a data communication equipment. A modem is a typical DCE.



## Working of Modem/Fax Modem

A modem is a modulation and demodulation device. A typical function of a modem is to convert the digital output of a computing device into analog signals at the transmitting end. This modification of a digital signal is known as modulation. A modem also converts the analog signal into digital at the receiving end of computing device. This function is known as demodulation. The computing devices (computers) connected with modems are also known as DTE (Data Terminal Equipments). The basic function of a modem is to enable communication between computers remotely located. Modem is connected to a computer port via a telephone line. The analog signals are carried through the telephone line. (Refer Figure 9.4)



**Figure 9.4: Working of a Modem**

The criteria for selection of modem should depend upon the speed of transmission, error correction, data compression capability and Hayes compatibility. The modems that are less than 14400 bits/sec data rates as speed are mostly obsolete now. User should prefer a modem with speed equivalent or greater than 28800 bits/sec. A modem should be easily configurable to be used for TCP/IP (Transmission Control Protocol/Internet Protocol). This protocol enables a modem to communicate with most of the other modems, use of internet and most of the networking technologies. We would discuss more of TCP/IP in the next chapter on 'Telecommunications'. A modem should support V protocol. V 4.2 protocols have supplanted the old Microcom's MNP4 protocols for error correction. For data compression, V.42b is protocol should be preferred. MNP5, MNP10 are data compression protocol available from Microcom. The shortcoming of MNP protocol is that these cannot handle already compressed data. A modem should be Hayes compatible. Hayes compatibility has become de-facto standard for modems because most modems follow Hayes command set for their configuration. (Refer Table 9.1)



**Table 9.1 : Modern Speed and Protocol**

Modem speed	Basic Protocol	Error correction	Data compression
14.4 kps	V.32	V.42	V.42bis
28.8 kps	V.34	V.42	V.42bis

There are two types of modems; internal and external. Internal modems are card sized and installed inside the computer. An external modem is box shaped powered by an external power adapter and connected to the computer with a serial cable. For faster modems 14.4 kps and above the computer should be fitted with 16550 UART chip based serial port. Fax modems are designed to send and receive faxes in addition to data.. Fax software is also needed to send fax. There are fax standards ranging from Group I to Group IV or Class 1 and Class 2. Group IV and Class 2 are faster, more efficient and the latest standard and therefore generally preferred. Some of the modems come with digitalized voice capability also. These modems can function as voice answering machine also when used with appropriate software.

The popular brands of modems available today are TEK from MroTek, Boca from Boca Research/Power Tel, Soltrix from Soltrix/Amketeer, Optima, Accra from Hayes/Datamatics, Sportster from US Robotics/Soom from Soom Telephonics, MT Series from multitech, Comsphere from AT&T, Paradyne/Crompton Greaves, etc.

### **Serial and Parallel Transmission**

In serial transmission each byte of information takes eight time slots for transmission. In parallel transmission eight separate wires are used to send each bit simultaneously. Over long distances serial transmission is a popular approach for data transmission. Parallel transmission is generally used over short distances because of its advantage of speed in comparison to the serial transmission. Generally the interface between a computer and a printer have a parallel connection. The cost overheads of parallel transmission is higher than serial transmission. Internal clocks facilitate the synchronization of data received from eight transmission lines because these bits may traverse at marginally different speeds.

### **Lines of Communications**

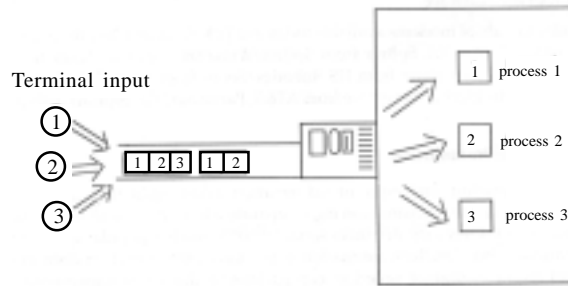
There are basically two popular lines for communications. A public telephone is the ordinary voice grade line. This line is routed through many relay systems and electromechanical systems. This line of communication is also referred to as PSTN (Public Switched Telephone Network). A leased line of communications is generally not subjected to the level of switching as in PSTN. This line of communications accommodates wider range of frequencies than the voice grade. A leased line of communications consists of bidirectional simultaneously operating two telephone circuits.

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## **9.3 MULTIPLEXING**

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Multiplexing is a technique of channelling multiple data inputs into one connection. The approaches used to implement multiplexing is generally based on division of communication channel into time slots or frequency bands. This technique was developed to overcome deficiency of old mainframe machine which had direct terminal connections access for various peripherals and other computers connected to it. Mainframe machine served as host to these terminals. This led to poor utilization of the system because majority of connected systems remain inactive for major period of time whereas some of the systems were saturated with requirement of data access or processing at a specific time. Moreover the feasibility to provide port for each terminal as requirements grew was vague. (Refer Figure 9.5)



**Figure 9.5: Working of a Multiplexer**

### Student Activity 1

1. Define data communication.
2. Differentiate between synchronous and asynchronous modes of transmission.
3. Describe error management in data transmission.
4. Describe various approaches of data transmission.
5. Describe the working of modem.

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## 9.4 COMPONENTS OF COMPUTER NETWORK

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Till now we have covered the basic concepts of data communication, therefore we are in a position to study the methodology of communication in a network of interconnected computers located in different places. The typical hardware in a network of computers consists of the following components:

- (a) computers,
- (b) peripherals such as printers, scanners, plotters and modems, cables, network interface cards,
- (c) hubs and switches,
- (d) repeaters, bridges, routers, gateways.

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## 9.5 LOCAL AREA NETWORK (LAN)

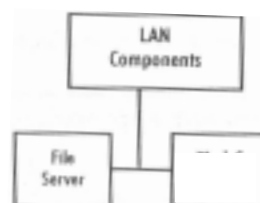
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A LAN is a network of computers that are interconnected in a particular fashion and contained within a limited area say a building.

A typical LAN has two components:

- a) A host computer that is called 'File server'. Large networks may have more than one Fileservers.
- b) Workstations or the terminals of a LAN are interconnected and connected to the Fileserver. Workstations in a LAN are personal computers that have their own processing power.

The significant feature of a LAN is that its workstations are intelligent terminals with a capability of distributed processing. This is unlike in a mainframe or miniframe centralized server based environment where the connected terminals are dumb without processing power of their own.



The prominent reasons which led to development and popularity of LANs are:

1. Sharing of expensive resources such as disk, files, printers, plotters, modems and software was needed.
2. Diskless nodes (workstations) of a LAN provided security and virus protection by not allowing to download important data from server or uploading unwanted software.
3. Distributed processing for inter-user communication within an organization and information exchange was the most suitable model for MIS development.
4. Data management in a LAN environment is more efficient than the centralized processing systems. Since, no users directly request to server for data without resorting to file transfer on a stored media like floppy or hard disk.
5. LANs are more flexible and modular. This implies that LANs can be expanded easily by adding of workstation with the support of networking software. If more disk storage is needed, another hard disk can be installed or other file server can be connected in a LAN. More than one LAN can be bridged to share data and communicate.
6. Most LANs have fault tolerant features such that in case of power failures LANs are capable of disk mirroring and disk duplexing to safeguard data.

**Notes:** The hardware components hubs, switches, repeater, bridges routers and gateways are generally applied whenever expansion of a LAN is required beyond geographic limits of optimum performance or when two or more LAN systems are needed to be integrated for sharing of peripherals and data resources. Modems are used alongwith telephone lines in the following cases:

- (i) WAN (Wide Area Network) is needed for communication of computers located in remote sites of an organization.
- (ii) A computer user needs to access information from remote file server.
- (iii) A computer user needs to send/receive electronic mail to/from a remote computer system.

We would describe this component appropriately while discussing internet working of LANs.

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## 9.6 USES OF A NETWORK

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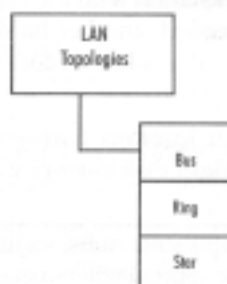
The network provides an intelligent switching capability between the devices for purpose of sharing. For instance an expensive laser printer in network can be share be by many microcomputers in a network. The network enable creation of a large buffer where data accumulates from various computing devices. In case of print sharing the buffer activates as a queue on a special device known as print server. In a typical office environment the facilities of terminal access to central computing machine such as mainframe, access to external and remote devices, access to database or messaging or e-mail provisions necessitate the networking of devices. The environments like point of sales in retail outlets, central heating thermostats and time clocks, automatic telling machines to banks main computers, process control devices in a manufacturing environment are not feasible without networking.

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## 9.7 TOPOLOGY

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The structure or layout of the cabling in connecting devices together to form a network is called topology of the network. The advantage of a structured topology is that it is easier to add or delete a node in the network.



## **Bus**

The Bus consists of a single communication channel. Each connected device is attached to the media at an interface point. Each connected device has a unique hardware address. Data transfer takes place using these hardware addresses. The bus will have more complex arrangements with several interconnected segments.

### **Advantages**

- Simple layout
- Ease in connectivity
- Locating cable faults is easy
- Ideal for one to many data transmissions since all connected devices see the traffic on the cable. The signal reaches all stations regardless of their position on the bus.

### **Bottlenecks**

There is no automatic acknowledgement of receipt by virtue of the topology. The signals stop on reaching the end of the cable and do not return by default to the sender. Therefore, the higher level protocols exist which can ensure that data is successfully exchanged.

## **Ring**

Unlike bus topology, in a ring configuration the data transmission is unidirectional. Data transmissions are received by each station's interface as the data passes through the interface connection. Like bus topology, each interface only copies the data from the network. Thereafter data communicates to the device connected to the network on basis of the packet's destination address. Each network interface connection has its own hardware address for identification. Typical ring topology is generally used in the large network Fibre Distributed Data Interface (FDDI).

In ring topology, each interface station allows data transmission to pass through the interface with only a few bits delay. For instance, consider circulation of a data packet (say 128 bytes), the start of data packet may well have circulated around the ring and arrived back at the originating station before the end of the packet has left for circulation. There is always only one circulating data packet on the ring.

### **Advantages**

- No routing problems since everyone on the ring receives the data. The addressed node makes copy of the data for circulation
- Every generated packet eventually returns to the node therefore the acknowledgment of successful data transmission is trivial
- Larger networks may be constructed from a number of interconnected rings.

### **Bottlenecks**

In case one of the nodes fails network comes to a halt.

## **Star**

Generally, it includes a central switching system or hub. In the figure, if station D wishes to talk to station B, it does so via the hub. In case a new device is required to be added it interfaces with another cable attached to the central point. And if the hub is physically close to the connected device then the individual cable run would not be problematic. (Refer Figures 9.6, 9.7 & 9.8)

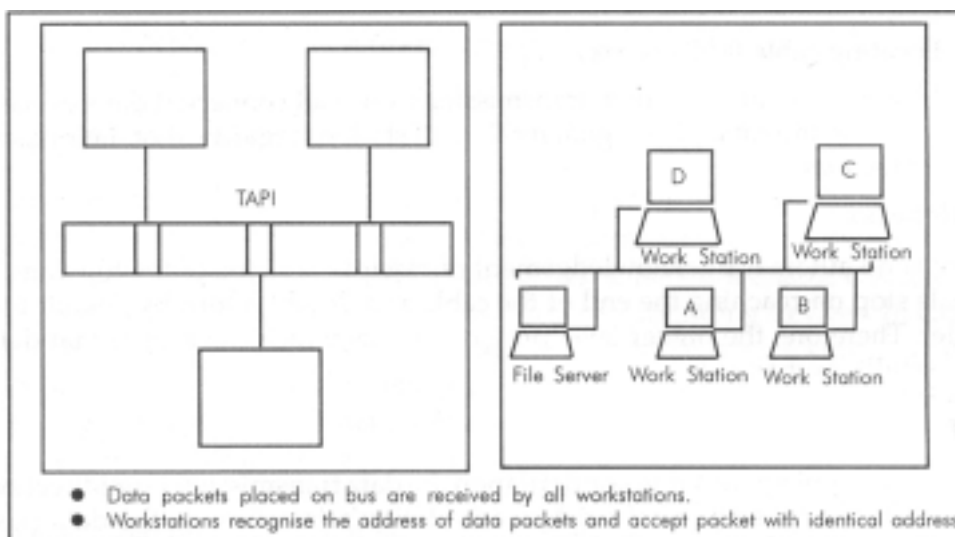


Figure 9.6: The Bus Topology

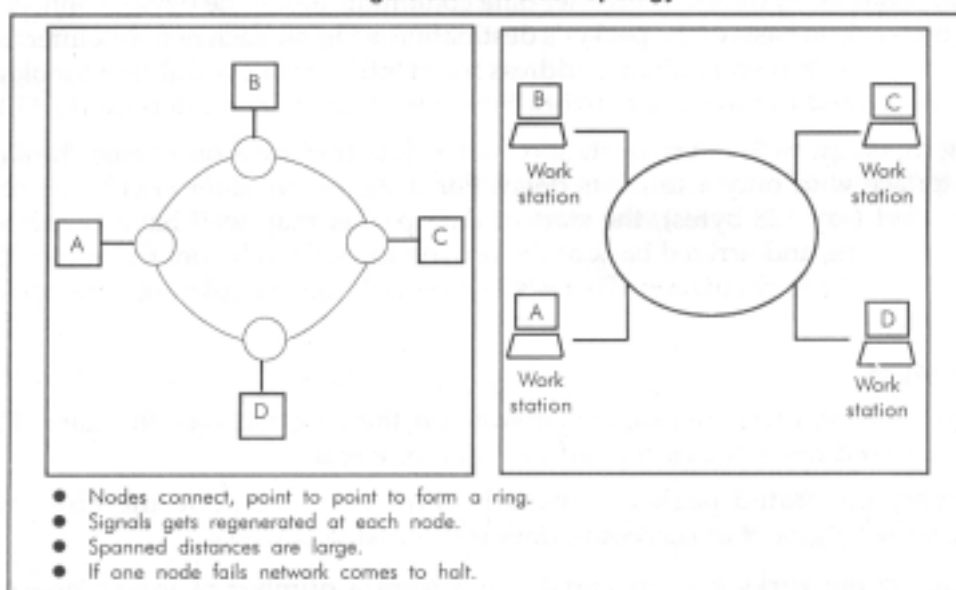


Figure 9.7: The Ring Topology

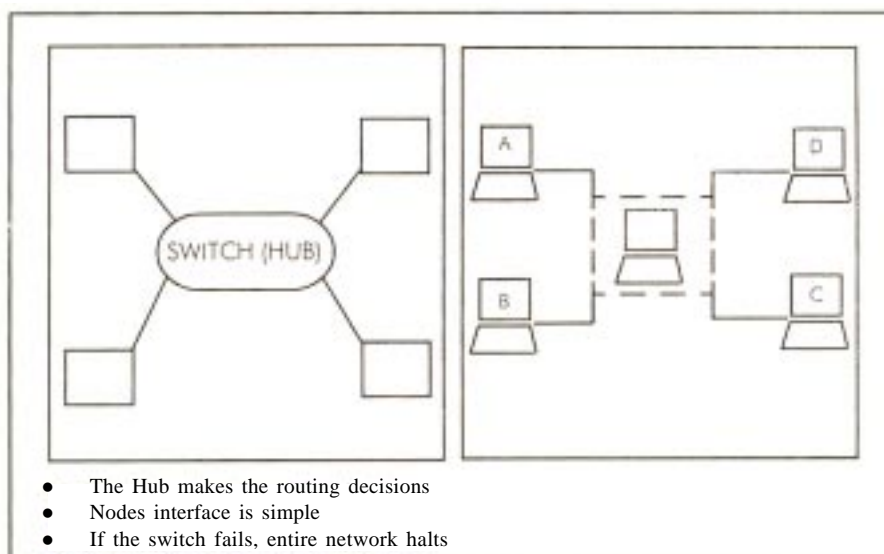


Figure 9.8: Star Topology

### Advantages

- Better overall reliability against cable faults provided the central point which is switching data to the destination is robust
- Only a single node will be unavailable in the event of cable failure
- LANs implemented on the star topology are sometimes based on existing telephone wiring in the building and do not normally have high data transfer rates.

### Bottlenecks

In case the switch or hub fails the entire network is halted.

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## 9.8 NETWORKING CABLES

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The main transmission media used in LANs are twisted pair, coaxial cable and fibre optic.

### Twisted Pair Cable

It consists of two wires which provides a signal path and a return polyethylene dielectric and shielded by braided metal. This is covered in a plastic jacket.

### Coaxial Cable

There are many types of coaxial cables reflecting the differing number and type of protection shield used.

Data rates, as high as 500 Mbps, are supportable, but normally it is upto 50 Mbps. Error rates may be of the order of  $10e-9$ . Distances up to 500m can be covered without signal degradation. Coaxial cable support baseband as well as broadband transmission. Baseband transmission possess digital signals from one workstation to another usually at a speed of 10 Mb/s upto distance of nearly 10000 feet. Broadband transmission enables transmitting of voice, audio, video and data signals (e.g., television and cable television transmission) at a speed of nearly 5 Mb/s over distances nearly 10 Km.

The cost of cable installation is usually higher than the cost of cable itself. Flexible coaxial cable is used in thin wire Ethernet. Therefore, it is relatively easy to install. Rigid coaxial cable is used in the original thickwire Ethernet. Therefore it is more difficult to install for it requires more careful handling.

### Fibre Optic Cable

It consists of hair like grass strands, covered with cladding and an outer jacket. This is often used for backbone networks and is the foundation for the over 100Mbps FDDI network. These span long distances without signal degradation. Though these are highly reliable, installation of these cables is much more expensive than other type of available cables. For category of cables and their features refer Tables 9.2 & 9.3.

**Table 9.2: Cable Category Rated in Mhz**

Category 1	Ordinary telephone cable or RS 232
Category 2	Data cables upto 4 Mbps
Category 3	Data cables upto 16 Mbps
Category 4	Data cables upto 20 Mbps
Category 5	Data cables upto 100 Mbps

**Table 9.3: IBM Cable Specifications**

IBM type 1 cable	AWG 22 grade copper wire with 2 shielded twisted pair (category 5)
IBM type 2 cable	AWG 24 grade copper wire with 2 to 4 unshielded twisted pair (category 2 to 5 depending upon quality)
IBM type 6 cable	AWG 26 grade copper wire with 2 shielded twisted pair used as panel cable

**Student Activity 2**

1. What are the various components of a computer network?
2. Define LAN. Name its components.
3. What are the used of a network?
4. What is a topology? Name various network topologies.
5. Describe various types of cables used in networking.

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## 9.9 OSI LAYOUT AND IEEE

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ISO (International Standards Organization) has put forward (ISO/OSI) reference model to ensure interoperability of LAN systems provided by various vendors. LAN operations and accessing schemes are described in OSI (Open System Interconnection) standards. Several IEEE committees have developed a set of standards for LAN topologies and access methods using the OSI standards as a foundation. (Refer Table 9.4). These standards aim at networking designs to become more flexible and open.

**Table 9.4: IEEE Established 802 Committees to Set Various LAN Standards**

802.3	CSMA/CD (Ethernet)
802.4	Token Bus
802.5	Token Ring
802.6	MAN (Metropolitan Area Network)
802.9	Data and Voice networking standard
802.11	Wireless LAN infrared, power line, spread spectrum (CDM), microwave transmissions
802.12	100 Mbps LAN

We discuss seven layers of OSI in a sequence, layer 1 to layer 7. We would perceive importance of OSI layering system later in our discussion where emphasis is drawn on usage of these layers by various components of LAN for a smooth functioning. (Refer Figure 9.9)

7	File transfer, access and management document and message interchange etc.	Application layer
6	Data representation transformation and security	Presentation layer
5	Dialog and synchronisation control	Session layer
4	End to end transfer management	Transport layer
3	Network routing and addressing	Network layer
2	Framing, data transparency, error control	Link layer
1	Mechanical and electrical network interface definitions	Physical layer

**Figure 9.9: OSI Reference Model**

### OSI Seven Layers Model

#### Physical Layer

This is the bottom layer of the model. It specifies:

- The way the data and control characters are physically signalled to each other.
- All the properties related with the representation of a bit.
- Physical connections, i.e., specifications of plugs and sockets.
- Details of the media.

## **Link Layer**

Flow control of data is implemented within this layer. This layer ensures that the bits carried by physical layer have a structure. This layer is responsible for transferring blocks or packets of information between each of the connecting points.

## **Network Layer**

Network layer is primarily responsible for routing of information on basis of internet address format. This level receives packet sized data block from transport level and maps to network addresses.

## **Transport Layer**

Flow control and sequencing of data blocks is performed at this level. Transport layer provides reliable end to end exchange of data. This layer is responsible for optimization of the transmission by multiplexing.

## **Session Layer**

Session layer provides coordination between users by selecting mutually acceptable protocols. This layer establishes calls to exchange the data bit streams. This layer effects check points for recovery of data.

## **Presentation Layer**

Presentation layer maps the various data representations into an external data format enabling correct interpretation of the information received. This layer implements the confidentiality or security of data. This layer enables the compression of data.

## **Application Layer**

Application layer provides a range of service interfaces for application programs such as e-mail, directory services, file transfer, etc. This effects the interchange of information amongst various application processes.

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## **9.10 POPULAR TYPES OF LAN**

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The most popular types of LAN are as follows:

- a) Ethernet
- b) ARCNet
- c) Token Ring
- d) Switched Ethernet
- e) 100VG and LAN
- f) Fast Ethernet
- g) Fibre Distributed Data Interface
- h) ATM

The types (d), (e), (f), (g) and (h) are the latest developments in the LAN types. The development of these LANs was necessitated due to increase in demand of network's bandwidth. The discussion on these LANs would be followed after we define the term 'bandwidth' and seek reasons for its increased demand in the modern corporate world. We initiate our discussion with explanation of the first three LAN types.

### **Ethernet**

Ethernet network was designed and developed by Xerox and DEC. It was initially designed to use coaxial cable though later development enabled it to use other cabling systems. The methodology



of communication for ethernet is CSMA/CD (Carrier Sense Multiple Access/Collision Detection). In the protocol CSMA/CD, the physical layer of user's workstation generates a carrier sense signal. This signal is listened to by the other workstation. This other workstation waits and begins communication only if such a signal is not detected. Popular cable connections for ethernet are thick ethernet coaxial and thin ethernet coaxial.

## ARCNet

ARCNet network was designed and developed by Datapoint Inc., United States. ARCNet is a baseband token passing network system. In an ARCNet network transmission speeds are nearly 2.5 Mbps. Generally, ARCNet LAN is on a hybrid topology that is combination of linear bus and star.

## Token Ring

Token ring network is physically a star and electrically a ring. It is based on IEEE 802.5 standard. In a token ring network token passing scheme is used. It involves a hardware known as MAU (Multistation Access Unit) that is used to connect up to 8 stations in a network.

**Notes:** All LAN connections need a network interface card and a networking operating software such as Novell Netware, Vines, etc. A LAN has a particular cabling system such as coaxial, thin or thick ethernet, twisted pair, etc. A LAN uses hubs, switches and connectors through the cabling system and networking topologies. A hub is a centralized distribution point for all traffic on a network just like a warehouse distribution centre. In bound data traffic from NIC (Networking Interface Card) arrives at the hub. The hub receives and rebroadcasts its copy to all workstations connected to the hub. Stackable hubs are stacked and connected through a proper interface port such that they appear as single hubs. These are also called Active hubs. Nonstackable hubs are not connectable. Active hubs split and relay network signals and amplify the signal strength whereas Passive hubs only split and relay network signals without strengthening signals. Active hubs are connected to the network backbone. Passive hub is generally connected to the active hubs. Intelligent hubs include a pooling protocol SNMP (Simple Network Management Protocol) that obtains network performance and the status data from network. Dumb hub needs management from MIS and networking department.

### Notes:

#### Bandwidth

Bandwidth of a communication network can be described as the amount of data that can be fit through a network connection. In broadcasting, bandwidth is the measure of the spectrum between the highest frequency and the lowest. Unit of bandwidth is hertz (Hz.). The evolution of more network capacity bandwidth in terms of computing efficiency and network speed in data communication has gained momentum owing to:

- The rapid increase in computing power at the desktop level.
- The proliferation of bandwidth hungry applications such as multimedia, e-mail, messaging Groupware and distributed databases.
- Advent of Internet and Intranet access; and availability of Web servers and browsers.

The corporate is demanding high bandwidth networks to boost quality of their data communication and management information systems. More users, file servers, application servers, workstations and peripherals of high performance capabilities has contributed to increase in network traffic. The aim of the corporate to improve the sharing of information by consolidating multiple LANs into one shared LAN has necessitated the search for high speed networking technologies.

## Switched Ethernet

Switched Ethernet 10 Mbps uses switch to segment a large LAN into smaller LANs. This ensures dedicated 10 Mbps connection to a particular PC at all times. Though the switched Ethernet hub is inexpensive and effective solution, it has a drawback. In some of situations it can move the bandwidth bottleneck to another point in the network.

## 100VG any LAN

This LAN was developed by Hewlett Packard and IBM and standardized under IEEE 802.12 specifications. This is based on DPAM (Demand Priority Access Method) which is somewhat similar to Token ring or FDDI. This LAN has not become much popular because other technologies like ATM and Fast Ethernet provide better compatibility with existing networks.

## Fast Ethernet

Fast Ethernet or 100BaseT is an extension of Ethernet specification as approved under IEEE 802.3. These networks provide higher bandwidth with data rate as high as 100Mbps. These networks preserve core Ethernet protocols CSMA/CD and are compatible with existing ethernet wiring types, media and applications.

## Fibre Distributed Data Interface

FDDI is an ANSI standard technology for fibre optic networks mostly suitable for high end workgroups requiring data rates around 100 Mbs. CDDI (Copper Distributed Data Interface) uses similar technology and is relatively much cheaper networking solution. Since FDDI is an expensive technology, it is being used mostly as a backbone interconnect between low speed LANs. Backbone is a wire that stretches between networks. Other application areas where it has been found useful are data intensive and bandwidth hungry such as multimedia, CAD/CAM (Computer Aided Design and Manufacturing), 3D modelling, etc.

**Notes:** The user workstations are connected to servers. Servers are connected to a network backbone. Generally backbone networks use broadband network system. The advantage of this system is that it provides large bandwidth and is capable of transmitting across very large distances.

## AIM

Asynchronous transfer mode is promoted by ITU (International Telecommunication Union) as high speed communication link for desktops as well as a high performance backbone for LANs and WANs. The most salient feature of ATM is its scalability in speed varying from 25 Mbps to multiple Gigabits per second. The other feature of ATM is that it allows simultaneous transmission and receipt of data without interruption (duplex mode). ATM also allows simultaneous transmission of video, image, audio and data over a single line. Despite the high potential of ATM technology for high bandwidth networking, the prevalence of ATM is currently severely restricted due to several factors. Firstly, ATM is considerably expensive technology. Secondly, many of the applications need alteration to be successfully run on high bandwidth provided by ATM. ATM may be considered if volume of transactions on a network is very high and a seamless integration of LANs and WANs is required.

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## 9.11 INTER NETWORKING

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In our earlier discussion we have learnt that a LAN is network of computers generally contained within a limited area say a building. These networks of computers are usually built on one type of network card and cable. A LAN may be expanded to a limited extent by adding workstations and limited length of cable. Beyond these limits performance of a LAN may degrade. Expansion of a LAN is possible by boosting the signals to accommodate long distances. A repeater may be used for this purpose.

Bridges are the devices that link two distinct LANs. Bridges may also be used to divide a overloaded LAN with great data traffic into two separate trunks. A router is bridge like device that interconnects several types of LANs. The main function of router is to provide the best route for the packets of information through the interconnection of LANs. Bridges can direct data to different segments of a network using physical addresses but they cannot direct data traffic to another network. A router directs data using logical addresses therefore it can send data to traffic bounds to unknown destination, to another router, which knows the destination. A Switch is a high speed bridge that segments a LAN traffic such that it switches packets from one segment of LAN to another in a

matter of milliseconds. This switching is done so efficiently that it appears that the whole and each segment of LAN has full access to the entire bandwidth of the network.

A Gateway is used to interconnect two dissimilar LANs. Since, a sort of translation is needed for two dissimilar networks therefore gateway is more sophisticated, slower in performance and expensive relay device. For example, if a Novel netware network which is running IPX/SPX protocol is connected to a VAX host running VMS operating system, the data from netware LAN has to be correctly interpreted by the VAX host. The Gateway relay device is extremely useful for communication of LANs as distinct as running on SNA and DECnet protocols. The Gateway operates on network layer and above. Besides the already described internetworking devices, there is another internetworking device known as Brouter which functions as a bridge as well as a router.

One of the popular vendors marketing Brouters is Bay Networks. Brouter routes when routing is possible and if unable to do so it bridges. Refer Figure 9.10 (A,B,C,D,E,F) to get a better understanding of the functionality of the internetworking devices.

## 9.12 PUBLIC NETWORKS

The most common public networks that have been available consist of X.25 services. X.25 network is interface between many remote LANs connected through gateways or routers. Frame relay and ATM are lately being used as alternative of X.25 services. X.25 implements addressing, routing and multiplexing at network

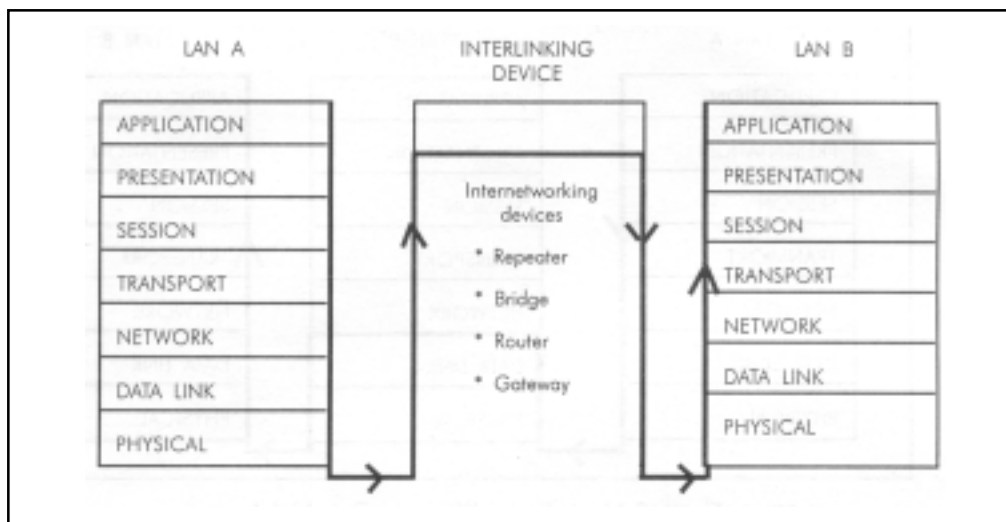


Figure 9.10 (a): Different Internetworking Device

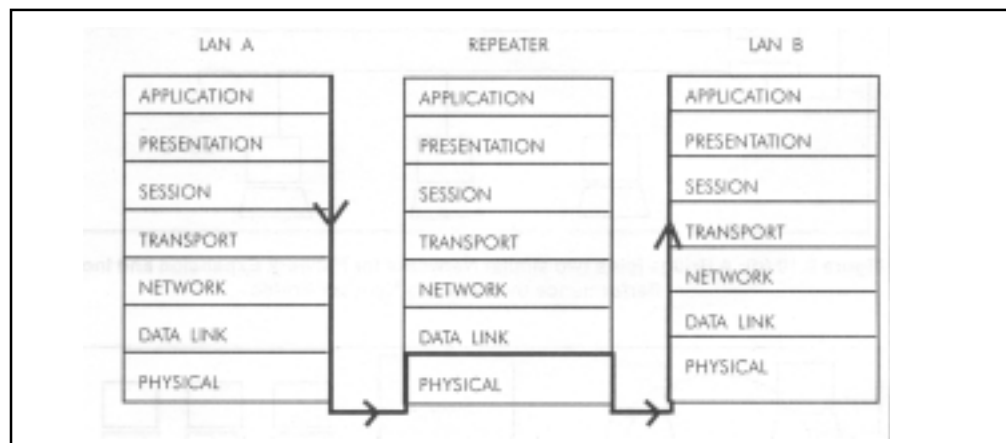
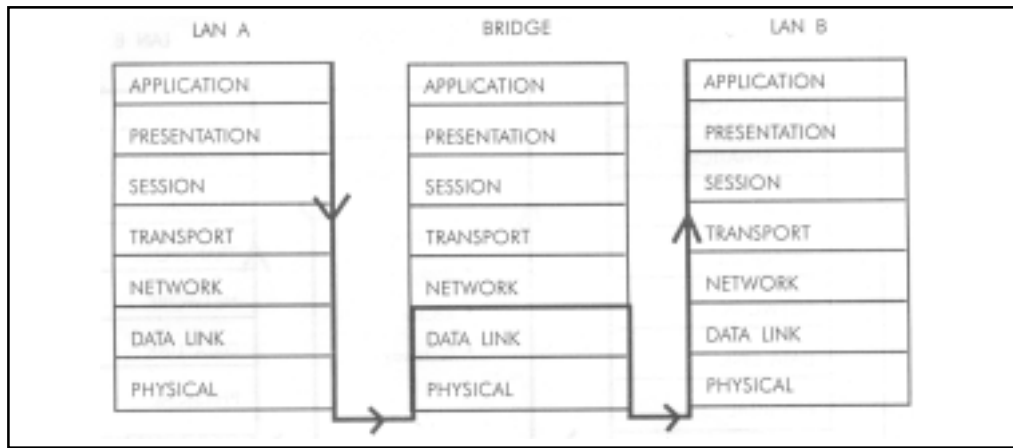
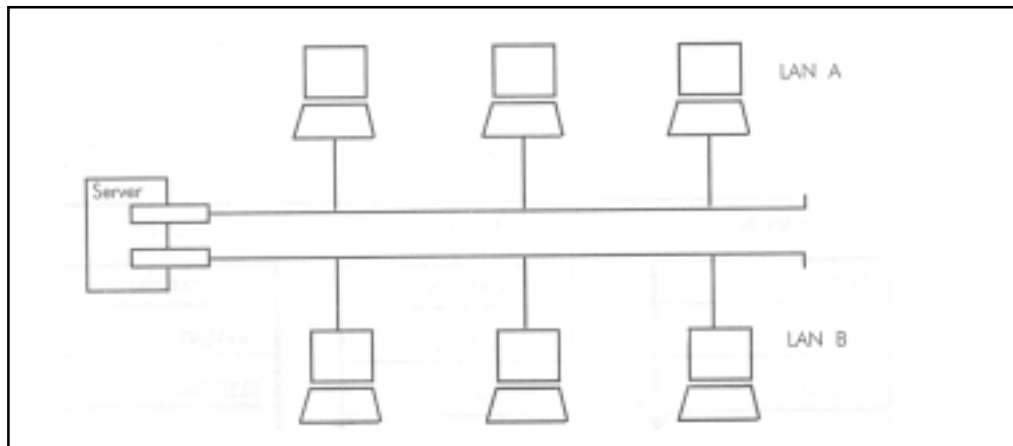


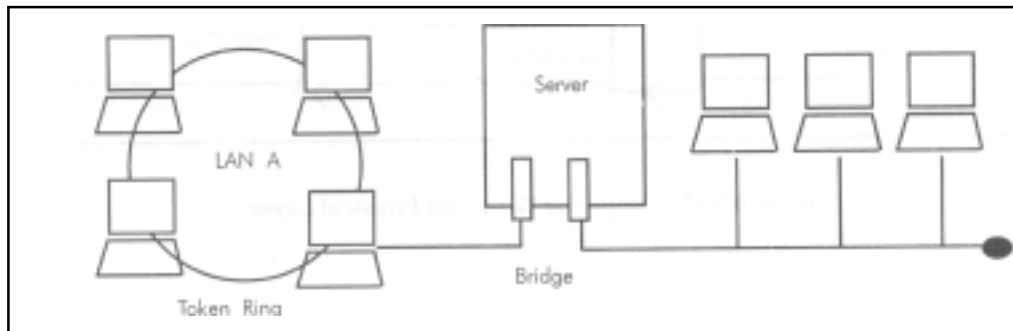
Figure 9.10 (b): Repeater Works on Physical Layer



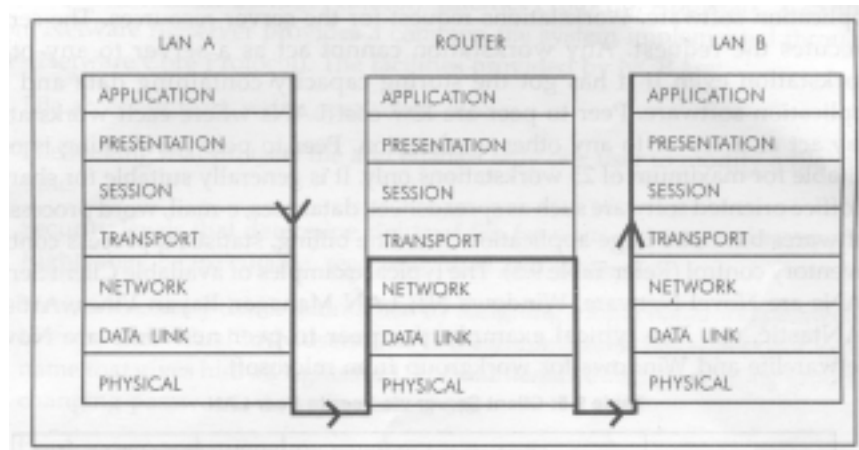
**Figure 9.10 (c): Bridge Works on Data Link Layer**



**Figure 9.10 (d): A Bridge Joins two Similar Networks for Network Expansion and Increase Performance by Reducing Network Traffic**



**Figure 9.10 (e): A Bridge also Connects Dissimilar LANs such as Ethernet and Token Ring**



**Figure 9.10 (f): Router Works on Network Layer**

layer whereas the X.25 services are available worldwide therefore interconnection between LANs is achievable on global basis. The speed of connection is 64 kbps, though in practice lower speeds such as 8 kbps are available at busy times. This renders high speed burst from LANs connected to X.25 without any advantage. Frame relay implements addressing, routing and multiplexing at data link layer. Frame relay services range normally from 64 Kbps to 2.048 Mbps. ATM and Frame relay technologies are generally complimentary. ATM can be used for high volume transmissions while Frame relay may be used for low speed connections in the same data network.

Salient features of Frame relay are:

- 1) Unlike X.25, Frame relay works without network layer involvement.
- 2) Frame relay uses error detection rather than error correction on transmission as in X.25.
- 3) The conversion of X.25 to frame relay is not tedious.
- 4) The Frame relay can carry voice.
- 5) The Frame relay has also been in use in broadband ISDN (Integrated Services Digital Network). ISDN is a digital phone connection technology that provides voice, data and image transmission facility over single connection. ISDN is capable of providing internet access speed to the tune of 56 KB.

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## 9.13 CLIENT/SERVER VS. PEER TO PEER NETWORKING

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There exist two kinds of LANs: Client/Server and Peer to peer that may be installed as per the requirement of an organization. In Client/Server LAN the server is centralized and has the large database, large internal memory, user interface and application software. Workstations request for the server resources. The server executes the request. Any workstation cannot act as a server to any other workstation even if it has got the storing capacity containing data and the application software. Peer to peer are low cost LANs where each workstation may act as a server to any other workstation. Peer to peer networking is only suitable for maximum of 25 workstations only. It is generally suitable for sharing of office oriented software such as spreadsheet, databases, e-mail, word processing softwares but not a large application of on-line billing, statistical process control, inventory control (Refer Table 9.5). The typical examples of available Client Server LANs are Novel Netware, Windows NT, LAN Manager, Banyan Vines, Artisoft LANtastic, etc. The typical examples for peer to peer networks are Novell Netwarelite and Windows for workgroup from microsoft.

**Table 9.5: Client Server vis Peer to Peer LAN**

	<b>Client server</b>	<b>Peer to Peer</b>
Workgroup size	10-500	2-25
Remote location	May include many remote locations	Limited to telephone access
Applications	Primarily a large database. Can also include standard productivity software	Primarily productive software such as spread sheets, graphics, etc.
Security	Data is sensitive and requires full authentication of user for each application. Security administrator is required to make changes	Password is appropriate for most data users who determine security needs for themselves

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## 9.14 NETWORK OPERATING SYSTEMS

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The salient feature of a networking operating system is that each workstation in a network works uniformly through the same operating system based at the server. This provides seem less

integration in the working environment. For example Networking operating systems Unix, Novell netware or Windows NT the file system is accessible by just providing the path search for particulars file from workstation to remote server. The structure and access control to all files is identical. We would discuss Novell netware as a LAN operating system in some details.

## Novell Netware

Novell Netware (current version 4.1) is presently one of the most popular NOS (Networking Operating Systems). Netware is compatible both with IBM compatible PCs and the Macintosh range of Apple computer systems. Netware is a very open system because it operates across multiple platforms and multiple protocols such as IPX/SPX (Internetwork Packet exchange/ Sequenced Packet exchange), TCP /IP (Transmission Control Protocol/Internet Protocol), Appletalk, X.25 and so on. Netware fileserver provides a common file system implemented through NCP (Netware Core Protocol). The facilities provided by NCP are:

1. File access in read, write, open, close modes.
2. File locking that protects file and enables only one user to modify a file at a time.
3. Security levels that determine rights of file for users, groups and everyone. Rights may be executable, read only, read and write, etc.
4. Network security that is maintained by assigning a login name and password to every individual LAN users. The LAN administrator has supervisor login name that gives him all rights for LAN maintenance such as creating groups, changing passwords or login names, etc.
5. Print server and queue management.
6. Network management.
7. Resource allocations to users/groups such as disk space, networking time and accounts, etc.
8. The netware include SFT (System Fault Tolerance) level 1, level 2 security. In case of server failure, in level 1 of SFT duplexing of FAT and directory entry table takes place. In similar cases, SFT level 2 provides disk mirroring and provides an object oriented approach in managing resources and users on internetwork. Other salient features are:
  - Login through windows;
  - Graphical network analysis;
  - WAN connectivity;
  - Multiple language capability of success or failure of a character transmission;
  - Imaging services using HCSS (High Capacity Storage System) that enables transfer or migration of image document and other files. HCSS also provides support for mounting optical devices and juke boxes as Netware server volumes;
  - Management capability through NetView or SNMP (Simple Network Management, Protocol).

Netware 4.1 is available in packs of ten users and above. For small scale implementation of LAN, Novell offers Netware Lite, a Peer to Peer networking system. Novell netware is a client server based networking operating system.

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## 9.15 NETWORK MANAGEMENT

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Having broad overview of LAN, we briefly discuss the technical issues of LAN management. The concern for interconnection and interoperability of LANs necessitates this discussion. There are variety of LANs available with variety of protocols such as TCP/IP, OSI, XNS (Xerox Networking System), SNA/APPC (System Network Architecture), ATP(Apple Transport Protocol), NETBEVI and IPX/SPX. The network management assumes more relevance where integration of these variety with interoperability is concerned. The popular range of network management tools that are available are CMIS/P (Common Management Information Service and Protocol) from BT,

Overview from HP, Netview from IBM, NMS from Novell, Spider Sentgel from Spider, SunNet Manager from SUN, SNMP Lattiset from SynOptics, Net Director from V-B. In a networking environment a network manager is responsible for maintaining the configuration, allocating necessary disk space, ensuring the appropriate growth and installation of LAN, user training and providing the appropriate security levels for smooth functioning of LANs. A networking uses the network management tools for troubleshooting any discrepancy in LAN functioning at any time.

## 9.16 LAN IN BUSINESS ENVIRONMENTS

LAN environments vary in functionality and services in distinct business environments. When we talk of business environment we take a note of the type of business the organization conducts such as hospitality, marketing, manufacturing, tours and travels,

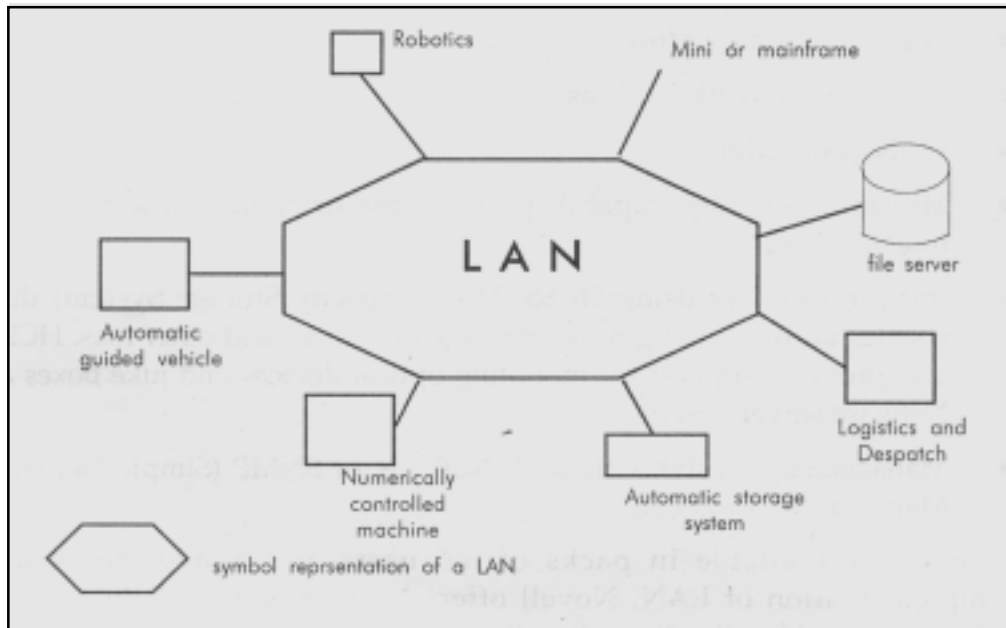


Figure 9.11 (a): Manufacturing Environment

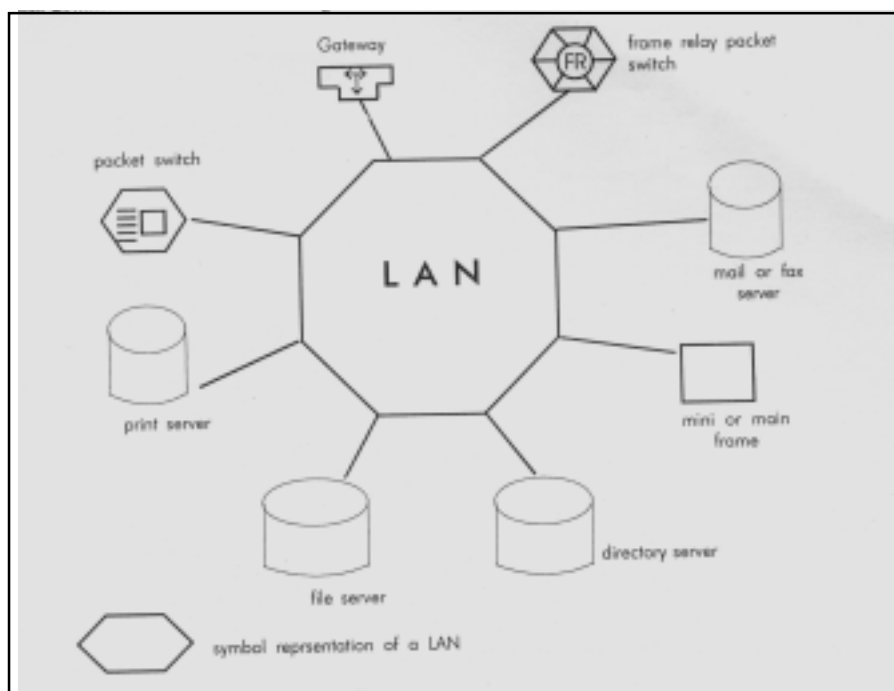


Figure 9.11 (b): Servers

banking, finance, stock and shares, engineering, etc. For example, LAN in a manufacturing set up may have numerically controlled machines, automatic guides vehicles, robotics and mini or mainframe as server, microcomputers as workstations, Novell netware or Vines or Unix as an operating system, CAD/CAM software (like Autocad) and a database software system such as sybase, informix, ingres, etc. A tour and travel reservation office may have a pentium microcomputer as a fileserver and microcomputer terminals (nodes) as workstations for on-line billing generation, networking operating system such as Microsoft windows NT or Novell netware, a database engine based on RDBMS Oracle, Ingres, Informix or Foxpro. (Refer Figure 9.11 (a,b))

### Student Activity 3

1. Describe OSI layer model of a network.
2. Name some popular LANS.
3. Define token ring network.
4. Define ATM.
5. Describe Internetworking.
6. What are public networks?
7. Write a short note on Novell network.
8. Write a short note on Lane in Business environment.

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## 9.17 SUMMARY

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Flow of information for purpose of efficient management and business process control requires effective use of computer systems and networking technologies. This communication is possible with the approach known as protocols. The data flows between two devices as sequential bits (0 and 1) across a transmission medium say copper use. In asynchronous mode of data transmission each character (byte) is transmitted one at a time.

The data transmission can be asynchronous or synchronous. CRC (Cyclic Redundancy Check) is the most common error detection technique in synchronous transmission.

A modem is used to convert the digital output of a computing device into analog signals and vice versa. The communicating device (computers) connected with modems are also known as DTE (Data Terminal Equipments).

Multiplexing is a technique of channeling multiple data inputs into one connection. Mainframe machine served as host to these terminals.

LAN is a network of computers that are interconnected in a particular fashion and contained within a limited area say a building. It has two components-A host and workstations.

The network provides an intelligent switching capability between the devices for the purpose of sharing. The structure of layout of the cabling in connecting devices together to form a network is called topology of the network. Various LAN topologies include BUS, RING, and STAR. The transmission media used in LANs are twisted pair curial cable and fabler optic. The seven layers of OSI model include Physical layer, link layer, network layer, transport layer, session layer, presentation layer and application layer.

Some popular LANs include Ethernet, AR (net token ring, Switched Ethernet, 100 VG and LAN, and Fast Ethernet.

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## 9.18 KEYWORDS

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**Modem:** A modulation and demodulation device which converts the digital signal into analog and vice versa.

**LAN:** A network of computers that are interconnected in a computers that are interconnected in a particular fashion and contained within a limited areas say a building.



**Topology:** The structure or layout of the cabling in connecting devices together to form a network.

**Gateway:** A device used to connect two or more dissimilar networks.

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## 9.19 REVIEW QUESTIONS

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### Unsolved Questions

1. **Fill in the blanks:**

- (a) In \_\_\_\_\_ mode of data transmission, each character is transmitted one at a time.
- (b) A block of data is also referred as a \_\_\_\_\_.
- (c) The two popular approaches for data transmission include \_\_\_\_\_ and \_\_\_\_\_.
- (d) A modem is a \_\_\_\_\_ and \_\_\_\_\_ device.
- (e) \_\_\_\_\_ is a technique of channeling multiple data inputs into one connection.
- (f) \_\_\_\_\_ is the layout of the cabling in connecting devices together to form a network.
- (g) \_\_\_\_\_ cable is often used for backbone network.

2. **State : True or False:**

- (a) Internal modems are designed to send and receive foxes in addition to data.
- (b) Parallel transmission is generally used over short distances.
- (c) In a bus topology, the data transmission is unidirectional.
- (d) The cost of cable installation is usually higher than the cost of cable itself.
- (e) ARCnet LAN is on hybrid topology.

### Answers (Unsolved Questions)

- 1. (a) asynchronous (b) packet (c) virtual circuit, datagram services (d) modulation, demodulation (e) Multiplexing (f) Topology (g) Fibre optic
- 2. (a) False (b) True (c) False (d) True (e) True.

### Detailed Questions

- 1. Differentiate between asynchronous and synchronous modes of transmission.
- 2. What are the advantages of asynchronous mode of transmission?
- 3. What are the various modes of data transmission?
- 4. What is the difference between serial and parallel transmission?
- 5. Give reason that led to the development and popularity of LANs.
- 6. What is a topology? Describe various types of topology? Describe various types of topologies?
- 7. What are the advantages of Bus topology?
- 8. What are the bottle necks of Ring topology?
- 9. Differentiate between twisted pair and coaxial cable.
- 10. Write a short note on fiber optic cables.
- 11. Describe the function of transport layer in OSI model.
- 12. Write short notes on the following:
  - (i) Ethernet
  - (ii) ARC net
  - (iii) Token ring
  - (iv) Switched Ethernet
  - (v) 100 VG any LAN

- (vi) Fast Ethernet
- (vii) Fiber Distributed Data Interface
- (viii) Peer to peer networking
- (ix) Client server networking.
- (x) Network management.

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## **9.20 FURTHER READINGS**

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Richard D Gitlin, Jeremiah F Hayes, Stephen B Weinstein, *Data Communications Principles*, Springer.

William Stallings, *Data and Computer Communications*, Prentice Hall.

Behrouz A. Forouzan, DeAnza College, *Data Communications and Networking*, McGraw-Hills.