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Ministry of Education, Science and Technology
Curriculum Development Centre
Sanothimi, Bhaktapur

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Computer Application



Feedback Copy

Technical and Vocational Stream
Learning Resource Materials

Computer Applications
(Grade 9)
Secondary Level



Government of Nepal

Ministry of Education, Science and Technology

Curriculum Development Centre

Sanothimi, Bhaktapur

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Preface

The curriculum and curricular materials have been developed and revised on a regular basis with the aim of making education objective-oriented, practical, relevant and job oriented. It is necessary to instill the feelings of nationalism, national integrity and democratic spirit in students and equip them with morality, discipline and self-reliance, creativity and thoughtfulness. It is essential to develop in them the linguistic and mathematical skills, knowledge of science, information and communication technology, environment, health and population and life skills. It is also necessary to bring in them the feeling of preserving and promoting arts and aesthetics, humanistic norms, values and ideals. It has become the need of the present time to make them aware of respect for ethnicity, gender, disabilities, languages, religions, cultures, regional diversity, human rights and social values so as to make them capable of playing the role of responsible citizens with applied technical and vocational knowledge and skills. This Learning Resource Material for Plant/Animal Science, Electrical/Civil Engineering has been developed in line with the Secondary Level Plant/Animal Science, Electrical/Civil Engineering Curriculum with an aim to facilitate the students in their study and learning on the subject by incorporating the recommendations and feedback obtained from various schools, workshops and seminars, interaction programs attended by teachers, students and parents.

In bringing out the learning resource material in this form, the contribution of the Director General of CDC Dr. Lekhnath Poudel, Dr. Jagatkumar Shrestha, Dr. Kamal Thapa, Dr. Bharat Mandal, Purushotam Chapagai, Jagadishchandra Karki, Bimal Thapa, Shankar Kumar Yadav, Nabin Maskey is highly acknowledged. The book is written by Bimal Thapa and the subject matter of the book was edited by Badrinath Timalsina and Khilanath Dhamala. CDC extends sincere thanks to all those who have contributed in developing this book in this form.

This book is a supplementary learning resource material for students and teachers. In addition they have to make use of other relevant materials to ensure all the learning outcomes set in the curriculum. The teachers, students and all other stakeholders are expected to make constructive comments and suggestions to make it a more useful learning resource material.

Content

S.N.	Topics	Page No.
UNIT 1 : Introduction to Computer		
1.1.	The Concept of Computer	1
1.2.	History of Computers	3
1.3.	The Computer system characteristics	12
1.4.	The Capabilities and limitation of computer:	13
1.5	The Types of Computer	16
1.6.	The Generations of computers and their features	19
1.7.	The Types of PC/Es and their characteristics	22
UNIT 2 : Computer System		
2.1.	Concept of Computer Organization	29
2.2.	Types of Computer Hardware	30
2.3.	Memory and Storage Devices:	34
2.6.	Input Device	44
2.7.	Output devices	50
2.8.	Computer Software:	57
2.8.1.	Necessity of computer software	58
2.8.2.	Types of Software	58
UNIT 3 : Operating System		
3.1.	Introduction of operating system:	66
3.2.	Types of operating system	67
3.3.	Disk operating system:	71
3.4.	Windows operating system	74
3.5.	Open sources operating system	87
UNIT 4 : Programming Languages		
4.1.	Introduction of Programming Language	93
4.2.	Types of language processor software	96
4.3.	List of high level programming language	96
4.4.	Difference between Program and Software:	98
4.5.	Program Control Structures	

4.6. Program design tools	101
4.7. Introduction to QBASIC	104
4.7.1. Elements of QBASIC	104
4.7.2.1 Declaration Statement	107
4.7.2.2 Assignment Statement	108
4.7.2.3 Input/output Statement	109
4.7.2.4 Control Statement	111
UNIT 5 : Application Software	123
5.1. Word processing software	123
5.2. Spreadsheet software	147
UNIT 6 : Computer Network and Topologies	193
6 .1. Introduction of computer network	193
6.2. Modes of transmissions:	194
6.3. Communication channels	195
6.4. Modem	198
6.5. Types of network	198
6.6. Topologies	200
4.7. Different network component:	204
6.9. Use of Communication in daily life	207
UNIT 7 : Internet and Electronic mail (Email)	213
7 .1. Introduction of Internet	213
7.2. Use of Internet	213
7.3. Protocol	215
7.4. The Web	216
7.5. Search Engine	218

Unit: 1

Introduction to Computer

Learning Outcomes:

After completion of this unit you will be able to

- To explain/describe the concepts of computer.
- To explain/describe history of computer.
- To explain/describe computer system characteristics.
- To explain/describe the types of computer.

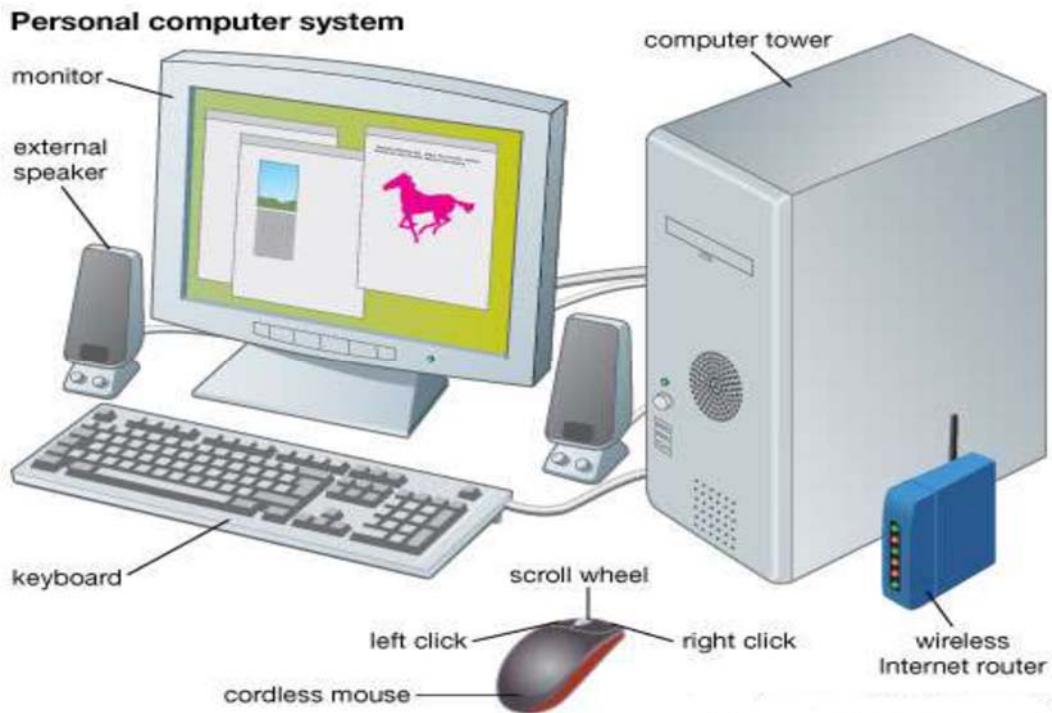
1.1. The Concept of Computer

Today's world is an information-rich world and it has become a necessity for everyone to know about computers. Computer is an advanced electronic device that takes raw data as an input from the user and processes it under the control of a set of instructions (called program), produces a result (output), and saves it for future use. This unit explains the foundational concepts of computer hardware, software, operating systems, peripherals, etc. along with how to get the most value and impact from computer technology.

A computer is an electronic data processing device, which accepts and stores data input, processes the data input, and generates the output in a required format.

Or

A computer is an electronic machine that accepts the data and instructions from the user, processes the data according to the given set of instructions, stores and gives the information (result).



Functionalities of a Computer

If we look at it in a very broad sense, any digital computer carries out the following five functions –

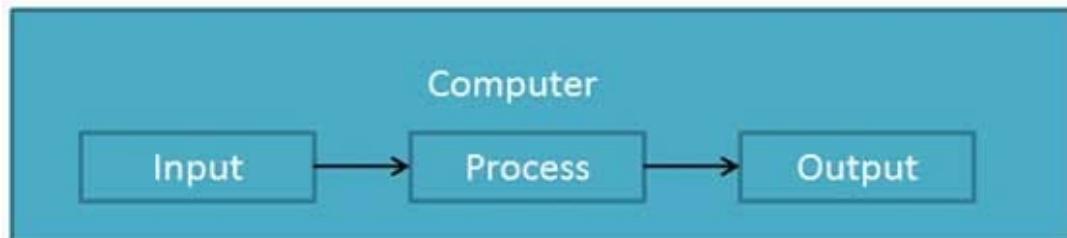
Step 1 – Takes data as input.

Step 2 – Stores the data/instructions in its memory and uses them as required.

Step 3 – Processes the data and converts it into useful information.

Step 4 – Generates the output.

Step 5 – Controls all the above four steps.



1.2. History of Computers

If we see the computer from the past to present, we can see that they don't have similar technology, shape, size, functionality etc. So, the present computer that we use differs from the past computer. The origin of computer starts from counting. A short description about the development process of computer is described below:

Mechanical Devices

Abacus

Many centuries ago when men started to count the numbers, they thought of a device which can trace the numbers and thus came the existence of ABACUS. It was the first counting device which was developed in China more than 3000 years ago. The name Abacus was obtained from Greek word Abax which means slab. This device basically consists of a rectangular wooden frame and beads. The frame is divided into two parts and beam separates these parts. The upper part is called heaven and the lower part is called earth.

The frame contains horizontal rods and the beads which have holes are passed through the rods. Counting was done by moving the beads from one end of the frame to the other.



Napier's bones

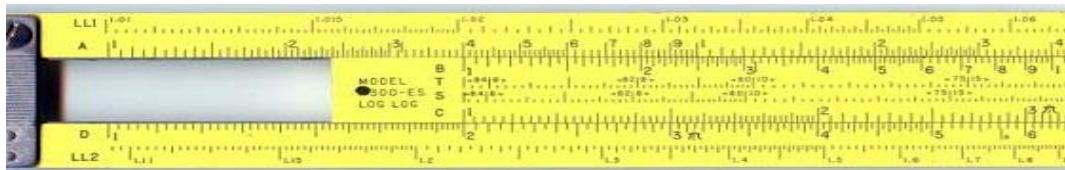
It is a device which contains a set of rods made of bones. It was developed by John Napier in 1617, a Scottish Mathematician and hence the device was named as Napier's bones. The device was mainly developed for performing multiplication

and division. In 1614, he also introduced logarithms.

0	1	2	3	4	5	6	7	8	9
0 0	0 2	0 4	0 6	0 8	1 0	1 2	1 4	1 6	1 8
0 0	0 3	0 6	0 9	1 2	1 5	1 8	2 1	2 4	2 7
0 0	0 4	0 8	1 2	1 6	2 0	2 4	2 8	3 2	3 6
0 0	0 5	1 0	1 5	2 0	2 5	3 0	3 5	4 0	4 5
0 0	0 6	1 2	1 8	2 4	3 0	3 6	4 2	4 8	5 4
0 0	0 7	1 4	2 1	2 8	3 5	4 2	4 9	5 6	6 3
0 0	0 8	1 6	2 4	3 2	4 0	4 8	5 6	6 4	7 2
0 0	0 9	1 8	2 7	3 6	4 5	5 4	6 3	7 2	8 1

Slide Rule

Slide Rule was an analog device invented by William Oughtred in 1620. The slide rule is used mainly for multiplication and division, and also for "scientific" functions such as roots, logarithms and trigonometry, but usually not for addition or subtraction. The slide rule is based on the work on logarithm. A simple slide rule consists of two movable marked scales in which one scale slips upon the other.



Pascaline

Pascaline is a calculating machine developed by Blaise Pascal in 1642, a French Mathematician. It was the first device with an ability to perform additions and subtractions on whole numbers. The device is made up of interlocked cog wheels which contains numbers 0 to 9 on its circumference. When one wheel completes its rotation the other wheel moves by one segment. Pascal patented this device in 1647 and produced it on mass scale and earned a handful of money.



Stepped Reckoner:

Stepped Reckoner a calculating machine designed (1671) and built (1673) by the German mathematician-philosopher Gottfried Wilhelm von Leibniz. The Stepped Reckoner expanded on the French mathematician-philosopher Blaise Pascal's ideas and did multiplication by repeated addition and shifting. It was the first calculator that could perform- addition, subtraction, multiplication and division. Even square roots could be calculated by series of stepped additions.



Jacquard's Loom

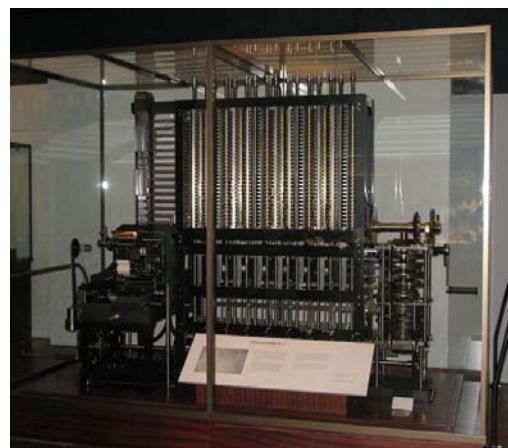
Jacquard's Loom was invented by Joseph Jacquard and first demonstrated in 1801. This device is an attachment for powered looms that uses a chain of punch cards to instruct the loom on how to make intricate textiles. For example, a loom could have hundreds of cards with holes in each of them that correspond to hooks that can be raised or lowered to make a textile brocade. Below is an illustration of the Jacquard Loom attachment on top of a textile loom.

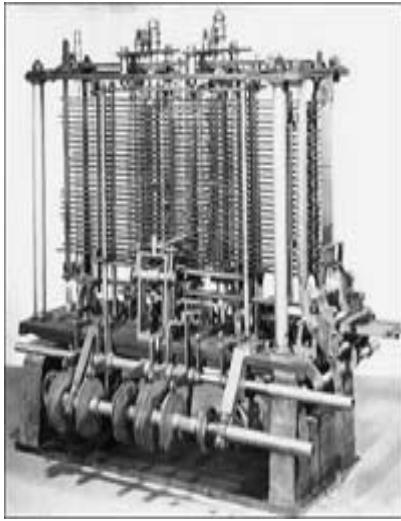


Charles Babbage and his Engines

Charles Babbage was born on December 26, 1791 in London, England. He designed the first mechanical computer, which he called the "Difference Engine" — a machine that could solve polynomial equations without using multiplication or division. He began developing the machine in 1822, and worked on it for over ten years, but its construction was never completed.

- He also invented and developed his Analytical Engine in the late 1833. This was the first general purpose fully programmable mechanical machine. This device could perform complex calculations and store the result.
- This analytical engine was based on input, process and output principle since the modern computers are based on Babbage's idea and principle. Therefore, Charles Babbage is also known as the father of modern computer science.





Lady Augusta Ada Lovelace

Lady Augusta Ada Lovelace was an English writer as well daughter of famous English poet Lord Byron. She suggested Charles Babbage to use binary number system for programs and data to be fed into the Analytical Engine. That was the first programming concept. So, she is regarded as the world's first computer programmer. In 1979, the US Department of Defense developed a programming language and named 'ADA' in her honor.



Tabulating Machine

The Hollerith tabulating machine, also known as the tabulating machine, was an electrical counting machine invented by Herman Hollerith. It was first described in his doctoral thesis, which he presented at Columbia University in 1889.

The machine was proof of his concept that data could be encoded by holes punched in a card and thereby counted and sorted electronically. It was successful, and Hollerith went on to found the Tabulating Machine Company, which later merged to become a company called IBM.



Electromechanical Computer (Devices)

Mark I

Mark I was designed by a Harvard graduate student, Howard H. Aiken in 1937 to solve advanced mathematical physics problems encountered in his research.

The IBM Automatic Sequence Controlled Calculator (ASCC),



called Mark I, uses 18000 vacuum tubes to store data in the memory. The machine weighed 35 tones, 500 miles of wire, 8 feet tall and 51 feet long etc.

Atanasoff-Berry Computer

Atanasoff-Berry Computer (the ABC) is considered as the first electronic digital computer and was the first machine to use vacuum tubes (over 300 vacuum tubes). Professor John Vincent Atanasoff and graduate student Cliff Berry developed the ABC in 1937 and continued development until 1942 at the Iowa State College (now Iowa State University). On October 19, 1973, Judge Earl R. Larson signed his conclusion that the ENIAC, patent by Eckert and Mauchly was invalid and named Atanasoff the inventor of the first electronic digital computer.



Electronic Computers (Devices)

ENIAC

Electronic Numerical Integrator and Calculator, (the ENIAC) was the first electronic computer used for general purposes, such as solving numerical problems. It was invented by J. Presper Eckert and John Mauchly at the University of Pennsylvania to calculate artillery firing tables for the United States Army's Ballistic Research Laboratory.

Its construction began in 1943 and was not completed until 1946. Although it was

not completed until the end of World War II, the ENIAC was created to help with the war effort against German forces.

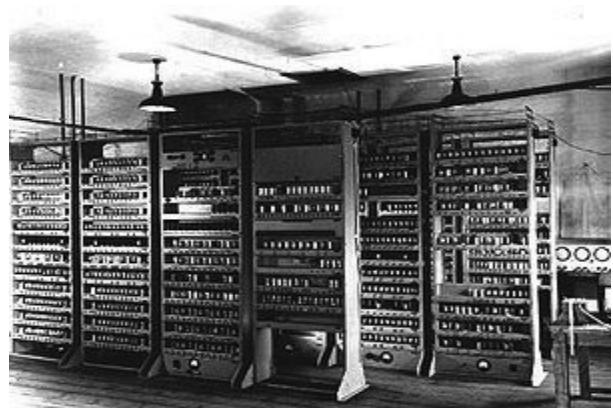
In 1956, the end of its operation, the (ENIAC) occupied about 1,800 square feet and consisted of almost 20,000 vacuum tubes, 1,500 relays, 10,000 capacitors, and 70,000 resistors. It also used 200 kilowatts of electricity, weighed over 30 tons, and cost about \$487,000.



EDSAC

Electronic Delay Storage Automatic Calculator (EDSAC) is an early British computer considered to be the first stored program electronic computer. It was created at the University of Cambridge in England, performed its first calculation on May 6, 1949, and was the computer that ran the first graphical computer game, nicknamed "Baby." In the picture to the right, is an example of the EDSAC computer.

In the picture below, is an example of the EDSAC simulator that can be run on today's computers. The simulator simulates the EDSAC computer as it existed between 1949-1951.



UNIVAC I

Universal Automatic Computer, the UNIVAC I was released in 1951 and 1952 when first developed by J. Presper Eckert and John Mauchly. The UNIVAC is an electrical computer containing thousands of vacuum tubes that utilizes punch cards and switches for inputting data and punch cards for outputting and storing data. The UNIVAC was later released the UNIVAC II, and III with various models, such as the 418, 490, 491, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, and 1108. Many of these models were only owned by a few companies or government agencies.

In the below picture is an example of the UNIVAC computer. As can be seen in the picture, this is a room-sized computer and often required multiple people to operate.



History of computer in Nepal

There is not a long history of computers in Nepal. Nepal hired some types of calculators and computers for its census calculation. Following list shows its history in Nepal. · In 2018 BS an electronic calculator called "Facit" was used for census. · In 2028 BS census IBM 1401 a second generation mainframe computer was used. · In 2031 BS a center for Electronic Data Processing, Later renamed to National Computer Center (NCC), was established for national data processing and computer training. In 2038 BS ICL 2950/10 a second generation mainframe computer was used for census. Now-a-days probably each and every institutions, business organizations, communication centers, ticket counters etc. are using computers.

After 2039 B.S., microcomputer s such as Sirus, Vector, IBM, Apple etc were imported by private companies and individuals in Nepal. Today there are thousands of computer training institutes, computer sales and repair centers in Nepal. Different universities are opening IT colleges in Nepal. Computer subject has been included in the curriculum of school education and universities.

1.3. The Computer system characteristics

High Speed

- Computer is a very fast device.
- It is capable of performing calculation of very large amount of data in a short time.
- The computer has units of speed in microsecond, nanosecond, and even the picosecond.
- It can perform millions of calculations in a few seconds as compared to man who will spend many months to perform the same task.

Accuracy

- In addition to being very fast, computers are very accurate.
- The calculations are 100% error free.
- Computers perform all jobs with 100% accuracy if the input is correct.

Storage Capability

- Memory is a very important characteristic of computers.
- A computer has much more storage capacity than human beings.
- It can store large amount of data.
- It can store any type of data such as images, videos, text, audio, etc.

Diligence

- Unlike human beings, a computer is free from monotony, tiredness, and lack of concentration.
- It can work continuously without any error and boredom.
- It can perform repeated tasks with the same speed and accuracy.

Versatility

- A computer is a very versatile machine.
- It is very flexible in performing the jobs to be done.
- This machine can be used to solve the problems related to various fields.
- At one instance, it may be solving a complex scientific problem and the very next moment it may be playing a card game.

Reliability

- A computer is a reliable machine.
- Modern electronic components have long lives.
- Computers are designed to make maintenance easy.

Automation

- Computer is an automatic machine.
- Automation is the ability to perform a given task automatically. Once the computer receives a program i.e., the program is stored in the computer memory, then the program and instruction can control the program execution without human interaction.

Reduction in Paper Work and Cost

- The use of computers for data processing in an organization leads to reduction in paper work and results in speeding up the process.
- As data in electronic files can be retrieved as and when required, the problem of maintenance of large number of paper files gets reduced.
- Though the initial investment for installing a computer is high, it substantially reduces the cost of each of its transaction.

4. The Capabilities and limitation of computer:

Computer - Applications

The application of computers in various fields are given as below :

Business

A computer has high speed of calculation, diligence, accuracy, reliability, or versatility. It is an integrated part in all business organizations. It is used in business organizations for Payroll calculations, Budgeting, Sales analysis, Financial

forecasting, Managing employee database, Maintenance of stocks, etc.

Banking

Today, banking is almost totally dependent on computers.

Banks provide the following facilities with the help of computers.

- Online accounting facility, which includes checking current balance, making deposits and overdrafts, checking interest charges, shares, and trustee records.
- ATM machines which are completely automated are making it even easier for customers to deal with banks.

Insurance

Insurance companies are keeping all records up-to-date with the help of computers.

Insurance companies, finance houses, and stock broking firms are widely using computers for their concerns. Insurance companies are maintaining a database of all clients with information showing Procedure to continue with policies, Starting date of the policies, Next due installment of a policy, Maturity date, Interests due, Survival benefits, Bonus etc.

Education

The computer helps in providing a lot of facilities in the education system.

- The computer provides a tool in the education system known as CBE (Computer Based Education).
- CBE involves control, delivery, and evaluation of learning.
- Computer education is rapidly increasing the graph of number of computer students.
- There are a number of methods in which educational institutions can use a computer to educate the students.
- It is used to prepare a database about the performance of a student and analysis is carried out on this basis.

Marketing

In marketing, uses of the computer are following –

- **Advertising** – With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.
- **Home Shopping** – Home shopping has been made possible through the use of computerized catalogues that provide access to product information and permit direct entry of orders to be filled by the customers.

Healthcare

Computers have become an important part in hospitals, labs, and dispensaries. They are being used in hospitals to keep the record of patients and medicines. It is also used in scanning and diagnosing different diseases. ECG, EEG, ultrasounds and CT scans, etc. are also done by computerized machines.

Following are some major fields of health care in which computers are used.

(i) Diagnostic System, (ii) Lab-diagnostic System, (iii) Patient Monitoring System, and (iv) Pharma Information System, Surgery etc.

Engineering Design

Computers are widely used for Engineering purpose. One of the major areas is CAD (Computer Aided Design) that provides creation and modification of images. Some of the fields are Structural Engineering, Industrial Engineering, Architectural Engineering, etc.

Military

Computers are largely used in defense. Military also employs computerized control systems. Some military areas where a computer has been used are Missile Control, Military Communication, Military Operation and Planning, Smart Weapons etc.

Communication

Communication is to convey a message, an idea, a picture, or speech that is received and understood clearly and correctly by the person for whom it is meant. Some main areas in this category are E-mail, Chatting, Usenet, FTP, Telnet, Video-conferencing, etc.

Government

Computers play an important role in government services. Some major fields in this category are budgets, Sales tax department, Income tax department, Computation of male/female ratio, Computerization of voters lists, Computerization of PAN card, Weather forecasting etc.

Disadvantages of Computers

Following are certain disadvantages of computers.

- A computer is a machine that has no intelligence to perform any task.
- Each instruction has to be given to the computer.
- A computer cannot take any decision on its own.
- Computers have no feelings or emotions.

4. The Types of Computer

There are different types of computer having different features. Computers differ based on their data processing abilities. They are classified according to purpose, data handling and functionality.

According to purpose, computers are either general purpose or specific purpose.

- a. Special Purpose Computers
- b. General Purpose Computers

a. Special Purpose Computers

A special purpose computer is designed only to meet the requirements of a particular task or application. The instructions needed to perform a particular task are permanently stored into the internal memory, so that it can perform the given task on a single command. It therefore doesn't possess unnecessary options and is less expensive.

b. General Purpose Computers

A General Purpose computers are designed to meet the needs of many different applications. In these computers, the instructions needed to perform a particular task are wired permanently into the internal memory. When one job is over, instructions for another job can be loaded into the internal memory for processing.

This, a general purpose machine can be used to prepare pay-bills, manage inventories, print sales report and so on.

Based on the operating principles, computers can be classified into the following types :

- a. Analog Computers
- b. Digital Computers
- c. Hybrid Computers

a. Analog Computers

An analog computer is a form of computer that uses the continuously changeable aspects of physical phenomena such as electrical, mechanical, or hydraulic quantities to model problem being solved. In contrast, digital computers represent varying quantities symbolically, as their numerical values change.

b. Digital Computers

Operate essentially by counting. All quantities are expressed as discrete numbers. Digital computers are useful for evaluating arithmetic expressions and manipulations of data (such as preparation of bills, ledgers, solution of simultaneous equations etc)

C. Hybrid Computers

Hybrid Computers are computers that exhibit features of analog computers and digital computers. The digital component normally serves as the controller and provides logical operations, while the analog component normally serves as a solver of differential equations.

Classification of digital Computer based on size and Capability

Based on size and capability, computers are broadly classified into

a. Microcomputers (Personal Computer)

A microcomputer is the smallest general purpose processing system. Microcomputer can be classified into 2 types:

1. Desktops
2. Portables

The difference is portables can be used while travelling whereas desktops computers cannot be carried around.

The different portable computers are: -

- 1) Laptop
- 2) Notebooks
- 3) Palmtop (hand held)
- 4) Wearable computers

b. Minicomputer

A minicomputer is a medium-sized computer. That is more powerful than a microcomputer. These computers are usually designed to serve multiple users simultaneously (Parallel Processing). They are more expensive than microcomputers.

Examples : Digital Alpha, Sun Ultra.

c. Mainframe computers

Computers with large storage capacities and very high speed of processing (compared to mini- or microcomputers) are known as mainframe computers. They support a large number of terminals for simultaneous use by a number of users like ATM transactions. They are also used as central host computers in distributed data processing system. Examples: - IBM 370, S/390.

d. Supercomputer

Supercomputers which have extremely large storage capacity and computing speeds are many times faster than other computers. A supercomputer is measured in terms of tens of millions instructions per second (mips), an operation is made up of numerous instructions. The supercomputer is mainly used for large scale numerical problems in scientific and engineering disciplines such as weather analysis. Examples: - IBM Deep Blue

1.6. The Generations of computers and their features

Computer generation is the classification of computers into different groups according to their manufacturing date, other hardware and software technology used inside those computers.

There are five computer generations known till date. Each generation has been discussed in detail along with their time period and characteristics. In the following table, an approximate date against each generation has been mentioned, which are normally accepted.

Following are the main five generations of computers.

Computer - First Generation:

The period of first generation was from 1945 to 1955. The computers of first generation used vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit). These tubes, like electric bulbs, produced a lot of heat and the installations used to fuse frequently. Therefore, they were very expensive and only large organizations were able to afford it. The computers in this generation used machine code as the programming language.

The main features of the first generation are Vacuum tube technology, Unreliable, Supported machine language only, Very costly, Generated a lot of heat, Slow input and output devices, Huge size, Need of AC, Non-portable, Consumed a lot of electricity, etc.

Some computers of this generation were ENIAC, EDVAC, UNIVAC, IBM-701, IBM-650, etc.

Computer - Second Generation

The period of second generation was from 1956 to 1964. In this generation, transistors were used that were cheaper, consumed less power, more compact in size, more reliable and faster than the first generation machines made of vacuum tubes. In this generation, magnetic cores were used as the primary memory and magnetic tape and magnetic disks as secondary storage devices. In this generation, assembly language and high-level programming languages like FORTRAN,

COBOL were used. The computers used batch processing and multiprogramming operating system. The main features of second generation are; use of transistors, reliable in comparison to first generation computers, smaller size as compared to first generation computers, generated less heat as compared to first generation computers, Consumed less electricity as compared to first generation computers, faster than first generation computers, still very costly, AC required, supported machine and assembly languages, etc.

Some computers of this generation were IBM 1620, IBM 7094, CDC 1604, CDC 3600, UNIVAC 1108 etc.

Computer- Third Generation

The period of third generation was from 1965 to 1971. The computers of third generation used Integrated Circuits (ICs) in place of transistors. A single IC has many transistors, resistors, and capacitors along with the associated circuitry.

The IC was invented by Jack Kilby. This development made computers smaller in size, reliable, and efficient. In this generation remote processing, time-sharing, multiprogramming operating system were used. High-level languages (FORTRAN, COBOL, PASCAL, BASIC, etc.) were used during this generation. The main features of third generation are IC used, More reliable in comparison to previous two generations, smaller size, generated less heat, faster, lesser maintenance, supported high-level language etc.

Some computers of this generation were IBM-360 series, Honeywell-6000 series, PDP (Personal Data Processor), IBM-370/168, TDC-316 etc.

Computer - Fourth Generation

The period of fourth generation was from 1972 to 1980. Computers of fourth generation used Very Large Scale Integrated (VLSI) circuits. VLSI circuits on a single chip made it possible to have microcomputers of fourth generation.

Fourth generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to Personal Computer (PC) revolution. In this generation, time sharing, real time networks, distributed operating system were

used. All the high-level languages like C, C++, DBASE etc., were used in this generation. The main features of fourth generation are VLSI technology used, very cheap, portable and reliable, use of PCs, very small size, pipeline processing, no AC required, concept of internet was introduced, great developments in the fields of networks, computers became easily available, etc.

Some computers of this generation were DEC 10, STAR 1000, PDP 11, CRAY-1 (Super Computer), CRAY-X-MP (Super Computer) etc.

Computer - Fifth Generation

The period of fifth generation is from 1980 onwards. In the fifth generation, VLSI technology became ULSI (Ultra Large Scale Integration) resulting in the production of microprocessor chips having ten million electronic components.

This generation computer is based on parallel processing hardware and AI (Artificial Intelligence) software. AI is an emerging branch in computer science, which interprets the means and method of making computers think like human beings. All the high-level languages like C and C++, Java, .Net etc., are used in this generation.



AI includes Robotics, neural networks, game playing, development of expert systems to make decisions in real-life situations, natural language understanding and generation etc.

The main features of fifth generation are ULSI technology, development of true artificial intelligence, development of natural language processing, advancement in parallel processing, advancement in superconductor technology, more user-friendly interfaces with multimedia features, availability of very powerful and compact computers at cheaper rates etc.

Some computer types of this generation are Desktop, Laptop, NoteBook, UltraBook, Chrome Book etc

1.7. The Types of PC/Es and their characteristics

Computers can be broadly classified by their speed and computing power.

Desktop Computer (Personal Computer)

A PC (Personal Computer) can be defined as a small, relatively inexpensive computer designed for an individual user. PCs are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip. Personal computers are used in business sectors for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications. At home, the most popular use for personal computers is playing games and surfing the Internet. The characteristics of desktop computer are

- Computers used to be huge and would sometime take up the whole space of a room.
- These computers were cheap and affordable for the public.
- Desktop Computer normally have a separate monitor, keyboard, mouse, speakers etc.
- Can be used as a standalone computer in your home for personal or work use.
- Tends to be connected to own printer and internet connection.

Laptop:

Laptop computers, also known as notebooks, are portable computers that you can take with you where as you like and use in different environments. They include a screen, keyboard, and a trackpad or trackball, which serves as the mouse. Because laptops are meant to be used on the go, they have a battery which allows them to

operate without being plugged into a power outlet.

Laptop computer consists of all the components (monitor, keyboard etc.) are together on a single device. The main advantages of a laptop computers area they are portable and they can connect wirelessly to network connections.



Notebook:

A notebook computer is a battery - or AC-powered personal computer generally smaller than a briefcase that can easily be transported and conveniently used in temporary spaces such as on airplanes, in libraries, temporary offices, and at meetings. A notebook computer, sometimes called a laptop computer, typically weighs less than 5 pounds and is 3 inches or less in thickness. Among the best-known makers of notebook and laptop computers are IBM, Apple, Compaq, Dell, Toshiba, and Hewlett-Packard.

A serial port also allows a regular mouse to be attached. The PC Card is insert able hardware for adding a modem or network interface card to a notebook. CD-ROM and digital versatile disc drives may be built-in or attachable.

Palmtop:

A palmtop computer is a personal computer or other electronic device that has many of the same features as a computer and fits in the palm of your hand. A good example of an early palmtop computer is the PalmPilot. Because of their size, early palmtop computers did not have a keyboard or a mouse and often relied on a pen that used Graffiti or something similar.

The term "palmtop computer" was an early term used when computers were big and

cumbersome and small cell phones and even smartphones were not yet invented. Today, this term is rarely used to describe a computer that fits in your hand because of the invention of the smartphone.

Workstations

Workstation is a computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other such types of applications which require a moderate amount of computing power and relatively high quality graphics capabilities.

Workstations generally come with a large, high-resolution graphics screen, large amount of RAM, inbuilt network support, and a graphical user interface. Most workstations also have mass storage device such as a disk drive, but a special type of workstation, called diskless workstation, comes without a disk drive.

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

Summary

- A computer is an electronic data processing device, which accepts and stores data input, processes the data input, and generates the output in a required format.
- Abacus was the first counting device which was developed in China more than 3000 years ago.
- Napier's bone is a device which contains a set of rods made of bones. It was developed by John Napier in 1617, a Scottish Mathematician
- Slide Rule was an analog device invented by William Oughtred in 1620. The slide rule is used mainly for multiplication and division, and also for "scientific" functions such as roots, logarithms and trigonometry, but usually not for addition or subtraction. The slide rule is based on the work on logarithm.
- Pascaline is a calculating machine developed by Blaise Pascal in 1642, a French Mathematician. It was the first device with an ability to perform

additions and subtractions on whole numbers.

- Stepped Reckoner a calculating machine designed in (1671) and built in (1673) by the German mathematician-philosopher Gottfried Wilhelm von Leibniz.
- Jacquard Loom is an attachment for powered looms that uses a chain of punch cards to instruct the loom on how to make intricate textiles. It was invented by Joseph Jacquard and first demonstrated in 1801.
- The analytical engine was based on input, process and output principle since the modern computers are based on Babbage's idea and principle. Therefore, Charles Babbage is also known as the father of modern computer science.
- The Hollerith tabulating machine, also known as the tabulating machine, was an electrical counting machine invented by Herman Hollerith.
- Mark I was designed (1937) by a Harvard graduate student, Howard H. Aiken to solve advanced mathematical physics problems encountered in his research. Aiken's ambitious proposal envisioned the use of modified, commercially-available technologies coordinated by a central control system.
- Atanasoff-Berry Computer, (ABC) is considered as the first electronic digital computer and was the first machine to use vacuum tubes (over 300 vacuum tubes).
- Electronic Numerical Integrator and Calculator (ENIAC) was the first electronic computer used for general purposes, such as solving numerical problems.
- Electronic Delay Storage Automatic Calculator (EDSAC) is an early British computer considered to be the first stored program electronic computer.
- The UNIVAC is an electrical computer containing thousands of vacuum tubes, utilizes punch cards and switches for inputting data and punch cards for outputting and storing data.
- Communication is a way to convey a message, an idea, a picture, or speech that is received and understood clearly and correctly by the person for whom it is meant.
- A special purpose computer is designed only to meet the requirements of a

particular task or application.

- A General Purpose computer are designed to meet the needs of many different applications. In these computers, the instructions needed to perform a particular task are wired permanently into the internal memory.
- An analog computer is a form of computer that uses the continuously changeable aspects of physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved.
- Digital Computers operate essentially by counting. All quantities are expressed as discrete or numbers.
- Hybrid Computers:- are computers that exhibit features of analog computers and digital computers.
- A microcomputer is the smallest general purpose processing system.
- A minicomputer is a medium-sized computer. That is more powerful than a microcomputer.
- Computers with large storage capacities and very high speed of processing (compared to mini- or microcomputers) are known as mainframe computers.
- Supercomputers have extremely large storage capacity and computing speeds which are many times faster than other computers.
- Computer generation is the classification of computers into different groups according to their manufacturing date, other hardware and software technology used inside those computers.
- The computers of first generation used vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit).
- Computers of fourth generation used Very Large Scale Integrated (VLSI) circuits.
- A PC(Personal Computer) can be defined as a small, relatively inexpensive computer designed for an individual user.
- A notebook computer is a battery- or AC-powered personal computer generally smaller than a briefcase it can easily be transported and conveniently used in temporary spaces such as on airplanes, in libraries, temporary offices, and at meetings.

- A palmtop computer is a personal computer or other electronic device that has many of the same features as a computer and fits in the palm of your hand.
- Workstation is a computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other such types of applications which require a moderate amount of computing power and relatively high quality graphics capabilities.

Self Evaluation

1. Write very short answer of the following questions

- a. What is obtained after processing data?
- b. Computer is electronic or electrical device?
- c. Who is considered as the father of computer science?
- d. When was Abacus developed?
- e. Who was John Napier?
- f. Who is known as the first programmer?
- g. Which was the first computer brought in Nepal?
- h. What is the major component of second generation computer?
- i. What was the duration of first generation computer?
- j. Which generation computer supported GUI operating system?
- k. Write one example of fifth generation computer.
- l. What does the word "digital" means ?
- m. Which type of computers is in briefcase style?

2. Write short answer of the following question.

- a. What is computer? How is it used in business and banking.
- b. Why is data processing done in computer?
- c. List any five features of computer.
- d. Why is computer called a versatile machine?
- e. Why is Charles Babbage known as father of computer science?
- f. Draw the figure of Abacus showing its parts.
- g. Write the feature of Mark-I.
- h. How are computer generations classified?

- i. List any two advantages of second generation computer.
- j. Define the term artificial intelligence.
- k. Distinguish between analog and digital computer.
- l. List the type of digital computers.
- m. Write the application of super computer.
- n. Discuss one simple example of hybrid computer.

3. Write long answer to the following question.

- a. Explain the working principle of computer with suitable diagram.
- b. Discuss any five features of computer.
- c. Explain the history of computing device of mechanical era.
- d. Compare and discuss between electromechanical and electrical era of computer.
- e. Describe the history of computer in Nepal in your own words.
- f. What is computer generation? Discuss different generation of computer with technologies used in each generation.
- g. Classify the types of digital computer with short description.
- h. Differentiate between general purpose and special purpose computer with suitable examples.

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Unit: 2

Computer System

Learning Outcomes:-

After completion of this unit you will be able to

- explain the concepts of computer organization
- explain computer hardware and memory
- explain input and output devices
- explain computer software

2.1. Concept of Computer Organization

The computer along with various hardware units and software that makes the computer function and perform the different tasks is collectively known as computer system. Computer system covers some categories some of which are given below :

- Hardware
- Software
- Data or information
- Procedure (data which the computer converts)
- User
- Communication

1. Hardware

Hardware refers to the part of computer. Hardware are observable and we can touch them. It refers to the physical devices of the computer. It consists of interconnected electronic equipment that controls everything the computer does. It includes input devices, input devices, output devices, processing devices and storage devices. Example of hardware are keyboard, monitor, CPU, hard disk and RAM.

2. Software

The software is the term used to describe the instruction that tells the hardware, what and how to perform a task. Without software, the hardware is useless. Examples of software are Window 7, MS office, Internet explorer, etc.

3. Data/Information

The function of a computer system is to convert data into information. Data can be considered as the raw facts whether in a paper, electronic or the other form that is processed by the computer. In other words , data consist of the raw facts and figures that are processed to form information. Information is summarized or manipulated or processed data.

4. People

People constitute the most important parts of the computer system. People operate the computer hardware and create the computer software. They also follow a certain procedure when using the hardware and software.

5. Procedure

The procedure is a description of how things are done, step for accomplishing a result. Procedure for a computer system appears in documentation manual, also known as reference manual which contains instruction, rules, and guidelines to follow when using hardware and software. When you buy a microcomputer or software package, it comes with one or more documentation manuals.

6. Communication

When one computer system is set up to share data and information electronically with another computer system, communication becomes a system element. In other words, the manner on which the various individual system are connected by wires, cables, phone lines, microwave, Wi-Fi or satellite is an element of the total computer system.

2.2. Types of Computer Hardware

The computer is a device that is operated upon information or data. It is an electronic device which accepts inputs data, stores the data, carries out arithmetic, logic operations and provides the outputs in the desired format. The computer receives data, processes it, produces output and stores it for further references. So, a computer should have at least four major components to perform these tasks. A block diagram of the basic computer organization has the following functional units.

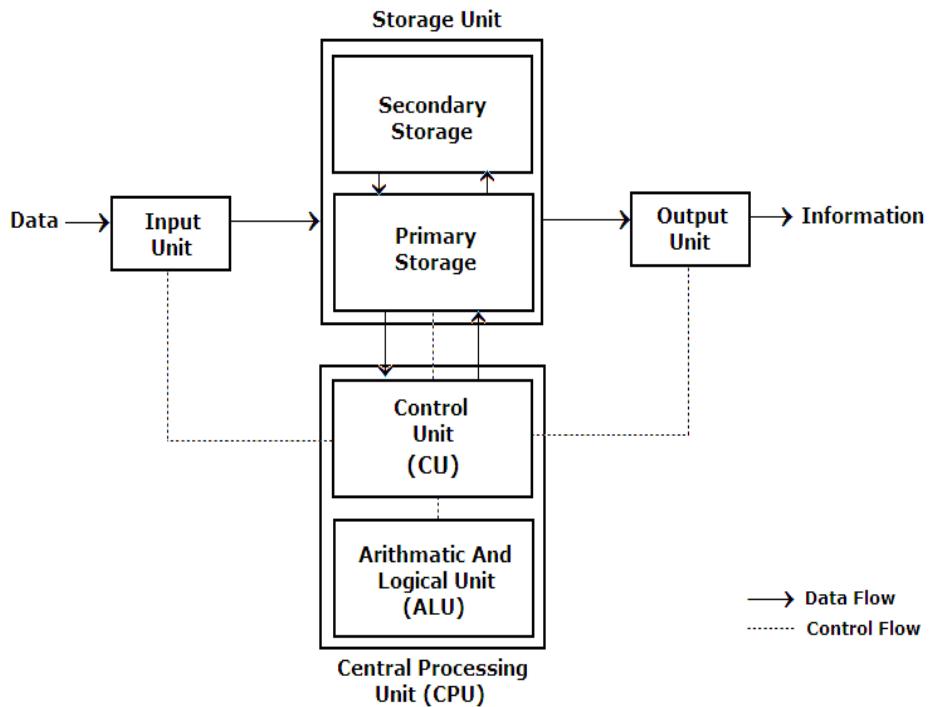


Fig: Block diagram of computer architecture

Input Unit

The input unit is formed by the input devices attached to the computer. Input devices are used to interact with a computer system or enter data and instructions to the computer. These devices convert input data and instructions into a suitable binary form such as ASCII, which can be acceptable by the computer. In brief, an input unit performs the following functions:

- It accepts data and instruction from the outside world.
- It converts these data and instruction into computer understandable from a binary form.
- It supplies the converted data and instructions to the computer system for further processing.

The examples of input devices are keyboard, mouse, scanner etc.

Central Processing Unit (CPU)

CPU is the component that is actually responsible for interpreting and executing most of the commands from the computer hardware and software and also controlling the

operation of all other components such as memory unit, input and output devices. It simply accepts binary data as input and processes data according to those instructions and provides the result as output. It is the logic machine. So, its main function is run the program by fetching instructions from the RAM, evaluating and executing them in sequence. In summary, the function of CPU are as follow:

- Reading instruction from memory
- Communicating with all peripherals using the system bus.
- Controling the sequence of instructions.
- Controling the flow of data from one component to another component.
- Performing the computing task specified in the program.

The CPU has three components responsible for different function, these components are Control units, arithmetic-logical unit (ALU) and Register.

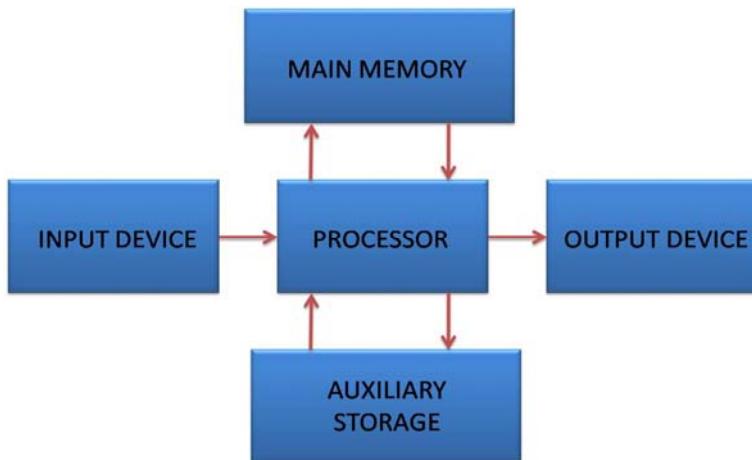


Fig: Components of CPU

Control Unit

The control unit provides the necessary timing and control signals to all the operations on the computer. It controls the flow of data between the CPU, memory and peripherals. It also controls the entire operation of a computer. It obtains the instructions from the program stored in the main memory, interprets the instructions and issues the signals which cause the other units of the system to execute them. So, it is considered as a central nervous system of a computer that provides status, control and timing signals necessary for the operation of other parts of CPU,

memory and I/O devices. The main functions of control units are given below:

- It performs the data processing operations with the aid of program prepared by the user and sends control signals to various parts of the computer system.
- It gives commands to transfer data from the input devices to the memory to an arithmetic logic unit.
- It also transfers the results from ALU to the memory and then to the output devices.
- It stores a program in the memory.
- It fetches the required instruction from the main storage and decodes each instruction; and hence executes them in sequence.

Arithmetic Logic Unit

This is the area of CPU where various computing functions are performed on data. The ALU performs arithmetic operations such as addition, subtraction, multiplication and division and logical operation such as comparison AND, OR and Exclusive OR. The result of an operation is stored in Accumulator or in some register. The main functions of ALU are as follow:

- It accepts operands from registers.
- It performs arithmetic and logic operations.
- It returns a result to register or a memory.

The logical operations of ALU give the computer the decision-making ability.

Registers

Registers are the high-speed temporary storage locations in the CPU made from electronic devices such as transistors, flip-flops, etc. So, registers can be thought as CPU's working memory. Registers are primarily used to store data temporarily during the execution of a program and are accessible to the user through instructions. These are the part of Control unit and ALU rather than of memory

Output Unit

The output unit is formed by the output devices attached to the computer. Output devices are used to present result produced by the computer to the users. The output

from the computer is in the form electric signals, which is then converted into human understandable form into human readable form.

The examples of output devices are the monitor, printer and speaker.

The main functions of the output unit are as follow:

- It accepts the result produced by the computer which is in electric binary signals.
- It then converts the result into human readable form.
- Finally, it supplies the converted results to the outside word.

2.4. Memory and Storage Devices:

Memory Unit:

This unit is also called storage unit. The data and instructions which are entered through an input unit must be stored on the computer before the actual processing starts. The result produced by the computer after processing is also kept somewhere before passing to the output units. If intermediate results are produced during processing, it should be stored in somewhere in memory. The storage unit of a computer performs all these needs. In brief, the specific functions performed by the storage unit are as follow:

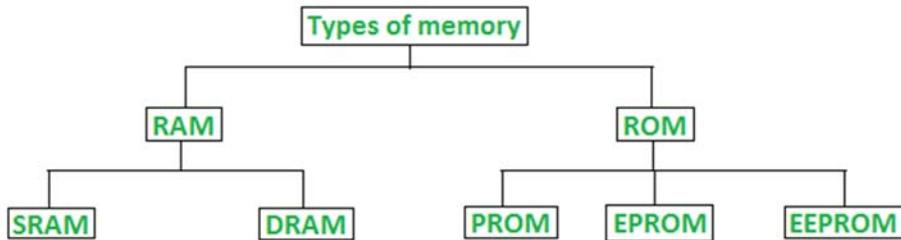
- It stores data and instructions, which are entered through input devices.
- It stores an intermediate result of processing.
- It stores the final result of processing before these results are passed to an output device.

The storage unit of computers consists of two types of memory or storage: primary and secondary storage:

i. Primary Storage

Memory storage that communicates directly with CPU is called main memory. It enables the computer to store, at least temporarily data and instruction. It is mainly used to hold data and instructions and as well as the intermediate result of processing which the computer system is currently working on. Primary memory is volatile, that is, it loses its content when power supply is off. There are two types

of primary memory. They are RAM and ROM.



Classification of computer memory

1. Random Access Memory (RAM)

- It is also called as read write memory or the main memory or the primary memory.
- The programs and data that the CPU requires during execution of a program are stored in this memory.
- It is a volatile memory as the data loses when the power is turned off.
- RAM is further classified into two types- SRAM (Static Random Access Memory) and DRAM (Dynamic Random Access Memory).

DRAM	SRAM
1. Constructed of tiny capacitors that leak electricity.	1. Constructed of circuits similar to D flip-flops.
2. Required a recharge every few milliseconds to maintain its data.	2. Holds its contents as long as power is available.
3. Inexpensive.	3. Expensive.
4. Slower than SRAM.	4. Faster than DRAM.
5. Can store many bits per chip.	5. Can not store many bits per chip.
6. Use less power.	6. Uses more power.
7. Generates less heat.	7. Generates more heat.
8. Used for main memory.	8. Used for cache.

2. Read Only Memory (ROM)

The functions of ROM are given below ;

- Stores crucial information essential to operate the system, like the program essential to boot the computer.

- It is not volatile.
- It is used in embedded systems or where the programming needs no change.
- It is used in calculators and peripheral devices.
- ROM is further classified into 4 types- *ROM, PROM, EPROM, and EEPROM*.

Types of Read Only Memory (ROM)

1. **PROM (Programmable read-only memory)** – It can be programmed by user. Once programmed, the data and instructions in it cannot be changed.
2. **EPROM (Erasable Programmable read only memory)** – It can be reprogrammed. To erase data from it, expose it to ultra violet light. To reprogram it, erase all the previous data.
3. **EEPROM (Electrically erasable programmable read only memory)** – The data can be erased by applying electric field, no need of ultra violet light. We can erase only portions of the chip

Difference between RAM and ROM

RAM	ROM
1. Temporary Storage	1. Permanent storage
2. Store data in MBs.	2. Store data in GBs.
3. Volatile.	3. Non-volatile.
4. Used in normal operations.	4. Used for startup process of computer.
5. Writing data is faster.	5. Writing data is slower.

Cache Memory

As CPU has to fetch instruction from main memory speed of CPU depending on fetching speed from main memory. Cache is cheaper so we can access cache. Cache memory is a very high speed memory that is placed between the CPU and main memory, to operate at the speed of the CPU. It is used to reduce the average time to access data from the main memory. ***The cache is a smaller and faster memory which stores copies of the data from frequently used main memory locations.***

ii. Secondary Storage

Auxiliary storage is also known as secondary storage. It is the memory that

supplements the main memory. These are a non-volatile memory. It is mainly used to transfer data to program from one computer to another computer. There are high capacity storage devices used to store data and program permanently. These are also used as backup devices which allow to store the valuable information as backup on which you are working on. The examples of secondary memory are Magnetic Tape, Magnetic Disk, Optical disk, etc.

Primary Vs Secondary data

BASIS FOR COMPARISON	PRIMARY DATA	SECONDARY DATA
Meaning	Primary data refers to the first hand data gathered by the researcher himself.	Secondary data means data collected by someone else earlier.
Data	Real time data	Past data
Process	Very involved	Quick and easy
Source	Surveys, observations, experiments, questionnaire, personal interview, etc.	Government publications, websites, books, journal articles, internal records etc.
Cost effectiveness	Expensive	Economical
Collection time	Long	Short
Specific	Always specific to the researcher's needs.	May or may not be specific to the researcher's need.
Available in	Crude form	Refined form
Accuracy and Reliability	More	Relatively less

Various Storage Devices

Magnetic Tape

Magnetic tape is a type of physical storage media for different kinds of data. It is considered an analog solution, in contrast to more recent types of storage media, such as solid state disk (SSD) drives. Magnetic tape has been a major vehicle for audio and binary data storage for several decades, and is still part of data storage for some systems. Magnetic tape was used in many of the larger and less complex mainframe computers that predated today's personal computers (PC).

Magnetic Storage Devices

Magnetic storage or magnetic recording is the storage of data on a magnetized medium. Magnetic storage uses different patterns of magnetisation in a magnetisable material to store data and is a form of non-volatile memory. The information is accessed using one or more read/write heads.

Floppy Disks

A floppy disk, also called a floppy, diskette, or just disk, is a type of disk storage composed of a disk of thin and flexible magnetic storage medium, sealed in a rectangular plastic enclosure lined with fabric that removes dust particles. Floppy disks are read and written by a floppy disk drive (FDD).



Hard Disks

A hard disk drive (HDD), hard disk, hard drive, or fixed disk is an electromechanical data storage device that uses magnetic storage to store and retrieve digital information using one or more rigid rapidly rotating disks (platters) coated with magnetic material. The platters are paired with magnetic heads, usually arranged on a moving actuator arm, which read and write data to the platter surfaces. Data is accessed in a random-access manner, meaning that individual blocks of data can be stored or retrieved in any order and not only sequentially. HDDs are a type of non-volatile storage, retaining stored data even when powered off.



Optical Disks

An optical disc (OD) is a flat, usually circular disc which encodes binary data (bits) in the form of pits (binary value of 0 or off, due to lack of reflection when read) and lands (binary value of 1 or on, due to a reflection when read) on a special material (often aluminum) on one of its flat surfaces. The encoding material sits atop a thicker substrate (usually polycarbonate) which makes up the bulk of the disc and forms a dust defocusing layer. The encoding pattern follows a continuous, spiral path covering the entire disc surface and extending from the innermost track to the outermost track. The data is stored on the disc with a laser or stamping machine, and can be accessed when the data path is illuminated with a laser diode in an optical disc drive which spins the disc at speeds of about 200 to 4,000 RPM or more, depending on the drive type, disc format, and the distance of the read head from the center of the disc (inner tracks are read at a higher disc speed). There are four types of optical disks-

1. CD-ROM- Compact Disk Read Only Memory
2. WORM – Write Once Read Many
3. Erasable Optical Disk
4. DVD ROM.
5. VCD

1. CD-ROM

It is an optical ROM in which, pre-recorded data can be read out. The manufacturer writes data on CD-ROMs. The disk is made up of a resin such as polycarbonate. It is coated with a material which will change when a high intensity laser beam is focused on it. The coating material is highly reflective, usually aluminum. It is also called a laser disk.

The advantages of CD-ROM are its high storing capacity, mass copy of information stored, removable from the computer, etc.

2. WORM or CD-R(CD-Recordable)

It is write- once read-many type optical disk memory. The users can write data on WORM and read the written data as many times as desired. To write data on the

disk the laser beam of modest density is employed, which forms pits or bubbles on the disk surface. Its disk controller is somewhat expensive than that for CD-ROM. For writing operation, required laser power is more than that required for reading. Its advantages are its high capacity, better reliability and longer life. The drawback is greater access time compares to that of hard disk.

3. Erasable Optical Disk or CD-ROM

It is a read /write optical disk memory. Information can be written to and read from the disk. The disk contents can be erased and new data can be rewritten. So it can serve as a secondary memory of a computer. Its advantages over magnetic hard disk are :

- Very high storage capacity
- An optical disk can be removed from the drive
- It has long life
- It is more reliable etc.
- The drawback is its longer access time compared to that of a hard disk

4. DVD ROM

DVD stands for Digital Versatile Disks. A DVD stores much more data than CD-ROM. Its capacity are 4.7 GB, 8.5 GB, 20 GB, etc. the capacity depends on whether it is a single layer, double layer single sided or double sided disk. DVD ROM uses the same principle as a CDROM for reading and writing. But a smaller wavelength beam is used. A lens system is used to focus on two different layers on the disk. On each layer data is recorded. Thus, the capacity can be doubled. Further the recording beam is sharper compared to CDROM and the distance between successive tracks on the surface is smaller. The total capacity of DVD ROM is 8.5 GB. In double sided DVDROM two such disks are stuck back to back which allows recording on both sides. This requires the disk to be reversed to read the reverse side. Hence, the double sided DVDROM's capacity is 17 GB. However, double sided DVDROM should be handled carefully as both sides have data, they are thinner, and could be accidentally damaged.

5. VCD

Video CD (abbreviated as VCD, and also known as Compact Disc digital video) is a home video format and the first format for distributing films on standard 120 mm (4.7 in) optical discs. The format is a standard digital format for storing video on a compact disc. VCDs are playable in dedicated VCD players and widely playable in most DVD players, personal computers and some video game consoles.

6. DVD RW

Stands for "Digital Versatile Disk Rewritable." A DVD-RW is like a DVD-R but can be erased and written to again. Like CD-RWs, DVD-RWs must be erased in order for new data to be added. DVD-RWs can hold 4.7GB of data and do not come in double-layered or double-sided versions like DVD-Rs do. Because of their large capacity and ability to be used multiple times, DVD-RW discs are a great solution for frequent backups. To record data onto a DVD-RW disc, you'll need a DVD burner that supports the DVD-RW format.

7. Blue Ray Disc.

Blu-ray Disc is a high-density optical disc format similar to DVD. Blu-ray is the type of disc used for PlayStation 3 games and for playing high-definition (HD) movies. In the past, there were other standards for such movies, such as the HD DVD format. Blu-ray won what is called the format war.

A dual-layer Blu-ray disc can store up to 50GB (gigabytes) of data. This is over five times the capacity of a DVD, and over 70 times more than a CD or VCD.

Flash drives

A flash drive is a small, ultra-portable storage device which, unlike an optical drive or a traditional hard drive, has no moving parts.

Flash drives connect to computers and other devices via a built-in USB Type-A plug, making a flash drive a kind of combination USB device and cable.

SD Cards

The SD card is a basic way of transferring information and storing it. The good thing about it is that it's a non-volatile solution just like the majority of storage

devices and you don't need power source for it to keep the data



MMC Memory Cards:

MultiMediaCard (MMC) is a memory-card standard used for solid-state storage. MMC operates as a storage medium for a portable device, in a form that can easily be removed for access by a PC. For example, a digital camera would use an MMC for storing image files. MMCs are available in sizes up to and including 512 GB.



Physical structure of floppy and hard disk ,drive naming conventions in PC

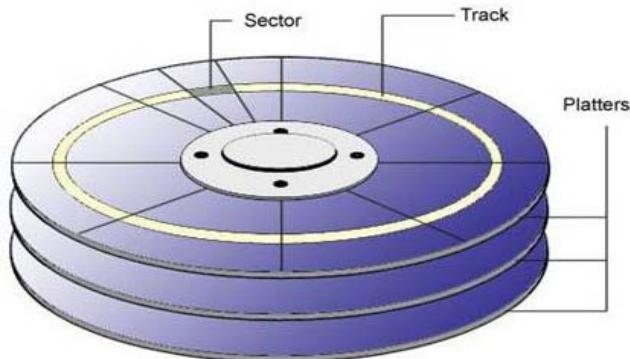
Physical Structure of floppy disk

A floppy disk is basically a circular sheet of plastic, coated with magnetic material. A hard disk is made of a stack of circular metal platters, also coated with magnetic material. Before a disk can be used it must be formatted. The surface of the disk is divided up into a number of concentric **tracks**, each of which is subdivided into **sectors**.

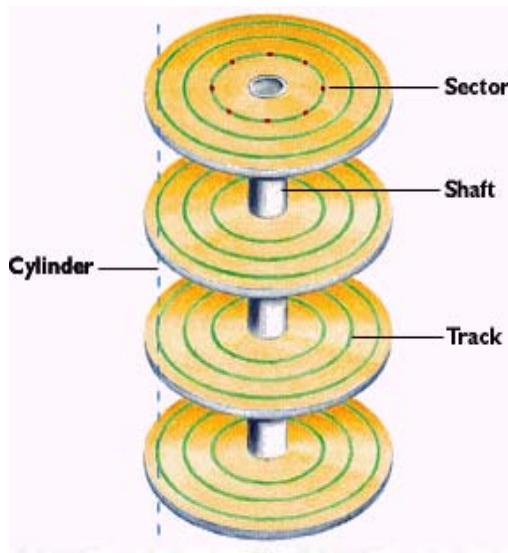
Floppy disks have 80 tracks on each side and each track is split into 18 sectors. A 3.5" floppy disk with 80 tracks and 18 sectors will have $80 \times 18 = 1,440$ storage units, each uniquely identified by its track and sector position. Each storage unit can hold 512 bytes of data, so the disk has a capacity of $1,440 \times 512 = 737,280$ bytes (720 KBytes) per side, or 1,400 KBytes (1.4 MBytes) per disk.

A hard disk is a sealed unit containing a stack of circular platters mounted on a common spindle. Electromagnetic **read/write heads** are located above and below each platter. The platters rotate at a constant speed, eg: 7200 rpm. While they are spinning the heads can move in towards the centre or out towards the edge. This

allows them to reach any location on the platter.



Physical Structure of hard disk



The above picture is the physical structure of a hard disk; the hard disk consists of several discs. How to locate a position on a hard disk? There are three words you should learn: cylinder, head and sector.

Cylinder

The disc that makes up the hard disk is divided into tracks; tracks of all discs which have same track value are called a cylinder, so the cylinder is a pile of tracks with same track value of a hard disk.

Head

Normally, a disc has two heads for reading or writing data, one is for the top and the other one is for the opposite side; the head value means the disc location and side.

Sector

A track is composed of sectors and the number of sectors of all tracks on the hard disk is the same. Sector is the minimal storage unit of a hard disk; the size of one sector is always 512 bytes (rarely, it might be 1024, 2048 or 4096 bytes in some special hard disks).

2.4. Input Device

An input device is a piece of computer hardware equipment used to provide data and control signals to an information processing system such as a computer or information appliance. Examples of input devices include keyboards, mouse, trackball, joystick, digitizing tablet, scanners, digital cameras, MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light pen, Touch Screen etc.

Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.



Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

The keys on the keyboard are as follows

S.No	Keys & Description
1	Typing Keys These keys include the letter keys (A-Z) and digit keys (0-9) which generally give the same layout as that of typewriters.
2	Numeric Keypad It is used to enter the numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.
3	Function Keys The twelve function keys are present on the keyboard which are arranged in a row at the top of the keyboard. Each function key has a unique meaning and is used for some specific purpose.
4	Control keys These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5	Special Purpose Keys Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

Mouse

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.

Generally, it has two buttons called the left and the right button and a wheel is present between the buttons. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.

Track Ball

Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on

the ball, the pointer can be moved. Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button, or a square.

Joystick

Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions. The function of the joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Digitizer

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at. Digitizer is also known as Tablet or Graphics Tablet as it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for fine works of drawing and image manipulation applications.

Scanner

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation. Scanner captures images from the source which are then converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

Digital Camera

A digital camera is a camera that takes video or photographs and input to the computer in the digital format. At first, the photographs are stored in the camera's memory and then transferred to a computer through a cable. Then, we can edit that photograph according to our requirement. Most of the cameras we use today are digital.

Magnetic Ink Card Reader (MICR)

MICR input device is generally used in banks as there are large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.



This reading process is called Magnetic Ink Character Recognition (MICR). The main advantages of MICR is that it is fast and less error prone.

Optical Character Reader (OCR)

OCR is an input device used to read a printed text.



OCR scans the text optically, character by character, converts them into a machine readable code, and stores the text on the system memory.

Optical Mark Reader (OMR)

OMR 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 examinations having multiple choice questions.

Bar Code Readers (BCR)

Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines). Bar coded data is generally used in labeling goods, numbering the books, etc. It may be a handheld scanner or may be embedded in a stationary scanner.



Bar Code Reader scans a bar code image, converts it into an alphanumeric value, which is then fed to the computer that the bar code reader is connected to.

Voice Recognition

Voice or speaker recognition is the ability of a machine or program to receive and interpret dictation or to understand and carry out spoken commands. Voice recognition has gained prominence and use with the rise of AI and intelligent assistants, such as Amazon's Alexa, Apple's Siri and Microsoft's Cortana.

Voice recognition systems enable consumers to interact with technology simply by speaking to it, enabling hands-free requests, reminders and other simple tasks.

Voice recognition is a computer software program or hardware device with the ability to decode the human voice.

Light Pen

Light pen is a pointing device similar to a pen. It 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 the tip of a light pen is moved over the monitor screen and the pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Microphone

Microphone is an input device to input sound that is then stored in a digital form.

The microphone is used for various applications such as adding sound to a multimedia presentation or for mixing music.



Touch Screen

A touch screen is a display device that allows the user to interact with a computer by using their finger. They can be quite useful as an alternative to a mouse or keyboard for navigating a graphical user interface (GUI). Touch screens are used on a variety of devices such as computer and laptop monitors, smart phones, tablets, cash registers, and information kiosks. Some touch screens use a grid of infrared beams to sense the presence of a finger instead of utilizing touch-sensitive input.



2.5. Output devices

Following are some of the important output devices used in a computer.

- Monitors
- Graphic Plotter
- Printer

Monitors

Monitors, commonly called as **Visual Display Unit** (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter ‘e’ in the word help.



There are some disadvantages of CRT Large in Size and High power consumption.

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists. Current uses of flat-panel displays include calculators, video games, monitors, laptop computer, and graphics display.



The flat-panel display is divided into two categories

- **Emissive Displays**— Emissive displays are devices that convert electrical energy into light. For example, plasma panel and LED (Light-Emitting Diodes).
- **Non-Emissive Displays**— Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns. For example, LCD (Liquid-Crystal Device).

Characteristics of a monitor

Following are the characteristics of a monitor:

- a) **Size:** The most important aspect of a monitor is its size. Screen sizes are measured in diagonal inches, the distance from one corner to another opposite corner diagonally.
- b) **Resolution:** The resolution of a monitor indicates how density the pixels are packed. Pixel is short for picture element. A pixel is a single point in a graphic image.
- c) **Band Width:** The amount of data that can be transmitted in a fixed amount of time.
- d) **Refresh Rate:** Display monitors must be refresh many times per second. The refresh rate determines how many times per seconds the screen is to be red

drawn. The refresh rate of a monitor is measured in Hertz.

- e) **Interlacing:** It is a technique in which instead of scanning the image one line at a time, it scans alternately i.e. alternate lines are scanned at each pass.

Video Standard

It will be frustrating if you get a new monitor and then find out you can't connect it to your computer! Your computer needs to send information to your monitor so you can see it. The precise way it does that, and through what kind of cable, is the video standard used. Four different standards are widely used. Each has sub-standards. Your computer will normally have from 1 to 3 of those options available to you. They seldom offer all four standards. Your monitor will probably offer 2 or 3 options. Sometimes your computer might not have the type of standard used by your monitor, especially if you are adding a second monitor.

VGA

The oldest standard is VGA. It stands for Video Graphics Array and was introduced by IBM in 1987. It has been improved since then to allow for more pixels and better performance. This is an Analog display standard, so cabling, and distance can degrade the quality of the output. Generally speaking, newer monitors will look better using a digital standard.

SVGA

A Super Video Graphics Array (SVGA) monitor is an output device which uses the SVGA standard. SVGA is a video-display-standard type developed by the Video Electronics Standards Association (VESA) for IBM PC compatible personal computers (PCs).

XGA

XGA (Extended Graphics Array) is a high-resolution video display mode that provides screen pixel resolution of 1,024 by 768 in 256 colors or 640 by 480 in high (16-bit) color.

The XGA standard is used in desktop and laptop computers as well as in projection systems.

Printers

Printer is an output device, which is used to print information on paper.

There are two types of printers—

- Impact Printers
- Non-Impact Printers

Impact Printers

Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.

Characteristics of Impact Printers are the following –

- Very low consumable costs
- Very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

These printers are of two types –

- Character printers
- Line printers

Character Printers

Character printers are the printers which print one character at a time.

These are further divided into two types:

- Dot Matrix Printer(DMP)
- Daisy Wheel

Dot Matrix Printer

In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in the form of pattern of dots and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which come out to form a character which is why it is called Dot Matrix Printer.



Advantages

- Inexpensive
- Widely Used
- Other language characters can be printed

Disadvantages

- Slow Speed
- Poor Quality

Daisy Wheel

Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower) which is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices that require a few letters to be sent here and there with very nice quality.



Advantages

- More reliable than DMP
- Better quality
- Fonts of character can be easily changed

Disadvantages

- Slower than DMP
- Noisy
- More expensive than DMP

Line Printers

Line printers are the printers which print one line at a time.



These are of two types—

- Drum Printer
- Chain Printer

Drum Printer

This printer is like a drum in shape hence it is called drum printer. The surface of the drum is divided into a number of tracks. Total tracks are equal to the size of the paper, i.e. for a paper width of 132 characters, drum will have 132 tracks. A character set is embossed on the track. Different character sets available in the market are 48 character set, 64 and 96 characters set. One rotation of drum prints one line. Drum printers are fast in speed and can print 300 to 2000 lines per minute.

Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters Fonts cannot be changed

Chain Printer

In this printer, a chain of character sets is used, hence it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

Disadvantages

- Noisy

Non-impact Printers

Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.

These printers are of two types

- Laser Printers
- Inkjet Printers

Characteristics of Non-impact Printers

- Faster than impact printers
- They are not noisy
- High quality
- Supports many fonts and different character size

Laser Printers

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.



Advantages

- Very high speed
- Very high quality output

- Good graphics quality
- Supports many fonts and different character size

Disadvantages

- Expensive
- Cannot be used to produce multiple copies of a document in a single printing

Inkjet Printers

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.



They make less noise because no hammering is done and these have many styles of printing modes available. Color printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

Advantages

- High quality printing
- More reliable

Disadvantages

- Expensive as the cost per page is high
- Slow as compared to laser printer

2.6. Computer Software:

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

Software is a collection of instructions that enable the user to interact with a

computer, its hardware, or perform tasks. Without software, most computers would be useless. For example, without your Internet browser software, you can not surf the Internet or read the page. Without an operating system, the browser can not run on your computer. The picture to the right shows a Microsoft Excel box, an example of a spreadsheet software program.

2.6.1. Necessity of computer software

Software is the soul of the computer. Without it, the computer will never be useful. In simple words software is a set of programs, procedures, algorithms and its documentation. Program software performs the function of the program it implements, either by directly providing instructions to the computer hardware or by serving as input to another piece of software.

Some necessities of computer software are Security, Encryption Software, Backup & Disaster discovery, Network Enhancement, etc.

2.6.2. Types of Software

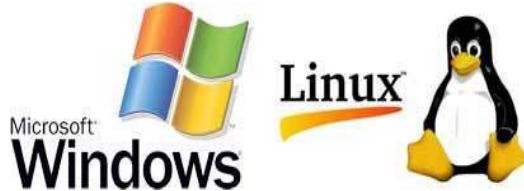
There are two types of software –

- System Software
- Application Software

System Software

The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software is generally prepared by the computer manufacturers. These software products comprise of programs written in low-level languages, which interact with the hardware at a very basic level. System software serves as the interface between the hardware and the end users.

Some examples of system software are Operating System, Compilers, Interpreter, Assemblers, etc.



Here is a list of some of the most prominent features of a system software –

- Close to the system
- Fast in speed
- Difficult to design
- Difficult to understand
- Less interactive
- Smaller in size
- Difficult to manipulate
- Generally written in low-level language

Application Software

Application software products are designed to satisfy a particular need of a particular environment. All software applications prepared in the computer lab can come under the category of Application software.

Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are the following—

- Payroll Software
- Student Record Software
- Inventory Management Software
- Income Tax Software
- Railways Reservation Software
- Microsoft Office Suite Software
- Microsoft Word

- Microsoft Excel
- Microsoft PowerPoint



Features of application software are as follows –

- Close to the user
- Easy to design
- More interactive
- Slow in speed
- Generally written in high-level language
- Easy to understand
- Easy to manipulate and use
- Bigger in size and requires large storage space

SUMMARY

- The computer along with various hardware units and software that makes the computer function and perform the different tasks is collectively known as computer system.
- Hardware refers to the part of the computer which we can touch. It is the physical devices of the computer.
- The software is the term used to describe the instruction that tells the hardware, what and how to perform a task.
- Data can be considered as the raw facts whether in a paper, electronic or the other form that is processed by the computer.
- Input devices are used to interact with a computer system or used to enter data and instructions to the computer.
- CPU is the component that actually responsible for interpreting and executing most of the commands from the computer hardware and software and also controls the operation of all other components such as memory unit, input and

output devices.

- The control unit provides the necessary timing and controls signals to all the operations on the computer.
- The ALU performs arithmetic operations such as addition, subtraction, multiplication and division and logical operation such as comparison AND, OR and Exclusive OR.
- Registers are the high-speed temporary storage locations in the CPU made from electronic devices such as transistors, flip-flops, etc.
- The output unit is formed by the output devices attached to the computer. Output devices are used to present result produced by the computer to the users.
- Memory unit stores data and instructions, which are entered through input devices.
- Memory storage that communicates directly with CPU is called main memory.
- The programs and data that the CPU requires during execution of a program are stored in RAM memory.
- Stores crucial information essential to operate the system, like the program essential to boot the computer is ROM.
- Cache memory is a very high speed memory that is placed between the CPU and main memory, to operate at the speed of the CPU.
- Auxiliary storage is also known as secondary storage. It is the memory that supplements the main memory. These are a non-volatile memory. It is mainly used to transfer data to program from one computer to another computer.
- Primary data refers to the first hand data gathered by the researcher himself.
- Secondary data means the data collected by someone else earlier.
- Magnetic tape is a type of physical storage media for different kinds of data.
- A floppy disk, also called a floppy, diskette, or just disk, is a type of disk storage composed of a disk of thin and flexible magnetic storage medium, sealed in a rectangular plastic enclosure lined with fabric that removes dust particles.

- A hard disk drive (HDD), hard disk, hard drive, or fixed disk, is an electromechanical data storage device that uses magnetic storage to store and retrieve digital information using one or more rigid rapidly rotating disks (platters) coated with magnetic material.
- An optical disc (OD) is a flat, usually circular disc which encodes binary data (bits) in the form of pits (binary value of 0 or off, due to lack of reflection when read) and lands (binary value of 1 or on, due to a reflection when read) on a special material (often aluminum) on one of its flat surfaces.
- DVD stands for Digital Versatile Disks. A DVD stores much more data than CD-ROM.
- A flash drive is a small, ultra-portable storage device which, unlike an optical drive or a traditional hard drive, has no moving parts.
- Multi Media Card (MMC) is a memory-card standard used for solid-state storage.
- The disc that makes up the hard disk is divided into tracks; tracks of all discs which have same track value are called a cylinder, so the cylinder is a pile of tracks with same track value of a hard disk.
- Normally, a disc has two heads for reading or writing data, one is for the top and the other one is for the opposite side; the head value means the disc location and side.
- A track is composed of sectors and the number of sectors of all tracks on the hard disk is the same.
- Sector is the minimal storage unit of a hard disk; the size of one sector is always 512 bytes
- Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.
- Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse.
- Joystick is also a pointing device, which is used to move the cursor position

on a monitor screen.

- Digitizer is an input device which converts analog information into digital form.
- Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.
- A digital camera is a camera that takes video or photographs and input to the computer in the digital format.
- Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines).
- Voice or speaker recognition is the ability of a machine or program to receive and interpret dictation or to understand and carry out spoken commands.
- Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen.
- Microphone is an input device to input sound that is then stored in a digital form.
- A touch screen is a display device that allows the user to interact with a computer by using their finger.
- Monitors, commonly called as Visual Display Unit (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form.
- The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT.
- VGR stands for Video Graphics Array and was introduced by IBM in 1987. It has been improved since then to allow for more pixels and better performance.
- Printer is an output device, which is used to print information on paper.
- Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.
- Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page

Printers.

- Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.
- The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself.
- Application software products are designed to satisfy a particular need of a particular environment.

Self Evaluation

1. Write very short answer to the following question.

1. What is obtained after processing data?
2. Which memory is volatile?
3. Which is portable storage device these days?
4. Which type of software is designed to meet the specific requirement of individual or organization?
5. Is register an input device?
6. Which is an audio output device?

2. Write short answer to the following question.

1. What is computer system?
2. Differentiate between primary and secondary data.
3. Draw physical structure of hard disk.
4. Define computer hardware with some examples.
5. What is CPU ? Write its major parts.
6. Write the importance of software in computer.
7. Write the function of CU and ALU.
8. Differentiate between input device and output device.
9. List the main unit of computer system.
10. What is primary memory? List its major types.
11. What are the necessities of computer software?

3. Write long answer to the following question.

1. Explain different types of hardware devices that make computer system.
2. What is software? Discuss types of software with example and explain also.
3. Draw and explain the block diagram of computer system.
4. What is a printer? Differentiate between impact and non impact printer.
5. What is a monitor? Explain its types.
6. What is an input device? Explain its types.

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Unit: 3

Operating System

Learning Outcomes:-

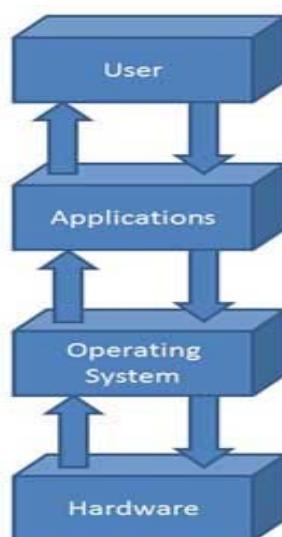
After completion of this unit you will be able to

- explain/describe introduction of operating system.
- explain/describe type of operating system.
- explain/describe disk operating system.
- explain/describe windows operating system
- explain/describe Open sources operating system

3.1. Introduction of operating system:

An operating system is a kind of system software that controls and co-ordinates the overall operations of the computer system. The Operating System is a program with the following features –

- An operating system is a program that acts as an interface between the software and the computer hardware.
- It is specialized software that controls and monitors the execution of all other programs that reside in the computer, including application programs and other system software.



Characteristics of Operating System

Here is a list of some of the most prominent characteristic features of Operating Systems

- Memory Management
- Processor Management
- Device Management
- File Management Security
- Job Accounting Control
- Over System Performance
- Interaction with the Operators
- Coordination Between Other Software and Users

3.2. Types of operating system

An Operating System performs all the basic tasks like managing file, process, and memory. Thus operating system acts as manager of all the resources, i.e. resource manager. Thus operating system becomes an interface between user and machine.

Some of the widely used operating systems are as follows-

Batch Operating System

The users of a batch operating system do not interact with the computer directly. Each user prepares his job on an off-line device like punch cards and submits it to the computer operator. To speed up processing, jobs with similar needs are batched together and run as a group. The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches.

The problems with Batch Systems are as follows –

- Lack of interaction between the user and the job.
- CPU is often idle because the speed of the mechanical I/O devices is slower than the CPU.
- Difficult to provide the desired priority.

Single-user, single tasking Operating System

As the name implies, this operating system is designed to manage the computer so that one user can effectively do one thing at a time. The Palm OS for Palm handheld computers is a good example of a modern single-user, single-task operating system.

Single-user, multi-tasking Operating System

This is the type of operating system most people use on their desktop and laptop computers today. Microsoft's Windows and Apple's Mac OS platforms are both examples of operating systems that will let a single user have several programs in operation at the same time. For example, it's entirely possible for a Windows user to be writing a note in a word processor while downloading a file from the Internet while printing the text of an e-mail message.

Multiprogramming Operating System

In a multiprogramming system there are one or more programs loaded in main memory which are ready to execute. Only one program at a time is able to get the CPU for executing its instructions (i.e., there is at most one process running on the system) while all the others are waiting their turn.

The main idea of multiprogramming is to maximize the use of CPU time. Indeed, suppose the currently running process is performing an I/O task. Then, the OS may interrupt that process and give the control to one of the other in-main-memory programs that are ready to execute (i.e. *process context switching*). In this way, no CPU time is wasted by the system waiting for the I/O task to be completed, and a running process keeps executing until either it voluntarily releases the CPU or when it blocks for an I/O operation. Therefore, the ultimate goal of multiprogramming is to keep the CPU busy as long as there are processes ready to execute.

Finally, note that if there are N ready processes and all of those are highly CPU-bound (i.e., they mostly execute CPU tasks and none or very few I/O operations), in the very worst case one program might wait all the other $N-1$ ones to complete before executing.

Multi-user Operating System

A multi-user operating system allows many different users to take advantage of the computer's resources simultaneously. The operating system must make sure that the requirements of the various users are balanced, and that each of the programs they are using has sufficient and separate resources so that a problem with one user doesn't affect the entire community of users. Unix, VMS and mainframe operating systems, such as MVS, are examples of multi-user operating systems.

Multiprocessing Operating System

Multiprocessing sometimes refers to executing multiple processes (programs) at the same time. This might be misleading because we have already introduced the term “multiprogramming” to describe that before. In fact, multiprocessing refers to the *hardware* (i.e., the CPU units) rather than the *software* (i.e., running processes). If the underlying hardware provides more than one processor then that is multiprocessing. Several variations on the basic scheme exist, e.g., multiple cores on one die or multiple dies in one package or multiple packages in one system. Anyway, a system can be both multi programmed by having multiple programs running at the same time and multiprocessing by having more than one physical processor.

Multitasking Operating System

Multitasking has the same meaning of multiprogramming but in a more general sense, as it refers to having multiple (programs, processes, tasks, threads) running at the same time. This term is used in modern operating systems when multiple tasks share a common processing resource (e.g., CPU and Memory). At any time the CPU is executing one task only while other tasks waiting their turn. The illusion of parallelism is achieved when the CPU is reassigned to another task (i.e. process or thread context switching). Just to make it easy to remember, both multiprogramming and multitasking operating systems are (CPU) time sharing systems. However, while in multiprogramming (older OSs) one program as a whole keeps running until it blocks, in multitasking (modern OSs) time sharing is best manifested because each running process takes only a fair quantum of the CPU

time.

Multithreading Operating System

Multitasking refers to multiple tasks running (apparently) simultaneously by sharing the CPU time. Finally, multiprocessing describes systems having multiple CPUs. Multithreading is an execution model that allows a single process to have multiple code segments (i.e., *threads*) run concurrently within the “context” of that process. Multiple threads of a single process can share the CPU in a single CPU system or (purely) run in parallel in a multiprocessing system.

Time-sharing operating systems:

Time-sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time. Time-sharing or multitasking is a logical extension of multiprogramming. Processor's time which is shared among multiple users simultaneously is termed as time-sharing.

Real-time operating system (RTOS)

Real-time operating systems are used to control machinery, scientific instruments and industrial systems. An RTOS typically has very little user-interface capability, and no end-user utilities, since the system will be a "sealed box" when delivered for use. A very important part of an RTOS is managing the resources of the computer so that a particular operation executes in precisely the same amount of time, every time it occurs. In a complex machine, having a part move more quickly just because system resources are available may be just as catastrophic as having it not move at all because the system is busy.

Distributed operating System

Distributed operating systems use multiple central processors to serve multiple real-time applications and multiple users. Data processing jobs are distributed among the processors accordingly.

Network operating System

A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking

functions. The primary purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network or to other networks.

Examples of network operating systems include Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.

3.3. Disk operating system:

Disk Operating System (DOS) was the first operating system used by IBM-compatible computers. It was originally available in two versions that were essentially the same, but marketed under two different names. "PC-DOS" was the version developed by IBM and sold to the first IBM-compatible manufacturers. "MS-DOS" was the version that Microsoft bought the rights to, and was bundled with the first versions of Windows.

DOS uses a command line, or text-based interface, that allows the user to type commands. By typing simple instructions such as `pwd` (print working directory) and `cd` (change directory), the user can browse the files on the hard drive, open files, and run programs. While the commands are simple to type, the user must know the basic commands in order to use DOS effectively (similar to Unix). This made the operating system difficult for novices to use, which is why Microsoft later bundled the graphic-based Windows operating system with DOS.

The first versions of Windows (through Windows 95) actually ran on top of the DOS operating system. This is why so many DOS-related files (such as .INI, .DLL, and .COM files) are still used by Windows. However, the Windows operating system was rewritten for Windows NT (New Technology), which enabled Windows to run on its own, without using DOS. Later versions of Windows, such as Windows 2000, XP, and Vista, also do not require DOS.

DOS is still included with Windows, but is run from the Windows operating system instead of the other way around. The DOS command prompt can be opened in Windows by selecting "Run..." from the Start Menu and typing `cmd`.

Command or Character based User Interface (CUI)

CUI is a traditional user interface. It provides the interactive terminal where user can enter the command to interpret. It is the only one common place where the program and the user communicate with each other. MS-DOS and Novell Netware are some example of CUI based operating system. In CUI, user has to interact with the applications by making use of commands. In CUI, only one task can run at a time.

CLI or CUI advantages and disadvantages

The advantages of a command line interface are:

- granular control of an OS or application
- faster management of a large number of operating systems
- ability to store scripts to automate regular tasks; and
- basic command line interface knowledge to help with troubleshooting, such as network connection issues.

The disadvantages of a command line interface are :

- GUI is more user-friendly;
- steeper learning curve associated with memorizing commands and complex syntax/arguments; and
- different commands used in different shells.

Concept of File and Directory

A file is systematic collection of related data or information or program instructions. A unique name is given for each file to identify it is called file name. A file name contains two parts: name and extension. Name helps to identify the file and extension helps to identify the type of file. Example, sarthak.exe. here, sarthak is file and .exe is extension.

Rules for writing Filename

1. Only alphanumeric characters are used in file name.
2. The name can have maximum 8 characters long and extension can have three characters long.

3. The name and extension are separated by. (period) sign.
4. Space, commas, colon and backslash cannot be used in filename.

A directory is a location for storing files on your computer. Directories are found in a hierarchical file system, such as Linux, MS-DOS, OS/2, and Unix.

In the picture to the right is an example of the tree command output that shows all the local and subdirectories (e.g., the "big" directory in the cdn directory). When looking at this overview, the C: drive is considered the current directory and root directory because there is nothing beneath it and you can't go back any further. If you are using an operating system with multiple user accounts the directory may also be referred to as a home directory.

Wildcards and pathname

Wild card character, a **wildcard** is a symbol used to replace or represent one or more characters. Wildcards are typically either an asterisk (*), which represents one or more characters or question mark (?), which represents a single character. In the examples below of how a wildcard may be used, realize that wildcards are relatively universal.

Path is used to specify the location of files. It is the way of indicating the location of file. The path is specified by giving pathname. The **pathname** is a sequence of directory name followed by a file name and separated by "\" slash.

Example: C:\program files\photoshop

System Files:

- IO.SYS (or IBMBIO.COM): This contains the system initialization code and built in device drivers. It is hidden file which manages and controls other programs.
- MSDOS.SYS (or IBMDOS.COM): This contains the DOS kernel. Command line interpreter (Shell). It is hidden file which manages input/output operations of input/output devices.
- COMMAND.COM: This is the command interpreter. User configuration files:

- AUTOEXEC.BAT: This is run by the default shell (usually COMMAND.COM) to execute commands at startup.
- CONFIG.SYS: This contains statements to configure DOS and load device drivers.

3.4. Windows operating system

In windows operating system, we can give commands to the computer by clicking on icons, menus and buttons by using a mouse. We do not need to remember commands to perform any tasks in the computer like MS-DOS.

Graphical User Interface (GUI)

With advancement of technology, computer system has become quicker and cheaper. Operating environment has also changed. This lead the development of graphical user interface where users can interact with the computer using picture and graphs, rather than character and commands. It displays the icon, buttons, dialog box etc. Popular GUI based operating system is Microsoft Windows.

Advantages of graphical user interface

- Easiness for non-technical people
- Drag and drop feature
- Looks nicer than text interface
- Hotkeys usage
- User-friendly
- Disabled people

Disadvantages of graphical user interface

- Difficult to develop and high cost
- Slower than command line tools
- Extra attention required
- Using flat screen
- Time consumption
- Memory resources
- Implementation

Examples of GUI

- Microsoft Windows, Mac OS

Difference between GUI and CUI

S.N.	GUI	CUI
1.	It is based on graphical user interface mode and instructions are given using graphical components like menu bar, toolbar etc.	It is based on command user interface mode and instructions are given using characters.
2.	It is graphical and user friendly and easy to learn and operate.	It is more textual and less user friendly and difficult to operate and learn. User needs to memorise the commands to operate the system.
3.	It consists of different components such as text box, icon, desktop, pointing devices etc.	It does not consist of such different components.
4.	E.g. Windows, Linux OS	E.g. MS-DOS, Unix OS

Working with a Windows Environment and Windows Application Program

Desktop

The desktop is the background displayed on your computer screen. It is the total visible area on the screen which users get immediately after turning on the computer. Files, folders, and program icons can be displayed on the desktop for easy access to users.



Fig.: Desktop icons

Desktop

On the desktop, files, folders and programs are displayed on window frame. The desktop may contain many items such as Computer, Network, Recycle Bin, User, etc. The desktop can be customized with themes and backgrounds to personalize the look of the computer.

Start Menu:

The start menu provides access to the most useful items on your computer including all programs, most recent documents, help and support and other items on your computer. Present Windows includes more Start menu customization options. This menu appears by clicking on the start button.



Fig. Startup menu

Icons

Icons are the small graphical image used in GUI OS environment. It represents the

symbolic meaning of the command, file, program, web page, etc. Icons help to execute commands, open programs or documents quickly. To execute a command by using an icon, click or double-click on the icon. An icon is a group of images of various formats (size and colors).



Fig. Icons

Window

Windows are frames on the desktop that contains the contents of opened files, folders, and programs. In other words, it is usually a rectangular portion of the display on a computer monitor that presents its contents (e.g. the contents of a directory, a text file or an image) on the screen. Windows are one of the elements that comprise a graphical user interface (GUI).

Task Bar

The taskbar displays opened files, folders, and programs. When multiple windows are open, you can click on the file, folder or program buttons in the taskbar to switch between windows.



Fig. Task Bar

List of components of tasks bar

1. Start button
2. Quick launch bar
3. System trays with some programs
4. Time bar

For example, all documents using the same extension have the same icon. Some folders can have a customized icon applied to them. The name of file, folder or

program is displayed under the icon.

Computer

Computer folder displays all hard disk drives and removable storage devices connected to your computer. Double-clicking on a drive or removable storage device displays its contents.



Fig. Computer

To open the computer Folder

1. Click on start Icon>Computer or double-click on the Computer icon.

Documents

Documents folder provides a place to store all of your files. When you save a document, the default save location is the Documents folder:



Fig. Documents

To open the Documents Folder

1. Click Start>Documents or Double-Click.
2. Networks
3. The Networks folder displays all the shared resources connected to your computer by a network.

Networks

The Networks folder display all the shared resources connected to your computer by a network.



Fig. Networks

To open the Network Folders

1. Click start>Networks or Double-click on the Networks.

Recycle Bin

When you delete a program, file or folder, it is moved to the Recycle Bin. The Recycle Bin gives you the opportunity of retrieving your deleted items later if you change your minds. Items in the Recycle Bin still take up hard disk space.



Fig. Recycle bin

When the Recycle Bin is full, Windows automatically cleans out enough space to accommodate the newest deleted items. By default, the Recycle Bin is located on your desktop.

To restore items from the Recycle Bin

1. Double-click on the Recycle Bin on the desktop. This opens the Recycle Bin windows.
2. Select the items you want to restore.
3. Click the Restore this item link in the Recycle Bin Tasks area.

Music

By default, the Music folder is situated in the Libraries folder. When you use Windows Media Player to copy music from a CD or download music from the Internet, the default save location is the music folder.



Fig. Music

To open the Music folder:

1. Click start>Music.

Pictures

By default, my pictures folder is situated in the libraries folder. When you save pictures from your digital camera or scanner to your computer or save a file in a graphics program, such as Microsoft Paint, the default save location is the pictures folder.



To open the Pictures folder:

1. Click start>My pictures.
2. Working with files and folders

Folder

Folders on a computer provide a storage system similar to folders in a filing cabinet. Folders can contain files and other subfolders. Windows provides a number of personal folders to start your computer filing system. A folder is typically represented by a folder icon. The folder name is the icon. The folder in Windows is also known as a directory in DOS.



Creating the personal folder on the desktop

1. Right click on the desktop.
2. Select New>folder.
3. Give the name of the folder then press enter.

Alternative way to create the personal folder

1. Click on the file>folder.
2. Give the name of the folder then press enter.

Operating a file or folder

1. Double-click on the file or folder you want to open.
2. The file or folder is displayed in a window.

To copy or cut files and folders

1. Right click on the file or folder you want to copy or cut.
2. From the pop-up menu, Select Copy or cut.
3. Open the location you want the copied or cut item to be placed.
4. Right-click in the location.
5. From the pop-up menu, select paste.

To rename files and folders

1. Right-click on the file or folder you want to rename.
2. From the pop-up menu, select rename.
3. Type a new name.
4. Press the Enter key on your keyboard.

To delete a file or folder location in a folder

1. Select the file or folder you want to delete.
2. Right, click on the file or folder you want to delete.
3. From the pop-up menu, select Delete.

OR

1. Select the file or folder you want to delete.
2. Press the Delete key on your keyboard.

Changing File and Folder Views:

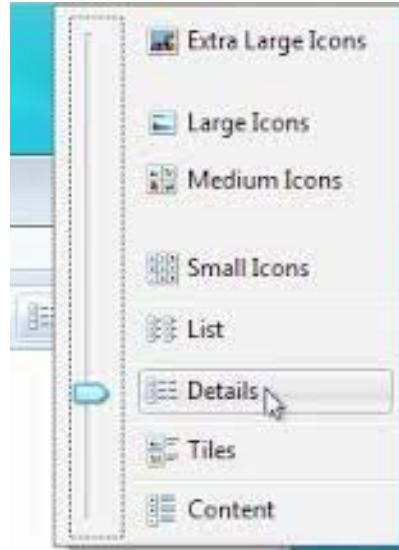


Fig. Changing file and folder views

To change how the files and folders within a folder are viewed

1. Click the Change your Views option.
2. Select the file and folder view you want.

Display File and Folder Properties

Files and folders have property sheets that include information such as the type, size and location of file or folder; the date of a file or folder was created, modified or accessed; file and folder attributes; the name of the program that opens a file and the number of files or subfolders contained in a folder.

To display properties for files and folders within a folder window:

1. Select the file or folder (in the folder window) for which you want to display properties.
2. Right –click on the file or folder for which you want to display properties.
3. From the pop-up menu, select properties.

Modifying Folder Options

1. Open the folder for which you want to modify.
2. Select Organize> Folder and Search Options.
3. This opens the folder Options dialog box.

4. Make the folder modifications you want
5. Click OK.

Using Task Panels

Task panels provide an easy way to access the most commonly used folder tasks. The task panel displays a list of hyperlinked tasks to the left of the folder contents.

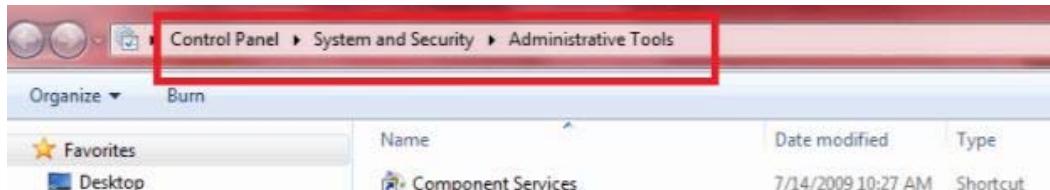


Fig.Using task panel

Several folders offer additional specialized hyperlinked tasks. For example, the pictures and Music folders offer links that help you manage your picture and music files. The recycle bin offers links to empty the Recycle Bin or restore items from Recycle Bin.

Computer folders offer links to view system information, add or remove programs, and change system settings.

Searching Files/ folders using search companion



Fig. Searching files and folders

Enhanced for Windows 7, the Search Companion is designed to help you quickly find what you're looking for.

1. Click start Icon
2. Type whatever you want to search.
3. Working with a Windows Application Program

Customizing the Desktop

By default, the Windows theme is applied the first time you start Windows. A desktop theme affects the whole look of your desktop.

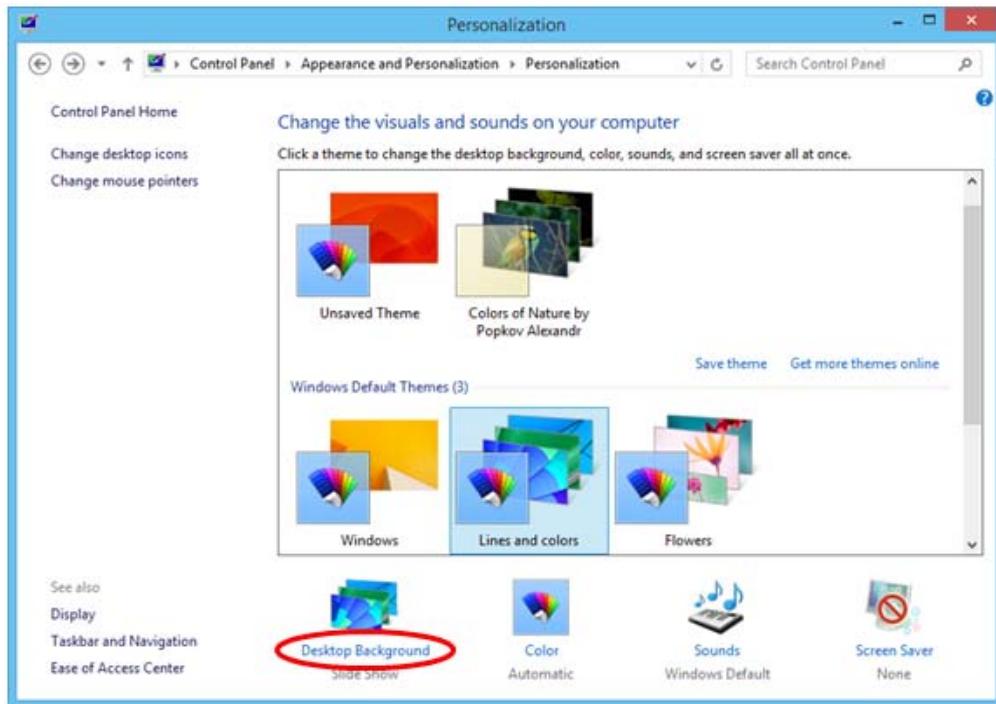


Fig. Customizing the desktop

To apply a desktop theme

1. Right click a desktop.
2. From the pop-up menu, select personalize. This opens the Personalization dialog box.
3. Select a theme from the Theme option.

To apply a desktop background

1. Right click on the Desktop.
2. From the pop-up menu, select Personalize. This opens the Personalization dialog box.
3. Click the Desktop Background option.
4. Select a background from Background list.

5. Click on Save Changes.

Control Panel

As you've read earlier Control panel is one of the most important system folders, which consist of various controlling program's icon to control an overall operation of the Windows. The following is the Sample of Control panel.

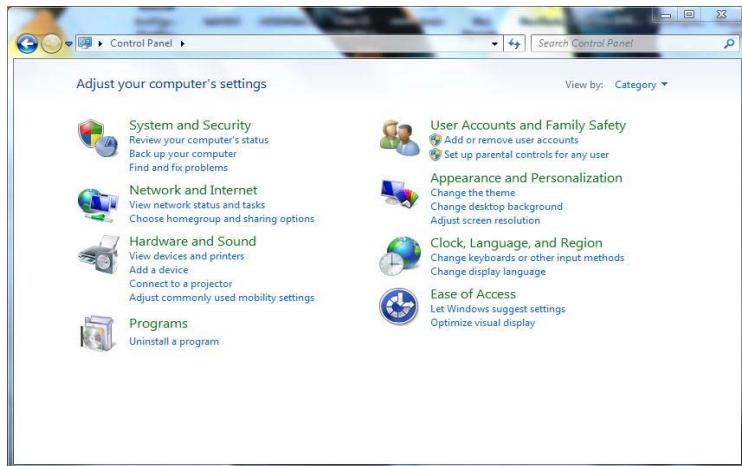
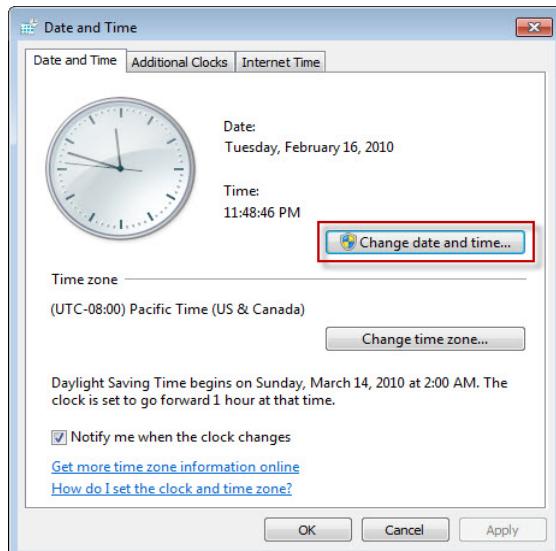


Fig. Control panel

Date and Time

With the help of this option, we can change / set our system date and time as we need.



Display

This option is to customize the Desktop environment.

Keyboard

We can set keyboard settings like its character repetition and cursor blinking rate, a width of the cursor.

Program and Features

This option allows the user to do following things;

Allows users to uninstall and change existing software packages, as well as indicating how much space individual programs take and how frequently they are used.

1. Allows users to manually install software and install add-ons from Windows Update.
2. Allows users to change which Windows components are installed.

Administrative Tools

This option contains tools for system administration, including security, performance, and service configuration. These are the links to various configurations of the Microsoft Management Console such as the local services list and the Event Viewer.

Windows Update

This option is used to specify how the automatic updates client should download updates from Microsoft update website, by default this is set to download and install daily.

Windows Keyboard Shortcuts

Use shortcut keys as an alternative to the mouse when working Windows. You can open, close and navigate the Start menu, desktop, menus dialogue boxes and Web pages using keyboard shortcuts. It makes users use Windows easy.

Shortcut keys	Description
Alt + F	File menu options in current program
Alt + E	Edit options in current program
F1	Universal help (for all programs)
Ctrl + A	Select all text
Ctrl + F	Find
Ctrl + X	Cut selected item
Shift + Del	Cut selected item
Ctrl + C	Copy selected item
Ctrl + Insert	Copy selected item
Ctrl + V	Paste
Shift + Insert	Paste
Home	Go to beginning of current line
Ctrl + Home	Go to beginning of document
End	Go to end of current line
Ctrl + End	Go to end of document
Shift + Home	Highlight from current position to beginning of line
Shift + End	Highlight from current position to end of line
Ctrl + <--	Move one word to the left at a time
Ctrl + -->	Move one word to the right at a time

3.5. Open sources operating system

Open-source software (OSS) is a type of computer software whose source code is released under a license in which the copyright holder grants users the rights to study, change, and distribute the software to anyone and for any purpose. Open-source software may be developed in a collaborative public manner. According to scientists who have studied it, open-source software is a prominent example of open collaboration. The term is often written without a hyphen as "open source software".

Open-source software development, or collaborative development between multiple independent contributors, generates an increasingly more diverse scope of design perspective than any one company is capable of developing and sustaining long term.

Advantages of open source software

1. These software are freely available and no license is required to use them.
2. Source code of these software is freely available in the internet and it can be

easily downloaded.

3. It has freedom at work. Everyone is free to modify the software according to the requirement from its source code.
4. The OSS allows to take our own security ownership.
5. There is no restriction of law to use them.
6. By adopting open source software, we become part of a community of users and developers.

Introduction to Linux

Linux is a free open-source operating system based on Unix. Linux was originally created by Linus Torvalds with the assistance of developers from around the globe. Linux is free to download, edit and distribute. Linux is a very powerful operating system and it is gradually becoming popular throughout the world.

Advantages of Linux

Low cost: There is no need to spend time and huge amount money to obtain licenses since Linux and much of its software come with the GNU General Public License.

Stability: Linux has high stability compared with other operating systems. There is no need to reboot the Linux system to maintain performance levels.

Performance: Linux provides high performance on various networks. It has the ability to handle large numbers of users simultaneously.

Networking: Linux provides a strong support for network functionality; client and server systems can be easily set up on any computer running Linux. It can perform tasks like network backup faster than other operating systems.

Flexibility: Linux is very flexible. Linux can be used for high performance server applications, desktop applications, and embedded systems.

Compatibility: It runs all common Unix software packages and can process all common file formats.

Fast and easy installation: Linux distributions come with user-friendly installation.

Security: Linux is one of the most secure operating systems. File ownership and

permissions make linux more secure.

Open source: Linux is an Open source operating systems. You can easily get the source code for linux and edit it to develop your personal operating system.

Today, Linux is widely used for both basic home and office uses. It is the main operating system used for high performance business and in web servers. Linux has made a high impact in this world.

Introduction to UNIX

The Unix operating system is a set of programs that act as a link between the computer and the user. The computer programs that allocate the system resources and coordinate all the details of the computer's internals is called the **operating system** or the **kernel**. Users communicate with the kernel through a program known as the **shell**. The shell is a command line interpreter; it translates commands entered by the user and converts them into a language that is understood by the kernel. Unix was originally developed in 1969 by a group of AT&T employees Ken Thompson, Dennis Ritchie, Douglas McIlroy, and Joe Ossanna at Bell Labs. There are various Unix variants available in the market. Solaris Unix, AIX, HP Unix and BSD are a few examples. Linux is also a flavor of Unix which is freely available.

- Several people can use a Unix computer at the same time; hence Unix is called a multiuser system.
- A user can also run multiple programs at the same time; hence Unix is a multitasking environment.

SUMMARY

- An operating system is a kind of system software that controls and co-ordinates the overall operations of the computer system.
- The processors communicate with one another through various communication lines (such as high-speed buses or telephone lines). These are referred as **loosely coupled systems** or distributed systems.
- A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions.

- Real-time operating systems are used to control machinery, scientific instruments and industrial systems.
- As the name implies, this operating system is designed to manage the computer so that one user can effectively do one thing at a time. The Palm OS for Palm handheld computers is a good example of a modern single-user, single-task operating system.
- A multi-user operating system allows many different users to take advantage of the computer's resources simultaneously.
- In a multiprogramming system there are one or more programs loaded in main memory which are ready to execute.
- Multitasking has the same meaning of multiprogramming but in a more general sense, as it refers to having multiple (programs, processes, tasks, threads) running at the same time.
- Stands for "Disk Operating System." DOS was the first operating system used by IBM-compatible computers. It was originally available in two versions that were essentially the same, but marketed under two different names. "PC-DOS" was the version developed by IBM and sold to the first IBM-compatible manufacturers. "MS-DOS" was the version that Microsoft bought the rights to, and was bundled with the first versions of Windows.
- CUI is a traditional user interface. It provides the interactive terminal where user can enter the command to interpret.
- A file is systematic collection of related data or information or program instructions.
- A directory is a location for storing files on your computer.
- Wild card character, a wildcard is a symbol used to replace or represent one or more characters. Wildcards are typically either an asterisk (*), which represents one or more characters or question mark (?), which represents a single character.
- In windows operating system, we can give commands to the computer by clicking on icons, menus and buttons by using a mouse.
- With advancement of technology, computer system has become quicker and

cheaper. Operating environment has also changed. This lead the development of graphical user interface where users can interact with the computer using picture and graphs, rather than character and commands. It displays the icon, buttons, dialog box etc. Popular GUI based operating system is Microsoft Windows.

- The desktop is the background displayed on your computer screen.
- The start menu provides access to the most useful items on your computer including all programs, most recent documents, help and support and other items on your computer.
- Icons are the small graphical image used in GUI OS environment.
- Windows are frames on the desktop that contains the contents of opened files, folders, and programs.
- The taskbar displays opened files, folders, and programs.
- When you delete a program, file or folder, it is moved to the Recycle Bin.
- Folders on a computer provide a storage system similar to folders in a filing cabinet.
- Open-source software (OSS) is a type of computer software whose source code is released under a license in which the copyright holder grants users the rights to study, change, and distribute the software to anyone and for any purpose.
- Linux is a free open-source operating system based on Unix. Linux was originally created by Linus Torvalds with the assistance of developers from around the globe.
- The Unix operating system is a set of programs that act as a link between the computer and the user.

Self Evaluation

1. Write very short answer to the following question.

1. Where is open source software available for user?
2. Is Unix a single user operating system?
3. Which file of Ms Dos contains all internal commands?

4. Which wild card symbol indicates single characters?
5. Write one example of GUI operating system besides windows.
6. What is file?
7. What is directory?

2. Write short answer to the following question.

1. Write the features of OSS.
2. What is an operating system? Write two examples.
3. What are the basic functions of an operating system? List any four of them.
4. What is single user operating system? Write two examples.
5. What is MS DOS? Write its two features.
6. What are wild cards? Write some wildcard characters.
7. Distinguish between GUI and CUI?
8. What is Linux? Write its advantages.

3. Write long answer to the following question.

1. Explain the types of operating system.
2. Why is GUI operating software more popular than CUI give reasons these days? Discuss.
3. What is windows operating system? Explain.

Unit: 4

Programming Languages

Learning Outcomes

After completion of this unit you will be able to

- explain/describe programming languages
- explain/describe type of language processing software
- explain/describe high level programming language
- explain/describe program control structures
- explain/describe program design tools, and
- explain/describe QBASIC

4.1. Introduction of Programming Language

Programming

The method used to develop a solution or a program is called programming. It is the way of writing program using specific computer language to perform specific task.

Computer Language(Code) : The set of codes which is used to write computer program is called computer language . It is artificial language and can be used to define a sequence of instructions that can ultimately be processed and executed by the computer.

Source program(Code) : The original program written in high level language is called source program. It should be translated into machine code, so that computer understands and responses it.

Object Program(Code) : The program converted into machine code by compiler is called object program.

Types of computer language

Machine level language

The program written using machine code or binary numbers (0 and 1) is called

machine level language. It is computer's own binary-based language, or machine language which is difficult for human beings to use. It is machine dependent complicated and time consuming. It is also called first generation language.

Assembly language

The language which permits the use of mnemonics (which are combination of codes and English phrases) for each instruction that machine can do is called low level language. It remains in between machine level language and high level language. It is easier than machine level language and should be translated into machine code using assembler. It is also called second generation language. Example pseudo programming.

Advantages of low level language

- I) The computation time of an assembly language program is less.
- II) Program debugging is easier.

Disadvantages of low level language

- I) It is machine dependent.
- II) Too difficult to learn and implement.

Bug and Debug

Any type of error in the program is called bug. The process of correcting bugs is called debug.

High level language

The language which uses plain English words or phrases and mathematical notation, following the correct syntax (Certain rules which are followed to write programs) is called high level language. It should be translated into machine code using compiler or interpreter. So they are slower. It is also called third generation language. Example: QBASIC, C, C++, LOGO, LISP, ADA, PASCAL etc.

Advantages of high level language

- It is very simple because plain English words are used for programming.
- There are pre-defined commands, which minimize the work of programmers.
- All the commands are syntax driven, so they are very easy to learn and

implement.

Features of high level language:

- It is machine independent and problems oriented.
- It does not require extensive mathematics knowledge and computer hardware knowledge.
- It requires less time to learn and write the programs.
- Provide better implementation and documentation.

4GL: Fourth-generation language (4GL):

Fourth-generation computer programming language (4GL) are closer to human language than other high-level languages and are accessible to people without formal training as programmers. They allow multiple common operations to be performed with a single programmer-entered command. They are intended to be easier for users than machine languages (first-generation), assembly languages (second-generation), and older high-level languages (third-generation).

A 4GL normally contains utility software (tool) that interacts with the database management system (DBMS) software to store, manipulate and retrieve data needed to satisfy user requirements for information.

Merit of 4GL

1. Programming productivity is increased. One line of 4GL code is equivalent to several lines of 3GL code.
2. System development is faster.
3. Program maintenance is easier.
4. The finished system is more likely to be what the user envisaged, if a prototype is used and the user is involved throughout the development.
5. End user can often develop their own applications.
6. Programs developed in 4GLs are more portable than those developed in other generation of languages.
7. Documentation is improved because many 4GLs are self documenting.

Demerit of 4GL

1. The programs developed in the 4GLs are executed at a slower speed by the CPU.
2. The programs developed in these programming languages need more space in the memory of the computer system.

4.2. Types of language processor software

Language processor: The set of program codes, which are used to translate program written in high level language or low level language into machine code, is called language processor. There are three types of language processor.

- **Interpreter :** The language processor which converts High level language and Low level language into machine code is called interpreter. It translates programming codes line by line so it is slower than compilers and assemblers.
- **Compiler :** The language processor which translates the program written in high level language into machine code is called compiler.
- **Assembler :** The language processor which translates the program written in low level language into machine code is called assembler.

4.3. List of high level programming language

Fortran

It is a procedural, imperative, general purpose computer programming language that works well for scientific computations and numeric operations. After IBM developed it in the 1950s, it soon gained popularity in programming. It is very popular in the field of high-performance computing. It is a structured and compiled programming language that is a subset of Fortran95. Fortran 2003, a revised version of Fortran supports object-oriented programming.

COBOL

The name stands for Common Business-Oriented Language that is designed for the business and finance domain. COBOL 2002 standard supports object-oriented programming. It is one of the very old programming languages that are still in use.

BASIC

Developed by John George Kemeny and Thomas Eugene Kurtz at Dartmouth in 1964, it is an acronym for Beginner's All-purpose Symbolic Instruction Code. It was designed with the intent of giving the non-science people an access to computers.

Pascal

It is a procedural programming language that was intended to use data structuring and structured programming. Niklaus Wirth, a Swiss computer scientist designed this language and it was named after Blaise Pascal, a French mathematician and philosopher.

C

Dennis Ritchie at the Bell Telephone Laboratories developed C to be used on the Unix platform. It is a general-purpose, cross-platform, procedural, imperative programming language. It is used for implementing system software and application software and is one of the most-used computer programming languages today. The development of C++ and C# was influenced by C.

C++

It consists of a combination of high-level and low-level language features and is hence considered as a middle-level programming language. Bjarne Stroustrup of Bell Labs developed C++ as an extension of the C language. Originally known as ‘C with Classes’, it came to be known as C++ from 1983. It is a multi-paradigm language that supports procedural programming, generic programming, object-oriented programming, and data abstraction.

C#

C Sharp is a multi-paradigm programming language that supports imperative, generic and object-oriented programming. It is a part of the Microsoft .NET Framework. It is similar to C++ in its object-oriented syntax and is also influenced by Java and Delphi.

Java

It is a general-purpose computer programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. Compiled Java code can run on all platforms that support Java without the need for recompilation. It is a very popular language of the modern times.

Visual Basic

It is an event-driven programming language that is packaged with an integrated development environment. It inherits many of its features from BASIC. Its graphical development features make it easy for beginners to learn VB.

Visual FoxPro

It is an object-oriented and procedural programming language derived from FoxPro. It is integrated with a relational database system of its own and does not require an additional programming environment. It supports dynamic programming.

XML

The name stands for Extensible Markup Language. It is extensible because it allows the users to define their own XML elements. It supports the sharing of structured data over the Internet and the encoding and serializing of data. It originated as a subset of SGML.

PHP

PHP is one of the very popularly used general purpose scripting languages. It is developed for creating dynamic web pages and supports a command line interface capability.

4.4. Difference between Program and Software:

SOFTWARE-Software are made up of two or more than two programs.

It instructs computer processor to perform specific operation .

(In simple words it gives instruction or data to computer processor(CPU). .)

PROGRAMS- A computer program is a collection of instructions that performs a

specific task when executed by a computer. A set of instruction tells a computer what to do (instruction is in the form code .binary.)

A software can be program but a program can not be software.

Software typically consists of files while programs can be files or even notes.

4.5. Program Control Structures

The structures which regulate the order in which program statements are executed are called Control Structures. There are 3 types of control structure. They are:

Sequence

It is the set of program instructions which follow one another and are to be executed unconditionally (not dependent on any program conditions). Instructions are put in a predefined sequence (just like a queue in a cinema hall) and the next instruction is executed by CPU only after the execution of the previous instruction (C never comes before B).

Selection

It is the set of instructions which are to be executed conditionally i.e. they are executed based on a condition that can be either true or false. Commonly used logic for selection are if condition, if else condition, if else if condition, nested if else condition and switch case condition.

If condition

If condition is used in case the given problem has only one condition and only one action. Considering either true or false part, if the given condition is true then the statement will be executed. Otherwise, the control exits from the condition.

else If condition

This condition is used if the problem has one condition but two alternative actions. Here, if the condition is true, statement 1 will be executed; otherwise, statement 2 will be executed.

Iteration

These are the computer instructions which are to be performed repeatedly and

conditionally i.e. loop statements are driven by the loop condition. Commonly used logic for iteration are while loop, do while loop and for a loop.

While loop

In this loop, first, the condition is checked by the computer and if the condition turns out to be true, then the statement inside the loop is executed. This process is repeated and the value of increment and decrement operator is always changing. When the condition is false, the loop stops.

Algorithm Syntax

Initialization

while (condition)

{

statements

.....

.....

increment/decrement

}

Do while loop

In this loop, first, the computer checks the initial value; second executes the statements inside the loop and finally, checks the condition. The process is repeated for next pass, if the condition is true. Otherwise, the loop stops. If the condition is initially false, it will execute for at least one time.

Algorithm Syntax

Initialization

do {

statements

.....

.....

increment/ decrement

} while (condition)

For loop

It is the most commonly used loop. It consists of 3 expressions; initialization, condition and counter, which are defined within a statement.

Algorithm Syntax

for (initialization; condition; counter)

{

statements

.....

.....

}

Where, initialization is starting point, the condition is stopping point and increment/decrement is a counter.

4.6. Program design tools

Also known as the Programming tools, Program Design tools are the tools used to develop a program. During designing a program, different tools are required to solve several problems. Some of the frequently used tools are:

1. Algorithm

An algorithm is a sequence of instructions or step by step instruction to find the solution of a problem. An algorithm should be simple and clear. It must be to the point and should lead to the solution of the problem in a finite number of steps.

An algorithm is a collection of a finite number of instructions arranged in a sequence to find the solution of a problem.

Example 1: Algorithm for adding the two numbers.

Step 1: Start the program

Step 2: Input number x, y

Step 3: Read x, y

Step 4: $Z = x + y$

Step 5: Print Z

Step 6: Stop the program

Example 2: An algorithm to go to the cinema and see a movie.

Step 1: Start the program

Step 2: Go to the cinema hall

Step 3: Is the ticket counter open?

Step 4: If it is not open, return home

Step 5: If it is open, buy a ticket

Step 6: Get into the cinema hall

Step 7: Watch the movie

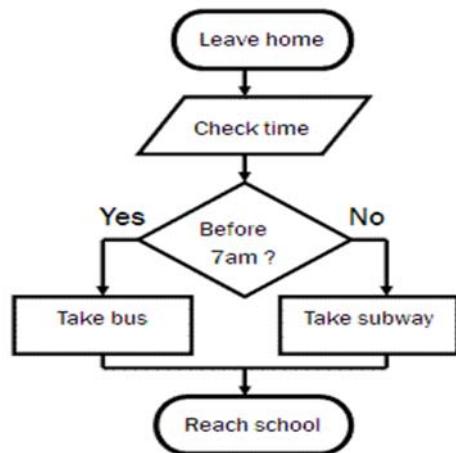
Step 8: Return home

Step 9: End the program

2. Flowchart

A flowchart is a pictorial representation of an algorithm. We can also define it as a program planning tool for organizing a sequence of steps necessary to solve a problem, which is shown in terms of symbols.

Flowchart uses symbols that have geometrical shapes to indicate the different operations. These symbols are connected by flow lines which indicate the order of execution of the various activities. It is used by the programmers to develop programs and by system, designers to represent the overall system while analyzing and developing the system.



Example

The advantages of flowchart are :

- It is an independent language. So, the flowchart we design for programming in one language is applicable for programming in another language.
- Once the flowchart is prepared, it is very easy to do the coding by looking at the algorithm.
- It is very easy to understand the logic of program by designing the flowchart. Even people who don't know the coding can understand the logic of a program with the help of flowchart.
- Systematic debugging and testing is easily possible with the help of flowchart.

The disadvantages of flowchart are

- Preparing a flowchart is a time-consuming process.
- If there is a change in logic again, we have to develop the new flowchart.
- Flowchart does not provide any convenient means to highlight the most important operation.
- The flowchart is quite costly to produce and difficult to use and manage.
- Complex and detailed charts can be laborious to plan and draw.

Symbols for flowcharts:

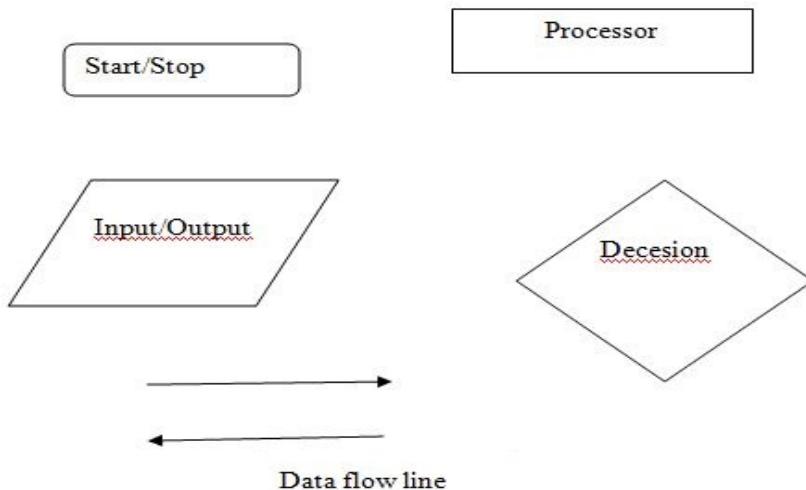


Fig. Basic symbol for flowchart

3. Structured English (Pseudo code)

The general meaning of Pseudo code is false code or fake code. Before we write a real program, we write a program that *looks* like a code on the basis of algorithm and flowchart, which may not be syntactically correct but looks like a program code is called Pseudo code. The instruction of pseudo code is written by using English phrase and mathematical expression. It has no hard or fast rules for writing instruction but the instruction is closer to high-level language instructions. Therefore, the pseudo code designers should have basic knowledge about high-level language before writing it. It is independent of any programming language.

Example: Pseudo code for calculating area of rectangle

Input length, breadth

Calculate area= length*breadth

Output area

4.7. Introduction to QBASIC

Q-BASIC is a high level programming language developed by Microsoft Corporation, USA for microcomputers in 1985. It uses Interpreter as a language translator program. It uses a set of keywords and mathematical symbols to write programs. The programs written in QBASIC need to be converted into machine codes by using Interpreter.

4.7.1. Elements of QBASIC

The elements used in Q basic are as follows:

- Character set
- Variables
- Constants
- Operator and Operands
- Expression
- Statements

Character Set

QBASIC has the character set consisting of the following elements:

1. Alphabets: A, B, C,...Z
2. Digits: 0, 1, 2.....,9 and
3. Special characters: + - * / () . , \$; : , = , > , < , ^

The symbol ^ (caret) is used to denote exponentiation operator, the symbol * (asterisk) is used to denote multiplication and other symbols which have their usual meanings.

Constants

A quantity in a computer program which does not change its value during the execution of the program is called a constant. QBASIC allows the following constants:

Numeric constant

The numeric constant is one that is formed by a sequence of digits 0, 1, 2.....9 and may include a decimal point. A numeric constant may be an integer or a real number. 383, +57, 0, -6.2 and 6.15E4 are valid numeric constants. The number 6.15E4, in fact, represent 6.15×10^4 . The notation E is used to represent the exponential form. The number after E is the exponent which can be positive or negative. However, its length cannot exceed two digits.

String constant

A string constant consists of a sequence of characters which must be enclosed by a quotation mark.

Variables

The quantity which may change its values during the execution of the program is called the variable.

In QBASIC, variables are also of two types

- **Numeric variable:** Numeric variable can assume numeric value and is represented by an alphabet or an alphabet followed by another alphabet or

digit. For example A, C, A2, ABC, A6 etc, represent numeric variables.

- **String variable:** A string variable is represented by an alphabet followed by dollar (\$) sign. It should be kept in mind that while constructing the string variable, dollar (\$) should be the last character. For example, B1\$, NAME\$, BOOK1\$, etc are valid string variables.

Expression

An expression can be a string, or numeric constant, a variable or a combination of constants, variables with operators which return a single value.

Operands

Operands are the data or variables on which mathematical, logical and string operations take place.

Operators

Operators are the symbols, which are used to perform specific task such as arithmetic operations, logical expressions, and string expressions.

Statements

A statement is a set of instructions written using keywords or commands of QBASIC. Every programming language uses keywords as a statement with certain syntax.

4.7.2. QBASIC Statement

A statement (for the QBASIC) is a set of instructions written by using keywords or commands of QBASIC. Every programming language uses keywords as a statement with certain syntax. The keywords have specific meaning in the QBASIC programming. The statements are first stored in the memory and executed only when the RUN command is given.

The different types of statements used in QBASIC are as follows:

- Declaration statement
- Assignment statement
- Input/output statement

- Control statement

4.7.2.1 Declaration Statement

The statements which are used to define and declare the values, variables, constants etc for programming purpose are known as declaration statement. The declaration statements are DIM, REM, CONST, DECLARE etc.

REM Statement

It is a basic declaration statement that allows explanatory remarks to be inserted in a program. The remarks may be useful in a program to explain about different kinds of statements and user defined words. Adding comments in the program allows us to remind about the program and also helps other programmers to understand the logic of the program.

Syntax: REM < Remarks>

CONST Statement

The statement declares one or more symbolic constants in program.

Syntax CONST constantname = expression [,constantname = expression]...	
Constant name	The name of the constant. This name can consist of up to 40 characters and must begin with a letter. Valid characters are A-Z, 0-9, and period (.).
expression	An expression that is assigned to the constant can consist of literals (such as 1.0), other constants, any arithmetic or logical operators except exponentiation (^), or a single literal string.

Example CONST PI = 3.141593

DIM Statement

DIM declares an array or specifies a data type for a non array variable.

Syntax

Example

CLS

Const pi = 3.14

Dim r as single

```

Dim a as single
r = 5
a= pi *r^2
PRINT "area of circle ="; a
END

```

DIM [SHARED] variable [(subscripts)] [AS type] [, variable[(subscripts)] [AS type]]...		
SHARED	Specifies that variables are shared with all SUB or FUNCTION procedures in the module.	
Variable	The name of an array or variable.	
Subscripts	Dimensions of the array, expressed as follows: [lower TO] upper [, [lower TO] upper]...	
	lower	The lower bound of the array's subscripts. The default lower bound is zero.
	upper	The upper bound.
AS type Declares the data type of the array or variable (INTEGER, LONG, SINGLE, DOUBLE, STRING, or a user-defined data type).		

4.7.2.2 Assignment Statement:

The statements which are used to assign the value to the related variable are known as assignment statements. The assignment statements are Let, Swap etc.

LET Statement

LET is an assignment statement. It is used to assign the value to a variable. LET is an optional statement i.e. without using LET statement one can assign the value to a variable. The data type must match with the variable type otherwise type mismatch error will occur.

Syntax: |LET| variable = value or expression

Example:

CLS

```
INPUT " First Number"; A
INPUT "Second Number"; B
LET S = A+B
PRINT " The Sum is"; S
END
```

Read Data Statement

It is used in conjunction with the DATA command which lets QBASIC to read data. It is used mostly when dealing with large quantities of data in program.

Example

```
CLS
READ A, B, C
PRINT A, B, C
DATA 15,25,35
END
```

4.7.2.3 Input/output Statement

The statements which are used to provide input to variables of QBASIC program for processing and display the result as output on the screen are known as input/output statement. The input/output statements are : CLS, INPUT, LINE INPUT, PRINT, PRINT USING etc.

CLS Statement

The CLS statement clears the screen. If you write CLS statement in the middle of the program then you cannot see the outputs generated before execution of CLS because it clears the screen.

Syntax: CLS

INPUT statement

It receives input from the keyboard during the execution of the program.

Syntax: INPUT ["Message"] ; Variable

PRINT Statement

PRINT statement provides output on the screen. It prints the values of the expression on the screen. If the expression list is blank, no characters are printed. The expressions in the list may be numeric or string. In case of number, the negative number is preceded by a minus sign (-) but in positive number it is preceded by a space.

We can use semicolon and comma with a print statement which results differently than a normal PRINT statement. If expression list ends with comma or semicolon, the next PRINT statement prints on the same line. Comma provides a TAB space but semicolon provides only one space.

Syntax: PRINT ["Message"]; expression

Example

CLS

PRINT "We live in Nepal."

PRINT

PRINT "Nepal lies in between India and China."

PRINT 2076

PRINT " The number is: "; 7

END

Output

We live in Nepal.

Nepal lies in between India and China.

2076

The number is: 7

LINE INPUT

This statement allows inputting line of data at a time and assigning it to single variable.

Syntax: LINE INPUT “string”; string variable

Example

CLS

LINE INPUT “please enter the data”; n\$

PRINT n\$

END

4.7.2.4 Control Statement

The statements which are used to transfer the control of program from one part to another part with or without condition are known as control statements. The control statements are IF THEN, SELECT CASE, FOR NEXT, DO LOOP, ON GOTO etc.

GOTO Statement

The GOTO is a jumping statement which jumps from one point to another point within program. It is used to transfer the control from one point of the program to another point without testing a condition. The GOTO statement is marked by label statement. It sends the controls to the labeled block and starts executing.

Syntax: GOTO <label / line number>

Where label is a name followed by a colon.

Example

CLS

INPUT "ENTER YOUR AGE"; A

IF A>18 THEN GOTO TEST1 ELSE GOTO TEST2

TEST1:

PRINT "YOU ARE ELIGIBLE FOR VOTE"

GOTO LAST

TEST2:

PRINT "YOU ARE NOT ELIGIBLE FOR VOTE"

LAST:

END

If – Then Statement

When there is a single option to be executed on the basis of true result of a condition, then 'if – then – end if' statement used. So, there is a test for a condition in 'if – then' statement and if the result of the condition is found to be 'TRUE', then the statement of 'If- Then' block is executed and if the result of the condition is FALSE, then there is no statement to execute. In such case, simply the program execution goes to the line below the END IF statement. So, it performs when the condition is only TRUE.

Syntax

If [condition] then

 Block of statements

End If

Example:

Cls

Input"Enter your age"; a

If a<=10 then

 Print "Child"

End if

End

If Then Else Statement

When there is a need to select an option to be executed out of two options on the basis of two conditions, the 'if – then – else' statement is used but the second condition is seldom checked. So, there is a test for a condition in if – then – else ' statement and if the result of the condition is found to be true, then the block of statement associated with 'if' part is executed otherwise the block of statement associated with 'Else" part is executed. There is no chance to execute both if and else part within a single if – then – else statement.

Syntax

If [condition] then
Block 1 of statements
Else
Block 2 of statements
End if

Example

CLS
INPUT "ENTER A NUMBER"; N
IF N MOD 2 = 0 THEN
PRINT "EVEN NUMBER"
ELSE
PRINT "ODD NUMBER"
END IF
END

If Then Elseif Statement

When there is a need to select an option to be executed out of multiple options on the basis of multiple conditions, the 'if – then – elseif statement is used. If none of condition is true, then statement associated with 'else' part is executed.

Syntax

If [condition1] then
Block 1 of statements
Elseif [condition2] then
Block 2 of statements
Elseif[condition3] then
Block 3 of statements
.....

.....

.....

Else

Block 'n' of statements

End if

Example

REM POSITIVE, NEGATIVE OR NEUTRAL NUMBER

CLS

INPUT "ENTER A NUMBER"; N

IF N > 0 THEN

PRINT "POSITIVE NUMBER"; N

ELSEIF N<0 THEN

PRINT "NEGATIVE NUMBER"; N

ELSE

PRINT "NEUTRAL NUMBER"; N

END IF

END

Select... Case... Statement

Select case is also the multiple branching statements. It is used to executed one of several statement blocks depending on the value of an expression.

Syntax

Select case test_expression

Case test1

Statements

Case test 2

Statement

Case Else

Statement

End Select

Example

CLS

INPUT "ENTER AGE OF A PERSON"; A

SELECT CASE A

CASE 1 TO 12

 PRINT"CHILD "

CASE 13 TO 19

 PRINT"TEENAGE "

CASE 1 TO 12

 PRINT"CHILD "

CASE 20 TO 40

 PRINT"YOUNG "

CASE 41 TO 70

 PRINT"OLD "

END SELECT

END

FOR NEXT Statement

Repeats a group of statements a specified number of times.

Syntax

For counter = start To end [Step step]

[*statements*]

[**Exit For**]

[*statements*]

Next

The **For...Next** statement syntax has these parts:

Part	Description
<i>Counter</i>	Numeric variable used as a loop counter. The variable can't be an <u>array</u> element or an element of a user-defined type.
<i>Start</i>	Initial value of <i>counter</i> .
<i>End</i>	Final value of <i>counter</i> .
<i>Step</i>	Amount <i>counter</i> is changed each time through the loop. If not specified, <i>step</i> defaults to one.
<i>statements</i>	One or more statements between For and Next that are executed the specified number of times.

Remarks

The *step* argument can be either positive or negative. The value of the *step* argument determines loop processing as follows:

Value	Loop executes if
Positive or 0	<i>counter</i> \leq <i>end</i>
Negative	<i>counter</i> \geq <i>end</i>

Once the loop starts and all statements in the loop have executed, *step* is added to *counter*. At this point, either the statements in the loop execute again (based on the same test that caused the loop to execute initially), or the loop is exited and execution continues with the statement following the **Next** statement.

Example

```
REM DISPLAY FROM 1 TO N NUMBER
```

```
CLS
```

```
INPUT " ENTER THE VALUE OF N"; N
```

```
FOR I =1 TO N
```

```
PRINT I;
```

```
NEXT I
```

```
END
```

Write a program to display Fibonacci series 2,2,4,6,10,16,..., up to 10th terms.

```
CLS
A=2
B=2
FOR J=1 to 10
    PRINT A;
    C=A+B
    A=B
    B=C
NEXT
J
END
```

Write a program to display the reverse word for any entered word by a user.

```
CLS
INPUT "Enter any word";n$
FOR j=LEN(n$) TO 1 STEP -1
    C$=MID$(n$,j,1)
    Rev$=Rev$+C$
NEXT
j
PRINT "The reverse word is ";Rev$
END
```

Write a program to find the greatest number among any 10 numbers entered by a user using an array.

```
CLS
OPTION BASE 1
DIM n(10)
PRINT "Enter any 10 numbers"
FOR j=1 TO 10
```

```
INPUT n(j)
NEXT j
FOR k=1 TO 10
    IF n(k)>g THEN g=n(k)
NEXT k
PRINT "The greatest number is ";g
END
```

SUMMARY

- The method used to develop a solution or a program is called programming. It is way of writing program using specific computer language to perform specific task.
- The set of codes which is used to write computer program is called computer language.
- The original program written in high level language is called source program.
- The program converted into machine code by compiler is called object program.
- The program written using machine code or binary numbers (0 and 1) is called machine level language.
- The language which permits the use of mnemonics (which are combination of codes and English phrases) for each instruction that machine can do is called low level language.
- The language which uses plain English words or phrases and mathematical notation, following the correct syntax (Certain rules which are followed to write programs) is called high level language.
- Fourth-generation computer programming language. 4GLs are closer to human language than other high-level languages and are accessible to people without formal training as programmers.
- The set of program codes, which are used to translate program written in high level language or low level language into machine code, is called language

processor.

- The language processor which converts High level language and Low level language into machine code is called interpreter.
- The language processor which translates the program written in high level language into machine code is called compiler.
- The language processor which translates the program written in low level language into machine code is called assembler.
- Developed by John George Kemeny and Thomas Eugene Kurtz at Dartmouth in 1964, it is an acronym for **B**eginner's **A**ll-purpose **S**ymbolic **I**nstruction **C**ode. It was designed with the intent of giving the non-science people an access to computers.
- PHP is one of the very popularly used general purpose scripting languages. It is developed for creating dynamic web pages and supports a command line interface capability.
- Software are made up of two or more than two programs.
- Software are made up of two or more than two programs.
- A computer program is a collection of instructions that performs a specific task when executed by a computer.
- The structures which regulate the order in which program statements are executed are called Control Structures. There are 3 types of control structure.
- Program Design tools are the tools used to develop a program. During designing a program, different tools are required to solve several problems.
- An algorithm is a sequence of instructions or step by step instruction to find the solution of a problem.
- A flowchart is a pictorial representation of an algorithm.
- The instruction of pseudo code is written by using English phrase and mathematical expression.
- Q-BASIC is a high level programming language developed by Microsoft Corporation, USA for microcomputers in 1985. It uses Interpreter as a language translator program. It uses a set of keywords and mathematical symbols to write programs.

- A quantity in a computer program which does not change its value during the execution of the program is called a constant.
- The quantity which may change its values during the execution of the program is called the variable.
- An expression can be a string, or numeric constant, a variable or a combination of constants, variables with operators which return a single value.
- Operands are the data or variables on which mathematical, logical and string operations take place.
- Operators are the symbols, which are used in arithmetic operations, logical expressions, and string expressions.
- A statement is a set of instructions written using keywords or commands of QBASIC. Every programming language uses keywords as a statement with certain syntax.
- The statements which are used to define and declare the values, variables, constants etc for programming purpose are known as declaration statement. The declaration statements are DIM, REM, CONST, DECLARE etc.
- The statements which are used to assign the value to the related variable are known as assignment statements. The assignment statements are Let, Swap etc.
- The statements which are used to provide input to variables of QBASIC program for processing and display the result as output on the screen are known as input/output statement. The input/output statements are : CLS, INPUT, LINE INPUT, PRINT, PRINT USING etc.
- The statements which are used to transfer the control of program from one part to another part with or without condition are known as control statements. The control statements are IF THEN, SELECT CASE, FOR NEXT, DO LOOP, ON GOTO etc.

Self Evaluation

1. Write very short answer to the following question.

- a. Which is computer's native language?

- b. Which codes are used by Assembly language?
- c. Write two examples of high level programming language.
- d. Which type of language is known as first generation programming language?
- e. Which language is used to write algorithm?
- f. Which symbol is used to put processing in flowchart?
- g. What is the extension of Q basic program file?
- h. Which key is used to run Q basic program?
- i. Which operator is used to perform addition in Q basic?

2. Write short answer to the following question.

- a. What are the lists of high level programming language?
- b. Distinguish between program and software?
- c. What is control structure? Write its type.
- d. What are the elements of Q basic?
- e. What are the different types of Q basic statement?
- f. What is language processing software? Write its types.
- g. Differentiate between compiler and interpreter.
- h. Define term program and programming.
- i. What is programming language? Write its types.
- j. What is machine level language? Write its features.
- k. What is assembly language? Write merits of assembly language.
- l. Why is pre planning necessary before writing actual program?
- m. What is algorithm? Write algorithm to calculate area of rectangle.
- n. What are character set used in Q basic while programming?

3. Write long answer to the following question.

- a. What is programming language? Explain machine level and assembly level programming language.
- b. What is high level language? Write its features.
- c. What is programming tool? Discuss the role of algorithm to design effective program.

- d. Explain flowchart with the common symbols used in it.
- e. What is Q basic programming language? Discuss its features.
- f. What is 4GL? Explain its merits and demerits.

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Unit: 5

Application Software

Learning Outcomes

After completion of this unit you will be able to

- explain/describe word processing software
- explain/describe spreadsheet software, and
- explain/describe presentation software

5 .1. Word processing software

Word processor software is an application package that allows a user to create, edit, store and print out text based documents. Word processing is the techniques of creating, formatting, editing and manipulating documents, reports, etc. Most modern companies that have a need for producing business letters or other types of text documents will have access to word processing software and a printer.

Some of the widely used computer word processing software are Microsoft Word, Word Perfect, Word Star, Word Pad, Vim Editor etc.

Types of Word Processing Software

Microsoft Word

Microsoft Word is a widely used commercial word processor designed by Microsoft. Microsoft Word is a component of the Microsoft Office suite of productivity software, but can also be purchased as a stand-alone product. It was initially launched in 1983 and has since been revised numerous times. Microsoft Word is available for both Windows and Macintosh operating systems. Microsoft Word is often called simply Word or MS Word.

Microsoft Word offers several features to ease document creation and editing, including:

- WYSIWYG (what-you-see-is-what-you-get) display: It ensures that everything displayed on screen appears the same way when printed or moved to another format or program.

- Spell check: Word features a built-in dictionary for spell checking; misspelled words are marked with a red squiggly underline. Sometimes, Word auto-corrects an obviously misspelled word or phrase.
- Text-level features such as bold, underline, italic and strike-through
- Page-level features such as indentation, paragraphing and justification

The default file format was .doc prior to the Microsoft Word 2007 version; in 2007, .docx became the default file format.

WordPerfect

WordPerfect is a word processing application from Corel Corp.. WordPerfect was popular in the early 1990s. It is best for writing simple essays and articles. Though it isn't used as much today, WordPerfect is compatible with Microsoft Word, meaning that you can open and edit WordPerfect files in the Word program, then save them as WordPerfect files again. WordPerfect also can be used for formatting and laying out documents.

Lotus Word Pro

If you use Lotus Notes or Lotus 1-2-3--common in corporate environments--Lotus Word Pro is an ideal program for your word processing needs. This program works in concert with Lotus applications to allow you to create and distribute formatted text documents. It is produced and distributed by IBM Corp. Lotus Word Pro is also compatible with Microsoft Word and ideal for writing reports, memos and proposals.

Uses of Word Processor

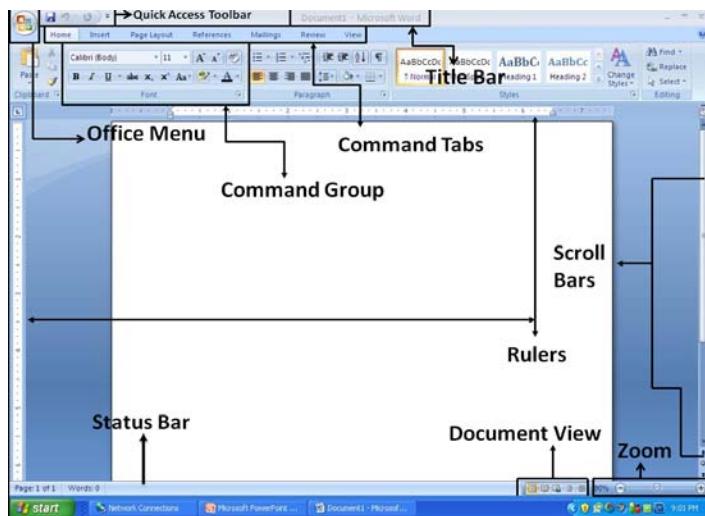
Word processors have a variety of uses and applications within the business world, home, and education. Businesses tend to have their own format and style for any documents produced. In Business word processing is used for legal copies, letters and letter head, memos, reference documents etc.

Many homes have word processors on their computers, in the home word processing tends to be educational, planning or business related, dealing with assignments or work being completed at home, or recreational.

In education word processing is used in a variety of different ways in the production of assignments, notes, exams, and for practicing its uses!

Word Processor's Interface

Word processor interface consists of main editing window; it displays a document and several tools to manipulate it. Tools are grouped together in different toolbar in order to work with document.



Title Bar

Title bar is located at the top of the screen. Word processor displays the name of the current document on it.

Menu bar

Each word on the menu bar represents a different menu. Each menu contains different commands of word.

Standard bar

Standard bar displays some of the most common word processing tasks. The tasks are opening, copying and printing files etc.

Formatting toolbar

Formatting toolbar is used to access various formatting commands quickly such as font type, font style and text alignment etc.

Status Bar

The status bar is a horizontal area at the bottom of the document window. It provides information about the current state of the documents.

Scroll Bars

Scroll bars are used to move in the document. You can scroll the document by clicking the scroll arrows at either end of the scroll bar or by dragging the scroll button in scroll bar.

Rulers

The horizontal ruler can be used to set tab stops and indents or to adjust the width of columns. The horizontal or vertical ruler can also be used to change the page margins or place items on the page.

Enter and Edit Text Formatting:

The processing of typing text in a document is called entering text. The processing of changing the existing document is called editing text. The word processor places a blinking insertion point at the top left corner of screen. It is known as cursor. The cursor indicates the location where the next character will be placed in the document. The cursor moves forward on the screen as the user types. The cursor moves to the next line as it reaches the end of line.

Word process allows the user to change some text without retying the whole document. It is different from type writer where the user has to type whole document again. There are many ways to edit an existing document.

1. Typing Modes

All word processor provide two modes of typing. These are as follows:

i. Insert Mode

Insert mode is used to insert text in the existing document. The existing character moves to the right side when the user types a character. It is the default mode of MS word. The following procedure is used to write text in insert mode:

2. Place the cursor where the text is to be typed in insert mode.

3. Make sure that [OVR] option on status bar is not highlighted. If it is highlighted, press insert key to disable it.
4. Type any text. The existing text will move to the right side and new text will appear.

ii. **Overtype Mode**

In overtype mode, the new character replaces the existing characters. The following procedure is used to write text in overtype mode:



5. Place the cursor where the text is to be typed in overtype mode.
6. Press the insert key, the overtype mode will be activated. The [OVR] option on status bar will be highlighted.
7. Type any text. The existing text will be overwritten by the new text.

8. **Erasing Text**

Two keys on the keyboard are used to erase text from a document. These are:

ii. **Delete Key**

The delete key erases the character to the right of the cursor.

iii. **Backspace key**

Backspace key erases the character to the left of the cursor.

The delete and backspace keys erase one character at a time. The user can select multiple characters and then press delete key to delete all selected characters.

iv. **Undo and Redo**

Undo command is used to remove the effect of the last action or number of actions.

Redo command is used to remove the effect of undo command.

9. **Formatting text**

Formatting of a document includes:

- i. Changing the appearance of the text.

- ii. Adding picture and graphics
 - iii. Controlling the layout of the text on the page.
- The formatting toolbar is the easiest way to change any attribute.

Paragraphs Formatting:

A paragraph is a unit of text or other content that starts at the beginning of a document, immediately after a hard return (a carriage return), a page break, or a section break, or at the beginning of a table cell, header, footer, or list of footnotes and ends with a hard return (carriage return) or at the end of a table cell. Word documents generally contain paragraphs with different formatting. Even a very simple document with a centered heading and a justified body contains paragraphs with two different types of formatting.

Word's graphical user interface (GUI) provides ways to apply numerous formatting options to your paragraphs. However, these options are not available in a single location, and some of these locations differ in different versions of Word. For this reason, this page is divided into the following sections, and the applicable options are described in each section.

- The Paragraph Group
- The Paragraph Dialog Box
- The Tabs Dialog Box
- Keyboard Shortcuts
- More Information

The Paragraph Group

Many options are available directly in the **Paragraph** group on the **Home** tab of the Ribbon, in the **Paragraph** group on the **Page Layout** tab, and on the contextual toolbar and menu that appear when you right-click within text.

Alignment

Alignment or *justification* refers to the way in which the lines of a paragraph are aligned. There are four types of alignment, and the type of alignment of the paragraph where your cursor is located is indicated by the highlighted button in the **Paragraph** group on the **Home** tab.



- With *left alignment* (Horizontal bars) (the default), the left-hand ends of all the lines in the paragraph are aligned along the left-hand margin of the text area.
- With *center alignment* (Center dot), the mid-points (centers) of all the lines in the paragraph are aligned along the same imaginary vertical line at the center of the text area between the margins.
- With *right alignment* (Vertical bars), the right-hand ends of all the lines in the paragraph are aligned along the right-hand margin of the text area.
- With *justified alignment* or *full justification* (Bars with a center dot), all the lines in the paragraph, except the last line, are extended so that the left-hand end of each line is aligned along the left-hand margin of the text area, the right-hand end of each line is aligned along the right-hand margin of the text area, and the lines are all of the same length. This is achieved by inserting additional space between words.

You can change the type of alignment of the paragraph where your cursor is located or of a group of selected paragraphs by clicking the applicable button in the **Paragraph** group on the **Home** tab. There are also shortcut keys (see the table in Keyboard Shortcuts below) for setting the type of alignment.

Note. When you apply justified alignment to a paragraph, the last line does not extend across the full width of the text area. You can make all the lines in a paragraph extend across the full width of the text area by placing your cursor within the paragraph and pressing **Ctrl+Shift+J**, but it should be mentioned that in this case Word also adds space between letters within words to extend the lines.

Line Spacing

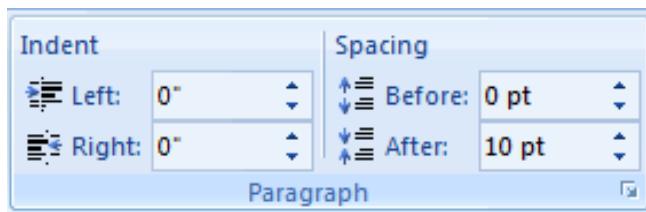
Line spacing refers to the vertical distance between the lines within a paragraph and determines the location of each line relative to the line above it. Line spacing can be specified by name (single, 1.5 lines, double), by a number that indicates a

multiple of single spacing (for example, 2.0 is equivalent to double spacing), and by an exact distance in points, where a point (pt) is equal to 1/72 of an inch. You can quickly view and change the line spacing to several common standard values by clicking the **Line Spacing** button () in the **Paragraph** group on the **Home** tab. More line spacing options become available when you click **Line Spacing Options** to open the **Paragraph** dialog box ([see below](#)).

Indents

The *indent before text* refers to the width of the additional empty space that is inserted between the margin and the text on the left-hand side of a paragraph of left-to-right text, and the *indent after text* refers to the width of the additional empty space that is inserted between the text and the margin on the right-hand side of a paragraph of left-to-right text. You can quickly increase the indent before text to the next tab stop by clicking the **Increase Indent** button () in the **Paragraph** group on the **Home** tab, and you can quickly decrease the indent before text to the preceding tab stop by clicking the **Decrease Indent** button () in the **Paragraph** group on the **Home** tab.

You can set the indent before text (the left indent for left-to-right text) to values that do not correspond to tab stops, and you can also set the indent after text (the right indent for left-to-right text) in the **Paragraph** group on the **Page Layout** tab.



Paragraph Spacing

The spacing between your paragraphs is determined by the *spacing before it* and the *spacing after it* that are set for each paragraph. You can modify the spacing before a paragraph and the spacing after it by changing the values in the applicable boxes in the **Paragraph** group on the **Page Layout** tab.

Note. When the first of two consecutive paragraphs has non-zero spacing after it and the second paragraph has non-zero spacing before it, only the larger of the two spaces will be inserted between the paragraphs.

Borders

If you want to add borders around the paragraph where your cursor is located, click the **Borders** button () to add the current default borders (the original default or the last border style that you selected). If you want to select a border style that differs from the current default border style, click the small arrow on the **Borders** button, and select one of the border styles displayed or click **Borders and Shading** to define your own custom borders. If you want to add borders around multiple paragraphs, select the applicable paragraphs before you click the **Borders** button or the small arrow on it.

Shading (Colored Background)

If you want to add shading with the current default background color to the entire text area of the paragraph where your cursor is located, click the **Shading** button () in the **Paragraph** group on the **Home** tab. If you want to select a background color other than the current default color, click the small arrow on the **Shading** button and then click one of the colors displayed or define your own custom color. If you want to apply the same shading to multiple paragraphs, select the applicable paragraphs before you click the **Shading** button or the small arrow on it.

If you choose a very dark background color, Word will automatically change the text color to white to maintain good contrast and keep your text visible.

The Paragraph Dialog Box

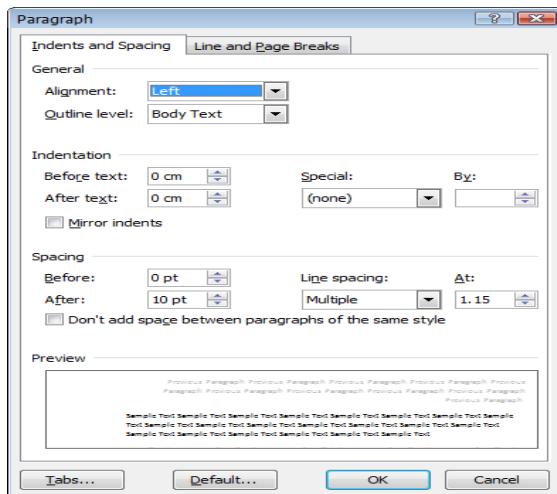
Many of the paragraph formatting options described in the previous sections and additional paragraph formatting options are available in the **Paragraph** dialog box, which has two tabs.

- Indents and Spacing
- Line and Page Breaks

Before opening the **Paragraph** dialog box, place your cursor anywhere within a single paragraph that you want to format or select the multiple paragraphs that you want to format. To open the **Paragraph** dialog box, on the **Home** tab or on the **Page Layout** tab, at the bottom of the **Paragraph** group, click the **Paragraph** dialog box launcher ().

When you click **OK** in the **Paragraph** dialog box or press **Enter**, any changes that you have made on either tab will be applied to the single paragraph where you cursor was located or to the paragraphs that you selected.

The paragraph formatting options that are available on the **Indents and Spacing** tab of the **Paragraph** dialog box are divided among the **General**, **Indentation**, and **Spacing** groups.



These paragraph formatting options are described in the next subsections.

Alignment

Alignment or *justification* refers to the way in which the lines of a paragraph are aligned. There are four types of alignment, namely, *left*, *center*, *right*, and *justified*, and they have been described above in detail in The Paragraph Group.

Indentation

The value in the **Before text** box specifies the width of the additional empty space that is inserted between the margin and the text on the left-hand side of a paragraph

of left-to-right text, and the value in the **After** text box specifies the width of the additional empty space that is inserted between the text and the margin on the right-hand side of a paragraph of left-to-right text. A negative value specifies the distance by which the text extends beyond the respective margin.

Two types of special indentation can be specified in the **Special** box.

- If you choose **First line**, you can set the amount of additional indentation before the text on the first line of a paragraph or multiple paragraphs in the **By** box.
- If you choose **Hanging**, you can create a *hanging indent*. In this case you can set the additional indentation before the text for all the lines except the first in the **By** box. If you want a part of the text on the first line to be aligned with the other lines in the paragraph, set the value in the **By** box equal to the first tab stop or set the first tab stop equal to the value in the **By** box and insert a tab character in the first line before the text to be aligned.

Spacing

The spacing between two paragraphs is determined by the spacing *before* one paragraph and the spacing *after* the preceding paragraph, which are displayed and can be modified in the **Before** and **After** boxes.

Note. When the first of two consecutive paragraphs has non-zero spacing after it and the second paragraph has non-zero spacing before it, only the larger of the two spaces will be inserted between the paragraphs.

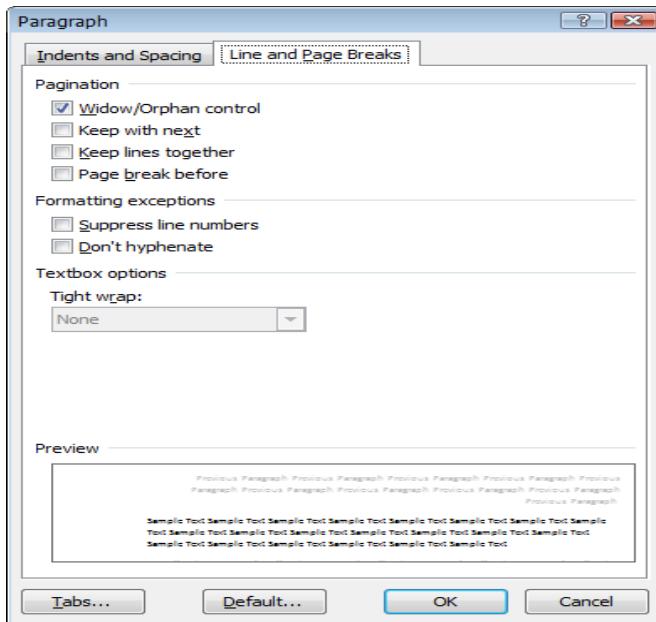
Line spacing refers to the vertical distance between the lines within a paragraph and determines the location of each line relative to the line above it. The following types of line spacing can be specified in the **Line spacing** box.

- **Single, 1.5 lines, Double,**
- **At least.** When this option is selected, an exact distance in points, where a point (pt) is equal to 1/72 of an inch, is specified in the **At** box.
- **Exact.** When this option is selected, an exact distance in points, where a point (pt) is equal to 1/72 of an inch, is specified in the **At** box.

- **Multiple.** When this option is selected, a number that indicates a multiple of single spacing (for example, 2.0 is equivalent to double spacing), is specified in the At box.

Line and Page Breaks Tab

The paragraph formatting options that you can configure on the **Line and Page Breaks** tab of the **Paragraph** dialog box can help you control where automatic page breaks occur in your document.



These paragraph formatting options include the following.

- **Widow/orphan control.** A *widow* is the last line of text in a paragraph with two or more lines that appears alone on the top of a page. An *orphan* is the first line of text in a paragraph with two or more lines that appears alone at the bottom of a page. When the **Widow/orphan control** option is selected for a paragraph, Word will break the paragraph at the end of a page only if it contains four or more lines and only if there is room for at least two lines at the bottom of the page before the break and there is room for at least two lines at the top of the page after the break.
- **Keep with next.** When this option is selected for a paragraph, the paragraph and the next paragraph will be on the same page, and no page break will occur

between them unless a manual page break is inserted between them or the **Page break before** option is selected for the next paragraph.

- **Keep lines together.** When this option is selected for a paragraph, all the lines in the paragraph will remain on the same page unless the paragraph cannot fit on a single page. If there is not sufficient space for the whole paragraph on the page containing the preceding paragraph, the paragraph will start at the top of the next page.
- **Page break before.** When this option is selected for a paragraph, the paragraph will be located at the top of the page following the preceding paragraph. In many situations, it is preferable to use this option to force a page break before a specific paragraph and not to insert a manual page break.

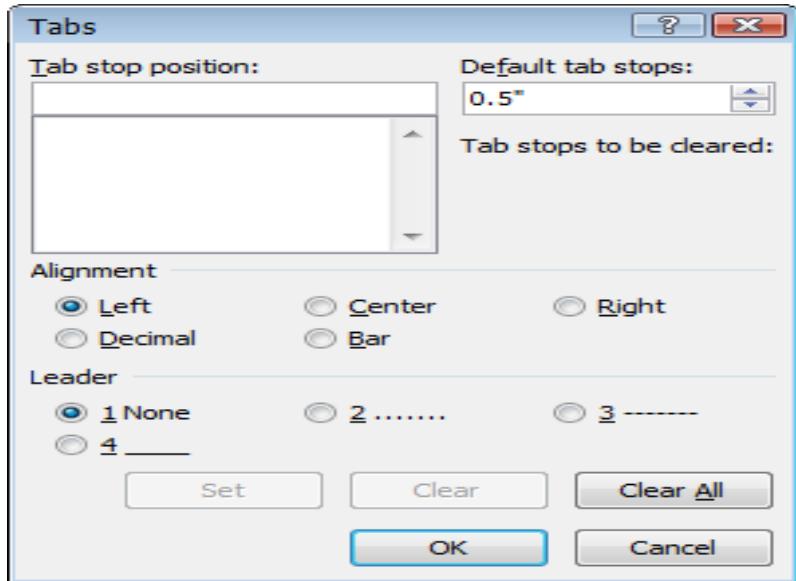
The Tabs Dialog Box

Tab stops are used to horizontally align portions of text or other content on one or more lines when the portions of text or other content in each line are separated by tab characters. When you set a tab stop, you can configure it to align text to the *left* of the *tab stop position*, to align text to the *right* of it, to *center* text at it, to align the *decimal* point in the text at it, or to add a solid vertical line or *bar* at the tab stop in front of the aligned text.

If you do not set any tab stops in a paragraph either directly or by applying a style to it, Word creates default tab stops every 0.5" (1.27 cm) across the entire width of the text area. The tab stops that are configured in a paragraph apply to all the lines in the paragraph.

The **Tabs** dialog box can be used to set tab stops for one or more paragraphs. Before opening the **Tabs** dialog box, place your cursor anywhere within a single paragraph for which you want to set tab stops or select the multiple paragraphs for which you want to create tab stops. Then open the **Tabs** dialog box as follows.

- First open the **Paragraph** dialog box as described in The Paragraph Dialog Box.
- Then in the **Paragraph** dialog box click **Tabs**.



If you want to modify the tab stops that appear in the **Tabs** dialog box for the single paragraph or multiple paragraphs that you selected, perform the following steps.

1. If one or more tab stops are listed under **Tab stop position**, click **Clear All** to delete all of them, or select each tab stop that you want to delete and click **Clear**.
2. To set a new tab stop, enter its position in the **Tab stop position** text box, under **Alignment** select the desired type of alignment, under **Leader** select **None** or the desired type of leader, and then click **Set**.
3. The position of the new tab stop should appear under **Tab stop position**.
4. If you want to set more than one tab stop, repeat the previous step for each tab stop that you want to set.
5. If you want to use evenly spaced default tab stops, after you have cleared any tab stops that may have been listed under **Tab stop position**, adjust the distance that appears in **Default tab stops** to the desired default spacing.
6. Click **OK**.

Keyboard Shortcuts

The keyboard shortcuts (or shortcut keys or shortcut key combinations) that you can use to quickly apply paragraph formatting are listed in the following table.

Keyboard shortcuts for using in paragraph formatting

Key	Action
Ctrl+E	Applies center alignment.
Ctrl+J	Applies justified alignment.
Ctrl+Shift+J	Spreads the current paragraph across the entire width between the margins.
Ctrl+M	Increases the indentation of the current paragraph or selected paragraphs to the next tab stop.
Ctrl+Shift+M	Decreases the indentation to the preceding tab stop.
Ctrl+Q	Resets the paragraph formatting to the default paragraph formatting of the applied style.
Ctrl+R	Applies right alignment.
Ctrl+Shift+S	Opens the Apply Styles task pane for applying, creating, or modifying styles and formatting (use Alt+Ctrl+Shift+S to modify a style without applying it to the selection).
Alt+Ctrl+Shift+S	Opens the Styles pane.
Ctrl+1	Applies single line spacing to the current paragraph or selected paragraphs.
Ctrl+2	Applies double spacing to the current paragraph or selected paragraphs.
Ctrl+5	Applies 1.5 line spacing to the current paragraph or selected paragraphs.
Ctrl+0	Adds or removes additional space before the current paragraph or selected paragraphs.
Shift+F1	Shows or hides the formatting properties in the task pane.

Formatting Document

Formatting document is the technique which allows making our document more attractive and professional. It includes changing font, setting margins, setting text alignments etc.

Changing the Font Type

There are different types of fonts supported by MS-Word. To change the font follow these steps:

Step 1: Select the text to change the font type.

Step 2: Click on the drop down arrow of Font button in the Font group of the Home tab.

Step 3: Click on the font name to apply.

Changing the Font style (Bold, Italic and Underline)

Different font styles such as bold, italic and underline are available in MS-Word.

Step 1: Select the text to make Bold, Italic and Underline.

Step 2: To make the text bold, click on bold button in the font group of the Home tab.

Step 3: To make the text italic click on the italic button

Step 4: To make the text underline click on the underline button.

Changing the Font Size

To change font size follow these steps:

Step 1: Select the text which you want to change the size.

Step 2: Click on the dropdown arrow of the Font size button in the font group of the Home tab.

Step 3: Choose required font size.

Press $ctrl+]$ key to increase the font size. Press $ctrl+[$ key to decrease the font size.

Changing the Font Color

To change font color follow these steps:

Step 1: Select the text which you want to change their colours.

Step 2: Click on the dropdown arrow of the font color button in the font group of the Home tab.

Then a color box with different colors will display.

Step 3: Click on desired color from the list.

Subscript and Superscript

Superscript is the number, figure or symbol that is raised up from the base line. For example $a^2 + b^2$. Likewise subscript is dropped down from the base line. For example H_2O . To change subscript/superscript follow these steps.

Step 1: Select the required character to make subscript or superscript.

Step 2: Open the Font dialog box.

Step 3: Put tick mark on the required option(subscript/superscript)

Step 4: Click on the OK button.

OR, press Ctrl and +keys for subscript. Ctrl, shift and + keys for superscript.

Changing line Spacing

1. Select Design > Paragraph Spacing.
2. However the cursor over each option to see a preview, and then select the option you want.
3. For single spacing, select No Paragraph Space.
4. Change line spacing for part of your document
5. Select the paragraphs you want to change.
6. Select Home > Line and Paragraph Spacing, and choose the spacing you want.

Work with Special features of Word Processing

A word processor enables you to create a document, store it electronically on a disk, display it on a screen, modify it by entering commands and characters from the keyboard, and print it on a printer.

The great advantage of word processing over using a typewriter is that you can make changes without retying the entire document.

If you make a typing mistake, you simply back up thecursor and correct your mistake.

If you want to delete a paragraph, you simply remove it, without leaving a trace.

It is equally easy to insert a word, sentence, or paragraph in the middle of a document.

Word processors usually support these features (and a few others) :

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

- **Word wrap:** The word processor automatically moves to the next line when you have filled one line with text, and it will readjust text if you change the margins
- **Print:** Allows you to send a document to a printer to get hardcopy
- **Font specifications:** Allows you to change fonts within a document
For example, you can specify bold, italics, and underlining
Most word processors also let you change the font size and even the typeface.
- **Graphics:** Allows you to embed illustrations and graphs into a document
Some word processors let you create the illustrations within the word processor; others let you insert an illustration produced by a different program
- **Headers, footers, and page numbering:** Allows you to specify customized headers and footers that the word processor will put at the top and bottom of every page

The word processor automatically keeps track of page numbers so that the correct number appears on each page.

- **Layout:** Allows you to specify different margins within a single document and to specify various methods for indenting paragraphs.
- **Merges:** Allows you to merge text from one file into another file.
This is particularly useful for generating many files that have the same format but different data.
Generating mailing labels is the classic example of using merges.
- **Spell checker:** A utility that allows you to check the spelling of words.
It will highlight any words that it does not recognize.
- **Thesaurus:** A built-in thesaurus that allows you to search for synonyms without leaving the word processor.

Language Tools

Microsoft Word's language tools are more than just red or blue squiggly lines. There's help to choose alternative words, alternate languages, check and improve grammar, hyphenate documents and even test the document for readability.

You may think you know all about the language tools, but Word always has a few

extras tucked away to surprise even experts.

- Spelling
- AutoCorrect
- Thesaurus
- Grammar
- Delay
- Options
- Word Count and Statistics
- Readability
- Hyphenation
- Translation

Spelling

We all know about the red squiggly line on misspelled words. Right-click to see possible correct spellings.

Ignore All— Word will consider that word as correctly spelled in this document. There's no option to ignore just one instance of a misspelled word.

Add to Dictionary— adds this word to your custom dictionary. It won't be marked as wrong in any other documents.

Smart Lookup— new in Office 2016. Opens a Bing search for that word in a side-pane.

AutoCorrect

AutoCorrect is Word magically changing common spelling mistakes as you type. It's different from the speller checker but related.

Things like tpye accomodation youve and many more are loaded into an AutoCorrect list at Options | Proofing | AutoCorrect. When you type something from the 'Replace' column, Word will insert the 'With' value instead.

You can add your own common mistakes to this list or use AutoCorrect to save typing by changing a shortcut term into a longer one. (e.g. type IRSf to get Internal Revenue Service)

At the bottom of these options is ‘Automatically use suggestions from the spelling checker’ which ties the spell check to Autocorrect.

Thesaurus

In a paper thesaurus (like the famous Roget’s Thesaurus that I pored over as a kid and still available) you looked up a word to see alternatives or synonyms

Microsoft Word has a thesaurus in some languages. Right-click on a correctly spelled word and choose Synonyms. Here we’re looking for synonyms of ‘thesaurus’:

Click on a synonym to replace the current word.

Or choose ‘Thesaurus...’ to see more in a side-pane. If your computer is connected to the Internet you’ll see extra options.

There’s a longer list of synonyms and you can type other words into the search box at the top.

The speaker icon next to the word will play a voice speaking the word.

Click on ‘See More...’ to open a web page about that word. In this case the page includes a great line from Steven Wright, “*What’s another word for Thesaurus?*”

At the bottom of the pane you can switch languages or variants. For example, switch between US English and ‘real’ English from the Mother Country <g>.

Grammar

The blue squiggly line checks not just for grammar but also common typing mistakes. For example, adding extra spaces between words.

Or missing the comma after ‘For example’ <g>.

Ignore Once – removes the blue squiggly line with no change.

Grammar – opens the Grammar pane to show more options and examples. Like the Spelling pane, there’s a change language option.

The English grammar check in Word isn’t perfect by any means. Just skimming through a document looking for blue squiggles won’t catch everything. Surely this

sentence deserves a squiggle or two?

And there are instances where the grammar check is wrong. English is such a messy language that the Microsoft grammar check should be regarded as a minor miracle for what it can do, rather than its shortcomings.

Tables

Insert a table

In Microsoft Office Word 2007, you can insert a table by choosing from a selection of preformatted tables — complete with sample data — or by selecting the number of rows and columns that you want. You can insert a table into a document, or you can insert one table into another table to create a more complex table.

Use table templates

You can use table templates to insert a table that is based on a gallery of preformatted tables. Table templates contain sample data to help you visualize what the table will look like when you add your data.

1. Click where you want to insert a table.
2. On the **Insert** tab, in the **Tables** group, click **Table**, point to **Quick Tables**, and then click the template that you want.
3. Replace the data in the template with the data that you want.

Use the Table menu

1. Click where you want to insert a table.
2. On the **Insert** tab, in the **Tables** group, click **Table**, and then, under **Insert Table**, drag to select the number of rows and columns that you want.

Use the Insert Table command

You can use the **Insert Table** command to choose the table dimensions and format before you insert the table into a document.

1. Click where you want to insert a table.
2. On the **Insert** tab, in the **Tables** group, click **Table**, and then click **Insert Table**.

- Under **Table size**, enter the number of columns and rows.
- Under **AutoFit behavior**, choose options to adjust the table size.

Word Art

WordArt is a gallery of text styles that you can add to your 2007 Microsoft Office system documents to create decorative effects, such as shadowed or mirrored (reflected) text. In Microsoft Office PowerPoint 2007, you can also convert existing text into WordArt. To insert word art, follow these steps:

- On the **Insert** tab, in the **Text** group, click **WordArt**, and then click the WordArt style that you want.
- Type your text in the **Text** box.

Convert existing text to WordArt in Office PowerPoint 2007

- Select the text that you want to convert to WordArt.
- On the **Insert** tab, in the **Text** group, click **WordArt**, and then click the WordArt that you want.

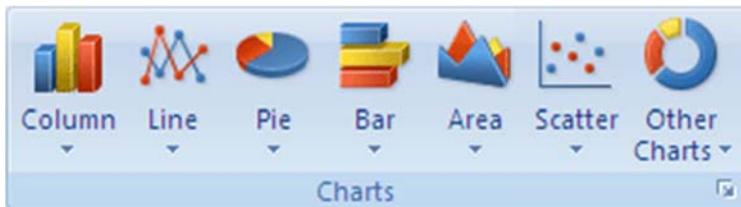


Create, apply, or remove a chart template

To reuse a favorite chart type that you customized to meet your needs, you can save that chart as a chart template (*.crtx) in the charts template folder.

Apply a chart template

- Do one of the following:
 - To create a new chart based on the template, on the **Insert** tab, in the **Charts** group, click any chart type, and then click **All Chart Types**.



You can also click the **Dialog Box Launcher**  next to **Charts** in the **Charts** group on the **Insert** tab.

2. To make a selected chart match a template, on the **Design** tab, in the **Type** group, click **Change Chart Type**.

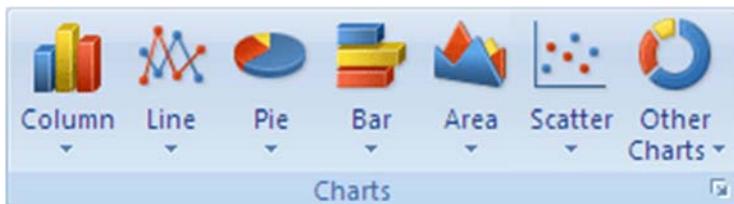


- 3.. Click **Templates** in the first box, and then click the template that you want to use in the second box under **My Templates**.

NOTE If a chart template is located in a folder other than the **Charts** folder, click **Manage Templates**, locate the chart template, and then copy or move it to the **Charts** folder under **Templates**.

Remove or delete a chart template

1. On the **Insert** tab, in the **Charts** group, click any chart type, and then click **All Chart Types**.



You can also click the **Dialog Box Launcher**  next to **Charts** in the **Charts** group on the **Insert** tab.

2. Click **Manage Templates**
3. Do one of the followings;

Save a chart as a chart template

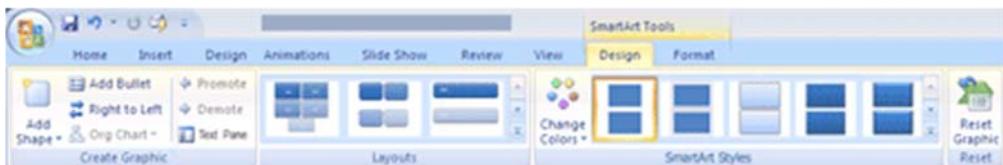
1. Click the chart that you want to save as a template.
This displays the **Chart Tools**, adding the **Design**, **Layout**, and **Format** tabs.
2. On the **Design** tab, in the **Type** group, click **Save Template**.



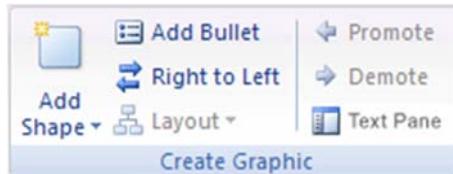
3. In the **Save in** box, make sure that the **Charts** folder is selected.
4. In the **File name** box, type an appropriate name for the chart template.

Add a shape from within the SmartArt graphic:

1. Click the SmartArt graphic that you want to add a shape to.
2. Click the existing shape that is located closest to where you want to add the new shape.
3. Under **SmartArt Tools**, click the **Design** tab.



4. In the **Create Graphic** group, click the arrow under **Add Shape**, and then do one of the following to select a location for the new shape:



- To insert a shape at the same level as the selected shape but following it, click **Add Shape After**.
- To insert a shape at the same level as the selected shape but before it, click **Add Shape Before**.
- To insert a shape one level above the selected shape, click **Add Shape Above**.
- The new shape takes the position of the selected shape, and the selected shape and all of the shapes below it are demoted one level each.
- To insert a shape one level below the selected shape, click **Add Shape Below**.
The new shape is added at the end of other shapes at the same level.

5.2. Spreadsheet software

Spreadsheet software is a software application capable of organizing, storing and analyzing data in tabular form. The application can provide digital simulation of paper accounting worksheets. They can also have multiple interacting sheets with data represented in text, numeric or in graphic form. With these capabilities, spreadsheet software has replaced many paper-based systems, especially in the business world. Originally developed as an aid for accounting and bookkeeping tasks, spreadsheets are now widely used in other contexts where tabular lists can be used, modified and collaborated.

Spreadsheet software is also known as a spreadsheet program or spreadsheet application.

Uses of Spreadsheets

Spreadsheets provide invaluable tools for collecting and calculating data of all types. Beyond arithmetic, they can be formatted to create clear, concise reports and can be sorted and updated with the touch of a button.

Lists

You can create lists, from shopping lists to contact lists, on a spreadsheet.

Accounting

Beyond sorting, spreadsheets are invaluable calculators. By entering the appropriate mathematical functions into cells, you can turn a simple spreadsheet into an accounting page.

Time Sheets

Besides adding and subtracting integers, spreadsheets can also perform those calculations on time-based numbers. Formatting cells to reflect data as a time (as opposed to simple integers) can allow you to use the spreadsheet as a time sheet.

Database Use

Although spreadsheets are not true relational databases, they can be designed and formatted to function as simplified ones.

Chart Creation

Charts and graphs create better depictions of trends and percentages than raw numbers.

Types of Spreadsheets

Spreadsheets play a central role in the daily administrative tasks within many businesses both small and large. With spreadsheet software such as Microsoft Excel, business managers and administrators can capture, manipulate, analyze and present valuable data related to particular areas of their operation. The types of data spreadsheets are used to manage typically fall into one of a few common categories. As well as recording business data, spreadsheets can be used to manage it in a variety of ways.

Financial

Many businesses use spreadsheets to manage accounting data. This includes budget management such as tracking income and expenses.

Statistical

Spreadsheets are primarily used to capture data, but they also provide the means to analyze and manipulate data sets.

Presentation

Once a spreadsheet has been populated with one or more data sets, users can exploit features within the spreadsheet application to present these data sets graphically.

Future Planning

Spreadsheet data sets can be used to inform the process of making future plans for a business. As well as including graphs or tables representing historical business data within business plans, spreadsheets can be created specifically for the purposes of projection.

Project Tracking

Spreadsheets can play a role in project management tasks within certain organizations.

Spreadsheet's Interface

The Excel Interface

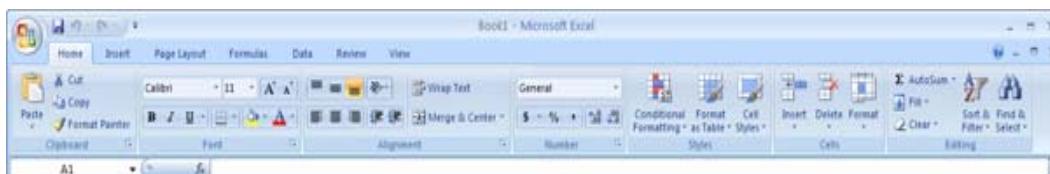
File Tab & Ribbon

In Excel 2010, the Office button has been replaced by a modification of the familiar File menu . Click to reveal the New, Open, Save, Print and Close options.

If you are upgrading to 2010 from 2007, not much of the interface has changed. However, if you are upgrading from an older version of Excel, you may be unfamiliar with the new interface, which will be explained in the sections below. Seven tabs are displayed across the top-left of the window.

Home Tab

The Home tab contains the most common text editing tools used in Excel.



Shortcut Menu

The most common Excel commands and functions can be accessed quickly by using the shortcut menu. To access this feature, simply right-click the element you wish to edit if you are using a PC, or control-click the element you wish to edit if you are using a Mac. The options displayed will vary depending on the element you have selected.

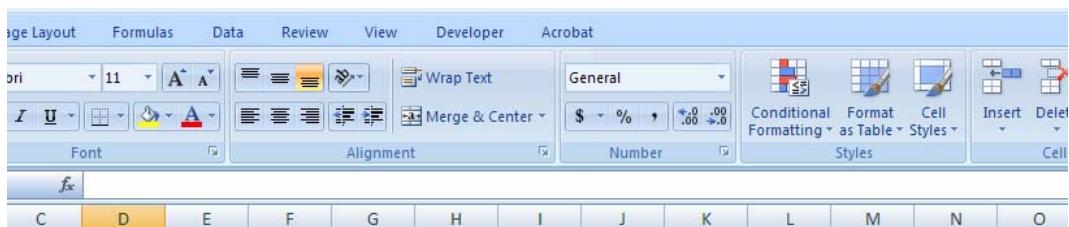
Spreadsheet Basics

Each Excel file is a workbook that can hold many worksheets. The worksheet is a grid of columns (designated by letters) and rows (designated by numbers). The letters of the columns are indicated in the blue buttons across the top of the worksheet. The numbers of the rows are indicated in the blue buttons down the left of the worksheet. The intersection of a column and a row is called a cell. You can input your data into the cells. Cells can contain text, numbers, or formulas for automatic calculations. Each cell on the spreadsheet has a cell address that is the

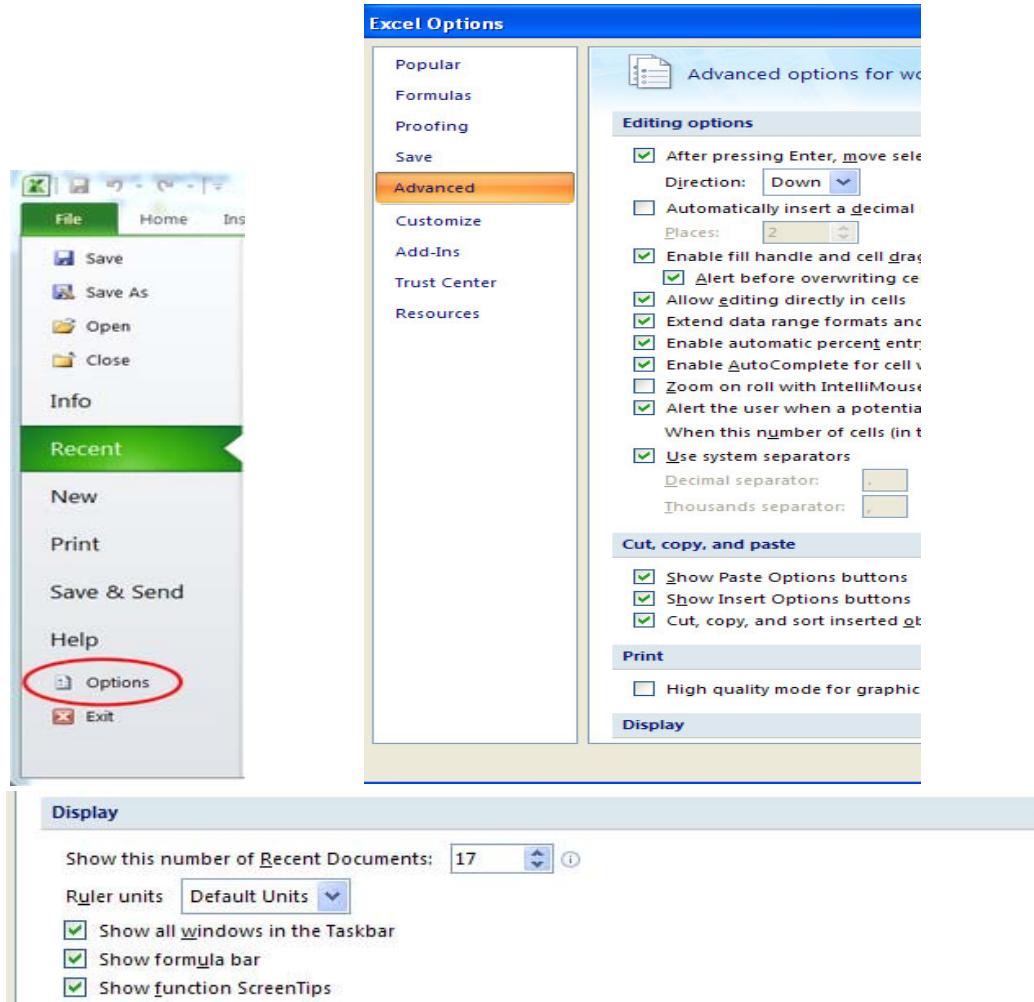
column letter followed by the row number.

Formula bar

This will be one of the most useful tools as you use Excel. The formula bar allows you to see all the details and methods used to return what is seen in a cell. Whenever you input any information into a cell, the output, or end result is what is shown once you move away from the cell. This is most prominent when using functions, as you do not see the whole equation in the cell in the worksheet, only the result. The formula bar is located below the ribbon and spans most of the window.



It is possible to hide the formula bar, though it is not recommended. We can hide or show the formula bar. If it is mistakenly hidden, go to **Excel Options** at the bottom right of the menu that opens when you click the Office button. Go to the **Advanced** option, and under **Display**, you can click the check box for **Show formula bar**. When done, simply click **Ok**.



Addin a Worksheet

By default, three worksheets are included in each Excel workbook. You can access the different worksheets by clicking the worksheet tabs just above the status bar.



To add a new worksheet, click the **Insert Worksheet** tab, to the right of the existing worksheet tabs.

Renaming a Worksheet

To rename a worksheet tab, follow either of these steps:

Steps Actions

Option 1

1. Right-click the tab you want to rename if you are using a PC, or control-click the tab you want to rename if you are using a Mac. A shortcut menu will open.
2. Click **Rename** from the shortcut menu.
3. Type the new name.
4. Press .

Option 2

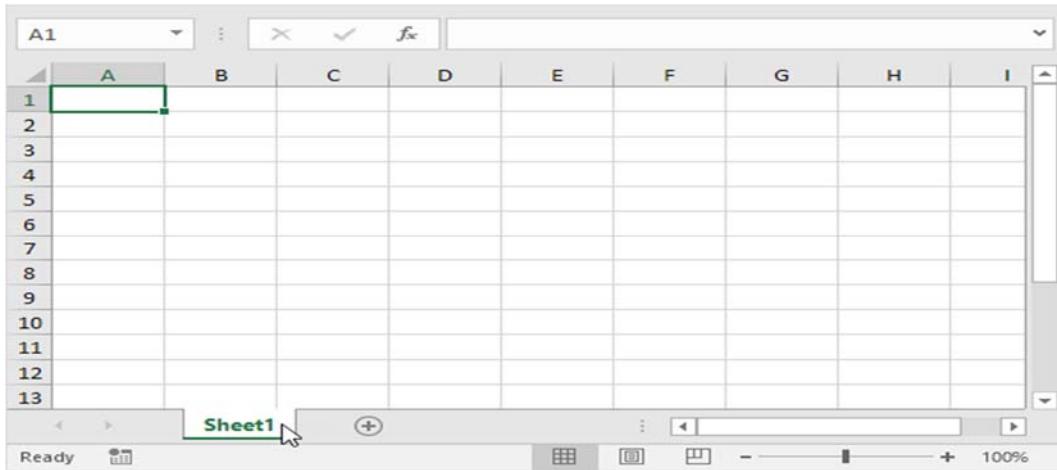
1. Hover over the tab you want to rename, and double Left-click the tab.
2. Begin typing to rename the tab.
2. Press

Worksheets

A worksheet is a collection of cells where you keep and manipulate the data. Each Excel workbook can contain multiple **worksheets**.

Select a Worksheet

When you open an **Excel** workbook, Excel automatically selects Sheet1 for you. The name of the worksheet appears on its sheet tab at the bottom of the document window.

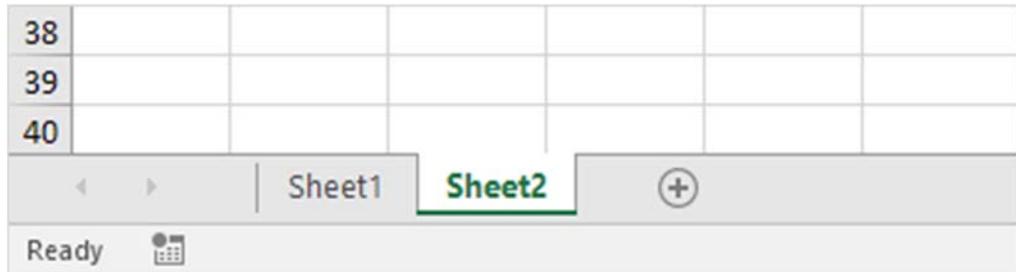


Insert a Worksheet

You can insert as many worksheets as you want. To quickly insert a new **worksheet**, click the plus sign at the bottom of the document window.



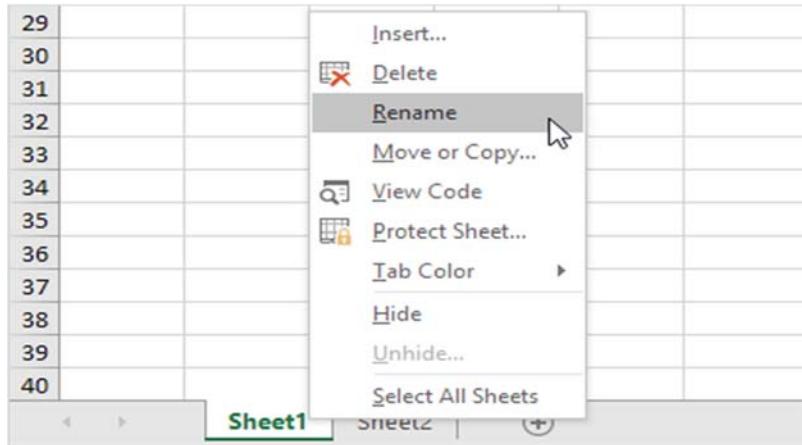
Result:



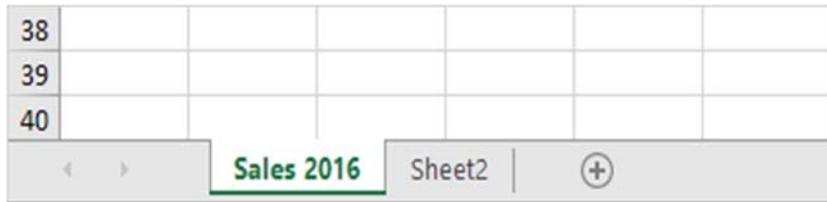
Rename a Worksheet

To give a worksheet a more specific name, execute the following steps.

1. Right click on the sheet tab of Sheet1.
2. Choose Rename.



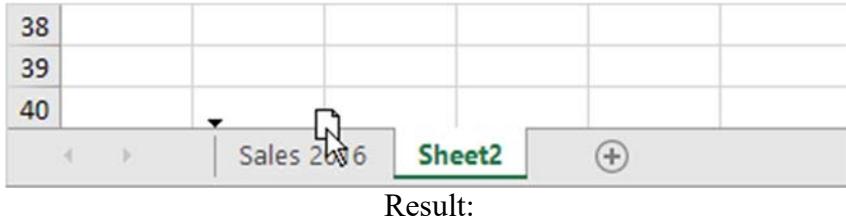
- For example, type Sales 2016.



Move a Worksheet

To move a worksheet, click on the sheet tab of the worksheet you want to move and drag it into the new position.

- For example, click on the sheet tab of Sheet2 and drag it before Sales 2016.



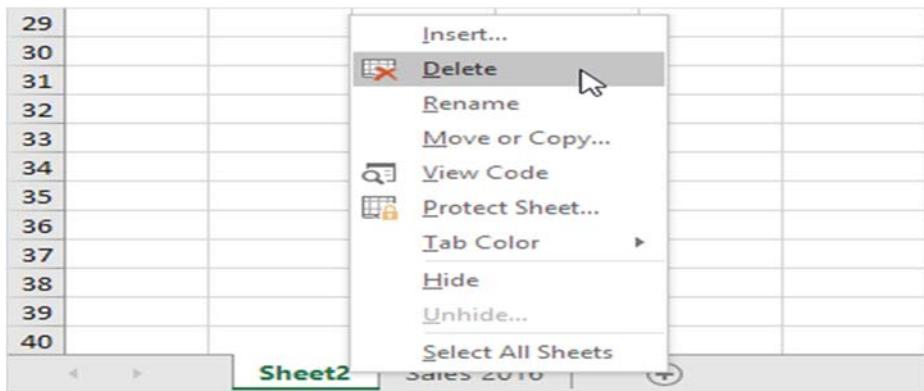
Result:



Delete a Worksheet

To delete a worksheet, right click on a sheet tab and choose Delete.

1. For example, delete Sheet2.



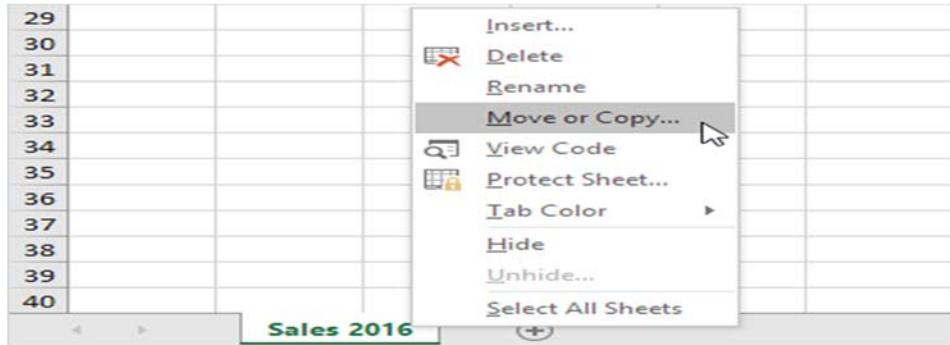
Result:

38						
39						
40						

Copy a Worksheet

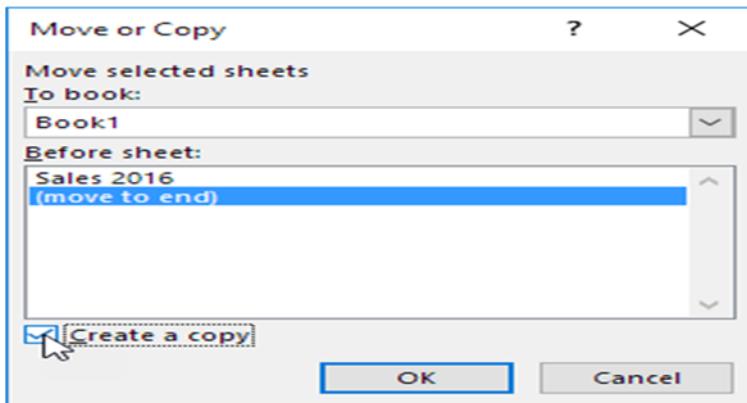
Imagine, you have got the sales for 2016 ready and want to create the exact same sheet for 2017, but with different data. You can recreate the worksheet, but this is time-consuming. It's a lot easier to copy the entire worksheet and only change the numbers.

1. Right click on the sheet tab of Sales 2016.
2. Choose Move or Copy.



The 'Move or Copy' dialog box appears.

3. Select (move to end) and check Create a copy.



4. Click OK.

Result:

38								
39								
40								
	◀ ▶		Sales 2016	Sales 2016 (2)	⊕			

Note: you can even copy a worksheet to another Excel workbook by selecting the specific workbook from the drop-down list (see the dialog box shown earlier).

Labels and values:

Entering data into a spreadsheet is just like typing in a word processing program, but you have to first click the cell in which you want the data to be placed before typing the data.

All words describing the values (numbers) are called labels. The numbers, which can later be used in formulas, are called values.

Notice also that the labels (composed of letters) are all left justified and the values (composed of numbers) are all right justified in their cells.

Formulas:

Click the cell in which you want the answer (result of the formula) to appear. Press enter once you have typed the formula.

All formulas start with an = sign.

Refer to the cell address instead of the value in the cell e.g. =A2+C2 instead of 45+57. That way, if a value changes in a cell, the answer to the formula changes with it.

+ means add	e.g. A2+C2	Add the value (number) in A2 to the value (number) in C2.
- means subtract	e.g. A2-C2	Subtract the value (number) in C2 from the value (number) in A2.
* means multiply	e.g. A2*4	Multiply the value (number) in A2 by 4.
/ means divide	e.g. A2/3	Divide the value (number) in A2 by 3.

Functions

These formulas are used for working with long lists of numbers. A typical function looks like this:

=SUM(A3:A30)

- SUM is a function, meaning that it sums (adds up) the list of numbers.
- The list of numbers is indicated in brackets.
- The address of the first cell in the list is A3.
- A colon : separates this cell address from the last cell in the list, which is A30.

=SUM(B3:B9) Adds list of values from cell B3 to cell B9	=AVERAGE(B3:B9) Averages the values from cell B3 to cell B9
--	--

Other functions:

There are many functions that you could explore with time. SUM and AVERAGE are two of the most common, below are a few more:

SUM	adds the numbers in the list
AVERAGE	averages the numbers in the list
PRODUCT	multiplies the numbers in the list
MAX	identifies the highest number in the list
MIN	identifies the lowest number in the list
COUNT	counts the number of numerical items in the list

COUNTA	counts the number of alphabetical items in the list
COUNTIF	counts the number of items that satisfy certain criteria e.g. =COUNTIF(A4:A20,>50") counts the number of values that are higher than 50 in the list from A4 to A20 - notice the use of the comma and quotation marks to separate the list (A4:A20) from the criteria (>50).

Date & Time Functions:

To enter a **date** in Excel, use the "/" or "-" characters. To enter a **time**, use the ":" (colon). You can also enter a date and a time in one cell.

Note: Dates are in US Format. Months first, Days second. This type of format depends on your windows regional settings. Learn more about [Date and Time formats](#).

Year, Month, Day

To get the year of a date, use the YEAR function.

Note: use the MONTH and DAY function to get the month and day of a date.

Format a worksheet

You can help improve the readability of a worksheet by applying different types of formatting. For example, you can apply borders and shading to help define the cells in a worksheet.

Apply cell borders

- Select the cell or range of cells that you want to add a border to.

Tip To quickly select the whole worksheet, click the **Select All** button.



- On the **Home** tab, in the **Font** group, click the arrow next to **Borders** 
- and then click the border style that you want.



Tips : The **Borders** button displays the most recently used border style.

You can click the **Borders** button (not the arrow) to apply that style.

Change text color and alignment

1. Select the cell or range of cells that contain (or will contain) the text that you want to format. You can also select one or more portions of the text within a cell and apply different text colors to those sections.
2. To change the color of text in the selected cells, on the **Home** tab, in the **Font** group, click the arrow next to **Font Color** , and then under **Theme Colors** or **Standard Colors**, click the color that you want to use.
Note To apply a color other than the available theme colors and standard colors, click **More Colors**, and then define the color that you want to use on the **Standard** tab or **Custom** tab of the **Colors** dialog box.
3. To change the alignment of the text in the selected cells, on the **Home** tab, in the **Alignment** group, click the alignment option that you want.



For example, to change the horizontal alignment of cell contents, click **Align Text Left** , **Center** , or **Align Text Right** .

Apply cell shading

4. Select the cell or range of cells that you want to apply cell shading to.
5. On the **Home** tab, in the **Font** group, click the arrow next to **Fill Color** , and then under **Theme Colors** or **Standard Colors**, click the color that you want.

Relative and Absolute Cell References:

There are two types of cell references: **relative** and **absolute**. Relative and absolute references behave differently when copied and filled to other cells. Relative references **change** when a formula is copied to another cell. Absolute references,

on the other hand, remain **constant** no matter where they are copied.

Relative references

By default, all cell references are **relative references**. When copied across multiple cells, they change based on the relative position of rows and columns. For example, if you copy the formula $=A1+B1$ from row 1 to row 2, the formula will become $=A2+B2$. Relative references are especially convenient whenever you need to **repeat** the same calculation across multiple rows or columns.

To create and copy a formula using relative references:

In the following example, we want to create a formula that will multiply each item's **price** by the **quantity**. Rather than create a new formula for each row, we can create a single formula in cell **D2** and then copy it to the other rows. We'll use relative references so the formula correctly calculates the total for each item.

1. Select the **cell** that will contain the formula. In our example, we'll select **cell D2**.
2. Enter the **formula** to calculate the desired value. In our example, we'll type $=B2*C2$.

Absolute references

There may be times when you do not want a cell reference to change when filling cells. Unlike relative references, **absolute references** do not change when copied or filled. You can use an absolute reference to keep a row and/or column **constant**.

An absolute reference is designated in a formula by the addition of a **dollar sign** (\$). It can precede the column reference, the row reference, or both.

\$A\$2	The column and the row do not change when copied
A\$2	The row does not change when copied
\$A2	The column does not change when copied

You will usually use the **\$A\$2** format when creating formulas that contain absolute references. The other two formats are used much less frequently.

When writing a formula in Microsoft Excel, you can press the **F4** key on your

keyboard to switch between relative and absolute cell references. This is an easy way to quickly insert an absolute reference.

To create and copy a formula using absolute references

In our example, we'll use the 7.5% sales tax rate in cell **E1** to calculate the sales tax for all items in **column D**. We'll need to use the absolute cell reference **\$E\$1** in our formula. Because each formula is using the same tax rate, we want that reference to remain constant when the formula is copied and filled to other cells in column D.

1. Select the **cell** that will contain the formula. In our example, we'll select cell **D3**.
2. Enter the **formula** to calculate the desired value. In our example, we'll type **=(\$B3*C3)*\$E\$1**.
3. Press **Enter** on your keyboard. The formula will calculate, and the result will display in the cell.
4. Locate the **fill handle** in the lower-right corner of the desired cell. In our example, we'll locate the fill handle for cell **D3**.

Formatting Values

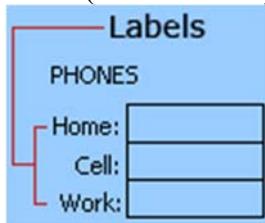
Create and build a custom numeric format to show your numbers as percentages, currency, dates, and more.

1. Select the numeric data.
2. Select **More** in the **Number** group.
3. Select **Custom**.
4. In the **Type** list, select an existing format, or type a new one in the box.
5. To add text to your number format:
6. Type what you want in quotation marks.
7. Add a space to separate the number and text.
8. Select **OK**.

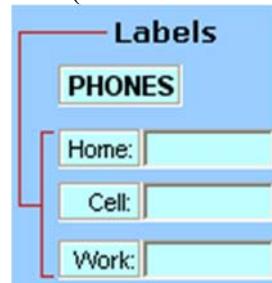
Labels and Cells

A label is text that identifies the purpose of a cell or text box or that displays descriptive text, such as titles, captions, or brief instructions. In addition, a label can

Label (Form control)



Label (ActiveX control)



Text Box (ActiveX control)



display a descriptive picture. Use a label for flexible placement of instructions, to emphasize text, and when merged cells or a specific cell location is not a practical solution.

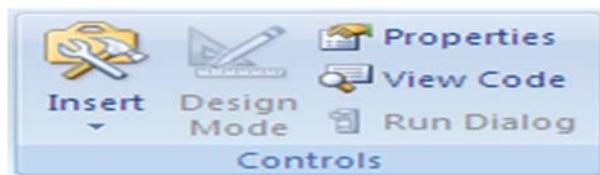
A cell or text box is a rectangular box in which you can view, enter, or edit text or data that is bound to a cell. A text box can also be a static text field that presents read-only information. Use a text box as an alternative to entering text in a cell, when you want to display an object that floats freely. You can also use a text box to display or view text that is independent of row and column boundaries, preserving the layout of a grid or table of data on the worksheet.

Add a label (Form control)

1. If the **Developer** tab is not available, display it.

Display the Developer tab

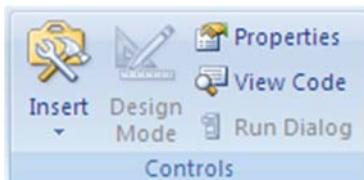
- a. Click the **File** tab, click **Options**, and click **Customize Ribbon**.
- b. Under **Main Tabs**, select the **Developer** check box, and then click **OK**.
1. On the **Developer** tab, in the **Controls** group, click **Insert** and then, under **Form Controls**, click **Label**



2. Click the worksheet location where you want the upper-left corner of the label to appear.
3. To specify the control properties, right-click the control, and then click **Format Control**.

Add a label (ActiveX control)

4. If the **Developer** tab is not available, display it.
 - a. **Display the Developer tab**
 - b. Click the **File** tab, click **Options**, and click **Customize Ribbon**.
5. Under **Main Tabs**, select the **Developer** check box, and then click **OK**.
On the **Developer** tab, in the **Controls** group, click **Insert** and then, under **ActiveX Controls**, click **Label** .



6. Click the worksheet location where you want the upper-left corner of the label to appear.
7. To edit the ActiveX control, make sure that you are in design mode. On the **Developer** tab, in the **Controls** group, turn on **Design Mode** .
8. Click the worksheet location where you want the upper-left corner of the label to appear.
9. To specify the control properties, on the **Developer** tab, in the **Controls** group, click **Properties** .

Add Charts

A simple chart in Excel can say more than a sheet full of numbers. As you'll see, creating charts is very easy.

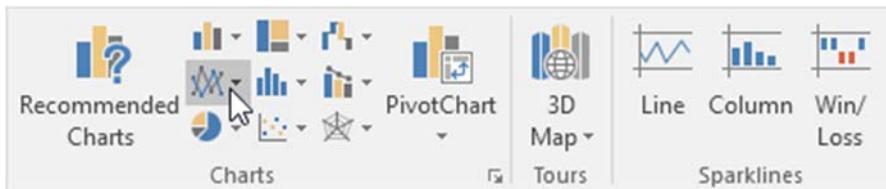
Create a Chart

To create a line chart, execute the following steps.

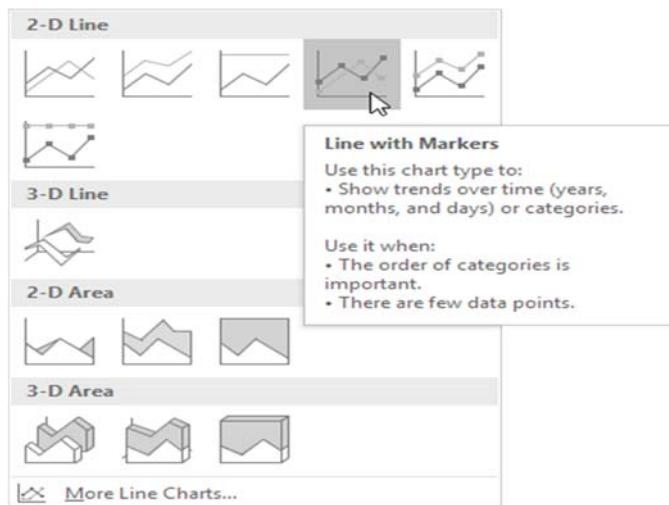
1. Select the range A1:D7.

A	B	C	D	E
1	Month	Bears	Dolphins	Whales
2	Jan	8	150	80
3	Feb	54	77	54
4	Mar	93	32	100
5	Apr	116	11	76
6	May	137	6	93
7	Jun	184	1	72
8				

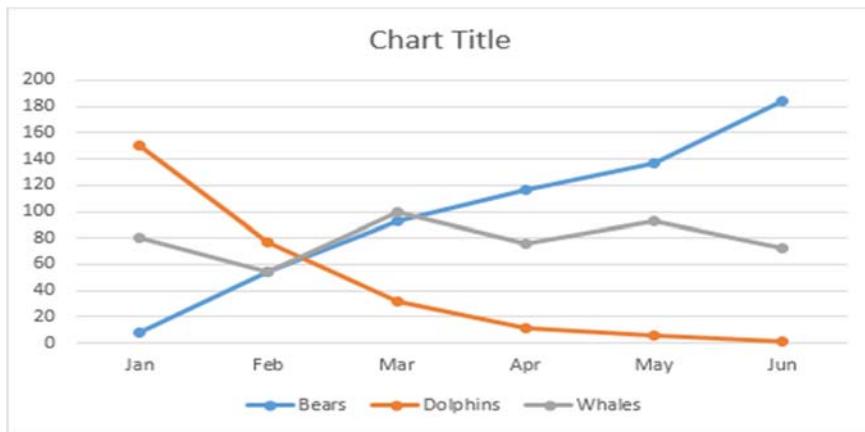
2. On the Insert tab, in the Charts group, click the Line symbol.



3. Click Line with Markers.



Result



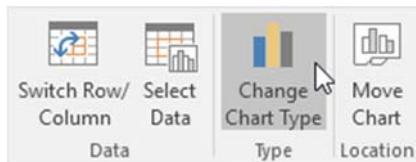
Note: enter a title by clicking on Chart Title. For example, Wildlife Population.

Change Chart Type

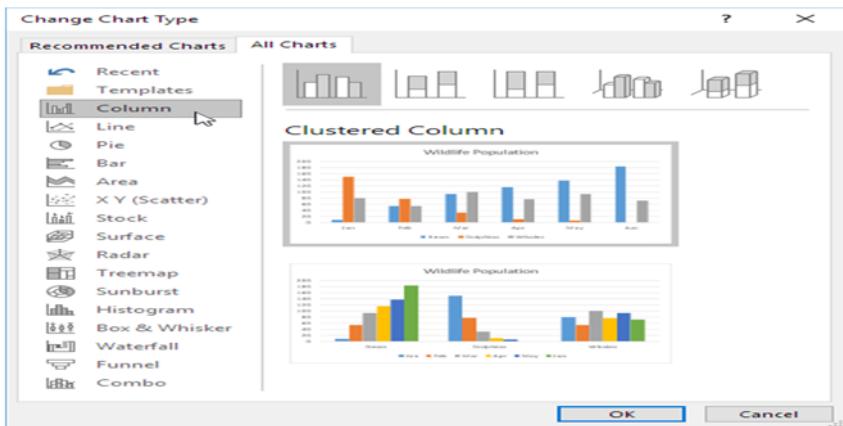
You can easily change to a different type of chart at any time.

1. Select the chart.

2. On the Design tab, in the Type group, click Change Chart Type.

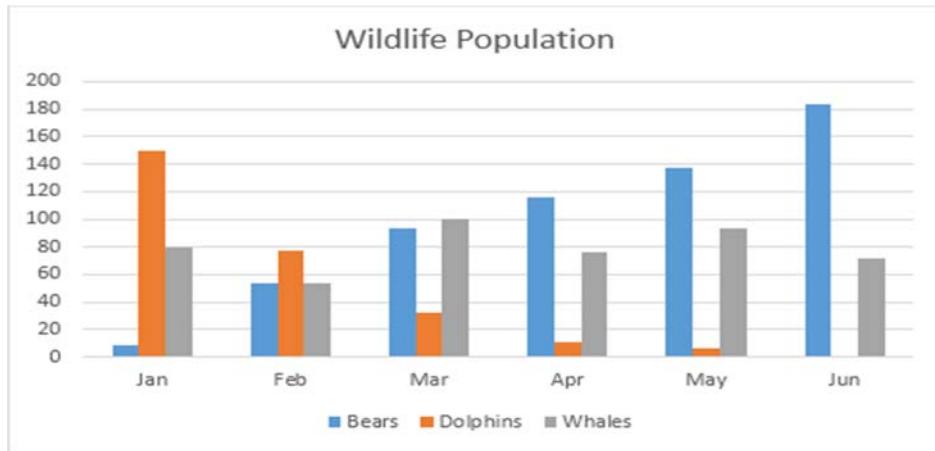


3. On the left side, click Column.



4. Click OK.

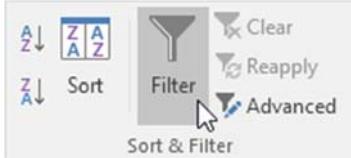
Result



Data Filter

Filter your Excel data if you only want to display records that meet certain criteria.

1. Click any single cell inside a data set.
2. On the Data tab, in the Sort & Filter group, click Filter.



Arrows in the column headers appear.

3. Click the arrow next to Country.
4. Click on Select All to clear all the check boxes, and click the check box next to USA.
5. Click OK.

Result. Excel only displays the sales.

6. Click the arrow next to Quarter.
 7. Click on Select All to clear all the check boxes, and click the check box next to Qtr 4.
 8. Click OK.
- Result. Excel only displays the sales in the USA in Qtr 4.
9. To remove the filter, on the Data tab, in the Sort & Filter group, click Clear.
 - To remove the filter and the arrows, click Filter.

Sort data

Sorting data is an integral part of data analysis. You might want to arrange a list of names in alphabetical order, compile a list of product inventory levels from highest to lowest, or order rows by colors or icons. Sorting data helps you quickly visualize and understand your data better, organize and find the data that you want, and ultimately make more effective decisions.

You can sort data by text (A to Z or Z to A), numbers (smallest to largest or largest to smallest), and dates and times (oldest to newest and newest to oldest) in one or more columns. You can also sort by a custom list you create (such as Large, Medium, and Small) or by format, including cell color, font color, or icon set.

Sort text

1. Select a cell in the column you want to sort.
2. On the **Data** tab, in the **Sort & Filter** group, do one of the following:

- To quick sort in ascending order, click  (**Sort A to Z**).
- To quick sort in descending order, click  (**Sort Z to A**).

Working with special features of spreadsheet

When spreadsheet software first became available for computers in the early 1980s, it was known as a "killer application" because people began to buy computers just so they could work with spreadsheets. Today, spreadsheet software is practically a required part of any collection of office software, and it remains as useful now as it was in the beginning.

Visual Design

Spreadsheets allow you to lay figures out on a grid, calculating and manipulating them visually. Often, this may result in you being able to process the information more quickly. On a spreadsheet, you may also notice errors or omissions that you would not have otherwise.

Automatic Calculations

Spreadsheet software gives you the ability to enter mathematical formulas ranging from simple arithmetic to complex statistics.

Dynamic Updates

In addition to the standard method of entering data in a spreadsheet -- typing numbers in cells -- you can also create a cell with a value generated dynamically based on other cells.

Data Analysis

Spreadsheet software gives you the ability to analyze your data in ways other than simply looking at grids and lines. Most spreadsheet software can automatically create graphs and charts from your data, giving you different ways of comparing and analyzing information. These visual representations can also be printed and emailed, or exported into slide shows for presentations.

Formulas and Functions:

A **formula** is an expression which calculates the value of a cell. **Functions** are

predefined formulas and are already available in Excel.

For example, cell A3 below contains a formula which adds the value of cell A2 to the value of cell A1.

A3		X	✓	f _{xc}	=A1+A2	
A	B	C	D	E	F	
1	2					
2	3					
3	5					
4						

For example, cell A3 below contains the SUM function which calculates the sum of the range A1:A2.

A3		X	✓	f _{xc}	=SUM(A1:A2)	
A	B	C	D	E	F	
1	2					
2	3					
3	5					
4						

Enter a Formula

To enter a formula, execute the following steps.

1. Select a cell.
2. To let Excel know that you want to enter a formula, type an equal sign (=).
3. For example, type the formula A1+A2.

A3		X	✓	f _{xc}	=A1+A2	
A	B	C	D	E	F	
1	2					
2	3					
3	5					
4						

Tip: instead of typing A1 and A2, simply select cell A1 and cell A2.

4. Change the value of cell A1 to 3.

A1		X	✓	f _{xc}	3	
A	B	C	D	E	F	
1	3					
2	3					
3	6					
4						

Excel automatically recalculates the value of cell A3. This is one of Excel's most powerful features!

Edit a Formula

When you select a cell, Excel shows the value or formula of the cell in the formula bar.

A	B	C	D	E	F
1	2				
2	3				
3	5				
4					

1. To edit a formula, click in the formula bar and change the formula.

A	B	C	D	E	F
1	2				
2	3				
3	=A1-A2				
4					

2. Press Enter.

A	B	C	D	E	F
1	2				
2	3				
3	-1				
4					
5					

Operator Precedence

Excel uses a default order in which calculations occur. If a part of the formula is in parentheses, that part will be calculated first. It then performs multiplication or division calculations. Once this is complete, Excel will add and subtract the remainder of your formula. See the example below.

A4	<input type="button" value="X"/>	<input type="button" value="√"/>	<input type="button" value="fx"/>	=A1*A2+A3
1	A	B	C	D
2	2			
3	2			
4	1			
5	5			

First, Excel performs multiplication ($A1 * A2$). Next, Excel adds the value of cell A3 to this result.

Another example,

A4	<input type="button" value="X"/>	<input type="button" value="√"/>	<input type="button" value="fx"/>	=A1*(A2+A3)
1	A	B	C	D
2	2			
3	2			
4	1			
5	6			

First, Excel calculates the part in parentheses ($A2+A3$). Next, it multiplies this result by the value of cell A1.

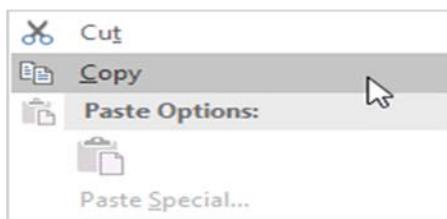
Copy/Paste a Formula

When you copy a formula, Excel automatically adjusts the cell references for each new cell the formula is copied to. To understand this, execute the following steps.

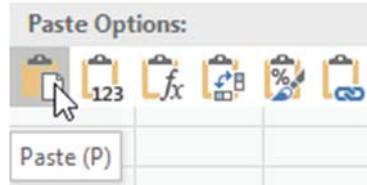
1. Enter the formula shown below into cell A4.

A4	<input type="button" value="X"/>	<input type="button" value="√"/>	<input type="button" value="fx"/>	=A1*(A2+A3)
1	A	B	C	D
2	2	5		
3	2	6		
4	1	4		
5	6			

- 2a. Select cell A4, right click, and then click Copy (or press CTRL + c)...



...next, select cell B4, right click, and then click Paste under 'Paste Options:' (or press CTRL + v).



- 2b. You can also drag the formula to cell B4. Select cell A4, click on the lower right corner of cell A4 and drag it across to cell B4. This is much easier and gives the exact same result!

A4	B	C	D	E	F
1	2	5			
2	2	6			
3	1	4			
4	6				
5					

Result. The formula in cell B4 references the values in column B.

B4	A	B	C	D	E	F
1	2	5				
2	2	6				
3	1	4				
4	6	50				
5						

Insert a Function

Every function has the same structure. For example, SUM(A1:A4). The name of this function is SUM. The part between the brackets (arguments) means we give Excel the range A1:A4 as input. This function adds the values in cells A1, A2, A3 and A4. It's not easy to remember which function and which arguments to use for each task. Fortunately, the Insert Function feature in Excel helps you with this.

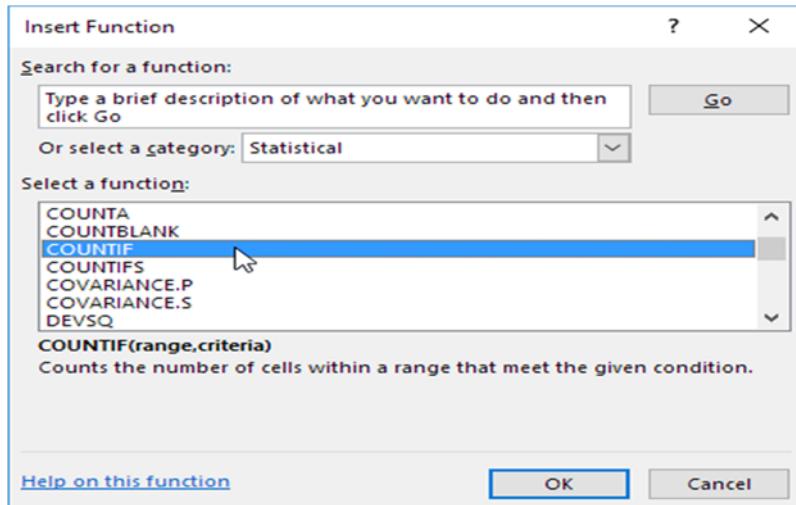
To insert a function, execute the following steps.

1. Select a cell.
2. Click the Insert Function button.

D1	A	B	C	D	E	F
1	3	8	6			
2	10	5	4			
3						

The 'Insert Function' dialog box appears.

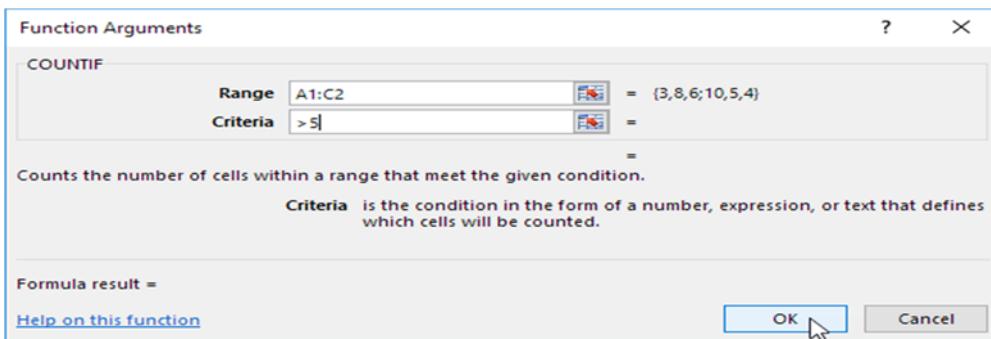
- Search for a function or select a function from a category. For example, choose COUNTIF from the Statistical category.



- Click OK.

The 'Function Arguments' dialog box appears.

- Click in the Range box and select the range A1:C2.
- Click in the Criteria box and type >5.
- Click OK.



Result. The COUNTIF function counts the number of cells that are greater than 5.

D1	A	B	C	D	E	F
1	3	8	6	3		
2	10	5	4			
3						

Note: instead of using the Insert Function feature, simply type =COUNTIF(A1:C2,">5"). When you arrive at: =COUNTIF(instead of typing A1:C2, simply select the range A1:C2.

5.3. Presentation software

Present Program Basics

Presentation software (sometimes called "presentation graphics") is a category of application program used to create sequences of words and pictures that tell a story or help support a speech or public presentation of information. Presentation software can be divided into business presentation software and more general multimedia authoring tools, with some products having characteristics of both. Business presentation software emphasizes ease- and quickness-of-learning and use. Multimedia authoring software enables you to create a more sophisticated presentation that includes audio and video sequences. Business presentation software usually enables you to include images and sometimes audio and video developed with other tools.

Some very popular presentation software, such as Microsoft's Power point and Lotus's Freelance Graphics, are sold stand-alone or can come as part of office-oriented suites or packages of software. Other popular products include Adobe Persuasion, Astound, Asymetrix Compel, Corel Presentations, and Harvard Graphics. Among the most popular multimedia authoring tools are Macromedia Director and Asymetrix's Multimedia Toolbook. These authoring tools also include presentation capability as well. Most if not all of these products come in both PC and Mac versions.

Recently, a new presentation tool has arrived: your Web browser and the tools for creating Web pages, such as Microsoft's FrontPage and Adobe's PageMill. The

ubiquity of these tools and the browser as a playback device make this a popular approach, especially when a presentation can combine HTML pages on the hard disk with links to outside sites (if you have a live Internet connection).

Powerpoint Software

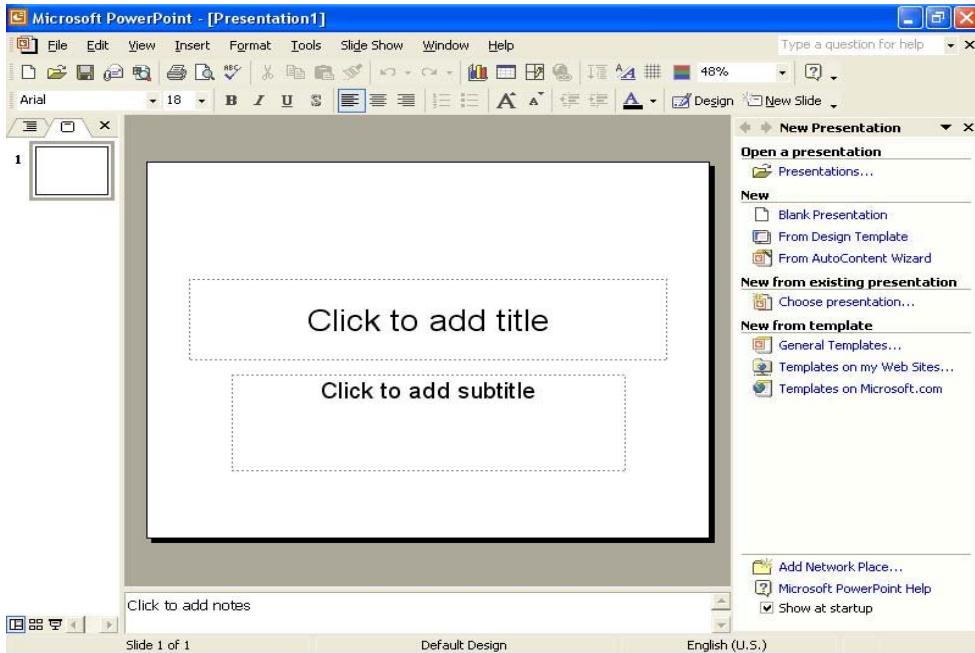
Everyone agrees that Microsoft Powerpoint is so 20th century. It is not the best free presentation tool (In fact it's not free at all).

Powerpoint is a part of Microsoft office Package which allows to create, edit and display presentation in an interesting and effective way.

The PowerPoint Interface

To begin a presentation, open PowerPoint (Click Start, All Programs, Microsoft PowerPoint). PowerPoint opens as shown in Figure

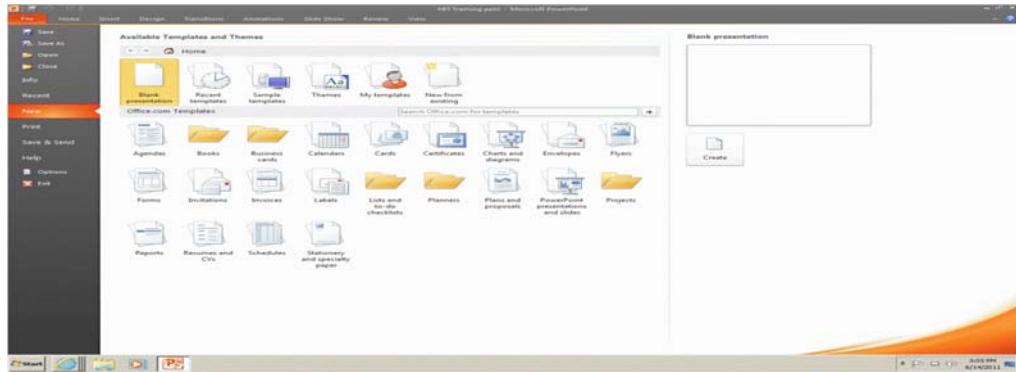
- a. Title bar
- b. PowerPoint window control buttons
- c. Presentation close button
- d. Menu bar
- e. Standard toolbar
- f. Formatting toolbar
- g. Task pane
- h. Slide pane
- i. Notes pane
- j. Outline tab
- k. Slides tab
- l. View buttons
- m. Status bar
- n. Splitter bar



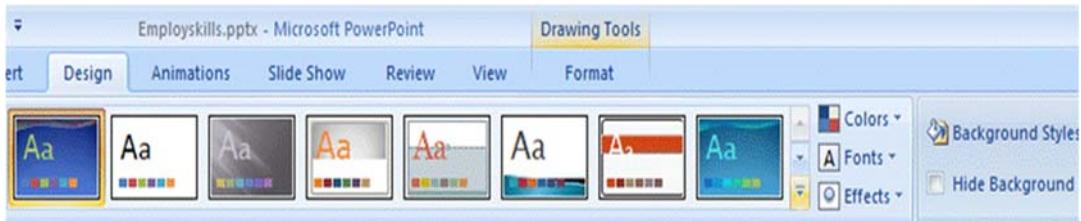
Create a Presentation Format Slides

A PowerPoint has two methods for creating a slide presentation:

- *Choose a theme template*
- *Create a blank presentation (this method is covered in Unit 3)*
- PowerPoint software has built in and free online pre-designed templates that contain various color schemes and pre-arranged elements in a slide, eg. text and graphics. Select a template and PowerPoint will format the entire presentation according to that template.
- *Steps to choosing a theme template:*
- Open PowerPoint.
- At the PowerPoint window, click the File tab, then click New.
- The Available Templates and Themes screen will appear, click on an available template or download a free template from the office.com online templates.



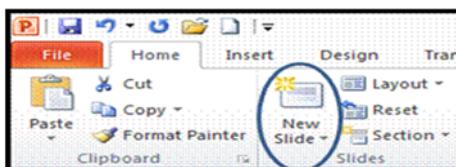
- Once you have selected the desired template, it will be displayed in normal view. New slides can be added as needed.
- A theme template can be added to a presentation before, during or after you have added the presentation content.
- To apply various templates to a presentation, click the Design tab, then click on the desired template in the themes group.



Create a New Slide

Whether you are using a pre-made theme template or working from your own design, it is very easy to insert a new slide.

- In the slide pane click on the slide where you would like the new slide to appear below.
- Click on the **New Slide** button located on the **Home** tab in the **Slides** group.



- The new slide should appear below the selected slide. If you want to add a new slide between two, select the first of the two slides and click **New Slide**.

2. Notice the New Slide button contains a New Slide button arrow. Click on the arrow to view different slide layouts. Another way to change the slide layout is by clicking on the **Layout** button located in the **Slides** group. The slide layout option determines the position of the objects on a slide. Simply click on the layout you want to use and it will appear in the slide

Special features of Presentation Programs

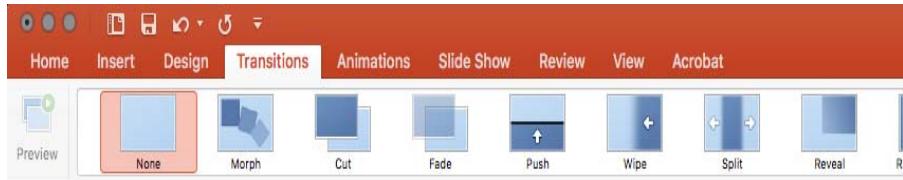
1. Insert Slide Feature: Allows you to inset slide anywhere in the presentation, at the beginning, middle or end.
2. Deletion of Inserted slides: Any slide of the presentation can be removed.
3. Allows cut and paste slides in any order.
4. Allows duplication content or slide
5. Allows you to display the presentation designed in a slide show system. (View Slide Feature)
6. Allows animations and/or sounds manipulations on objects in the slide.
7. Simple Find and Replace, and text editor features.

Full Featured Presentation software need more features than that above

8. Good font specifications - Allows you to change and use different font faces, styles, and effects
9. Additional features for slide: footnotes, cross references, advanced navigation system, headers, footers
10. Good layout management system: Presets or Customized layout designing
11. Macros - for add interactive features
12. Spell checkers and dictionary support

Transition

Transitions are a type of animations *in between* slides. You can view the Transitions pane to view all possible transition effects you can use. These are ideal when you want to have a noticeable transition between two slides, as you'll find in some examples later in this tutorial.



The transition pane, with transition effects you can choose.

Animation

You can view your options in the Animations pane. These are often used as action effects while you're presenting your slide. For example, an animation can be used to highlight a particular element on your slide.



The animation pane, with different animations you can choose once you select an element on your slide.

Your animations are controlled by using the animation pane. If you'd like to learn a little bit more about the animation pane in PowerPoint.

Discover how and when to add animation to PowerPoint. Without further ado, let's dive into these helpful PowerPoint animation tips and tricks.

Custom Animation

Custom animation in PowerPoint 2007 is used to animate pictures, graphics and charts. Many presenters like to add animation to make their presentations more dynamic. There are four types of animations that can be applied: an entrance effect, emphasis effect, an exit effect, and a motion path effect. Each of these effects have numerous animation styles available to choose from.

Entrance Effect

The entrance effect tells PowerPoint how the item will appear in the presentation. By default, all images, graphs and other graphic items simply appear in the slide. However, by applying an entrance effect, the user can control not only how the item

appears, but also when. This allows the presenter to display graphical items before, during or after discussing the slide.

Emphasis Effect

Sometimes presenters like to have an image change once it is in the slide. These changes can include having the object grow, shrink, fade, change colors, change fonts, become transparent or blink. This gives the benefit of emphasizing a point while speaking, and also adds some pizzazz to the presentation. For example, you can use the emphasis effect as you talk about each bar in a bar chart.

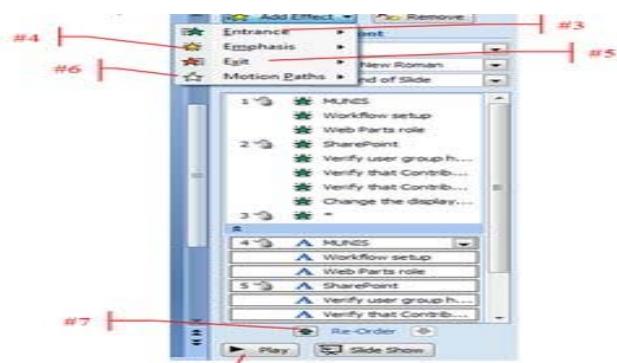
Exit Effect

The exit effect is essentially how an animation leaves the screen. Presenters often use exit effects in conjunction with entrance effects to have an item disappear in tandem as another object is appearing. Some exit effects can be subtle, like simply disappearing, while other effects can be more exciting, like spiraling out or bouncing off the screen.

Motion Path Effect

The motion path effect allows a presenter to create movement in a presentation. Motion paths are used to move images across the screen. Some examples include moving text boxes to the middle of the screen while speaking and then move them back to the original position, separating pieces of a pie chart, or even having a picture zoom across the screen. There are more than 65 different motion paths available to choose from or a presenter can create a custom motion path.

How to Apply a Custom Animation



Custom Animation Task Pane

1. On the "Animations" tab, click the "Custom Animation" button.
2. Click the "Add Effect" button.
3. To make the text or object enter the slide show presentation with an effect, select an "Entrance Effect."
4. To add an effect to text or an object that is on the slide, select an "Emphasis Effect."
5. To add an effect to text or an object that makes it leave the slide at some point, select an "Exit Effect."
6. To add an effect that makes an object move in a specified pattern, select a "Motion Path Effect."
7. To reorder the animations, click the "Reorder" buttons.
8. To preview the animation, click the "Play" button.

Work with tables:

In PowerPoint, tables are useful for organizing and presenting data. To use tables in your slide show, you'll need to know how to **insert** them, apply **table styles**, and **format** them.

To insert a blank table:

1. On the **Insert** tab, click the **Table** command.
2. Hover your mouse over the diagram squares to select the number of **columns** and **rows** in the table.
3. Click your mouse. The table will appear on the slide.
4. You can now place the insertion point anywhere in the table to add text.

To make sure your table looks good with the slide layout, you can also insert a table using the **placeholder**. Click the **Insert Table** icon in the placeholder, then enter the desired number of rows and columns.



To move a table

1. Place the cursor over the **edge** of the table. The cursor will turn into a cross with arrows .
2. Click and drag the table to the desired location.
3. Release the mouse button to drop the table in the new location.

Graphics or Pictures and clip arts

On each slide you create in your presentation, you have information you want to communicate with the audience. You can do this with text and illustrations, such as pictures and clip art.

You will learn how to **insert** a picture and clip art, as well as how to **modify** both types of illustrations.



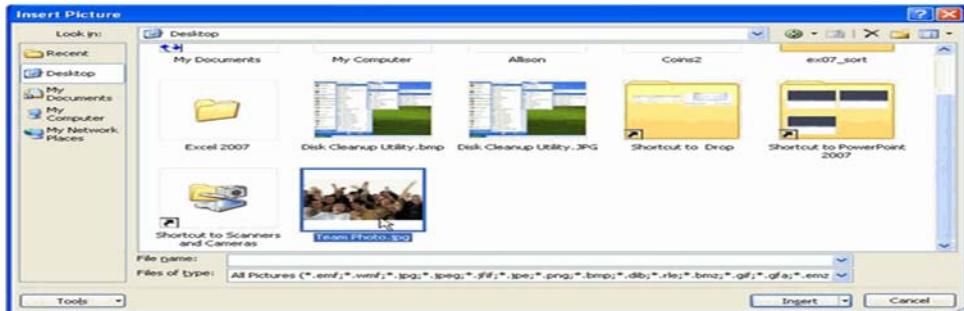
Pictures and **clip art** can be inserted from the **Ribbon**, as well as by using the commands that appear in certain placeholders. In both methods, the image is centered in the middle of any selected slide placeholders.

To insert a picture from the Ribbon:

- Select the **Insert** tab.
- Click the **Insert Picture** command in the **Illustrations** group. The Insert Picture dialog box will appear.



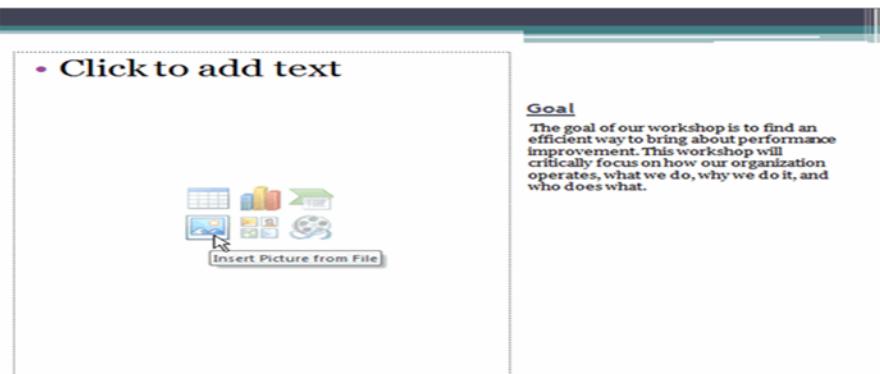
- Locate and select the picture you want to use.



- Click **Insert**, and it will appear on the slide.

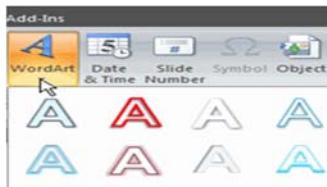
To insert a picture from a placeholder command:

- Click the **Insert Picture** command in the placeholder. The Insert Picture dialog box will appear.



- Locate and select the picture you want to use.
- Click **Insert**, and it will appear on the slide.

Word Art



There are many features and commands you can use in PowerPoint to create visually appealing slides. Two of these features are **WordArt** and **shapes**. **WordArt** allows you to create **stylized text** with textures, shadows, and outlines. It can be applied to text on any slide. Additionally, in PowerPoint you can insert

a variety of shapes such as lines, arrows, callouts, stars, and basic shapes, including rectangles and circles.

Working with WordArt

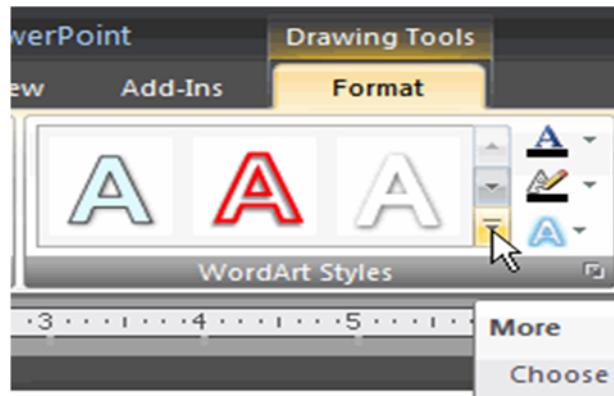
To apply a WordArt style:

- Select the text you want to modify. The Format tab will appear.
- Select the Format tab.
- Move your cursor over a WordArt style in the WordArt Styles group to see a live preview of the style on the slide.



ch

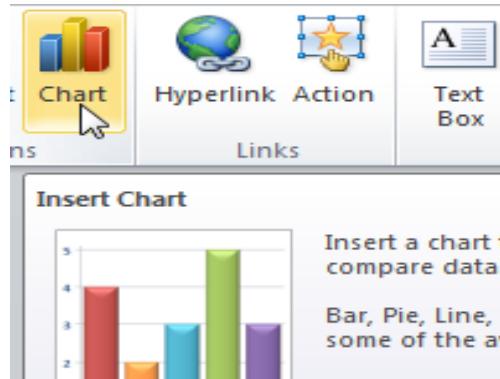
- Click the **More** drop-down arrow to see all possible WordArt styles.



- Click an option to select it.

Charts:

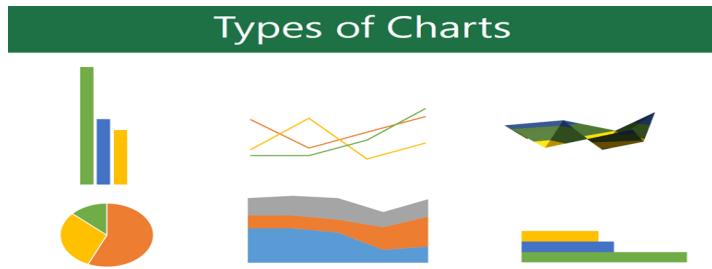
A **chart** is a tool you can use to **communicate your data graphically**. Displaying charts in PowerPoint allows your audience to see the **meaning behind the numbers**, and it makes showing **comparisons** and **trends** much easier. In this lesson, you will learn how to **insert** charts and **modify** them so they communicate information effectively.



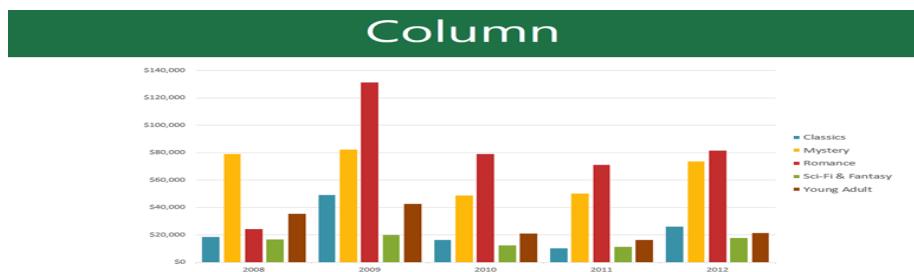
In many ways, charts are an ideal way to present information in **PowerPoint 2010**. They give you an **illustration** of your data. A chart can help you **show your audience** what your data means and why it's important. Plus, they can add **visual interest** to slide shows that are otherwise filled with text. To use charts effectively, you'll need to know how to **insert** and **modify** them.

Types of charts

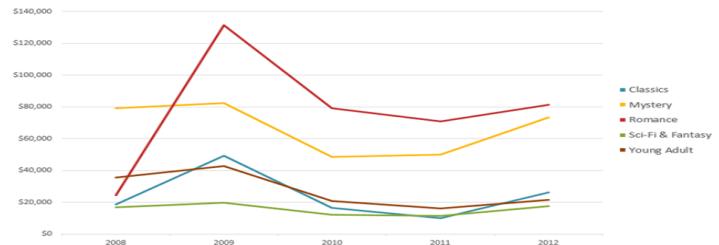
Click the arrows in the slideshow below to view examples of some of the types of charts available in PowerPoint.



PowerPoint has a variety of chart types, each with its own advantages. Click the arrows to see some of the different types of charts available in PowerPoint.



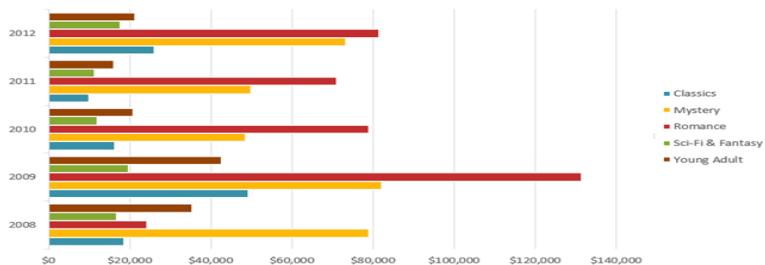
Line



Pie

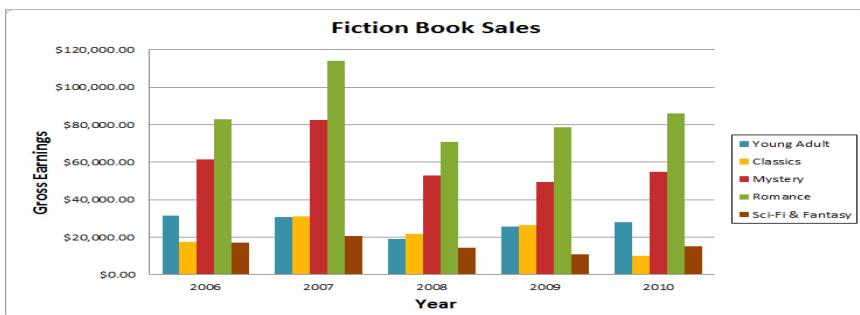


Bar



Identifying the parts of a chart

Click the buttons in the interactive below to learn about the different parts of a chart.



Inserting charts

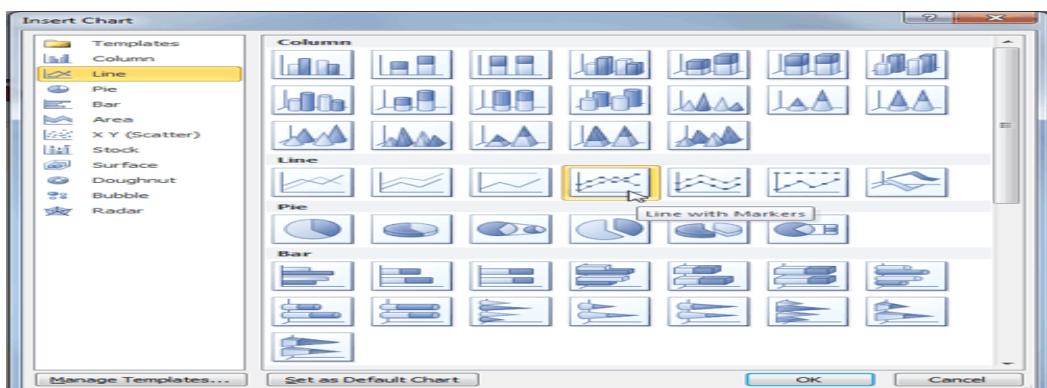
PowerPoint uses an **Excel worksheet** as a placeholder for entering chart data. Therefore, when you insert or edit a chart in PowerPoint, an Excel window will automatically open.

To insert a chart:

1. Select the **Insert** tab.
2. Click the **Insert Chart** command in the **Illustrations Group**. The **Insert Chart** dialog box will appear.



3. Select a **category** from the left pane of the dialog box, and review the **charts** that appear in the center. If you are unsure about which chart best fits your needs, review the interactive on the previous page.



4. Select the desired chart.
5. Click **OK**. An Excel window will open with a placeholder for your data.

	A	B	C	D	E	F	G	H	I	J	K	L
1		Series 1	Series 2	Series 3								
2	Category 1	4.3	2.4	2								
3	Category 2	2.5	4.4	2								
4	Category 3	3.5	1.8	3								
5	Category 4	4.5	2.8	5								
6												

To resize chart data range, drag lower right corner of range.

If a slide layout has a content placeholder, you can also click the **Insert Chart** command to insert a new chart.



To enter chart data

The data that appears in the Excel spreadsheet is **placeholder source data** that you will replace with your own information. The Excel source data is used to create the PowerPoint chart.

The placeholder source data

The source data entered above will appear in the chart

	A	B	C	D	E	F	G
1		Series 1	Series 2	Series 3			
2	Category 1	4.3	2.4	2			
3	Category 2	2.5	4.4	2			
4	Category 3	3.5	1.8	3			
5	Category 4	4.5	2.8	5			
6							

To resize chart data range, drag lower right corner of range.

1. Enter your data into the Excel spreadsheet.

A	B	C	D	E
1	Sales	Column1	Column2	
2	January			
3	February			
4	Mar			
5	Category 4			
6				
7				
8				

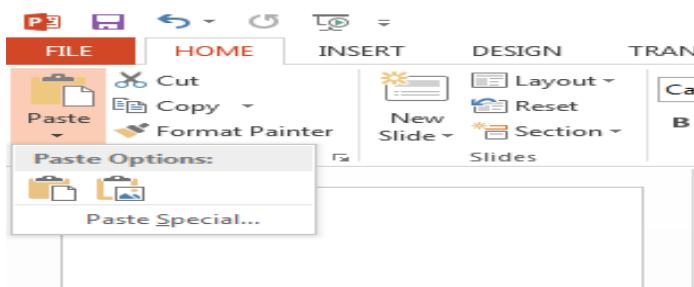
Data Integration

The main reason you want integration between Power Point and Excel surely is the ability to update Tables or/and Charts you are using in a PPT presentation for which the data source is in an Excel workbook. You gain in efficiency because the data or chart you have on PPT presentation will refresh automatically every time you have new input in the data source in Excel.

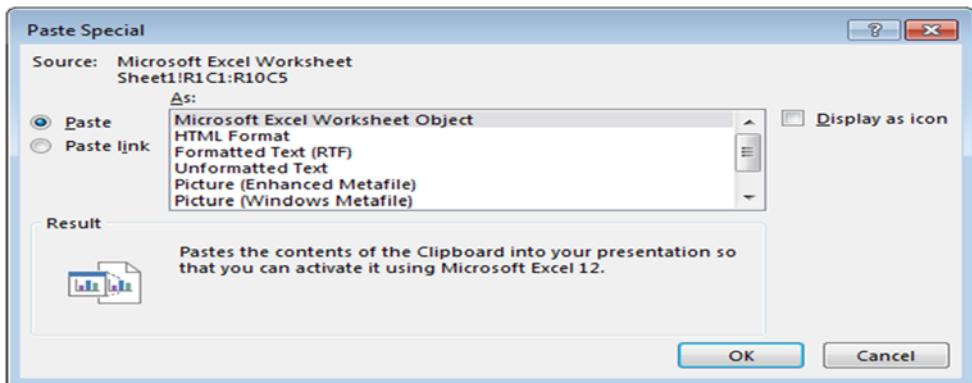
That's a same as PPT/Excel has pretty good linking options. Below some of favorite ones.

1. Paste special

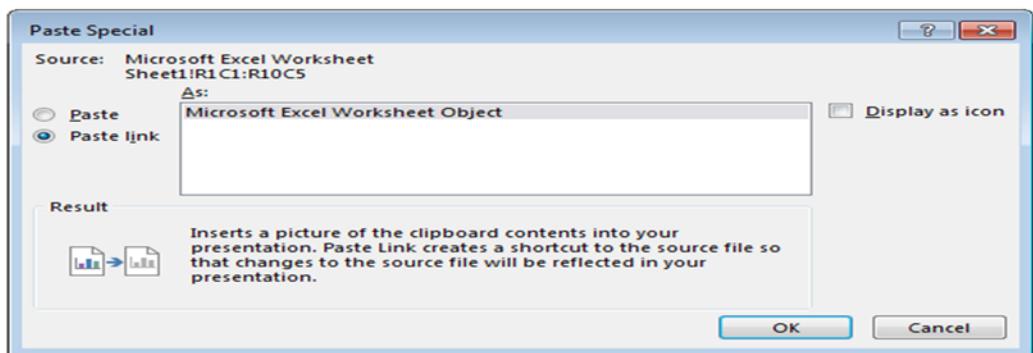
 - Copy your selected range from excel (table i.e.)
 - Go to PPT and select Paste → Paste special



- This allows you to copy an exact range to your PPT which will update when you update the excel values



- In order to allow the mirroring select “Paste link”



- Test this by editing the excel spreadsheet values.
 - You can use the feature to create a support excel file which you edit and the beautiful report ppt you will craft will automatically update the figures to charts/highlights you want in the ppt
 - If you reopen the Powerpoint presentation, the application will show warning to update the links. If you press YES, it will fetch the most recent numbers (in case you have for example restarted the pc), if NO it keeps the most recent values.
2. This is just one of the many ways to do this, as this allows you to select a specific range and you can double click the sheet in PPT to be taken to the Excel application. With the Embed function it creates a mini-excel inside the PPT.

If your excel has a lot of VBA or otherwise heavy, you might consider creating a sheet that captures the selected ranges as snapshots first and then use the technique

described above to copy + paste special the photos to your PPT.

SUMMARY

- Word processor software is an application package that allows a user to create, edit, store and print out text based documents.
- Microsoft Word is a widely used commercial word processor designed by Microsoft.
- WordPerfect is a word processing application from Corel Corp...
- Word processor interface consists of main editing window; it displays a document and several tools to manipulate it.
- Title bar is located at the top of the screen. Word processor displays the name of the current document on it.
- Backspace key erases the character the left to the cursor.
- A paragraph is a unit of text or other content that starts at the beginning of a document, immediately after a hard return (a carriage return), a page break, or a section break, or at the beginning of a table cell, header, footer, or list of footnotes and ends with a hard return (carriage return) or at the end of a table cell.
- *Line spacing* refers to the vertical distance between the lines within a paragraph and determines the location of each line relative to the line above it.
- The spacing between your paragraphs is determined by the *spacing before it* and the *spacing after it* that are set for each paragraph.
- If you want to add borders around the paragraph where your cursor is located, click the **Borders** button to add the current default borders (the original default or the last border style that you selected).
- *Alignment* or *justification* refers to the way in which the lines of a paragraph are aligned.
- Formatting document is the technique which allows making our document more attractive and professional.
- The word processor automatically moves to the next line when you have

filled oneline with text, and it will readjust text if you change the margins.

- WordArt is a gallery of text styles that you can add to your 2007 Microsoft Office system documents to create decorative effects, such as shadowed or mirrored (reflected) text.
- Spreadsheet software is a software application capable of organizing, storing and analyzing data in tabular form.
- In Excel 2010, the Office button has been replaced by a modification of the familiar File menu .
- A worksheet is a collection of cells where you keep and manipulate the data. Each Excel workbook can contain multiple **worksheets**.
- A label is text that identifies the purpose of a cell or text box or that displays descriptive text, such as titles, captions, or brief instructions.
- Sorting data is an integral part of data analysis. You might want to arrange a list of names in alphabetical order, compile a list of product inventory levels from highest to lowest, or order rows by colors or icons.
- Presentation software (sometimes called "presentation graphics") is a category of application program used to create sequences of words and pictures that tell a story or help support a speech or public presentation of information.
- Power point is a part of Microsoft office Package which allows to create, edit and display presentation in an interesting and effective way.
- **Transitions** are a type of animations *in between* slides.
- A **chart** is a tool you can use to **communicate your data graphically**.

Self Evaluation

1. Write very short answer to the following questions.

- a. Write any two word processing softwares.
- b. Which company released Excel programs?
- c. Which symbol is used to begin formula in MS Excel?
- d. How many types of data sorting are used in Excel?
- e. What is the extension of Excel worksheet?

- f. Write any two presentation software.
- g. Which function key is used to view presentation?

2. Write short answer to the following questions.

- a. What is word processor?
- b. What is MS Word? Write its features.
- c. What is meant by formatting document?
- d. What is spreadsheet? Write two examples.
- e. What is MS Excel? Write its features.
- f. What is formula? Write true rule for using formula.
- g. What is meant by sorting data?
- h. What is chart? List the common chart types.
- i. List any four features of power point.
- j. What is meant by formatting the presentation?

3. Write long answer to the following questions.

- a. What is word processor? Write the purpose and importance of word processing.
- b. Why is MS Excel popular and user friendly spreadsheets software? Give you views.
- c. What is presentation ? Why is presentation very important in education.

Unit: 6

Computer Network and Topologies

Learning Outcomes

After completion of this unit you will be able to

- explain/describe introduction of computer network and topologies.
- explain/describe modes of transmissions.
- explain/describe communication channels.
- explain/describe modem.
- explain/describe types of networks
- explain/describe topologies
- explain/describe different network component, and
- explain/describe uses of communication in daily life

6 .1. Introduction of computer network

Data communication

The process of transferring data or information between among computers called data communications.

Telecommunication

It refer to all types of data transmission like characters, numerical, photos, audios and videos etc using electronic or light emitting media.

Computer Network

A computer network is a logical or physical inter connection between two or more computers in such a way that people could communicate with each other. It is used to provide users with the access to share resources. These shared resources include data files, application software and hardware.

Components of computer network

- Computer
- Transmission media

- Network software.
- Protocols.
- Networking cables.(Transmission media)

Advantages of computer network

- It ensures resources data software and hardware can be shared.
- It provides faster & cheaper communication and data transmission.
- It provides as the tools for e-mail, teleconferencing, videoconferencing for communication.
- Flexible working condition.
- Office automation can be made very effective well managed.

Disadvantages of computer network

- High installation and administrative cost.
- Attack on the privacy of the people.
- Computer virus spread most easily through network.
- Technologically very complicated.
- If the server is out of order, then all workstations are hang up.
- Well trained technical support is required.

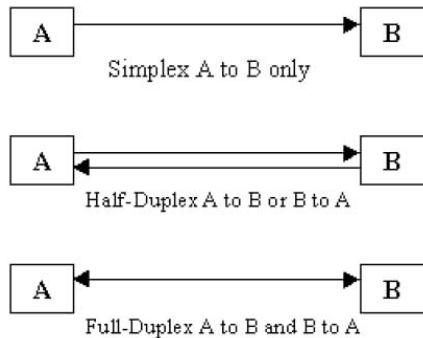
6.2. Modes of transmissions:

The manner in which data are transmitted from one location to another is called data transmission mode. There are two ways or modes for data transmitting from one location to another. These are:

1. **Simplex mode:** Simplex is one-way data transmission that takes place only from sender to receiver. An example of this would be a television that allows the signal to pass in only one direction. Computer network connections do not use simplex.
2. **Duplex mode:** Duplex is two-way data transmission that takes place both directions over a communication channel. Computer uses duplex channel. For example if computer A and computer B are connected together and then both computer can share data or information. From computer A to computer B or computer B to computer A.

Types of Duplex Mode

- **Half duplex:** Half duplex is two way data transmission that takes place in only one direction at a time
- **Full duplex:** Full duplex is two-way data transmission that takes place in both directions at a time.



6.3. Communication channels

The media that are used to transfer data between the computers in the networks are called transmission media or communication channels. There are two types of media used in the network. They are:

1. Wired or cable media(guided media)
2. Wireless media(unguided media)

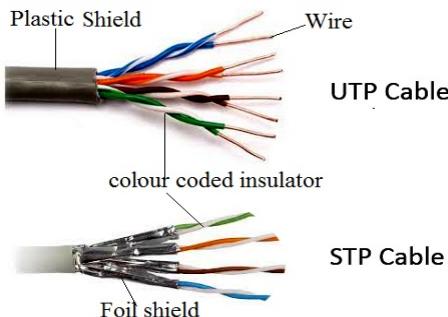
Wired or Cables (Guided Media)

Cables are the most common transmission media. Two or more devices are connected directly using cables. Three types of cables in computer networking they are :

- **Twisted pair cable :** Twisted copper cables are used only for lower bandwidth. It consists of two isolated strands of copper wire twisted around each other. There are two types of twisted pair cables they are as follows:
- **UTP (Unshielded Twisted Pair) :** UTP cables does not have metal shield except plastic coating. It contains number of twisted pairs of wires with a simple plastic casing. It is commonly used for LAN and Telephony. It is cheaper and easier to work with, but do not offer high bandwidth and good

protection from interferences. It can support data transmission rates from 10 to 100 mbps.

- **STP (Shielded Twisted Pair) :** STP is similar to UTP but it is shielded with metal sheath along with plastic coating. It offers high bandwidth and good protection from interferences. It is cheaper than fiber optic cable. It can support data transmission rates from 10 to 500 mbps



Twisted pair cable

- **Co- axial cable:** A co-axial cable carries higher bandwidth than twisted pair, it is easy to connect. It does not bend readily. This cable consists of one or more small cables in a protective covering. It offer very high data transfer rate and can be placed underground and laid on the floors of lakes and oceans.
- **Fiber Optic cable:** Fiber optic cable is a thin filament of glass fiber wrapped in a protective jacket. It consists of strands of glass like thread, each about the diameter of a human hair. It offers high-speed data transmission rate because data travel as high-speed pulses of light.

Summary of Cable Types

Cable Type	Susceptibility to Interference	Transmission Speed	Maximum Distance	Installation Difficulty
Thin coax	Low	10 Mbps	185 meters	Low
Thick coax	Very low	10 Mbps	500 meters	Difficult
UTP	High	10 to 100 Mbps	100 meters	Easy
STP	Low	10 to 500 Mbps	90 meters	Moderate

RS-232	N/A	20 Kbps	50 Feet	N/A
Infrared	High	115 Kbps-4 Mbps	1 meter	Easy
Fiber-optic	None	100 Mbps to 1Gbps and beyond	Up to 30 miles	Difficult

Wireless (Unguided Media): It is used to transfer data with in a large geographical areas or globally without the use of interconnecting wires or cables. It uses other components such as radio signals, microwaves, or infrared to connect network.

Types of wireless communication:

- Microwave Systems:** Microwave signals are similar to radio and television signals and are used to transmit data through the space without the use of cable. It provides high-speed data transmission. These signals cannot bend or pass obstacles like hills and tall buildings, so very high towers are used to mount the signals. The transmission is limited about 30 miles. Chain of towers is required to transmit the microwave signals in a long distance
- Satellite communication:** Both microwaves signals and telephone signals can be relayed to a earth station for transmission to a communication satellite. The earth station consists of a satellite dish that functions as an antenna a communication equipment to transmit and receive data from satellite passing overhead. It is not disturbed by hills and tall buildings and visible from any point. So sender and receiver easily communicate with each other using antenna by aiming the satellite. It is very expensive for placing satellite along the earth orbit.

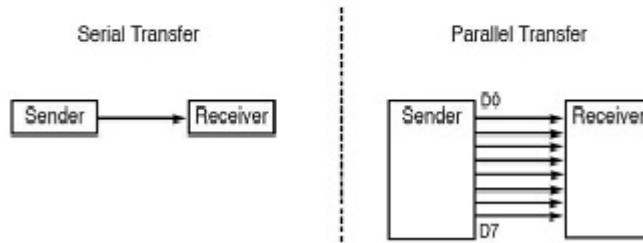
Serial and Parallel Communication

Data can be transmitted between a sender and a receiver in two main ways: serial and parallel.

Serial communication is the method of transferring one bit at a time through a medium.

Parallel communication is the method of transferring blocks, eg: BYTES, of data at the same time.

BASICS OF SERIAL COMMUNICATION



Comparison Chart

BASIS FOR COMPARISON	SERIAL TRANSMISSION	PARALLEL TRANSMISSION
Meaning	Data flows in bi-direction, bit by bit	Multiple lines are used to send data i.e. 8 bits or 1 byte at a time
Cost	Economical	Expensive
Bits transferred at 1 clock pulse	1 bit	8 bits or 1 byte
Speed	Slow	Fast
Applications	Used for long distance communication. Eg, Computer to computer	Short distance. Eg, computer to printer

6.4. Modem



The word "modem" is a contraction of the words **modulator-demodulator**. A modem is typically used to send digital data over a phone line.

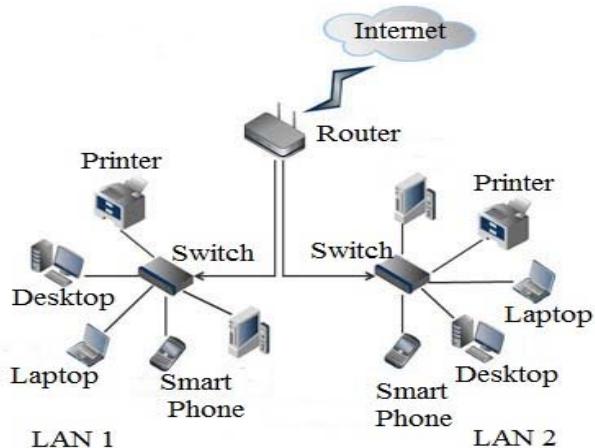
The sending modem **modulates** the data into a signal that is compatible with the phone line, and the receiving modem **demodulates** the signal back into digital data. **Wireless modems** convert digital data into radio signals and back.

6.5. Types of network

On the basis of size, physical and geographical division, computer network can be categorized into three types. They are :

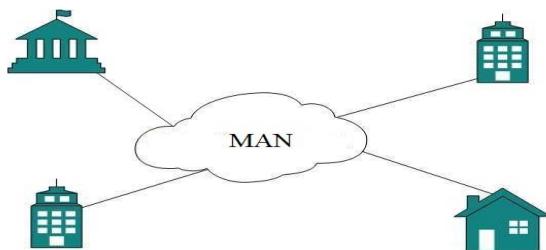
Local Area Network

The way of connecting two or more computers in a very limited area (about 100 to 300 meters) or within a same building or a group of adjacent building is called LAN. It enables very high speed communication through wire connection or wireless connection sometimes. Small organizations prefer it because of less expensive and faster communication.



Metropolitan Area Network

The way of connecting computers inside a metropolitan area is called MAN. The area may be a part of city, whole part of city, district, zone or country. Radio wave is used to transmit the data for communication between the workstation and server in the system. Many different systems of networking and computing are brought together to form a MAN.



Wide Area Network

The connection of computers of networks covering more distance or the world by the help of wave, frequency and satellite is called WAN. Different types of LAN

and MAN are connected to form a WAN. It covers more area but it is slower than LAN and MAN. Examples - satellite communication, internet etc.



Internet

The internet is worldwide collection of computer networks and gateways that use TCP/IP suite of protocols to communicate with one another using telephone lines modems or satellites. Internet is network of networks. At the heart of the internet is a backbone of high speed data communication lines between major nodes or host computers, consisting of thousands of commercial governmental, educational and other computer system, that route data and messages.

6.6. Topologies

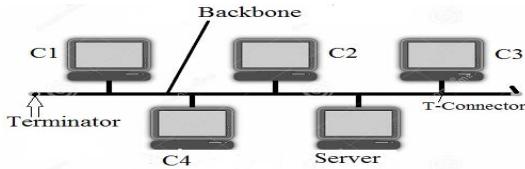
Network topology is the interconnected pattern of network elements. A network topology may be physical, mapping hardware configuration, or logical, mapping the path that the data must take in order to travel around the network.

Types of Network Topology

Network Topology is the schematic description of a network arrangement, connecting various nodes (sender and receiver) through lines of connection.

BUS Topology

Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called **Linear Bus topology**.



Advantages of Bus Topology

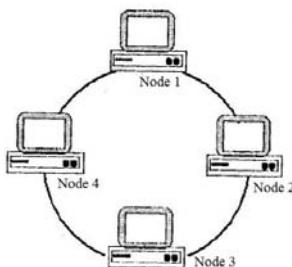
1. It is cost effective.
2. Cable required is least compared to other network topology.
3. Used in small networks.
4. It is easy to understand.
5. Easy to expand joining two cables together.

Disadvantages of Bus Topology

1. When cables fail whole network fails.
2. If network traffic is heavy or nodes are more, the performance of the network decreases.
3. Cable has a limited length.
4. It is slower than the ring topology.

RING Topology

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbors for each device.



Advantages of Ring Topology

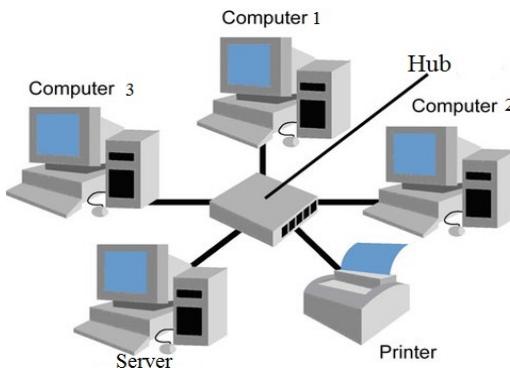
1. Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
2. Cheap to install and expand

Disadvantages of Ring Topology

1. Troubleshooting is difficult in ring topology.
2. Adding or deleting the computers disturbs the network activity.
3. Failure of one computer disturbs the whole network.

STAR Topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.



Advantages of Star Topology

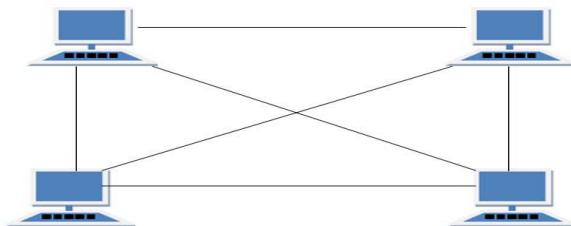
1. Fast performance with few nodes and low network traffic.
2. Hub can be upgraded easily.
3. Easy to troubleshoot.
4. Easy to setup and modify.
5. Only that node is affected which has failed, rest of the nodes can work smoothly.

Disadvantages of Star Topology

1. Cost of installation is high.
2. Expensive to use.
3. If the hub fails the whole network stops because all the nodes depend on the hub.
4. Performance is based on the hub that is it depends on its capacity

MESH Topology

It is a point-to-point connection to other nodes or devices. All the network nodes are connected to each other. Mesh has $n(n-1)/2$ physical channels to link n devices.



Advantages of Mesh Topology

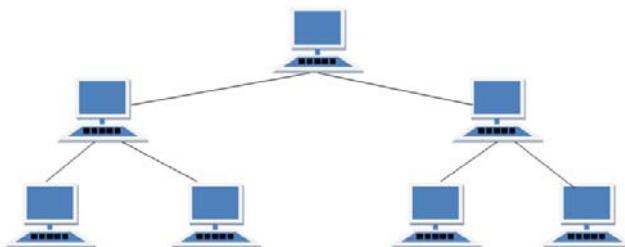
1. Each connection can carry its own data load.
2. It is robust.
3. Fault is diagnosed easily.
4. Provides security and privacy.

Disadvantages of Mesh Topology

1. Installation and configuration is difficult.
2. Cabling cost is more.
3. Bulk wiring is required.

TREE Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.



Advantages of Tree Topology

1. Extension of bus and star topologies.
2. Expansion of nodes is possible and easy.

3. Easily managed and maintained.
4. Error detection is easily done.

Disadvantages of Tree Topology

1. Heavily cabled.
2. Costly.
3. If more nodes are added, maintenance is difficult.
4. If central hub fails, network fails.

4.7. Different network component:

1. **MODEM:** Modem is a device that directly converts digital signal from a computer or other digital devices into analog form for transmission over analog link i.e telephone line and vice versa. MODEM stands for Modulation and Demodulation. There are two types of modem used in computer they are as follows:
 - a. Internal modem b. External modem.
2. **NIC:** It is a Network Interface Card, which connects each computer to the wiring to the network. A NIC is a circuit board that fits in one of the computer's expansion slots. It provides a port on the back of the computer to connect in the network.
3. **Hub:** Hubs are connectivity devices, which contain multiple ports for connecting to network components. Hubs connect the computers in a star topology. It lies between server and clients computers.
4. **Connector:** Bridge and Gateway are the two different connectors, which play role to link between two network systems.
 - a. **Bridge:** Bridge connects networks using same communications protocols or similar networks so that information can be passed from one to the other.
 - b. **Gateway:** Gateway connects networks using different communications protocols or dissimilar networks so that information can be passed from one to the other.
5. **Switch:** A device that is capable of forwarding packets directly to the ports

associated with particular network addresses. *Hubs and switches are almost same but switch is new technology and intelligent compare to hub.*

6. **Repeater:** A device used on communications circuits that decrees distortion by amplifying or regenerating a signals so that it can be transmitted onward in its original strength and form as they pass through a network cable.
7. **Protocols:** Protocols are the set of rules and formats for sending and receiving data. It works as guidelines to govern the exchange between equipments. *There are different types of protocols that we can use. Some of popular protocols are TCP/IP, HTTP, FTP, IPX/SPX.*
8. **Router:** A router is a device that is used to connect different LAN in the network. It receives transmitted messages and forwards them their correct destinations over most efficient available route.

NOS: The operating, which can support network environment, is called Network Operating System. For example Windows XP, 2000, server, unix, linux, Novel Netware etc.

Network architectures or (Types of Network Architecture) or LAN Architecture:

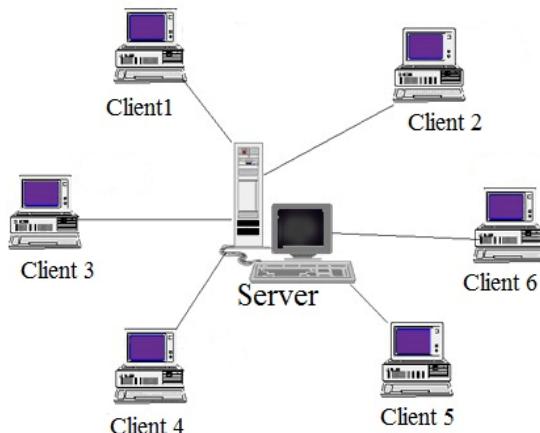
- **Client server:** This is old model of computer network. In this kind of network model one main computer equipped with very powerful processor, large memory and network operating system works as a main computer or service provider. Other computers connected with server, which are also called workstation or node or terminals can use the hardware and software resources of server computer. There are different types of server such as file server, print server, network server or email server.

Advantages of client server network:

- It works with any size or physical layout of LAN.
- It does not tend to slow down with heavy use.
- The network can be expanded to any size as we wish.
- It provides very high level security
- It reduces software installation time and cost to all computers.

Disadvantages of client server network:

- It is very difficult to setup and well trained technicians are required to handle and setup.
- It is expensive compared to peer to peer network.
- All software and operating systems are installed in server computer so that other client computer has to depend on it.



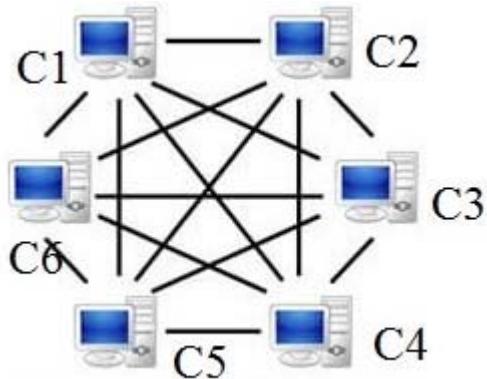
- **Peer to peer:** It is also called workgroups also. Because all computers in the network have equal responsibilities. All computers in the network have access to at least one or more computers. It mostly used in LAN and every organizations, research centers such as banks, travel agencies, airlines educational institutions etc.

Advantages of peer to peer network

- It is easy to setup.
- Users in each computer can determine the resources to be shared among other computers.
- Any required software can be installed on individual computers , they don't have to depend on the server.
- It is suitable at home, office, banks and small organization.
- It is cheaper compared to client server network.

Disadvantages of peer to peer network:

- It is slow because of heavy load.
- It is suitable for limited area such as school offices and small organization.
- The network expansion is limited and can not be expanded as the wish.
- It has limited security level.



Note: Band width : The amount of data which is sent through a data-transmitting medium, such as a computer network, telephone line, or coaxial cable, in a given amount of time is called band width.

Note: Bits : In computer processing and storage, a bit is the smallest unit of information handled by a computer and is represented physically by an element such as a single pulse sent through a circuit or a small spot on a magnetic disk capable of storing either a 1 or a 0.

Modulation: The process of changing some characteristics (amplitude, frequency or phase) of carrier wave in accordance with the intensity of the signal is known as **modulation**.

Types of modulation:

1. Amplitude Modulation (AM)
2. Frequency Modulation (FM)
3. Phase Modulation (PM)

6.9. Use of Communication in daily life:

1. It is an exchange of ideas.

Communication is the process through which an exchange of information takes place. It is the sharing of information, ideas, concepts and messages.

2. Two parties are involved in it.

In communication, the exchange of information takes place between two or more persons. This implies that there are minimum two people involved in the communication process at any given time.

The one who initiates the exchange is the sender of the message (speaker/writer) and the one who receives and interprets it is the receiver of the message (listener/reader).

3. It is a two-way process.

Communication is a two-way process of exchanging ideas or information. One person alone cannot carry out communication. When you communicate, there has to be a receiver or an audience that would reciprocate. Then only your communication can be complete.

Thus, communication is a process of transmitting and receiving verbal and non-verbal messages. It is considered effective only when it achieves the desired reaction or response from the receiver. The response may be positive or negative. In case of absence of any response, communication is incomplete.

Thus, communication is effective only when a concise and clear message is delivered well, received successfully, understood fully, and responded to promptly.

SUMMARY

- The process of transferring data or information between computers is called data communications.
- A computer network is a logical or physical interconnection between two or more computers such that they could communicate with each other. It is used to provide users with the access to share resources. These shared resources include data files, application software and hardware.
- The manner in which data are transmitted from one location to another is called data transmission mode.

- Simplex is one-way data transmission that takes place only from sender to receiver.
- Duplex is two-way data transmission that takes place both directions over a communication channel.
- **The media that are used to transfer data between the computers in the networks are called transmission media or communication channels.**
- Twisted copper cables are used only for lower bandwidth. It consists of two isolated strands of copper wire twisted around each other.
- A co-axial carries higher bandwidth than twisted pair, it is easy to connect.
- Fiber optic cable is a thin filament of glass fiber wrapped in a protective jacket.
- Wireless media is used to transfer data within a large geographical areas or globally without the use of interconnecting wires or cables.
- Both microwaves signals and telephone signals can be relayed to a earth station for transmission to a communication satellite.
- Serial communication is the method of transferring one bit at a time through a medium.
- Parallel communication is the method of transferring blocks, eg: BYTES, of data at the same time.
- The sending modem **modulates** the data into a signal that is compatible with the phone line, and the receiving modem **demodulates** the signal back into digital data.
- The way of connecting two or more computers in a very limited area (about 100 to 300 meters) or within a same building or a group of adjacent building is called LAN.
- The way of connecting computers inside a metropolitan area is called MAN. The area may be a part of city, whole part of city, district, zone or country.
- The connection of computers of networks covering more distance or the world by the help of wave, frequency and satellite is called WAN.
- The internet is worldwide collection of computer networks and gateways that use TCP/IP suite of protocols to communicate with one another using

telephone lines modems or satellites.

- Network topology is the interconnected pattern of network elements.
- Bus topology is a network type in which every computer and network device is connected to single cable.
- Ring topology forms a ring as each computer is connected to another computer, with the last one connected to the first.
- In star topology, all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.
- Mesh Topology is a point-to-point connection to other nodes or devices.
- Tree Topology is a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology.
- Network Interface Card, which connects each computer to the wiring to the network.
- Hubs are connectivity devices which contain multiple ports for connecting to network components.
- Bridge connects networks using same communications protocols or similar networks so that information can be passed from one to the other.
- Gateway connects networks using different communications protocols or dissimilar networks so that information can be passed from one to the other.
- Switch is a device that is capable of forwarding packets directly to the ports associated with particular network addresses.
- Repeater is device used on communications circuits that decrees distortion by amplifying or regenerating a signals so that it can be transmitted onward in its original strength and form as they pass through a network cable.
- Protocols are the set of rules and formats for sending and receiving data.
- A router is a device that is used to connect different LAN in the network.
- The operating, which can support network environment, is called Network Operating System. For example Windows XP, 2000, server, unix, linux, Novel Netware etc.

Self Evaluation

1. Write very short answer to the following questions

- a. What is data communication?
- b. Define computer network.
- c. Write the example of LAN.
- d. Give example of WAN.
- e. What is communication?
- f. Which is the fastest media in which data are transmitted according to the speed of light?
- g. Which network topology places hub at the center?
- h. Which device contains multiple ports?

2. Write short answer to the following questions.

- a. What are the advantages of computer network?
- b. What is meant by network topology?
- c. List types of topology and briefly explain.
- d. Draw and explain about star topology.
- e. Differentiate between star and ring topology.
- f. List components of data communication.
- g. What is data transmission mode? List different types of data transmission modes.
- h. Differentiate between simplex and duplex mode of communication.
- i. What are the differences between wired or wireless media with example.
- j. What is Local Area Network? Write its features.
- k. What is Metropolitan Area Network? Write its importance.
- l. What is WAN? Write its properties.
- m. What is modem with working?
- n. Explain the use of communication in our daily life.

3. Write long answer to the following questions.

- a. What is computer network? Explain the types of computer networks.
- b. Explain different services provided by computer network.
- c. What is network architecture or model? List its types.
- d. Explain different types of topologies with their merits and demerits.
- e. Differentiate between LAN and WAN.

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Unit: 7

Internet and Electronic mail (Email)

Learning Outcomes

After completion of this unit you will be able to

- explain/describe internet and its uses.
- explain/describe different protocol, and
- explain/describe web, web server, browser, DNS, URL.

7 .1. Introduction of Internet

The internet is worldwide collection of computer networks and gateways that use TCP/IP suite of protocols to communicate with one another using telephone lines modems or satellites. Internet is network of networks. At the heart of the internet is a backbone of high speed data communication lines between major nodes or host computers, consisting of thousands of commercial governmental, educational and other computer system, that route data and messages.

Equipment used in internet/ components required to use internet

- A set of computer
- A modem and regular telephone line or broadband internet connection.
- An account in ISP to access the internet host.
- Communication software for example: Internet Explorer, Netscape Navigator, Mozilla Firefox, Opera, Google Chrome etc.

7.2. Use of Internet:

Some of the common services provided by the internet are

- Electronic mail (E-Mail)
- Information sharing and resources.
- Business communication
- Advertising
- Online shopping
- Stock trading
- Discussion and chat

- Entertainment
- E-banking
- Virtual library

E-Mail: E-mail stands for electronic mail. It is most widely used feature on the internet. *Sending and receiving messages electronically through the internet is called E-mail.* We can exchange any message with the people around the world by using e-mail. It is very easy and quick means of communication available in the computer world. We can write an e-mail message in an mail program like Eudora, Outlook Express, Netscape Navigator etc. and several web base program like Yahoomail, Hotmail, Gmail and Zapakmail are also used to send and receive e-mail.

E-mail address: Each E-mail address is identified by a unique name is called E-mail address. For example sarthak@yahoo.com, swrikrit@fewanet.com.np, etc. It has five parts they are as follows :

- sarthak/swrikrit : User's name
- @ (At the rate) : A separator symbol
- yahoo, fewanet : ISP address or domain name
- .com or .edu or .net : commercial or educational groups
- .np : Country code

Advantages of using E-mail

- It is cheapest and fastest means of communication compared to our conventional postal mail.
- It is more reliable than postal mail.
- E-mail can be accessed from any part of the world and at any time.
- Information can be shared globally.
- We can send photos, songs, video clips and other file with e-mail attachments.
- A single mail can be sent to multiple people at a time.



E-fax: E-fax stands for electronic fax. It is very powerful desktop application that allows us to send and receive faxes directly on our computer. It is very similar to e-mail. The E-fax first goes to the internet server then the internet server sends it to its destination whereas E-mail means first goes to the local file server.

Different between E-mail and E-fax:

E-mail	E-fax
1. It is very cheap.	1. It takes more cost than E-mail.
2. Message first goes to the local server.	2. Message first goes to the internet server and then to its destination.
3. Message is to be stored in the hard disk of the destination computer (server).	3. Message directly goes to print in the printer of the destination computer.

7.3. Protocol

In information technology, a protocol is the special set of rules that end points in a telecommunication connection use when they communicate. Protocols specify interactions between the communicating entities.

Bottom of Form

Protocols exist at several levels in a telecommunication connection. For example, there are protocols for the data interchange at the hardware device level and protocols for data interchange at the application program level. In the standard model known as Open Systems Interconnection (OSI), there are one or more protocols at each layer in the telecommunication exchange that both ends of the exchange must recognize and observe. Protocols are often described in an industry or international standard.

TCP/IP

TCP (Transmission Control Protocol) is a standard that defines how to establish and maintain a network conversation via which application programs can exchange data. TCP works with the Internet Protocol (IP), which defines how computers send packets of data to each other. Together, TCP and IP are the basic rules defining the Internet. TCP is defined by the Internet Engineering Task Force (IETF) in the Request for Comment (RFC) standards document number 793.

HTTP (Hypertext Transfer Protocol):

HTTP (Hypertext Transfer Protocol) is the set of rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web. As soon as a Web user opens their Web browser, the user is indirectly making use of HTTP. HTTP is an application protocol that runs on top of the TCP/IP suite of protocols (the foundation protocols for the Internet).

File Transfer Protocol (FTP):

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections.

Terminal Network (Telnet):

Telnet is a protocol used on the Internet or local area network to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection. User data is interspersed in-band with Telnet control information in an 8-bit byte oriented data connection over the Transmission Control Protocol (TCP)

SMTP (Simple Mail Transfer Protocol):

SMTP (Simple Mail Transfer Protocol) is a TCP/IP protocol used in sending and receiving e-mail. However, since it is limited in its ability to queue messages at the receiving end, it is usually used with one of two other protocols, POP3 or IMAP, that let the user save messages in a server mailbox and download them periodically from the server.

POP(Post Office Protocol):

POP is short for *Post Office Protocol*, a protocol used to retrieve e-mail from a mail server. Most e-mail applications (sometimes called an *e-mail client*) use the POP protocol, although some can use the newer IMAP (Internet Message Access Protocol).

7.4. The Web

The **World Wide Web (WWW)**, also called **the Web**, is an information space where documents and other web resources are identified by Uniform Resource

Locators (URLs), interlinked by hypertext links, and accessible via the Internet. English scientist Tim Berners-Lee invented the World Wide Web in 1989. He wrote the first web browser in 1990 while employed at CERN in Switzerland.

Advantages of www:

- A link in a web document can be used to open other documents.
- Web pages can contain pictures, buttons and even links to sound files in addition to text, thus allowing multimedia applications.
- Sophisticated web document allows users to interact with applications through dialog boxes and forms.

Web server

Web server is a site on which the web pages are kept. It is a server computer that responds to requests from web browsers to relative resources.

Browser

Browser is client software that allows the users to display and interact with the web page. For example: Internet Explorer, Netscape Navigator, Mozilla Firefox or Opera etc.

Web pages

Webpage is a collection of information that is stored in website. The www consists of huge collection of documents with related website called webpage. Webpage provides vast collection of information of related websites.

Web site

Website is a location of the web pages created by any organizations, universities and government agencies to provide information regarding them like: <http://www.bbc.co.uk/nepali>,<http://www.nepalnews.com> etc. Each website has its own address that is also called internet address.

The domain name system (DNS)

The domain name system (DNS) is the way that internet domain names are located and translated into internet protocol (IP) addresses. The domain name system maps

the name people use to locate a website to the IP address that a computer uses to locate a website. For example, if someone types TechTarget.com into a web browser, a server behind the scenes will map that name to the IP address 206.19.49.149. It is a name of specific internet area controlled by any organization, company or government.

Home page

The home page is the first hypertext document regarding the web address displayed when a user connects to any web server.

Uniform resource locator (URL)

A uniform resource locator (URL) is the address of a resource on the Internet. A URL indicates the location of a resource as well as the protocol used to access it.

A URL contains the following information:

- The protocol used to access the resource
- The location of the server (whether by IP address or domain name)
- The port number on the server (optional)
- The location of the resource in the directory structure of the server
- A fragment identifier (optional)

Also known as a Universal Resource Locator (URL) or Web address. A URL is a type of uniform resource identifier (URI). In common practice, the term URI isn't used, or is used synonymously with URL, even though this is technically incorrect.

ISP(Internet Service Provider):

A company that provides individuals or companies access to the internet and the world wide web is called ISP.

Firewall:

Software or hardware that limits the certain kinds of access to a computer from the internal network or external network.

7.5. Search Engine:

Search engines are programs that search documents for specified keywords and

returns a list of the documents where the keywords were found. A *search engine* is really a general class of programs; however, the term is often used to specifically describe systems like Google, Bing and Yahoo! Search that enable users to search for documents on the World Wide Web.



Web Search Engines

Typically, Web search engines work by sending out a *spider* to fetch as many documents as possible. Another program, called an *indexer*, then reads these documents and creates an index based on the words contained in each document. Each search engine uses a proprietary algorithm to create its indices such that, ideally, only meaningful results are returned for each *query*.

SUMMARY

- The internet is worldwide collection of computer networks and gateways that use TCP/IP suite of protocols to communicate with one another using telephone lines modems or satellites. Internet is network of networks.
- E-mail stands for electronic mail. It is most widely used feature on the internet. *Sending and receiving messages electronically through the internet is called E-mail.*
- A protocol is the special set of rules that end points in a telecommunication connection use when they communicate.
- TCP (Transmission Control Protocol) is a standard that defines how to establish and maintain a network conversation via which application programs can exchange data.
- HTTP (Hypertext Transfer Protocol) is the set of rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web.
- File Transfer Protocol (FTP) is a standard Internet protocol for transmitting

files between computers on the Internet over TCP/IP connections.

- **Telnet** is a protocol used on the Internet or local area network to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection.
- SMTP (Simple Mail Transfer Protocol) is a TCP/IP protocol used in sending and receiving e-mail.
- POP is short for ***Post Office Protocol***, a protocol used to retrieve e-mail from a mail server.
- The **World Wide Web (WWW)**, also called **the Web**, is an information space where documents and other web resources are identified by Uniform Resource Locators (URLs), interlinked by hypertext links, and accessible via the Internet.
- Web server is a site on which the web pages are kept. It is a server computer that responds to requests from web browsers to relative resources.
- Browser is client software that allows the users to display and interact with the web page. For example: Internet Explorer, Netscape Navigator, Mozilla Firefox or Opera etc.
- Webpage is a collection of information that is stored in website.
- Website is a location of the web pages created by any organizations, universities and government agencies to provide information
- The Domain Name System (DNS) is the way that internet domain names are located and translated into internet protocol (IP) addresses.
- The home page is the first hypertext document regarding the web address displayed when a user connects to any web server.
- A uniform resource locator (URL) is the address of a resource on the Internet.
- A company that provides individuals or companies access to the internet and the world wide web is called ISP.
- Search engines are programs that search documents for specified keywords and returns a list of the documents where the keywords were found.

Self Evaluation

1. Write very short answer to the following question.

- a. What do you mean by Home Page?
- b. Define term web page and web site.
- c. What is web browser?
- d. Give two examples of web browser.
- e. Give two examples of search engine.
- f. What is called network of network?
- g. Define the term internet.
- h. What is meant by E-mail?
- i. What does URL mean?
- j. What is DNS?

2. Write short answer to the following questions.

- a. Explain the use of internet.
- b. List the advantages of Internet.
- c. What are the requirements to connect the internet?
- d. Mention the advantages of E-mail.
- e. What is web browser? Name common web browser software.
- f. Define URL with its parts.
- g. What is search engine? List any four search engine names.
- h. What is ISP? Write two popular ISPs of our country.
- i. List services of internet.

3. Write long answer to the following questions.

- a. What are the services provided by the internet? Explain briefly.
- b. What is protocol? Explain different protocols.
- c. Differentiate between e-mail and e-fax.

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