1

FUNDAMENTALS OF COMPUTER

- Know about the evolution of computer
- Describe brief history and generations of computer
- Define the types of computers (Analog, Digital and Hybrid)
- Differentiate between mainframe, mini and microcomputers
- Describe the use of computers in various fields
- Know the scope of the careers in the field of Information Technology
- Describe the components of computer (input/output devices, system unit and computer memory)
- Differentiate between port, expansion slot and expansion card
- Explain the input/output, processing and storage operations
- Define operating system, device drivers, utility programs and language processors
- Identify the use of productivity, business, entertainment and education software
- Elaborate open source software, shareware and freeware

UNIT INTRODUCTION

This Unit "Fundamentals of Computer" covers a foundational understanding of computer hardware and software along with how to get the most value and impact from computer technology. In this unit the history of computer is described so that students can understand how have computers evolved from very simple calculating devices to the modern electronic computing. It also provides material on application of computers in various fields to describe the role of computer in modern society and its impact on our daily life.

1.1 INTRODUCTION TO COMPUTER

Today's world is an information-rich world and it has become a necessity for everyone to know about computers. A computer is a general-purpose programmable machine. Computer is
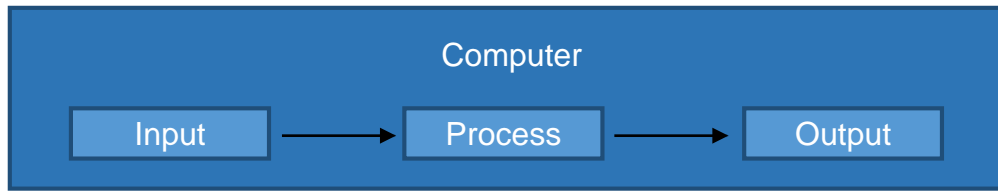

Fig.1-1 Computer processing system

an advanced electronic device that takes raw data as input from the user and processes it under the control of set of instructions (called program), gives the result (output), and saves it for future use. It has the ability to store, retrieve and process data. It processes data at very high speed according to the instructions given to it and produces accurate results. The instructions given to a computer to perform a particular task is known as computer program. Computer processing system is shown in Fig.1-1.

1.1.1 EVOLUTION OF COMPUTER

Evolution of computers means how the computers evolved from the first mechanical device, abacus, to electromechanical and then to the modern electronic digital computers.

Abacus

Abacus was the earliest calculating device most probably invented in China.

It consisted of a wooden frame having parallel rods as shown in Fig.1-2. These rods had a number of wooden beads which could slide freely along the length of rods. While performing calculations, beads were moved up and down with fingers. Abacus was used to perform addition, subtraction, multiplication and division. It has been used in China and some other Asian countries till the end of 20th century.

TITBITS
Abacus is still seen at some toy shops, made of plastic or wood for small children.

Fig.1-2 Abacus

Napier's Bone

John Napier, a Scottish mathematician invented a calculating device called Napier's Bone in 1614 which is shown in Fig.1-3. It consisted of a wooden box containing rotating cylinders each of which had the digits from 0 to 9. It could multiply, divide and find square roots of numbers by using simple addition and subtraction. His biggest achievement was the invention of logarithm.
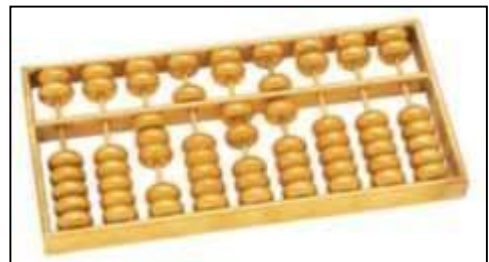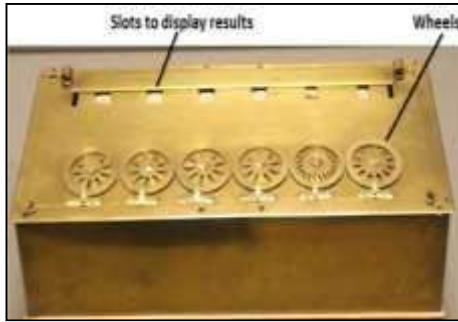

Fig.1-3 Napier's Bone

Fig.1-4 Pascaline

Pascaline

Blaise Pascal, a French mathematician invented a calculating machine called Pascaline in 1642 when he was only 19 years old. Pascaline used rotating wheels as shown in Fig.1-4. Each wheel had ten parts having digits from 0 to 9. Calculations were performed by the rotation of wheels. When one wheel completes a rotation, the next wheel moves by one digit. It had a number of small slots for displaying the result. It could perform addition and subtraction on whole numbers.
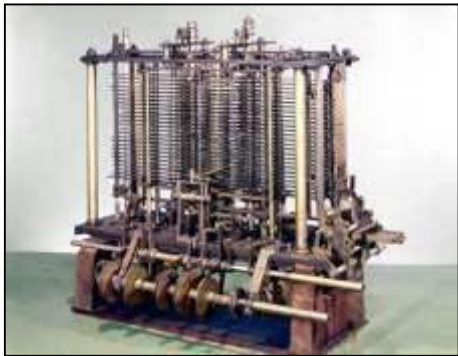

Fig.1-5 Analytical Engine

Difference Engine and Analytical Engine

In 1822, the English mathematician Charles Babbage started working on a big calculating machine about the size of a room. He called it Difference Engine.

Babbage worked for many years on this machine but he could not complete it. Later, he came up with idea of Analytical Engine which is shown in Fig.1-5. He could not complete it because the technology was not advanced enough but he laid the foundation stone of modern digital computers. Today's modern digital computers are based on the idea of analytical engine. Charles Babbage is known as the father of modern digital computers.

Fig.1-6 Hollerith Desk

Hollerith Desk

In 1890, Herman Hollerith built a tabulating machine called Hollerith Desk as shown in Fig.1-6. This machine was invented to help with the census of 1890 in America. Hollerith Desk consisted of a card reader which sensed the holes in the cards, a gear driven mechanism which could count and a large set of dial indicators to display the results. After building a Hollerith Desk, Hollerith started company by the name of Tabulating Machine Company.

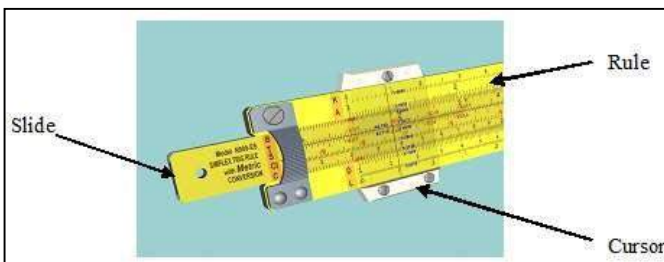Eventually this company changed its name to International Business Machines (IBM).

Fig.1-7 Slide Rule

Slide Rule

Based on the idea of logarithm, English mathematician, William Oughtred developed a device called Slid Rule in 1614. It was very useful for solving problems that involved

multiplications and divisions. It has three parts, slide, rule and a transparent sliding cursor as shown in Fig.1-7.

Mark-I

The next successful computing machine invented was a digital computer known as Mark-I. It was invented by Howard Aiken in 1944. Mark-I could add three numbers having eight digits in one second. It could print out its results on punched cards or on an electric typewriter. Mark-I was 50 feet long, 8 feet high and weighed about 5 tons. It used 3,000 electric switches. Mark-I is shown in Fig.1-8.

Fig.1-8 Mark-I Computer

More over Mark II, Mark III and Mark IV were also built under the supervision of Howard Aiken with extended capabilities.

Since computer evolution is a continuous process, it has not stopped in the modern era. New systems are being developed to provide voice recognition and understand natural languages. *High performance computing (HPC)* is being used in today's data centers for fast data processing. High-performance computing (HPC) is the use of parallel processing for running advanced application programs efficiently, reliably and fast.

The concept of "*Cloud Computing*" has been introduced. In the simplest terms, cloud computing means storing and accessing data and programs over the Internet instead of computer's hard drive. The current advancements in computer technology are likely to transform computer into intelligent machine having thinking power. The evolution of computers will probably continue till their processing capabilities have become equal to human intelligence or even beyond that.

1.1.2 GENERATIONS OF COMPUTER

History of computers is a chain that runs from the ancient abacus and the analytical engine of the nineteenth century, through the modern computers of present age. It is generally divided into five generations. Each generation of computers is characterized by major technological developments of that time.

First Generation Computers (1940 – 1956)

Vacuum tubes were used in the first generation computers. Vacuum tubes generated so much heat that they had to be cooled by air conditioner. Vacuum tubes burnt out very often and it was difficult to repair and maintain the computers of first generation. A vacuum tube is shown is Fig.1-9.

The following are the characteristics of first generation computers.

- First generation computers used vacuum tubes.
- Speed was slow and memory was very small.
- They were huge in size taking up entire room.

Fig.1-9 Vacuum Tube

- First generation computers were very expensive and unreliable.
- They consumed a lot of power and generated a lot of heat.
- Input was based on punched cards.
- Output was obtained on printouts through electric typewriter.
- Machine language was used in these computers.

Some examples of first generation Mini/Mainframe computers are ENIAC (Electronic Numerical Integrator and Computer), UNIVAC (Universal Automatic Computer), IBM 604, Mark-I and EDSAC. Electronic Delay Storage Automatic Calculator.

Fig.1-10 Transistor

Second Generation Computers (1956 – 1963)

In 1947, three scientists, William Shockley, John Bardeen and Walter Brattain invented transistor shown in Fig.1-10. Transistor functions like a vacuum tube. It replaced the vacuum tubes in the second generation computers. Transistor was faster, more reliable, smaller and much cheaper than vacuum tube.

The following are the characteristics of second generation computers.

- Transistors were used instead of vacuum tubes.
- Transistors reduced the size of computers and increased the speed and memory capacity.
- Computers became more reliable and cheaper.
- Second generation computers used punch card readers, magnetic tapes, magnetic disks and printers.
- Assembly language was used in these computers.
- High level programming languages, FORTRAN and COBOL were introduced in this generation of computers.

Examples of second generation computers are UNIVAC II, IBM 7030, 7780 and 7090, NCR 300 series, General Electric GE 635 and Control Data Corporation's CDC 1604 computers.

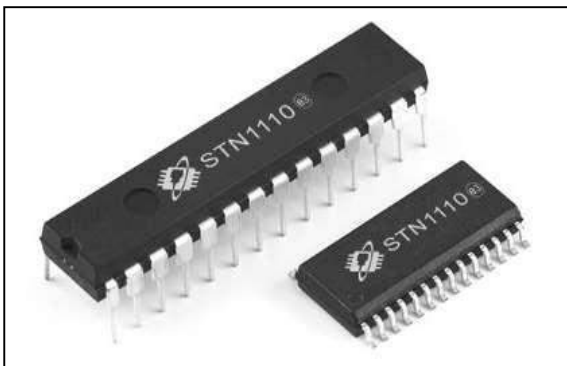### Third Generation Computers (1963 – 1971)

Fig.1-11 IC Chips

Integrated Circuits (ICs), also known as semiconductor chips were used in third generation of computers instead of transistors. IC chips were developed in early 1960s. A single IC chip contains a large number of transistors. IC chips increased the power and decreased the cost of computers. Invention of IC chips was a great breakthrough in advancing computer technology. IC chips are shown in Fig.1-11.

The following are the characteristics of third generation of computers.

- Third generation computers used IC chips.
- IC chips improved the speed and memory of computers.
- Computers consumed less electricity, became smaller, cheaper and more reliable than second generation computers.
- Keyboard and monitor were used with the computer.
- These computers could run different application programs at the same time.

Some examples of third generation computers are Burroughs 6700, IBM System/360, System 3 and Control Data Corporation's 3300 and 6600 computers.

Fourth Generation Computers (1971 – Present)

In this generation of computers LSI (Large Scale Integration) and VLSI (Very Large Scale Integration) chips having millions of transistors were developed. Microprocessor was also developed in fourth generation of computers. A microprocessor is a single chip that can handle all the processing of a computer. A microprocessor is shown in Fig.1-12.

The following are the characteristics of fourth generation of computers.

Fig.1-12 Microprocessor

- Microprocessor was developed which resulted in the development of microcomputers.
- Fourth generation computers are very fast, have large storage capacity and use advanced input/output devices.
- Microcomputers are very small in size, very reliable, consume less power and are affordable.
- Large variety of software is available for use in microcomputers.
- Operating system having Graphical User Interface (GUI) was developed in this generation.
- These computers support multimedia software that combines text, image, sound and video.
- These computers support modern programming languages such as Visual Basic, C++, Java and Python for developing powerful software.
- Fourth generation computers support a large variety of portable and wireless input/output devices.

Some examples of microprocessors developed in fourth generation of computers are Intel Pentium series, Dual Core, Core2 Duo, Core i3, i5, i7 and AMD Athlon.

Some examples of fourth generation computers are IBM ThinkPad series, HP Pavilion series, Dell Inspiron series and Apple's MacBook Pro and MacBook Air series.

Fifth Generation Computers (Present and Beyond)

The goal of fifth generation of computers is to develop devices that can understand natural languages and have thinking power. This is a big challenge for computer developers and programmers to design such systems and software for them.

The following are the characteristics of fifth generation of computers.

- Fifth generation computes are based on Artificial Intelligence (AI).
- In the fifth generation of computers, AI will minimize the need to write programs.
- These computers will allow users to give commands in any natural language such as English.

Examples of fifth generation computers are robots and expert systems.

1.1.3 TYPES OF COMPUTERS

On the basis of data representation, processing, Input and Output, Computers can be classified into the following three types.

- Analog Computers
- Digital Computers
- Hybrid Computers

Analog Computers

Analog computers represent and process data by measuring quantities such as voltage and current to solve a problem. They work on supply of continuous signals as input and display output simultaneously. Analog computers are special purpose devices, designed to perform single specific task. Mostly these devices are used in engineering and scientific applications. The

Fig.1-13 Analog computer

accuracy of analog computers is low but they are faster in speed as compared to digital computers. They mainly consist of electrical devices such as resisters, capacitors, transistors, etc. An analog computer with volt meter is shown in Fig.1-13.

Digital Computer

Digital computer works with digits. Everything in a digital computer is represented with binary digits 0s and 1s. It manipulates them at very fast speed. Data and instructions are fed into the digital computer through an input device in the form of 0s and 1s. The computer performs calculations on data according to the instructions given in a computer program. The results of calculations are displayed on monitor or printed on printer. A digital computer is shown in Fig.1-14.

Digital computers can store and process large amount of information at high speed. The results produced by digital computers are reliable and accurate. Digital computers are general-purpose computers, used in various fields.

Fig.1-14 Digital Computer

Hybrid Computers

Hybrid computers are the combination of analog and digital computers. They combine the characteristics of both analog and digital computers. Hybrid computers are mainly used for scientific applications. These computers are used in spaceships, missile systems, scientific research, hospitals and for controlling industrial processes.

A hybrid computer known as Vital Sign Monitoring Unit is shown in Fig.1-15. It is used in hospitals to monitor patient's important data such as blood pressure, temperature, respiration and heartbeat.

Fig.1-15 A Hybrid Computer (Vital Sign Monitoring Unit)

1.1.4 CLASSIFICATION OF DIGITAL COMPUTERS

Digital computers are classified into super, mainframe, minicomputer and microcomputer based on their size, speed, storage capacity and the number of users they can support.

Super Computer

Super computers are the largest and the most powerful computers. Super computers have been used for scientific and engineering applications that must handle very large databases and do a great amount of computation. These computers are very expensive. Their speed is measured in TIPS (Trillions of Instructions per Second). These computers are used in nuclear research and forecasting weather reports worldwide. Government organizations use these computers to meet their extra

Fig. A-1-16 Super computer

ordinary demand for processing data which require tremendous processing speed, memory and other services. Fig A-1-16 shows The Columbia Supercomputer located at the NASA Ames Research Center, USA.

Mainframe Computer

Mainframe computers were developed in early 1940s. A mainframe computer is a very large, very powerful and expensive computer that can support hundreds and even thousands of users at the same time. Therefore, these computers are used in large organizations. The modern mainframe computers that use cutting edge technology are the foundation of today's business in banking, insurance, education, air travel, research, health care, government and many other public and private organization. These

Fig. B-1-16 Mainframe computer

computers can execute more than trillion instructions per second (TIPS). Some examples of mainframe computers are IBM's z Enterprise EC12, EC 196, HP 16500 Series and HP Integrity Superdome. A mainframe is shown in Fig.B-1-16.

Minicomputer

Minicomputer was introduced in the 1960s when IC chips were introduced. A minicomputer is bigger than a microcomputer but smaller than a mainframe. These computers can execute billions of instructions per second (BIPS). Therefore, they can process more data than microcomputers. Today, minicomputers with cutting edge technology are playing an important role in business organizations for their data processing requirements. These are used in organizations that have hundreds of users such as PIA, NADRA, police departments, hospitals, etc. A minicomputer is shown in Fig.1-17. Examples of minicomputers are IBM System/36 and HP 3000.

Fig.1-17 Minicomputer

Microcomputer

Microcomputers are the smallest and the low cost computers. These computers are most commonly used in homes and offices. Microcomputer was introduced in 1970s when microprocessor was developed. A microprocessor is a single chip that controls the operations of the entire computer system. Modern microcomputers have large storage capacity and they can execute millions of instructions per second (MIPS). A variety of software is available for use in these computers.

Microcomputers are available in various forms such as desktop, laptop and tablet as shown in Fig.1-18. Some popular companies that manufacture microcomputers are IBM, Dell, HP, Toshiba and Acer. A microcomputer is also known as Personal Computer or PC. IBM Lenovo series, Dell XPS series and HP Envy series are some popular microcomputers.

> **Do you know?**
> Today, microprocessor is not only used in microcomputers, they are also used in the devices including mobile phones, microwave ovens, cameras, washing machines,

Fig.1-18 (a) Desktop   **(b) Laptop**   **(c) Tablet Microcomputer**

1.2 ROLE OF COMPUTER

Computer plays important role in modern society and it has changed it in many ways. It is the best invention ever made in the history of modern technology. It has brought advancement in various fields of life.

1.2.1 USE OF COMPUTERS IN VARIOUS FIELDS

Education

Role of computers in education has been given a lot of importance in the recent years. Computer technology eases the process of learning. Many programs are available for students to learn the subjects of Physics, Mathematics, Chemistry, Biology, etc. Multimedia software makes the process of learning interactive and interesting. It combines text, graphics, sound and video for effective learning. Internet has enormous information on a wide variety of subjects. Students can refer to Internet to find information on any topic. Nowadays computers with multimedia projectors are being used in classrooms for effective teaching. All the activities related to examinations are also being controlled using computers. Therefore, it plays an important role in education. Today, computer education is a part of curricula from elementary to university level. Use of computer in education is shown in Fig.1-19.

Fig.1-19 Use of computer in education

Business

Fig.1-20 Use of computer is business

Computers are used in all types of businesses as shown in Fig.1-20, to improve productivity. They help in running business activities efficiently. They are used to prepare business documents, reports, charts, presentations, invoices, etc. They help in staying in contact with employees and customers. The following are some important business areas where computers are used.

- Computer technology has revolutionized the banking business. Deposits and withdrawals are instantly logged into a customer's account. Accurate monthly bank statements are generated with the help of computer. Computer networks allow amount of bill to be transferred from customer's bank account to the store. People can obtain cash any time anywhere through Automated Teller Machine (ATM).

- Computers are used in retail stores. Bar code readers are linked to computer system that are used to read the bar code printed on each product sold to prepare the bill. With the use of computers at retail stores, the checkout process is faster and the bill produced is accurate.

- Electronic commerce, also known as e-commerce allows to sell products and services by means of computer networks such as Internet.

- Computers are very helpful in running many other types of businesses that include hotel, hospital, school, travel agency, real estate, stock exchange, etc.

Fig.1-21 Use of computer in cockpit of fighter plane

Defense

There are various applications of computer technology in defense. Computers are used in tanks, planes and ships to target enemy forces. They help in tracking missiles and destroying them. Modern defense weapons and other equipment are controlled by computers. Computers are used for designing and testing of weapons. Computers are also used in communication systems in defense. Fig.1-21 shows application of computer in a fighter plane.

Media

Computers have lot of applications in print and electronic media. Print media refers to mass communication through printed material. Computer technology helps in preparation and production of newspapers, magazines, booklets and brochures, flyers, press releases and books. Electronic media refers to broadcast media that includes radio broadcast, cable and satellite television broadcast and the new-age media like Internet and mobile devices. Computer is used for television broadcasting as shown in Fig.1-22.

Fig.1-22 Use of computer in television broadcasting

Manufacturing

Now days, computer technology is widely used in manufacturing industry. It has improved the accuracy, quality and speed of manufacturing. Computers are used for product design and automation of manufacturing process in factories as shown in Fig.1-23. This is known as Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM). CAD involves the use of computer hardware and graphics software to create product designs. CAM involves the use of

Fig.1-23 Computer controlled manufacturing machines

computer in planning and management of production operation. It helps in automatically producing finished products. CAD/CAM technology has been applied in many industries, including automobile, electronics, machine components, textiles, fashion, etc.

1.2.2 CAREERS IN INFORMATION TECHONOLOGY (IT)

Information Technology (IT) refers to anything related to computing technology, such as networking, hardware, software, the Internet, or the people that work with these technologies. Many companies now have IT departments for managing the computers, networks, and other technical areas of their businesses. Many jobs are offered in these departments. A few are discussed as below.

Software Engineer

Software engineer is a highly skilled person in the field of IT whose responsibilities involve the analysis, design, implementation and maintenance of computer software. Software engineer can be further classified into programmer and system analyst.

- **Programmer**

Computer programmers are IT professionals who have extensive knowledge and expertise in programming languages. Computer programmers write programs to solve problems related with business, education, engineering, government offices, hospitals, entertainment, etc.

- **System Analyst**

System analysts analyze the data processing requirements of organizations and develop information systems to implement them. They investigate problems, plan solutions, and recommend the type of hardware and software required for implementing the solution.

Hardware Engineer

Hardware engineers design and manufacture computer hardware. Their work also involves repair and maintenance of computer hardware. They have in-depth knowledge of internal working of computers, processors, circuit boards and other electronic equipment.

Network Administrator

Network administrators are responsible for installation, configuration and maintenance of computer networks in organizations. They are in charge of maintenance of computer hardware and software that make up a computer network.

Database Administrator

Database administrator is a person who is responsible for the design, implementation and maintenance of a database in an organization. He is also responsible for maintaining security and monitoring the performance of database.

Web Designer

Web designer is a person whose job is to plan and create websites. He designs web pages that include text, images, sound, video clips and make the website interactive. HTML (Hypertext Markup Language) is the most commonly used language for creating websites.

Multimedia Designer

Multimedia designers are people who organize and present information in an easy to understand and attractive manner. They combine text, graphics, animation, audio and video. Multimedia designers create digital images and arrange them in sequence for animation using computer software. They have the skills to edit and manipulate audio/video files. They usually work in film/TV industry, computer software companies and advertising companies.

Information Security Analyst

Information security analyst is a person whose job is to protect information and information systems from unauthorized access, use, modification, recording or destruction. He implements procedures and policies to ensure information security within the organization.

Computer Teacher

Computer teacher teaches the subject of computer science to students to make them computer literate. He conducts lessons on how to operate computers and the working principles and concepts of computer hardware. He also teaches how to develop computer programs using various programming languages.

1.3 COMPUTER HARDWARE

Computer hardware refers to the physical components that make up a computer system.

1.3.1 HARDWARE COMPONENTS OF COMPUTER

Hardware components of a computer system are classified into input devices, system unit, storage devices, output devices and memory.

INPUT DEVICES

All the devices used to feed data into the computer are known as input devices. Input devices allow us to communicate with the computer. Some commonly used input devices are keyboard, mouse, microphone, scanner, barcode reader, digital camera and touch screen.

> **POINT TO PONDER:**
> Why the keys on keyboard are not arranged in alphabetical order?

Keyboard: It is the main input device to communicate with the computer. It allows the computer user to enter letters, numbers and special symbols into the computer. A keyboard is shown is Fig.1-24.

Fig.1-24 A standard keyboard

Mouse: It is a hand-held device used to control the movement of cursor or pointer on the screen. It has two or three buttons at the front that allows the computer user to make selection in menu, draw graphics or open files, folders and programs. A mouse is shown is Fig.1-25.

Fig.A-1-25 Mouse

Joystick: A joystick is a pointing device with a vertical lever mounted on a base. The lever usually includes buttons called triggers, which activate certain events when pressed. Joysticks are mainly used for computer games.

Fig.B-1-25 Joystick

Microphone: It is a device that allows computer user to input audio into the computer. It changes audio signals into electrical signals which are translated into digital form by the sound card for processing in the computer. A microphone is shown in Fig.1-26.

Fig.1-26 Microphone

Scanner: It is a device that captures images from photographs, magazines, books etc. and stores them in computer in digital form. These images can be edited, displayed on the screen or inserted in documents. Many scanners also include optical character recognition (OCR) software, which can convert an image of text into a text file that can be edited. A scanner is shown in Fig.1-27.

Fig.1-27 Scanner

Barcode Reader: It is a device that reads the barcode printed on products that represents product code, description and price. This information is used by the computer to print bill for the customer. A barcode reader is shown in Fig.1-28.

Fig.1-28 Barcode Reader

Fig.1-29 Digital Camera

Digital Camera: It is a device used to capture pictures and store them in digital form. These pictures can be downloaded to computer for editing, viewing or inserting in documents. A digital camera is shown in Fig.1-29.

Touch Screen: It is a pressure-sensitive display screen that is used to interact with the computer by touching pictures or words with finger. Touch screen is more commonly used with mobile phone and tablet. A touch screen is shown in Fig.A-1-30.

Touchpad: A touchpad is an input device on laptops and some keyboards to move a cursor with finger. As user moves finger on the surface, the mouse cursor moves in that same direction. A touchpad is shown in Fig. B-1-30.

Fig.A-1-30 Touch Screen

Fig. B-1-30 Touch Screen

SYSTEM UNIT

System unit is the main part of computer. It includes motherboard, power supply and drives (such as DVD and hard disk) inside the computer casing. All the input/output devices of a computer are connected to system unit through the ports.

- **Motherboard**

Motherboard is the main circuit board inside the system unit. It contains microprocessor, main memory, expansion cards, many IC chips, connectors and other electronic components. It has many buses (electric pathways) printed on it. These are used to transmit information between various components of the computer. All the input/output devices are connected to the motherboard. A motherboard is shown in Fig.1-31.
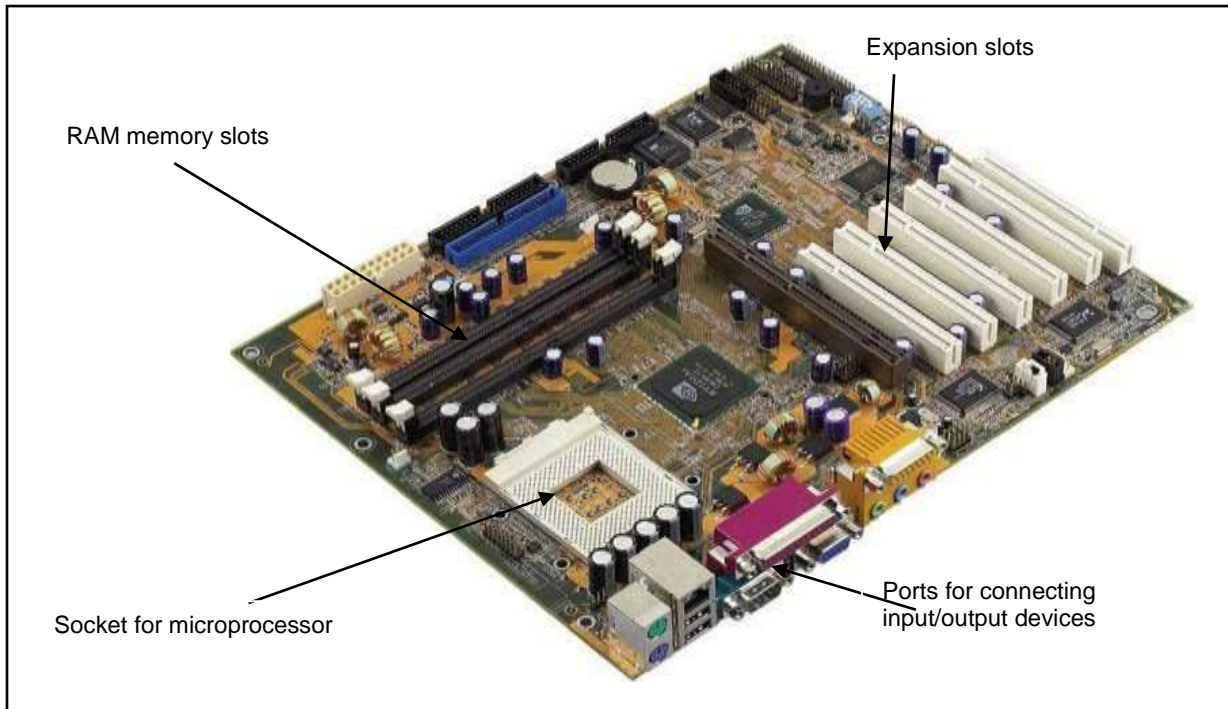
Fig.1-31 Motherboard

- **Microprocessor**

A microprocessor is the main chip on the motherboard that controls all the activities of the computer. It is also known as Central Processing Unit (CPU) or simply processor. It contains Control Unit (CU), Arithmetic Logic Unit (ALU) and registers. A microprocessor and the block diagram of CPU are shown in Fig.1-32.

(a)   (b)
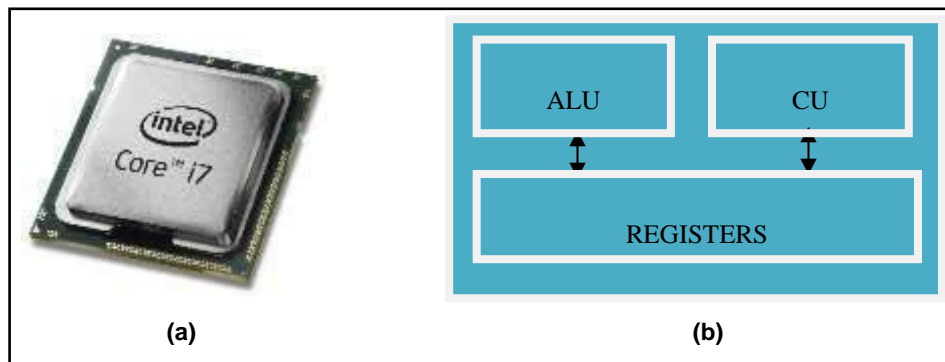
Fig.1-32 (a) Microprocessor (b) Block diagram of microprocessor

ALU is the part of the computer that performs all the calculations and comparisons. It consists of arithmetic unit and logic unit. Arithmetic unit performs all the arithmetic operations such as addition, subtraction, multiplication and division. Logic unit performs logical operations which include comparisons of numbers or alphabets.

Control unit controls the operations of all the components of the computer. It controls the working of all the input/output devices, storage devices and ALU. CU loads programs into memory and executes them. It consists of very complicated circuits.

Registers are small memory units inside the microprocessor used to temporarily store some information during the execution of a program. Some commonly used registers are Instruction Register, Accumulator Register, Data Register and Memory Address Register.

STORAGE DEVICES

Storage devices are used to store programs and data that are not currently used by the computer. They have huge storage capacity. Therefore, they are also known as mass storage devices or secondary memory. Hard disk is the most commonly used storage device that is fixed inside the system unit. Portable storage devices are CD, DVD, memory cards and USB flash drive. Portable storage devices have less storage capacity than hard disk but they are cheap and easy to carry.

Fig.1-33 Hard Disk

- **Hard Disk**

A hard disk is a magnetic storage device used to store computer data. It has storage capacity of hundreds of Gigabyte (GB). It is fixed inside the computer casing. Portable hard disk is also available that is attached to USB port.

- **CD**

CD stands for Compact Disk. It is a portable optical storage device with a storage capacity of 700 Megabytes (MB). A CD is 1.2 millimeter thick with a diameter if 120 millimeters. CD drive is used to read data from or write data to a CD.

Fig.1-34 CD/DVD

- **DVD**

DVD stands for Digital Versatile Disk. It has the same thickness and diameter as CD but has more storage capacity. Its storage capacity is in the range of 4 to 16 GB. A DVD writer is installed in the computer to read data from or write data to a DVD. A CD can also be used in a DVD writer.

Fig.1-35 Memory Card

- **Memory Card**

Memory card is a small storage device having storage capacity of few Gigabytes. It is available in different sizes and storage capacities. Memory cards are generally used in laptop computers and portable devices such as mobile phone and digital camera for storing pictures, audio and video. A memory card is shown in Fig.1-33.

- **USB Flash Drive**

USB flash drive is a small portable drive that is connected to computer through USB port. It is also known as USB memory. It is very fast in operation and its storage capacity is up to 128 GB till now. A USB flash drive is shown in Fig.1-34.

Fig.1-36 USB Flash Drive

OUTPUT DEVICES

Output devices are used to display text, graphics, and images on the monitor or to print information on paper. Information displayed on monitor is known as softcopy and anything printed on paper is known as hardcopy or printout. Commonly used output devices are monitor, printer, plotter and speaker.

- **Monito**

It is an output device that has a screen on which information is displayed. It has two common types i.e. CRT (Cathode Ray Tube) monitor and LCD (Liquid Crystal Display) monitor. CRT monitor is very similar to old television. It is almost obsolete due to its big size and low display quality. LCD monitor is slim, uses less power and has better display quality than CRT monitor. CRT and LCD monitors are shown in Fig.1-35.

(a)   (b)
Fig.1-37 (a) CRT Monitor (b) LCD Monitor

- **Printer**

Printer is an output device that prints text and graphics on paper which is known as hardcopy. There are two types of printers which are impact and non-impact printers.

FOR YOUR INFORMATION:
The first high-speed printer was developed in 1953 by Remington Rand (an early American business machines manufacturer) for use on UNIVAC computer.

Impact printer

Impact printer uses electro-mechanical mechanism which causes the character shape to strike against the paper and leave an image of the character on the paper. Dot matrix printer is the most commonly used impact printer. The printing speed varies from 50 to 500 cps (characters

(a)   (b)   (c)
Fig.1-38 (a) Dot Matrix Printer (b) Inkjet Printer (c) Laser Printer

per second). Their printing is very cheap but print quality is poor. They produce lot of noise while printing. These printers are still in use for printing invoices, bank statements, utility bills, etc. A Dot matrix printer is shown in Fig.1-36(a).

Non-Impact printer

Non-Impact printer prints without striking the paper. There are two types of non-Impact printers which are inkjet and laser printers. Inkjet printer stores ink in cartridge and sprays on paper through fine nozzles on the print-head. Laser printer uses technology similar to photocopying machine. Laser printer is more expensive, faster and has very high print quality compared to inkjet printer. Inkjet printers are used in all sectors such as homes and simple businesses. Laser printers are perfect for large scale businesses. Inkjet and laser printers are shown in Fig.1-36.(b,c).

- **Plotter**

Plotter is an output device used for printing engineering drawings, machine parts, building designs, maps, charts and panaflexes etc. on large size papers/sheets. Such large size printing

Fig.1-39 Plotter

is not possible on printers. It is more expensive than printer. There are two types of plotters, that is, ink plotter and pen plotter. Ink plotter is used for printing images whereas pen plotter is used for printing engineering drawings, machine parts, building designs, etc. Plotter is a slow output device but its printing quality is good. A plotter is shown in Fig.1-37.

- **Speaker**

Fig.1-40 Speakers

Speaker is a device used to produce audio output. A pair of speakers is attached to the sound card on the motherboard. Speakers are commonly used with multimedia software and for playing music and videos on computer. A pair of speakers is shown in Fig.1-38.

MEMORY

Memory unit stores data and programs that are being executed by the computer. It also stores the results produced by the ALU after processing the data. There are three types of memories on the motherboard which are ROM (Read Only Memory), RAM (Random Access Memory) and Cache. These are known as main memory or primary memory of computer.

ROM (Read Only Memory)

Fig.1-41 ROM chip

ROM is a single IC chip which is installed on the motherboard as shown in Fig.1-39.

It stores the Basic Input/Output System (BIOS) of computer that controls input/output devices and the start-up or boot process. BIOS

programs test the computer's components when it is turned on and then load the operating system into the RAM to make the computer ready for operation.

BIOS programs are permanently stored in ROM when it is manufactured. It is non-volatile memory, that is, the programs stored in it are not lost when the computer is turned off. There are three common types of ROM which are PROM (Programmable ROM), EPROM (Erasable Programmable ROM) and EEPROM (Electrically Erasable Programmable ROM).

RAM (Random Access Memory)

RAM is high speed memory installed on the motherboard. It is READ/WRITE memory. Information can be read from or written into it. Programs are loaded into RAM from secondary storage devices such as hard disk or USB flash drive for execution by the microprocessor. It is volatile memory which means information stored in it, is lost when the computer is turned off.

RAM modules are installed in the memory slots on the motherboard. RAM modules are shown in Fig.1-40
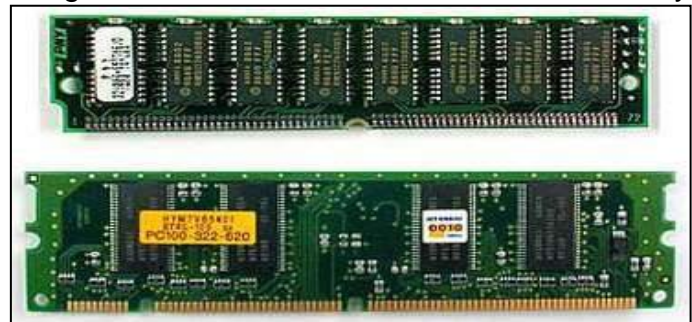
Fig.1-42 RAM modules

Cache Memory

Cache is a very small amount of extremely fast memory inside the microprocessor or on the motherboard. It is faster and more expensive than RAM. It stores information that is most frequently used by the computer. The purpose of using cache is to improve the processing speed of computer.

There are three types of cache memories which are Level 1 (L1), Level 2 (L2) and Level 3 (L3) as shown in Fig.1-41. L1 cache is built inside the microprocessor whereas L2 and L3 are on the motherboard. L1 cache is faster than L2 and L3 cache.
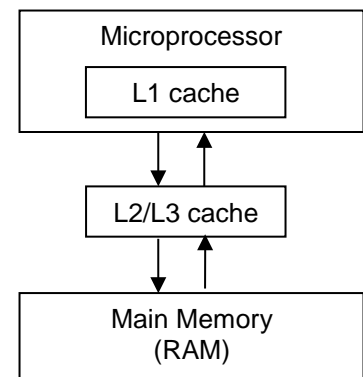
Fig.1-43 L1, L2 and L3 Cache Memories

1.3.2 PORTS, EXPANSION SLOTS AND EXPANSION CARDS

PORTS

Port is an interface for connecting various devices to the system unit. These are located on the motherboard and are usually seen at the back of the system unit. There are various types of ports for connecting keyboard, mouse, monitor, microphone, speakers and other input/output devices as shown in
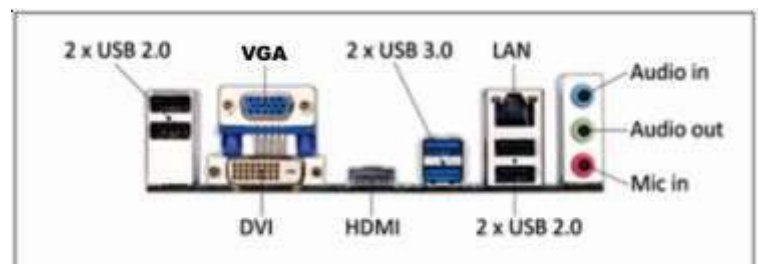
Fig.1-44 Ports on motherboard

Fig.1-42(a). In modern computers, USB (Universal Serial Bus), HDMI (High Definition Multimedia Interface), DVI (Digital Visual Interface), Audio and LAN (Local Area Network) ports are used for connecting various devices to the computer. These devices include digital camera, scanner, printer, external hard disk or DVD writer and USB memory, etc.

EXPANSION SLOTS AND EXPANSION CARDS

Fig.1-45 Network card

Expansion slots are long narrow sockets on the motherboard used for installing expansion cards. Expansion cards are small circuit boards. These cards add new capabilities to the computers. Commonly used expansion cards are sound card, graphics card, modem card and network card. In modern computers these cards are built-in on the motherboard. A network card is shown in Fig.1-43.

1.4 BASIC OPERATIONS OF A COMPUTER

The following four basic operations are performed by computers which are shown in Fig.1-44.

- Input operation
- Processing operation
- Storage operation
- Output operation
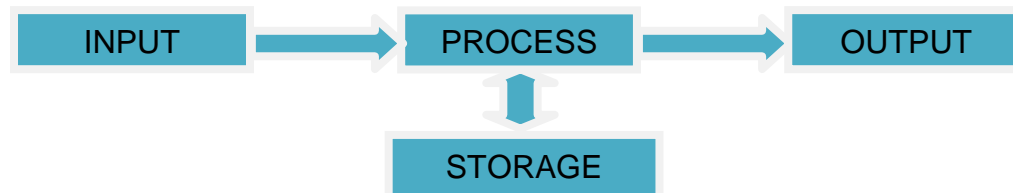
Fig.1-46 Basic operations of a computer

Input Operation

A computer is a data processing machine. Users enter data and instructions into the computer through keyboard or mouse. It can also be provided to the computer from a storage device such as hard disk, CD or USB memory. The input data/instructions are stored in memory for further processing.

Processing Operation

Microprocessor processes the data according to the instruction given to it. The microprocessor fetches the data/instructions from the memory and stores it in instruction register. The control unit then decodes the instruction to find out which operation is to be performed. After decoding the instruction, it sends signals to other parts of the computer to execute it.

Storage Operation

The results produced after processing are stored in memory before they are sent to the output device or permanent storage device like hard disk.

Output Operation

The results of data processing stored in memory must be output so that they can be seen by the user. The control unit displays the results on the monitor or prints it on the printer. Results can also be saved in a storage device such as hard disk for use in the future.

1.5 COMPUTER SOFTWARE

Computer programs are known as computer software. Computer program is a set of instructions that tells a computer what to do and how to do. It is classified into two categories, system software and application software.

1.5.1 SYSTEM SOFWARE

System software is a collection of programs which makes the use of computer easy and efficient. Highly experienced computer programmers develop system software. Following are the types of system software.

- Operating system
- Device drivers
- Utility programs
- Language processors

Operating System

An operating system is system software that is responsible for the management and coordination of all the activities performed by the computer. It provides the environment in which the user can interact with the computer hardware to operate the computer. The most popular operating system used in microcomputers is the Windows.

The following tasks are performed by the operating system.
i.   It loads programs into memory and executes them.
ii. It controls the operation of input/output and storage devices.
iii. It manages files and folders.
iv. It allows to create password to protect computers from unauthorized use.
v.   It detects hardware failures and displays messages to fix them.

Device Drivers

A device driver is system software that controls the operation of a computer device. When users attach a device such as printer or scanner to their computer, they should install its driver to make it operational. Device drivers are provided by device manufacturers.

Utility Programs

Utility programs perform specific tasks that are related to the management of the computer.

The following are some commonly used utility programs that perform specific tasks.
- Windows Explorer: It is used to manage files and folders.
- Backup utility: It is used to make backup of data.

- <u>WinZip utility:</u> It is used to compress files.
- <u>Diagnostic utility:</u> It is used to detect hardware and software problems.
- <u>Antivirus software:</u> It is used to detect and remove viruses.

Language Processors

A language processor is a system program used to translate computer programs into machine language. Machine language is directly understood by the computer. Therefore, all the programs must be translated into machine language before execution by the computer. Compiler and interpreter are language processors used to translate high level language programs into machine language. A program called assembler is used to translate assembly language programs into machine language.

1.5.2 APPLICATION SOFTWARE

Application software is developed for computer users to solve their problems such as preparing a letter, creating a presentation or managing a database. Commonly used application software includes productivity software, business software, entertainment software and education software.

Productivity Software

Productivity software includes word-processing, spreadsheet and database management software packages. These software packages are used by individuals to speed up their daily routine tasks by doing their work in an organized and efficient way.

Business Software

Any software that helps in running business in a more efficient way to improve productivity is known as business software. Some examples of commonly used business software are accounting, sales and marketing, inventory control, project management and payroll software.

Entertainment Software

Software developed to entertain people is known as entertainment software. Video games are one of the most popular forms of entertainment software. Many games are lot of fun to play but sometimes they can also help to improve skills such as typing or reading. The term edutainment merges games and education software into single software. Edutainment software is used mainly for entertainment but it educates as well.

Education Software

Software developed for educational purpose is known as education software. A large variety of education software has been developed. Education software includes typing tutor, spelling tutor, language learning, medical and healthcare, driving test and flight simulation software, etc.

1.5.3 OPEN SOURCE SOFTWARE, SHAREWARE AND FREEWARE

Open Source Software

It is computer software that is available in the form of source code that allows users to study, change and improve it. Open source software is free for use, modification and distribution. Some examples of open source software are Linux operating system, OpenOffice (office productivity software), Flight Gear (flight simulator) and Java programming language, etc.

Shareware

Shareware is distributed free of cost for a limited period, usually one or two months. It is trial version of software given to people to decide whether they would like to buy the full version of the software. Some shareware is installed on new computers when they are sold. Examples of shareware are antivirus software and computer games, etc.

Freeware

Freeware is given free of cost and it is full version of software for an unlimited period of time. It may have some restrictions such as allowed for personal or academic use only.

Examples of freeware are Google Chrome, Mozilla Firefox, VLC media player, etc.

Key Points

- Computer is a general-purpose programmable machine that has the ability to store, retrieve and process data that is represented in the form of 0s and 1s.

- First generation computers used vacuum tubes and their period was from 1940 to 1956.

- Second generation computers used transistors and their period was from 1956 to 1963.

- Third generation computers used IC chips that were developed in early 1960s and their period is from 1963 to 1971.

- Fourth generation computers use LSI and VLSI chips and their period is from 1971 to present.

- Fifth generation of computers is concerned with development of devices that can understand natural languages and have thinking power.

- Analog computer represents and processes data by measuring quantities such as voltage and current to solve a problem. It works on supply of continuous signals as input and displays output simultaneously.

- Digital computer works with binary digits 0 and 1. Data and instructions are fed into digital computer through an input device such as keyboard. The computer performs

calculations on data according to the instructions and displays results on monitor or prints on printer.

- Hybrid computer is a combination of analog and digital computers. It combines the characteristics of both analog and digital computers.

- Mainframe computer is a very large, very powerful and expensive computer that can support hundreds and even thousands of users at the same time.

- Minicomputer is bigger than microcomputer but smaller than mainframe. It is used in organizations that have hundreds of users.

- Microcomputer is the smallest and the low cost computer. It is the most commonly used computer in homes and offices.

- Software engineer is a highly skilled person in the field of IT whose responsibilities involve the analysis, design, implementation and maintenance of computer software.

- Computer programmer is an IT professional who has extensive knowledge and expertise in programming languages. He programs the computer by writing step-by-step instructions that tell the computer what to do.

- System analyst analyzes the data processing requirements of organizations and develops information systems to implement them.

- Hardware engineer is an IT professional who designs and manufactures computer hardware.

- Network engineer is a person who is responsible for installation, configuration and maintenance of computer networks in organizations.

- Database administrator is a person who is responsible for the design, implementation and maintenance of a database in an organization.

- Web designer is a person whose job is to plan, design and develop websites.

- Multimedia designer is a person who designs multimedia software by combining text, graphics, animation, audio and video.

- Information security analyst is a person whose job is to protect information and information systems from unauthorized access, use, modification, recording and destruction.

- Computer teacher is a person who teaches the subject of computer science to students.

- Computer hardware refers to the physical components that make up a computer system.

- Computer software is a set of instructions that tells a computer what to do and how to do.

- System software is a collection of programs which makes the use of computer easy and efficient.

- Operating system is system software that is responsible for the management and coordination of all the activities performed by the computer.

- Application software is developed to solve the problems of computer users such as writing letter, creating presentation or managing a database.

- Open source software is a program that is freely available in the form of source code that allows users to study, change and improve it.

- Shareware is trial version of software that is distributed free of cost for a limited period, usually one or two months.

- Freeware is software given free of cost for an unlimited period of time.

Exercise

Q1. Select the best answer for the following MCQs.

i. Who invented logarithm?

   A. Blaise Pascal   B. John Napeir

   C. Charles Babbage   D. Herman Hollerith

ii. Which generation of computer used transistor?

   A. 1st Generation of Computers   B. 2nd Generation of Computers

   C. 3rd Generation of Computers   D. 4th Generation of Computers

iii. In which generation of computer microprocessor was introduced?

   A. 1st Generation of Computers   B. 2nd Generation of Computers

   C. 3rd Generation of Computers   D. 4th Generation of Computers

iv. Which of the following computer supports thousands of users at the same time?

   A. Microcomputer   B. Minicomputer

   C. Mainframe computer   C. Laptop computer

v. Who is responsible for protecting information and information systems from unauthorized people in an organization?

   A. System Analyst   B. Information Security Analyst

   C. Network Administrator   D. Hardware Engineer

vi. Which of the following is the fastest memory?

   A. USB flash drive   B. RAM

   B. ROM   D. Cache

vii. What type of software a device driver is?

    A. Application software   B. Business software

    C. System software   D. Productivity software

viii. Which of the following is volatile memory?

    A. RAM   B. ROM

    C. USB flash drive   D. Hard disk

ix. Which software is distributed free of cost for a limited period as a trial version?

    A. Open source software   B. Shareware

    C. Freeware   D. Productivity software

x. When were IC chips developed?

    A. Early 1960s   B. Early 1970s

    C. 1980s   D. 1990s

Q2. Write short answers of the following questions.

i.   Describe Napier's Bone and Slide Rule.

ii.   Compare 1st and 3rd generation computers.

iii.   Differentiate between analog and digital computers.

iv.   Ahmed, a class IX student is asking his father to replace his home computer CRT monitor with LCD monitor. How will you justify his demand?

v.   What will happen if storage devices are removed from a computer?

vi.   Differentiate between systems software and application software.

vii.   How a student can use computer to improve academic performance?

viii. Give any three uses of computers in a school library.

ix.   Name few house hold appliances in which microprocessor is used.

x.   What are the tasks performed by operating system?

Q3. Write long answers of the following questions.

i.   Describe the five generations of computers.

ii. Write a note on mainframe, minicomputer and microcomputer.

iii. Explains the basic operations of a computer.

iv. Write short note on the following.

    a. Hardware Engineer
    b. Network Administrator
    c. Database Administrator
    d. Web Designer

  e. Multimedia Designer

 v. Describe the following types of application software.

  a. Productivity software

  b. Business software

  c. Entertainment software

  d. Education software

Lab Activities

Activity 1: Demonstrate how input/output devices are connected to the system unit of the computer.

Activity 2: Students should be shown components of computer such as RAM, ROM, microprocessor, ports, expansion slots and power supply attached to the computer system.

2

FUNDAMENTALS OF OPERATING SYSTEM

After completing this lesson, you will be able to:	This is 20 periods Chapter including practical work.

- Know the objectives of operating system
- Get familiar with functions of operating system
- Differentiate between common types of operating systems (Command Line Interface, Menu Driven Interface and Graphical User Interface)
- Define single user and multi-user operating systems
- Describe batch processing, time-sharing processing and real-time processing
- Identify the basic icons of operating system having graphical user interface
- Manage data (files/folders)
- Install operating system
- Install office automation software
- Install anti-virus software

UNIT INTRODUCTION

Computer user must know how to give commands to the computer to operate it properly. Therefore, this unit is dedicated to provide basic knowledge about operating system. It teaches the user how to use the operating system to run programs and manage files and folders. It describes the steps involved in installation of operating system, office automation software and antivirus software in computer. It presents material about the operating system used in modern computers and those used in the past. This will teach the user about the advantages of modern operating system over the old operating systems.

2.1 INTRODUCTION

Operating system is a collection of system software that controls the working of computer system. It acts as an interface between the computer user and computer. It facilitates program execution and helps in developing application programs.

2.1.1 OBJECTIVES OF OPERATING SYSTEM (O.S.)

The main objectives of the operating system are convenience and efficiency. It makes the computer more convenient to use. It allows computer resources such as CPU, memory, input/output devices and Internet to be used in an efficient manner. It can be viewed as a resource manager.

2.1.2 FUNCTIONS OF OPERATING SYSTEM

The following are the main functions of operating system.

- Process Management
- Memory Management
- Input/Output Management
- File Management
- Resource Management
- User Management

Process Management

Process management is an essential part of operating system (OS). A process is a program in execution. In computer system multiple processes are executing concurrently or waiting for their turn to be executed. A process in execution needs resources like processing resource, memory and I/O resources. The OS must allocate resources to processes, enable processes to share and exchange information, and protect the resources of each process from other processes.

Memory Management

Memory management is the process of allocating memory space for user programs in main memory. When programs are run by users, the operating system allocates portions of free memory to programs. When a program is closed, operating system will free the memory portion used by that program for reuse. The operating system automatically loads user programs in available memory space and executes them.

Input/Output Management

Input/output management is the process of controlling the operation of all the input/output devices attached to computer. User communicates with computer through various input/output devices such as keyboard, mouse, monitor printer, etc. Management of these devices is the responsibility of operating system. Operating system uses Input/Output controller to manage and coordinate the operation of all the input/output devices.

File Management

File management system is part of operating system that organizes stores and keeps track of computer files and folders. Computer files can be documents, programs, images, videos, etc. Operating system controls the common operations performed on files. These operations include creating, opening, editing, renaming, moving, copying, deleting and searching files.

Resource Management

Operating system automatically manages the resources of a computer when application programs are executed by computer user. The resources of a computer include microprocessor, memory and all the devices attached to the computer. Operating system allocates resources of a computer to the application program according to the user's requirement in an efficient way to improve the performance of the computer.

User Management

User management is an important feature of operating system for maintaining a secure computer system. The operating system gives full control over a computer system to a person known as administrator. Administrator installs various programs on the computer system for users. He also creates and manages user accounts. When a user account is created, the user is assigned a user name and a password. Administrator allows the users to run various application programs that are installed on the computer. A user can login to the computer system by entering the user name and password, run programs and save his files in his personal folder. Operating system does not allow the users to install programs or create new users.

2.1.3 OPERATING SYSTEMS INTERFACES

There are three types of operating systems based on ways of interaction with computer (interface). The three types of interfaces are:

- Command Line Interface
- Menu Driven Interface
- Graphical User Interface (GUI).

Command Line Interface (CLI)

In CLI, commands are given to computer with keyboard. It is based on textual input. The user types in a command and presses the Enter key to execute it. Two commonly used operating systems that use CLI are DOS (Disk Operating System) and UNIX. CLI is difficult to use because users have to remember the commands to perform any task.

- **Disk Operating System (DOS)**

DOS was the most popular CLI operating system. DOS displays the prompt (C:\>) to enter commands. User must know the syntax of the command. DOS commands are difficult to remember. Some DOS commands are still supported by the new Windows operating system. It is a single user and single task operating system.

The following are some examples of DOS commands with their description

DIR	Display the contents of current directory (folder)
FORMAT D:	Format the D drive
CD\PICS	CD stands for Change Directory, which makes PICS the current directory

Some DOS commands are shown in Fig.2-1.

- **UNIX**

Fig.2-1 DOS Interface

UNIX is a multi-user CLI operating system introduced in 1969. It allows multiple users to run different programs at the same time. UNIX was developed for use on large computer system

Fig.2-2 UNIX Interface

(Mainframe). It uses a command line interface but later Graphical User Interface was also introduced. UNIX commands are shown in Fig.2-2.

Menu Driven Interface

Menu driven interface presents a menu on the screen, user makes a choice and then the next menu appears. The user makes another choice and so on. Menu driven interface is easy to use as compared to CLI. The user reads the options and makes his choices. Menus contain the commands to use the operating system. Menu driven interface is also used in some application programs and other devices such as mobile phone and iPod.

Fig.2-3 Novell Netware Interface

The following are two common menu driven operating systems

- **Novell's Netware**

Novell's Netware was a menu-driven operating system that was used in the past. Its first version was released in 1993. Novell's Netware interface is shown in Fig.2-3.

- **ProDOS**

ProDOS was another menu-driven operating system that was used on some Apple computers. ProDOS interface is shown in Fig.2-4.

Fig.2-4 ProDOS Interface

Graphical User Interface (GUI)

GUI is a graphical interface for computer users to interact with computer. It uses windows, icons, menus and pointer. Window is a rectangular portion of monitor in which information is displayed. Icon is a graphical symbol that represents a file, folder, program, device, etc. To perform a task, the user has to select icons or make choices in menus using a pointing device such as mouse.

The following are the advantages of GUI.

    i.   Much easier to learn and use

    ii. No need to memorize the commands

    iii. Allows users to run more than one program at the same time

    iv. Most of the GUIs provide good help facilities

    v. Many application programs also use a similar interface so it is easy to use a new program

The following are the disadvantages of GUI.

    i.   Takes up lot of memory.

    ii. Needs faster comsuter as compared to other interfaces.

Examples of operating systems that use GUI are Macintosh, Linux and Windows.

- **Macintosh Operating System**

Mac OS is a series of operating systems developed by Apple Incorporation for their Macintosh computers. It was introduced in 1984 with the original Macintosh computer and has GUI. The latest version is Mac OS X. It is a UNIX based user-friendly operating system. There are some specialized versions of Mac OS X used on devices such as iPhone, iPod, iPad and new Apple TV. Mac OS X interface is shown in Fig.2-5.

Fig.2-5 Mac OS X Interface

- **Linux Operating System**

Linux is free open-source operating system introduced by Linus Torvalds in 1991. It is faster but difficult to use as compared to Macintosh and Windows operating systems. It is not a popular operating system. Linus Torvalds started the development of Linux operating system and laid its foundation. Millions of programmers around the world work on Linux to improve it

Fig.2-6 Linux Interface

Its source code is freely available on Internet. Programmers can view, edit and publish an improved version.

Linux OS can be installed on PCs, laptops, netbooks, mobile and tablet devices, video game consoles, servers, supercomputers and more. The Linux OS is frequently packaged as a Linux distribution for both desktop and server use, and includes the Linux kernel (the core of the operating system) as well as supporting tools and libraries. Popular Linux OS distributions include Debian, Ubuntu, Fedora, Red Hat and openSUSE. Linux operating system interface is shown in Fig.2-6.

- **Windows Operating System**

Windows is the most popular operating system used on microcomputers in English. It was developed by Microsoft. Many different versions of Windows operating system were developed and used successfully in the past. Some of these versions are Windows 95, Windows 98, Windows Millennium, Windows XP, Windows Vista, Windows 7, 8 and 10. The latest version is Windows 10. Windows 10 interface is shown in Fig.2-7. It is also operatable in Urdu Language.

Fig.2-7 Windows 10 Interface

2.2 OPERATING SYSTEM

2.2.1 CLASSIFICATION OF OPERATING SYSTEM

Operating systems can be classified into two major categories, single-user and multi-user operating systems.

Single-user Operating System

Operating system that is used by a single user at a time is known as single-user operating system.

- It allows a single user to login and use the computer at a time. It is easy to use.
- Resources of the computer, such as CPU, memory and input/output devices are not shared with other computers.
- It is used on microcomputers.
- User can open many programs at the same time and switch among them as required.
- It requires less memory and costs less.
- Some examples of single-user operating systems are DOS, Windows 95, Windows XP, Windows 7, etc.

Multi-user Operating System

Operating system that allows many users to use a computer at the same time is known is multi-user operating system.

- It allows many users to login to a single big computer and run different programs at the same time.
- It shares the resources of the computer with other users over the network.
- It is used on minicomputers and mainframes.
- Users can communicate with each other and share files.
- A person known as administrator is responsible for assigning and managing user names and passwords.
- It requires a powerful CPU, large memory and large hard drives.
- It supports multiprogramming and time-sharing.
- Windows NT, UNIX and Linux are popular multi-user operating systems.

2.2.2 TYPES OF OPERATING SYSTEMS

There are three types of operating systems. These are batch processing, Time-sharing and real-time operating systems.

Batch Processing System

In a batch processing system, jobs are grouped in batches and the computer executes them one.by.one. When the current job terminates, the computer automatically loads the next job and starts executing it. Batch processing operating systems greatly improved the use of computer system.

Batch processing systems are suitable for tasks where large amount of data has to be collected and processed on a regular basis. For example, in credit card billing systems, all the data of credit card holders is collected and held until processed as a batch at the end of billing cycle. As another example, in examination report card system, all the data of students' examinations is collected and processed as a batch for printing report cards.

Timesharing System

Timesharing system is a feature of operating system in which multiple users can run different programs on a large-scale computer. It allows many users to have access to a computer at the same time and share the computer's time. In a timesharing system, the central processing unit is switched rapidly between the programs so that all the user programs are executed simultaneously. The operating systems used in minicomputers and mainframe computers support timesharing. Timesharing operating systems are used in organizations such as airline, bank, hotel, university, etc. where many users need access to the central computer at the same time.

For example, hundreds of students access the university's mainframe computer at the same time and they run different programs in a timesharing system in interactive mode.

Real time Systems

Real time operating systems must process information and produce a response within a specified time. These operating systems are developed for special applications.

These are used to control industrial processes such as oil refining. Real time operating systems are used to supply immediate response within limited time. For example, a measurement from an oil refinery indicating that temperatures are getting too high might demand quick response to avert an explosion.

There are a number of real-time operating systems used in military and space research programs. For example, real-time operating system is used to monitor the position of rocket in the space. Many cities are installing real-time traffic control systems to facilitate smooth flow of traffic at busy intersections.

2.3 GETTING STARTED WITH GUI OPERATING SYSTEM

A GUI Operating System provides a user-friendly interface. This makes it easier for people with little computer skills to operate the computer. A GUI combines four elements which are Window, Icon, Menu and Pointer. All the information displayed on the screen is presented inside a window. Small graphical symbols known as icons are used to represent files, folders, drives, programs and commands. Menus present various commands from which the user makes a selection with a pointing device. Mouse or touchpad is used as pointing device for performing different tasks such as selecting an option or opening a file, folder or program.

2.3.1 BASIC ICONS OF GUI OPERATING SYSTEM

An icon is a small graphical symbol that represents a file, folder, application or device. There are some special system icons such as Recycle Bin and Computer that are kept on the desktop. Icon has a label at the bottom describing its name.

The basic icons of Windows 7 are shown in Fig.2-8 and are described below.

Fig.2-8(a) Recycle Bin, (b) Computer icon, (c) Folder icon, (d) File icon (e) Program icon (f) Shortcut icons

Recycle Bin

It is a temporary place (folder) for items that the user deletes from the hard disk. When a file or folder is deleted from a hard disk it goes to the Recycle Bin. The user can restore it to its original location. User can also delete a file or folder permanently from the Recycle Bin.

> **Tip:** You can delete a file from your hard disk without sending it to **Recycle Bin** by clicking the file and then pressing Shift + Delete keys.

Computer Icon

Computer icon allows the user to access the contents of computer drives and manage files and folders. When user double-clicks on Computer icon, it will open a window similar to the one shown in Fig.2-9 that displays the drives present in the computer. It is used to navigate and manage the computer resources.

Folder Icon

Folder icon resembles a physical file folder. It is used to store files. A folder can have another folder inside it which is known as subfolder. Folders are used to keep files in an organized manner on a storage device such as hard disk so that they can be accessed easily.

> **Tip:** Right click a shortcut icon, select **Properties** and click **Open File Location** to know the location of program, file or folder to which a shortcut belongs.

Fig.2-9 Computer-Icon window

File Icon

In a GUI, files are also represented by icons. A file may contain text, image, music or video. Users recognize a file by its icon. Icon of a Microsoft Word file is shown in Fig.2-8(d).

Program Icon

Executable program files are also represented by icons. Different graphical symbols are used for different program icons. Program icon of Acrobat Reader is shown in Fig.2-8(e).

Shortcut Icon

Shortcut icons are created to access a program, file or folder quickly. They have an arrow at the bottom left corner and the name below it. Shortcut icon of Google Chrome is shown in Fig.2-8(f).

2.3.2 MANAGING DATA (FILES/FOLDERS)

Managing data means storing files in secondary storage devices such as hard disk or USB flash drive, in an organized way. This helps in finding files easily and quickly. Files are stored in folders. The Document folder in Windows is the default folder where the user saves files.

> **Tip:** You can create a new folder in Windows Explorer by simply pressing the Ctrl+Shift+N keys and then rename it.

File management tools of GUI operating system provide facilities to quickly and easily create folders and copy or move files into them. It also allows the user to delete files and folders that are not needed any more.

The following are the steps to create a new folder.

1. Go to the location where a folder is to be created.
2. Right-click a blank area, point to **New** in the shortcut menu and then click **Folder** as shown in Fig.2-10.

3. Type a name for the new folder and then press **Enter** key.

The following are the steps to copy or move files.

1. Go to the location from where files are to be copied or moved.

2. Select the files to copy or move.

To select consecutive group of multiple files or folders, create a selection around the outside of all the items by dragging the mouse pointer.
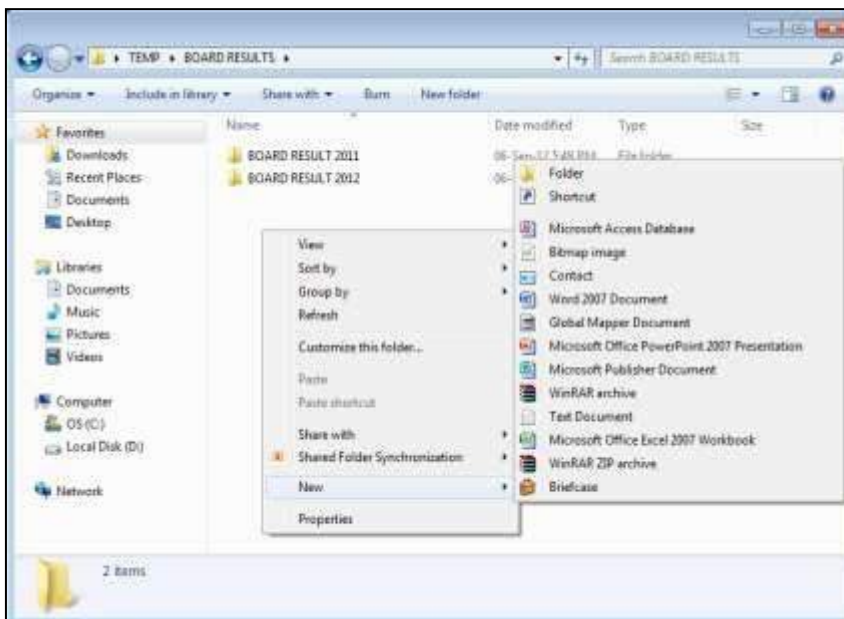
Fig.2-10 Shortcut menu to create a folder

To select non-consecutive group of files or folders, press and hold down the **Ctrl** key and then click each item one by one.

To select all the items in a window, click **Organize** on the toolbar and then click **Select all**.

3. Right-click on any selected file icon and then select copy or move from the shortcut menu as shown in Fig.2-11.

> **DO YOU KNOW?**
> There are six different versions of Windows 7. These are Starter, Home Basic, Home Premium, Professional, Enterprise and Ultimate.

Fig.2-11 Shortcut menu for copying or moving files
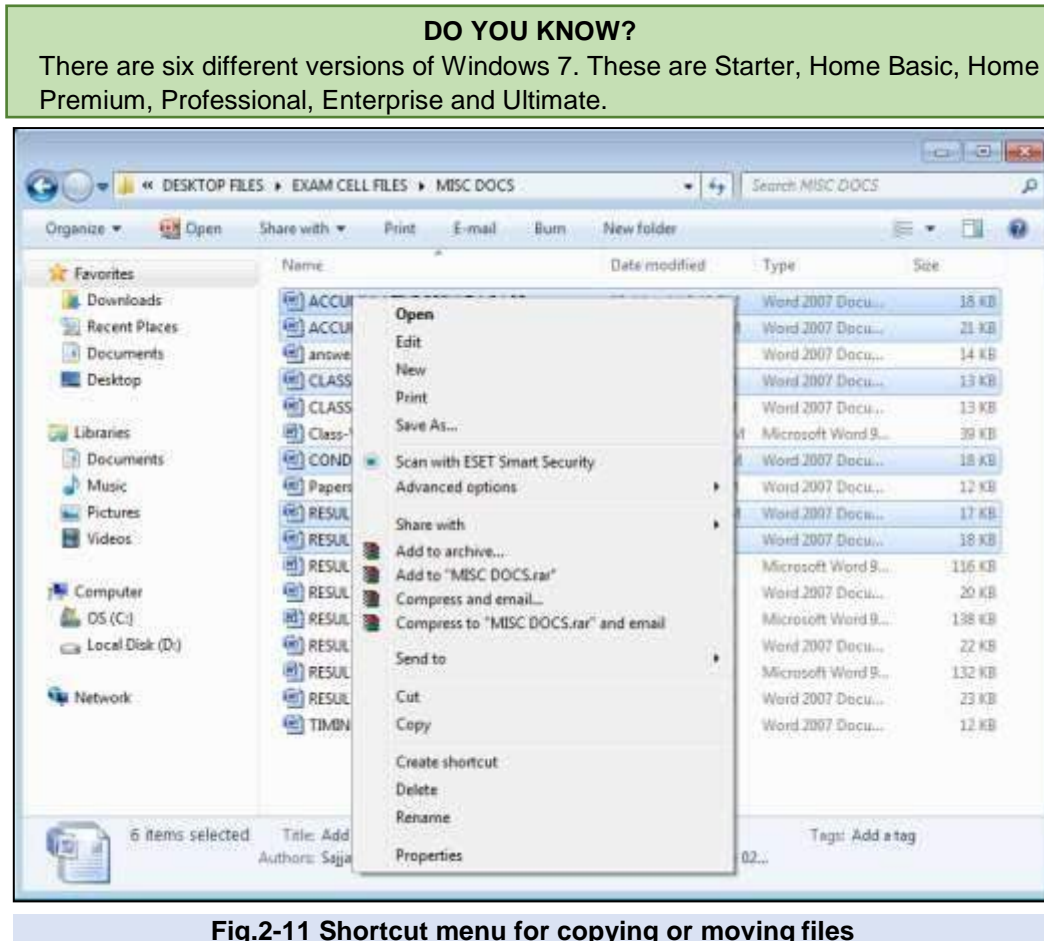
4. Go to the location where the files are to be copied or moved.
5. Right-click a blank area and click **Paste**.

The following are the steps to delete files or folders.

1. Go to the location from where files or folders are to be deleted.
2. Select the items to delete as describe earlier.
3. Right-click any selected item and then click **Delete** in the shortcut menu.

2.4 SYSTEM INSTALLATION

A computer system consists of hardware and software. Before the use of computer, user must install the operating system and other required software.

2.4.1 INSTALLATION OF WINDOWS 10 OPERATING SYSTEM

The following are the steps for installation of Windows 10 operating system.

1. Turn on the computer and insert the Windows 10 DVD and boot the computer. Make sure DVD is set as the first boot device.

2. When the screen shown in Fig.2-12 appears, select the Language, Time and currency format, Keyboard or input method and click Next.

Fig.2-12 Screen to select language and time and currency format

3. Click Install now in the screen shown in Fig.2-13 to start installation of Windows 10.

Fig.2-13 Screen to Install now

4. Wait for a few seconds for the setup to start (Fig. 2-14).
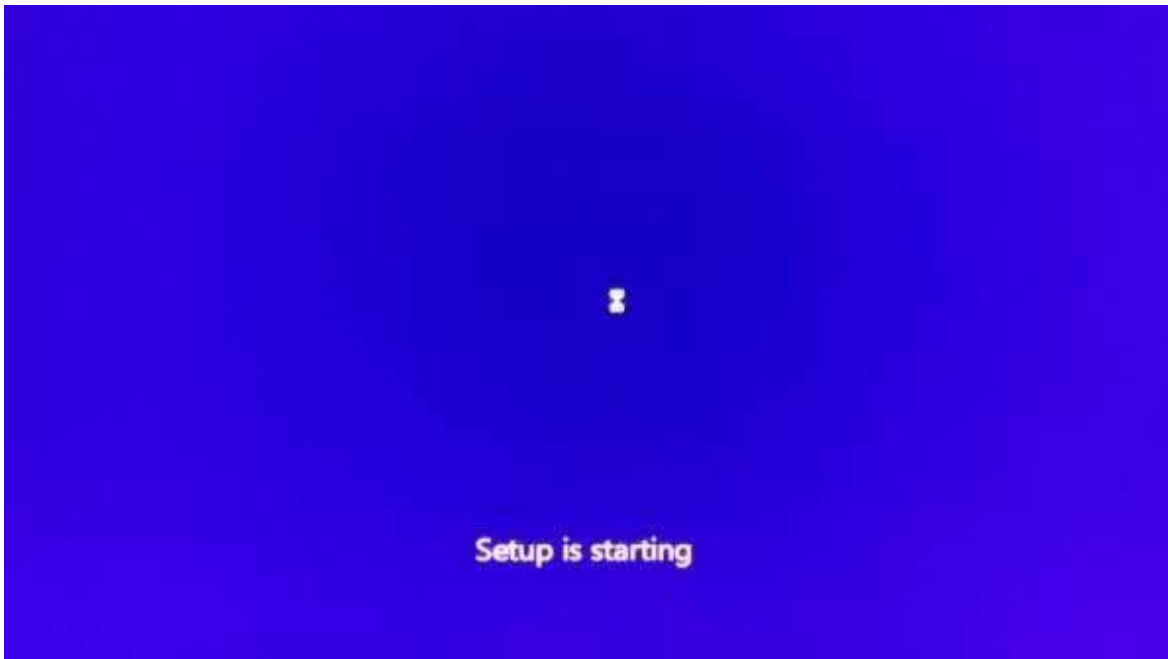
Figure 2-14

5. If you have a product key, enter it, otherwise click on Skip (Fig. 2-15).
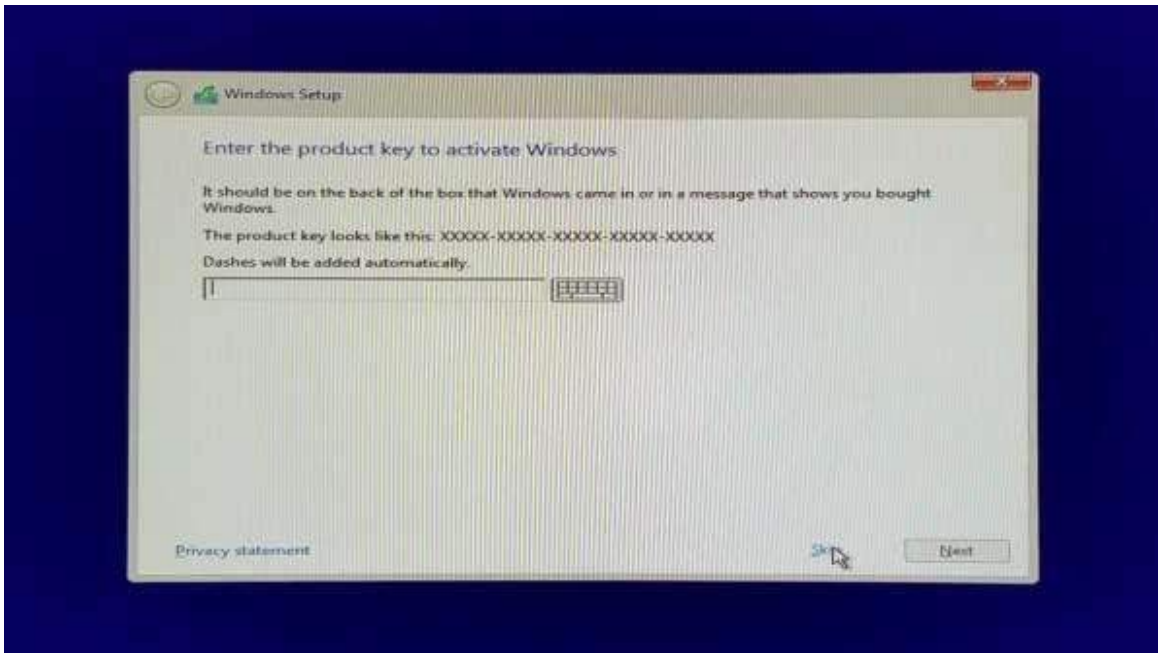
Figure 2-15

6.   Accept the license terms and click on Next (Fig. 2-16).
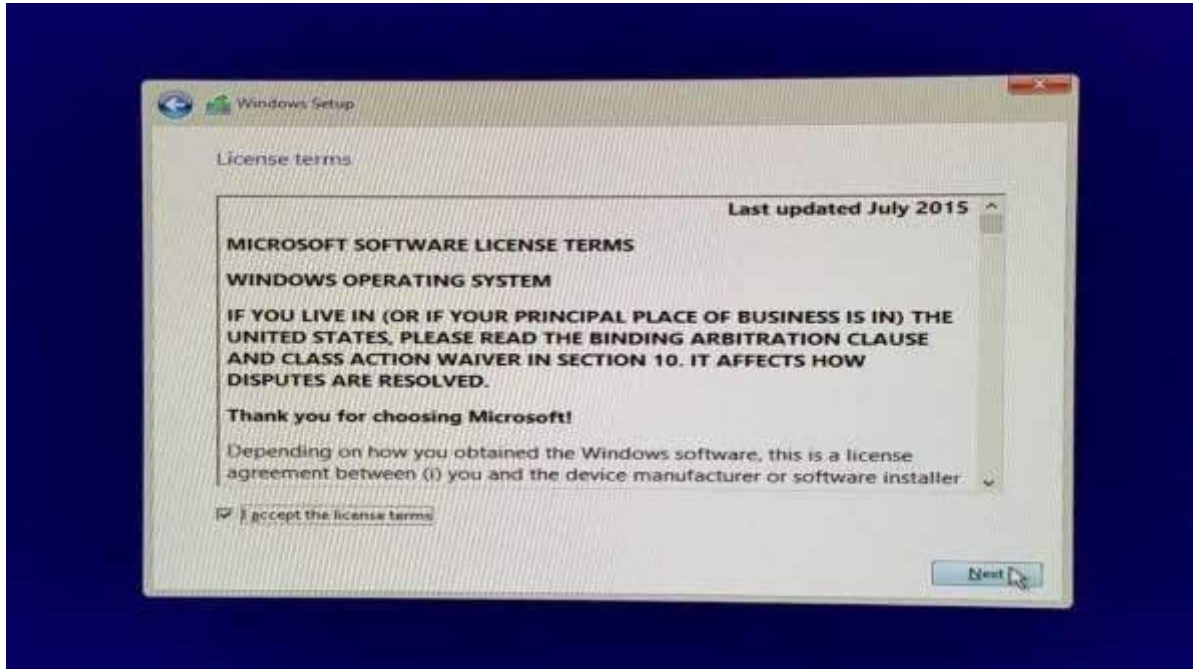
Figure 2-16

7.   Select "Custom: install Windows only (Advanced)" (Fig. 2-17)
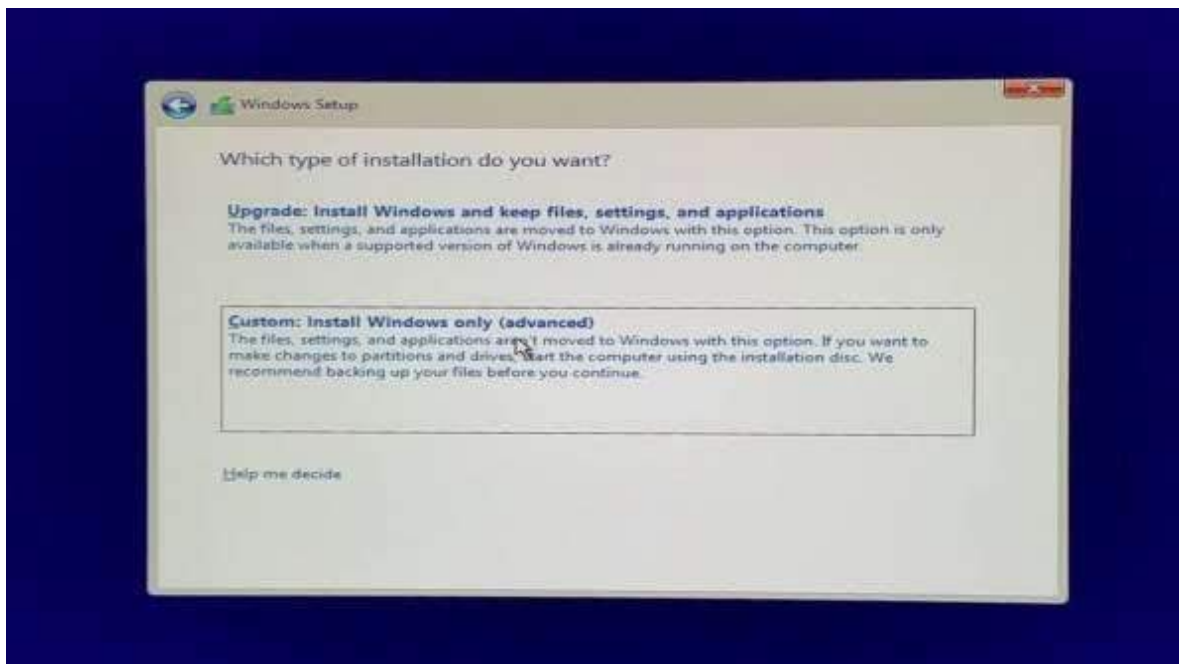
Figure 2-17

8. Select the drive where you want to install Windows 10 (Fig. 2-18).

   Note: Make sure the drive is formatted, if not you can format by selecting the format option provided.
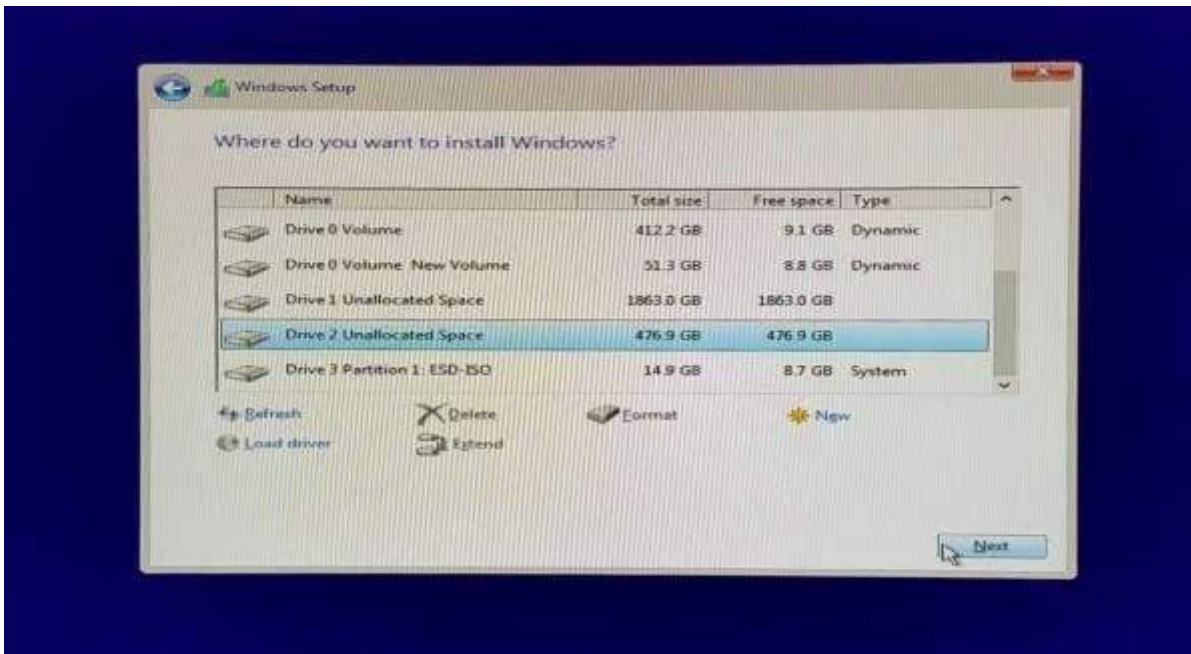
Figure 2-18

9. Wait for a sometime until Windows is being installed. This may take from a few minutes to an hour depending on the hardware of your personal computer. Once this process is complete, your PC will restart (Fig. 2-19).
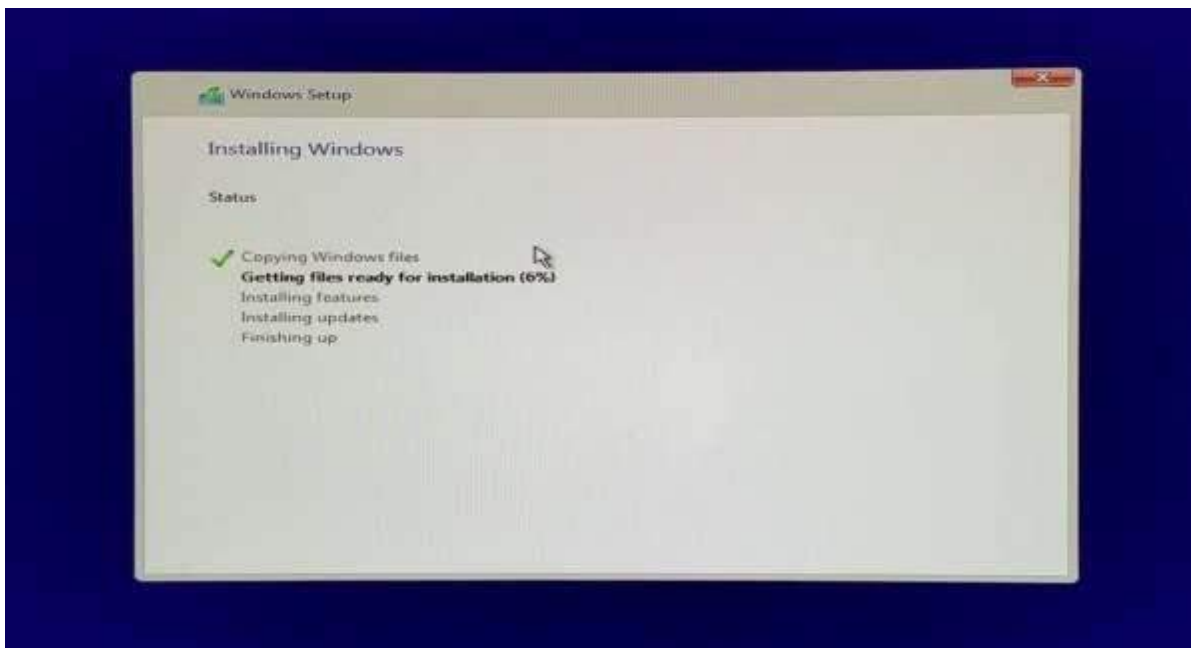
Figure 2-19

10. Choose Windows 10 (Fig. 2-20).
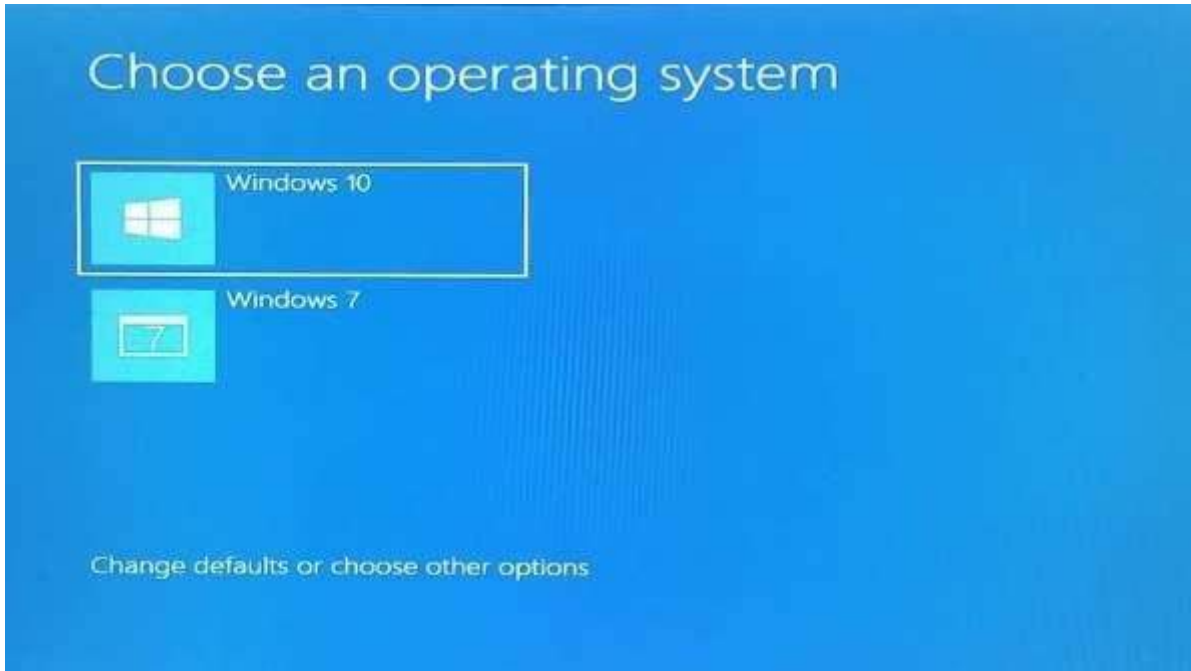
Figure 2-20

11. Wait for some more time (Fig. 2-21).

Figure 2-21

12. Enter a serial key, otherwise click on Do this later to skip this option (Fig. 2-22).

Figure 2-22

13. Click on Use express settings to use the recommended settings. Alternatively you can even click on Customize settings to customize the settings (Fig. 2-23).
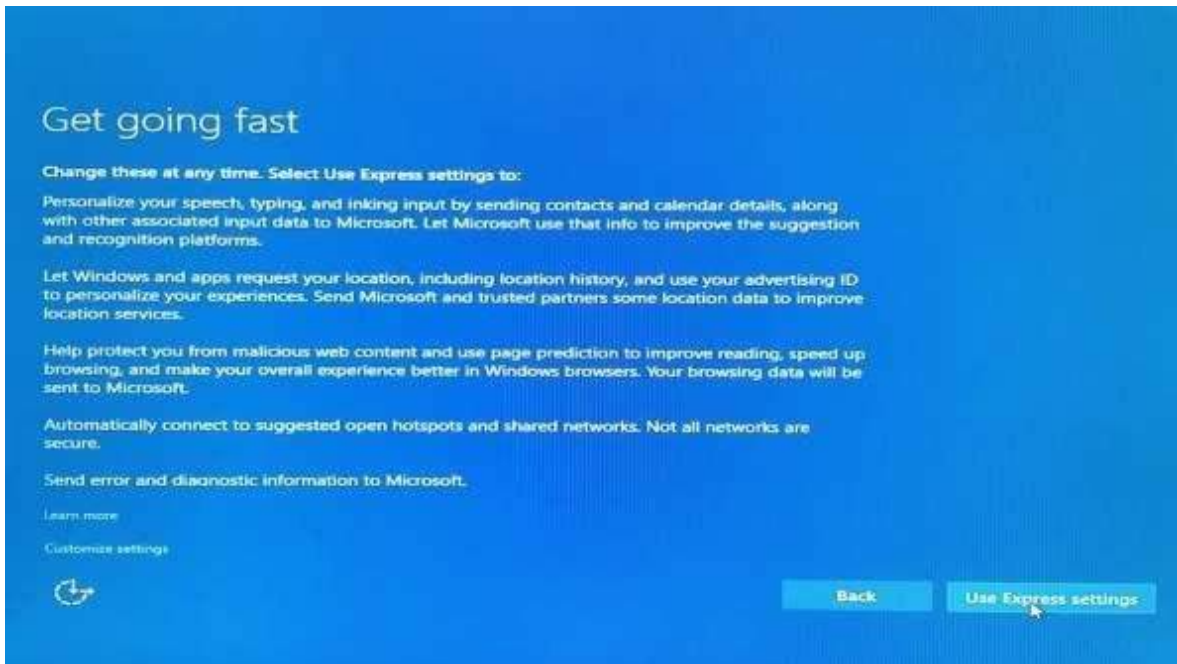
Figure 2-23

14. Wait for a few seconds more (Fig. 2-24).

Figure 2-24

15. Enter a name and password to create your account (Fig. 2-25).

Figure 2-25

16. Wait for a few seconds more (Fig. 2-26).

Figure 2-26 a
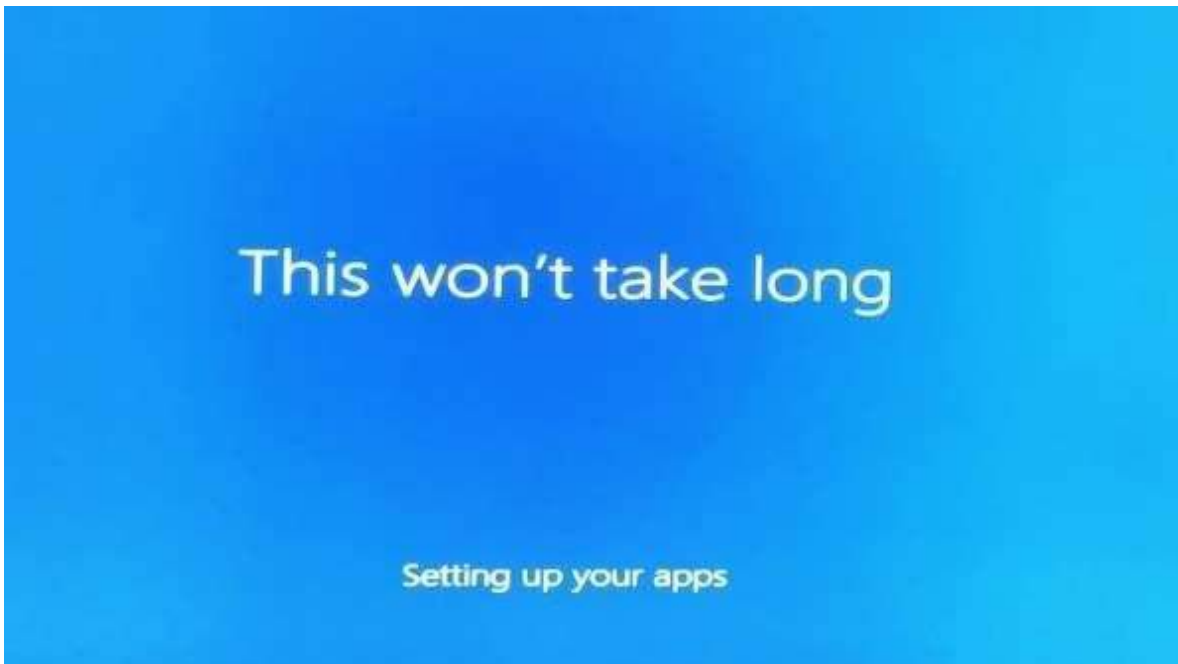
Figure 2-26 b

17. There you go, you are finally on Windows 10 (Fig. 2-27).

Figure 2-27 a

Figure 2-27 b

2.4.2 INSTALLATION OF ANITVIRUS SOFTWARE

The following are the steps for installation of AVG Antivirus software.

Fig.2-28 Icon of AVG Antivirus program

> **DO YOU KNOW?**
> The first antivirus software was developed by Bernd Fix in early 1987 to remove Vienna virus.

1. Download the AVG Antivirus Free Edition from Internet that runs on MicrosoftWindows.

2. Double-click on the installation program shown in Fig.2-28.

3. Welcome screen will appear as shown in Fig.2-29. Click the Next button to proceed with the installation.

Fig.2-29 Welcome screen of AVG Antivirus

4. License Agreement screen will be displayed as shown in Fig.2-30. Click Accept to continue with the installation.

Fig.2-30 License Agreement screen

5. Select Express Install in the screen shown in Fig.2-31 and click Next.

Fig.2-31 Screen to select type of installation

6. Click Next to accept the default Component Selection shown in the screen of Fig.2-32.
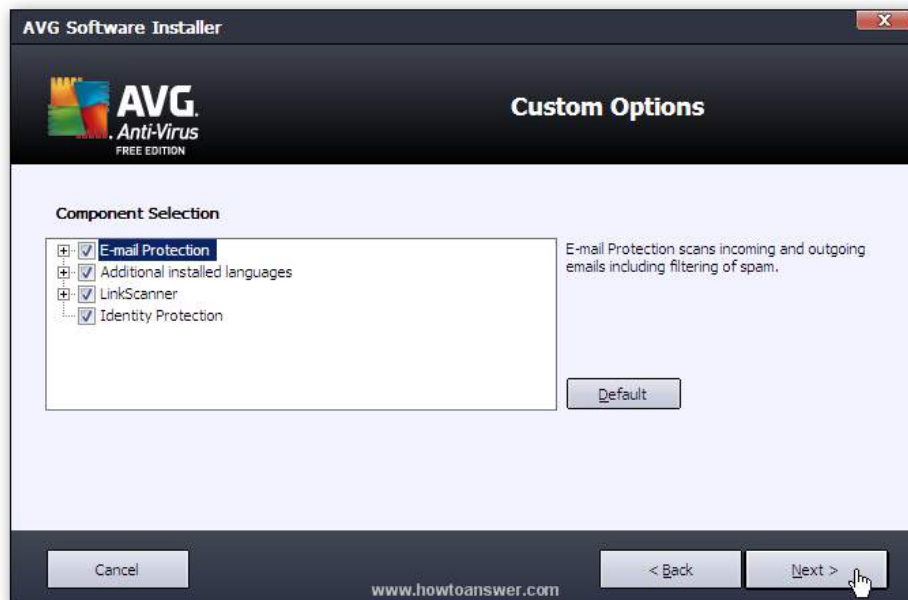
Fig.2-32 Screen to select custom options

7. Tick (✔) the option in the screen of Fig.2-33 if required and click Finish to complete the installation.

Fig.2-33 Screen to finish the installation

2.4.3 WINDOWS DEFENDER

Windows 10 comes with Windows Defender which is anti-virus software. Now, computer users do not have to buy anti-virus software. When Windows 10 is installed on a computer, Windows Defender is also installed as built-in anti-virus software. It runs in the background and checks for viruses. It automatically scans programs and files that user opens or downloads. If any type of malware is detected, it will display warning message and recommend what to do next to keep the computer safe.

Key Points

- Operating System is a collection of system software that controls the working of computer system and acts as an interface between the computer user and computer.

- The main objectives of operating system are convenience and efficiency. It makes the computer more convenient to use.

- Memory Management is the process of allocating memory space for user programs in main memory and managing it.

- Input/Output Management is the process of controlling the operation of all the input/output devices attached to computer.

- File Management System is the part of operating system that organizes, stores and keeps track of computer files and folders.

- Resource Management refers to the automatic management of resources of a computer by the operating system when application programs are executed by computer user. Resources of a computer are CPU, memory, input/output devices, etc.

- User Management is an important feature of operating system for creating and managing user accounts for a secure computer system.

- Command Line Interface (CLI) is a type of computer interface that is based on textual input. In CLI, commands are given with a keyboard.

- Menu Driven Interface presents a menu on the screen and the user makes a choice and then the next menu appears. The user makes another choice and so on to operate the computer.

- GUI is a graphical interface for computer users to interact with computer. It uses windows, icons, menus and pointer. To perform a task, the user has to select icons or make choices in menus using a mouse.

- The operating system that is used by a single user at a time is known as Single.user Operating System. It is used in microcomputers.

- Multi-user Operating System allows many users to use a computer at the same time. These are used on large computers such as minicomputers and mainframes. They manage a large number of users.

- Batch Processing System groups jobs in batches and the computer executes them one.by.one.

- Time-sharing System is a feature of operating system in which multiple users can run different programs on a large-scale computer. It allows many users to have access to a computer at the same time and share the computer's time.

- Real-time System must process information and produce a response within a specified time. It is developed for special applications.

- Recycle Bin is a temporary place (folder) for items that the user deletes form the hard disk. Deleted items can be restored if required.

- Computer icon allows the user to access the contents of computer drives and manage files and folders.

- Folder icon resembles a physical file folder and it is used to store files.

- In a GUI files are represented by file icons. A file can be easily recognized by looking at its icon. It opens by double-clicking on it.

- Program icons represent executable program files. They open when the user Double-clicks on them.

- Shortcut icons are created to access a program, file or folder quickly. They have an arrow at bottom left corner and the name below it.

- Managing Data means storing files in secondary storage devices such as hard disk or USB flash drive, in an organized way in folders so that they can be accessed easily and quickly when needed.

Exercise

Q1. Select the best answer for the following MCQs.

i. Which interface is based on textual input?

   A. GUI   B. CLI

   C. Menu-driven interface   D. Windows

ii. Which of the following interface uses window, icon, menu and pointer to interact with computer?

   A. GUI   B. CLI

   C. Menu-driven interface   D. DOS

iii. Which of the following operating system was introduced in 1969?

   A. Macintosh   B Linux

   C. Unix   D. Windows

iv. Which of the following operating system must process information and produce a response within a specified time?

   A. Batch Processing System   B. Time-sharing System

   C. Multiprogramming System   D. Real-time System

v. Which of the following is open source operating system?

A. UNIX   B. Linux

C. DOS   D. Novell's Netware

vi. Which of the following user interface is the easiest one to learn and use?

A. CLI   B. GUI

C. Menu driven interface   D. DOS

vii. Which of the following operating system allows many users to use a computer at the same time?

A. Single-user operating system   B. Batch processing system

C. Real-time processing system   D. Multi-user operating system

viii. In which of the following operating system, CPU is switched rapidly between all the programs to simultaneously execute all of them?

A. Batch Processing System   B. Time-sharing System

B. Real-time System   D. DOS

ix. Which of the following Windows icon allows user to access a program, file or folder quickly?

A. Program icon   B. Computer icon

C. Shortcut icon   D. Recycle Bin icon

x. Which of the following Windows icon allows user to access the contents of computer drives and manage files and folders?

A. Program icon   B. Computer icon

B. Shortcut icon   D. Recycle Bin icon

Q2. Write short answers of the following questions.

i.   Why operating system is important software for a computer? Give any five reasons.

ii.   Give any three objectives of operating system?

iii.   Mention few disadvantages of using DOS.

iv.   Name two operating systems which are used in modern mobile phones.

v.   What difficulties a student may face if he/she is not familiar with the operating system of a computer?

vi.   Define UNIX and Windows operating system.

vii.   Differentiate between single-user and multi-user operating systems.

viii.   What is meant by managing data and why is it important?

ix.   What is meant by resources of computer?

x.   What types of problems may a student face if no antivirus is installed in his/her computer system.

Q3. Write long answers of the following questions.

i.   Explain the main functions of operating system.

ii.   Describe the following computer interfaces.

a) Command Line Interface

b) Graphical User Interface

c) Menu-driven Interface

iii.   Describe the following types of operating systems.

a) Batch Processing System

b) Time-sharing System

c) Real-time System

iv.   Write notes on Macintosh and Linux operating systems.

v.   Describe the basic icons of Windows operating system.

Lab Activities

Activity 1: The commonly used commands for using Windows operating system should be demonstrated. Students should be shown how to open and close a program. The commands for setting date and time, adjusting resolution, changing desktop background, color scheme, screen saver, etc. should be demonstrated.

Activity 2: The file management commands such as create folder, copy, move, delete, rename files and folders are to be demonstrated. Use of Recycle Bin should be demonstrated.

Activity 3: Installation and un-installation of a program and antivirus software should be demonstrated to students.

3

OFFICE AUTOMATION

- Recognize and define word processor
- Manage a document (Create, Open, Save, Save as, Print)
- Edit text, show/hide Ribbon, insert symbols and use Equation Editor
- Format text, paragraph and page
- Insert page break, section break, header, footer and page number
- Insert and position pictures within a document
- Insert Word Art
- Create table with formatting
- Change the margins of document
- Use Hyperlink
- Know the basics of spreadsheet
- Work with functions and formulas in a spreadsheet
- Represent spreadsheet data graphically
- Manipulate and format spreadsheet data
- Use Urdu editor

UNIT INTRODUCTION

Computer users have to prepare documents in whichever profession they are. It is essential for all the users to learn how to create documents such as letters, reports, proposals, resumes, etc. Spreadsheets are also commonly required in business and office. These are used to store and process numeric data. Hence, all the users should have basic knowledge to create documents and spreadsheets. This unit describes how to prepare professional-looking documents and spreadsheets using a word processing and a spreadsheet program respectively. The last section of the unit describes how to prepare documents in Urdu with an Urdu editor.

3.1 OFFICE AUTOMATION

Office Automation refers to modern technology used to create, store, process and communicate information for accomplishing basic tasks performed in offices. The system that facilitates office automation is known as Office Automation System (OAS). Office Automation System consists of computer hardware, software and network. The software used for office automation consists of word-processing, spreadsheet, database management, presentation, graphics, electronic mail and video conferencing software. Office automation software allows users to create letters, reports, spreadsheets, graphs, manipulate images and send email to or receive email from users on the network. Office automation software helps in improving productivity and saving money and human efforts.

The most commonly used office automation software is Microsoft Office. It is an office suite of applications. It consists of MS Word, MS Excel, MS Access, MS PowerPoint and MS Outlook. It was first announced by Bill Gates on 1 August 1988. Its latest version is Microsoft Office 2016 released on 22 September, 2015. It is also operateable in Urdu.

Some other examples of office automation software are Apache OpenOffice, LibreOffice and NeoOffice. All of these are based on OpenOffice office suite. These can be freely downloaded and installed on Windows, Linux and MacOS operating systems.

3.1.1 INSTALLATION OF OFFICE AUTOMATION SOFTWARE

The common office automation software is Microsoft Office. It is productivity software for Windows operating system. It includes word processing, spreadsheet, presentation, database and e-mail communication programs. These programs provide facilities that are commonly required to run an office or business.

The following are the steps to install Microsoft Office 2010 software.

1.   Run the installation program.
2.   Enter the Product Key and click Continue button as shown in Fig.3-1.

3.   Read the Microsoft Software License Terms shown in

DO YOU KNOW?

Microsoft Office 2010 cannot be installed on a computer on which Windows XP operating system is installed.

Fig.3-1 Screen for entering Product Key

Fig.3-2, check the box to accept the terms of agreement and click Continue.

Fig.3-2 Microsoft Software License Terms

4. Click Install Now button shown in Fig.3-3 to start the installation.

Fig.3-3 Screen to choose preferred type of installation

5. Progress bar indicating how much installation has progressed will appear as shown in Fig.3-4. This may take several minutes to complete.

Fig.3-4 Progress bar indicating installation progress

6. Click the Close button shown in Fig.3-5 to exit the installation program.

Fig. 3-5 Screen indicating that installation has completed

DO YOU KNOW?
The first version of Microsoft Word was released in 1983 for DOS and first Windows version was released in 1989.

Word processing refers to the use of computer to create, edit, format and print documents.

Word processor is computer application software that is used for the creation of different types of documents on computer.

Word processor is a commonly used application of computer. Word processor allows user to delete, modify and rearrange document without retyping any of the existing text. Word processing system has the advantage of reducing time required to prepare documents. It provides features to create appealing professional documents. With word processing programs, user can create many types of documents such as letters, reports, resumes, newsletters, memos, flyers, etc.

A common word processing program used is Microsoft Word. It is a part of Microsoft Office software. Microsoft Office contains word processing, record-keeping, spreadsheet and presentation software.

Opening the MS Word Program

The following are the steps for opening the MS Word program.

1. Turn on the computer and click **Start** button.
2. Click **All Programs**.
3. Click **Microsoft Office** to display the submenu. The submenu contains all the programs included in **Microsoft Office** software.

4. Click **Microsoft Word 2010** to open the Word program shown in Fig.3-6.

Fig.3-6 Opening Word

Quick Access Toolbar   Title bar   Ribbon   Vertical Scroll bar   Minimize/Restore and Close buttons

Status bar   Blank Document   Zoom in & Zoom out bar
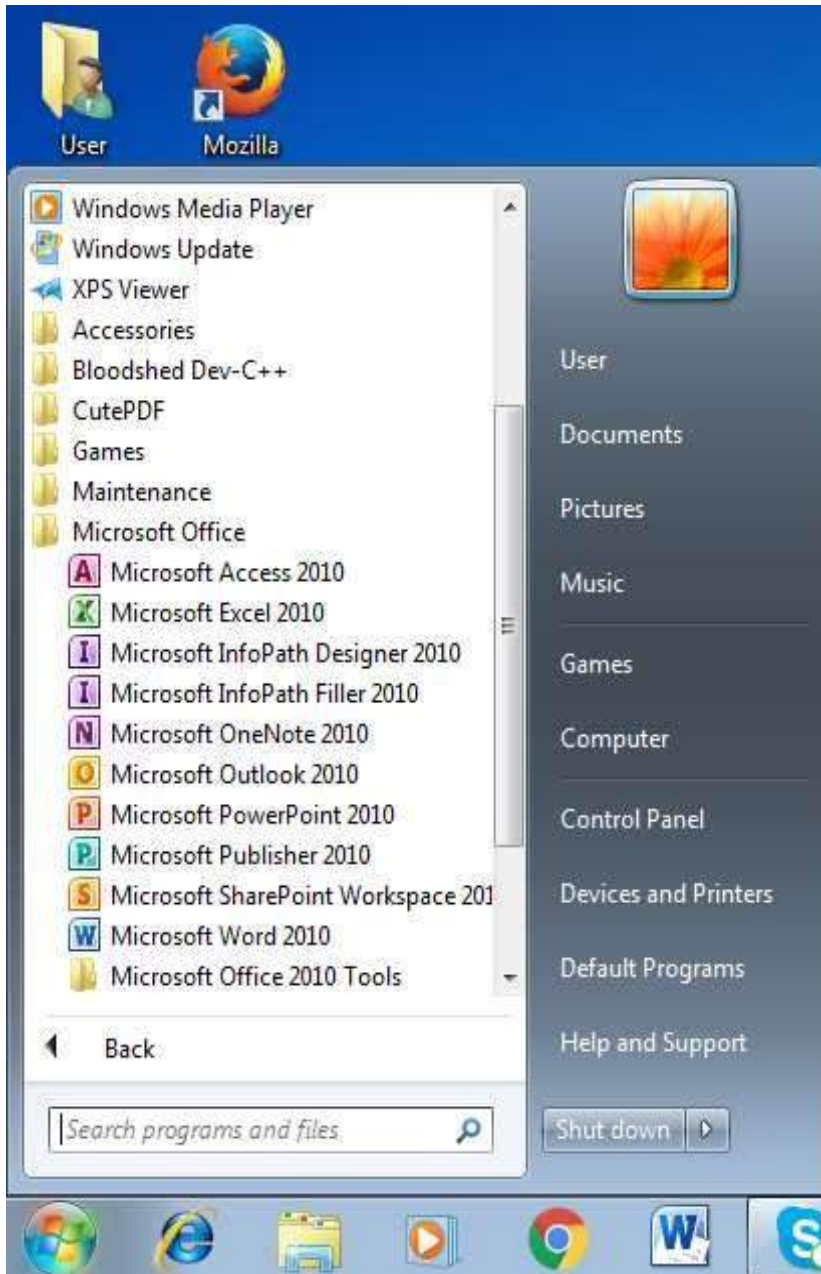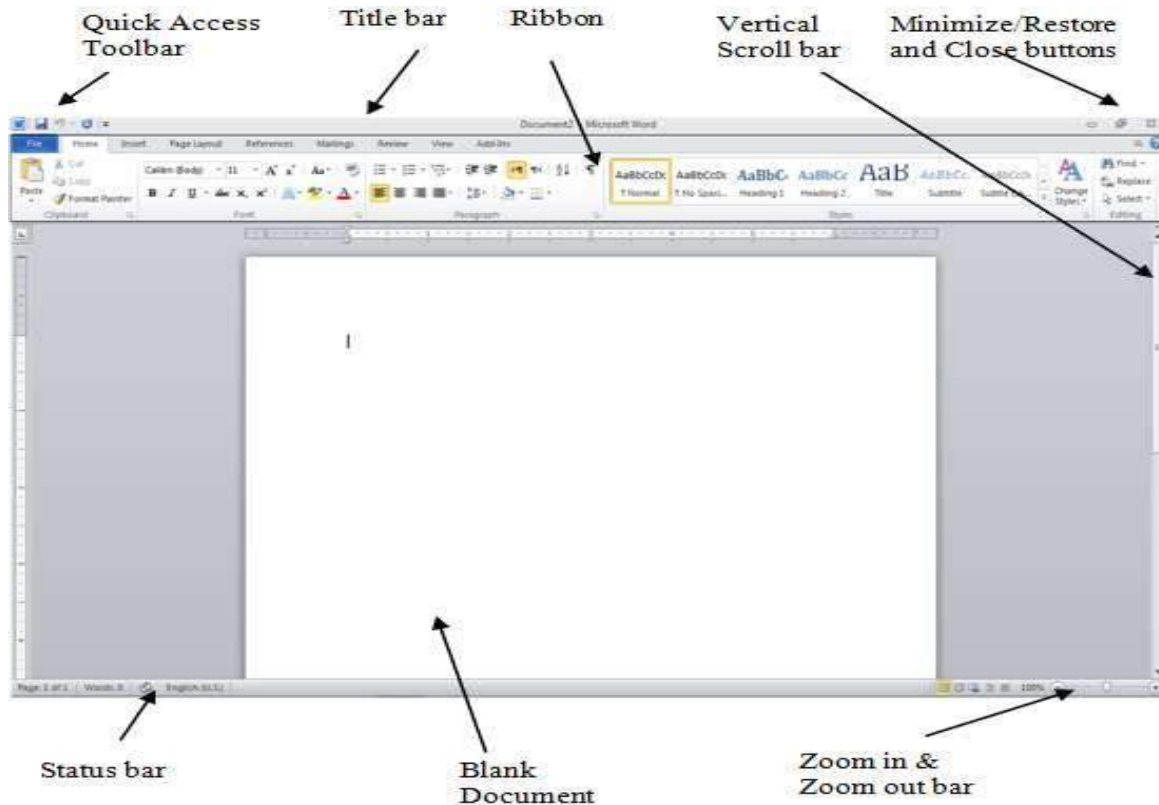
Fig.3-7 Word Window

Word Window

The main components of Word window consist of Quick Access Toolbar, Ribbon, Horizontal / Vertical Scroll bars and Status bar as shown in Fig.3-7.

Quick Access Toolbar

Quick Access Toolbar is located at the top left corner of Word window. It provides easy access to commonly used **Save**, **Undo** and **Redo** commands. If the user clicks the down arrow at the right side, Word will display a list of commands that can be quickly added to or removed from the Quick Access Toolbar.

Ribbon

Ribbon is located below the title bar of the Word window. Ribbon consists of tabs, groups and commands as shown in Fig.3-8. It provides access to the commands that are performed while working on a document.

There are nine types of tabs in the ribbon which are File, Home, Insert, Page Layout, References, Mailings, Review, View and Add-Ins. Home tab is the most commonly used tab. To display any of these tabs just click on it.
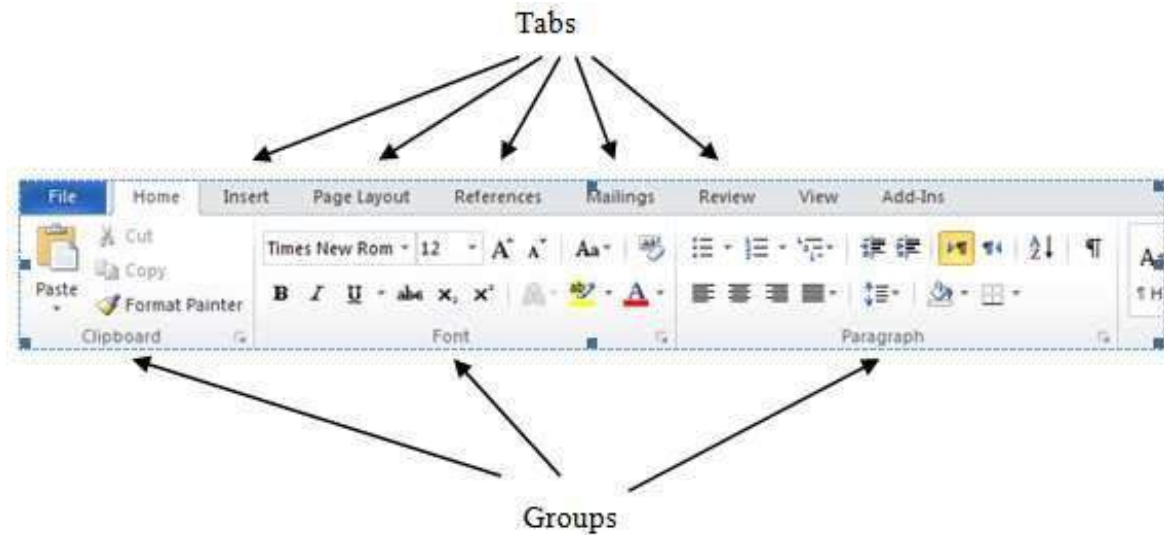
Fig.3-8 Ribbon

Horizontal and Vertical Scroll Bars

Vertical scroll bar is located at the right edge of the document window. It is used to scroll down or up the document that is too large to fit in the document window. Horizontal scroll bar appears automatically at the bottom of the document window if a document is too wide to fit in the document window.

Status Bar

Status bar is located at the bottom of the document window above the Windows task bar, It presents information about the document such as current page, total number of pages in the document, number of words in the document, etc. It also provides controls for viewing the document in different layouts. The right edge of status bar presents zoom in and zoom out bar. Zoom in is used to get close-up view of document and zoom out is used to view more of the page at a reduced size.
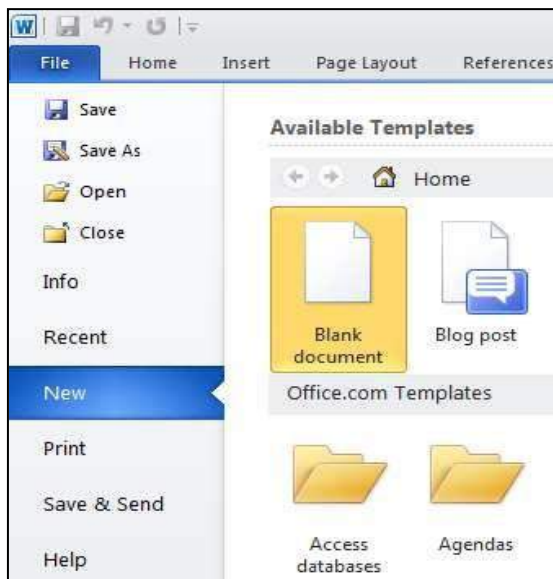
Fig.3-9 File tab

3.1.2 MANAGING A DOCUMENT

Creating a New Document

The following are the steps to create a new document.

1. Click the **File** tab.
2. Click **New** in the pull-down menu as shown in Fig.3-9.
3. Select **Blank document** which is below **Available Templates**. User can also start a new document by selecting a template.
4. Click **Create**. A new blank document will appear

Another way to start a new blank document is press Ctrl+N on the keyboard. Ctrl+N means keep pressing the Ctrl key while pressing the N key.

Opening a Document

1. Click the **File** tab
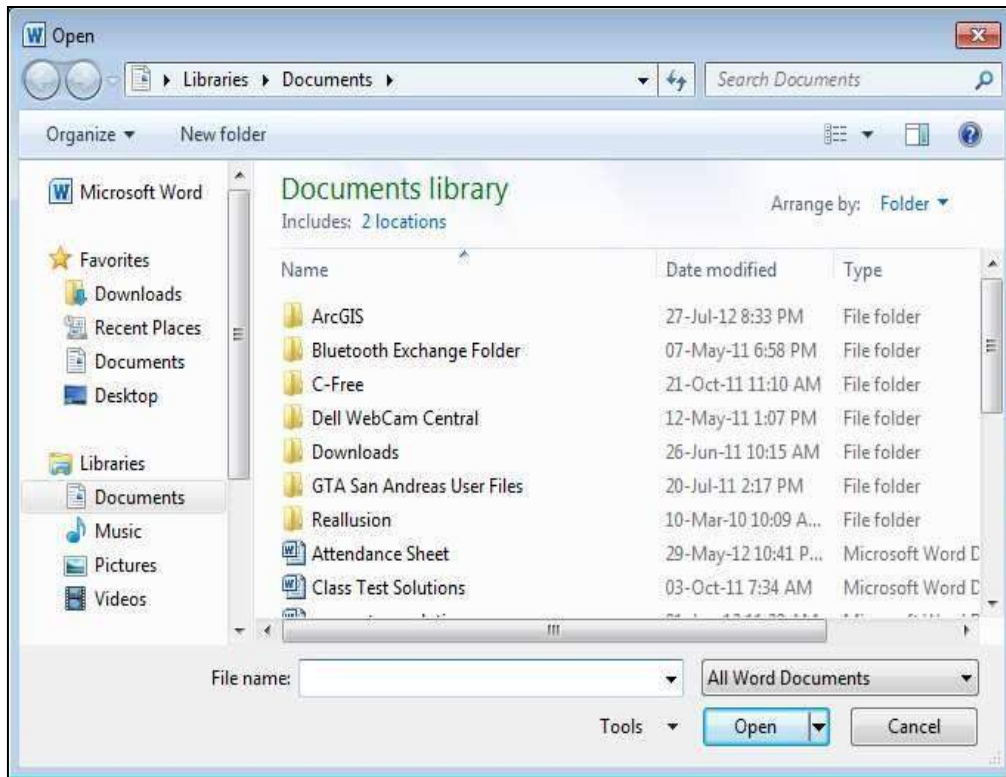
Fig.3-10 Open dialog box

2. Click **Open**. The Open dialog box as shown in Fig.3-10 will appear.
3. Select the document and click **Open**.

If the user has recently opened the document that he wants to open then he can follow the steps given below.

1. Click **File** tab.
2. Click **Recent**.
3. Select the document from the **Recent Document list**.

Saving a Document

1. Click **File** tab.

2. Click **Save** or **Save As**.

3. Select the folder where the document is to be saved as shown in Fig.3-11.

4. Give a file name to your document.
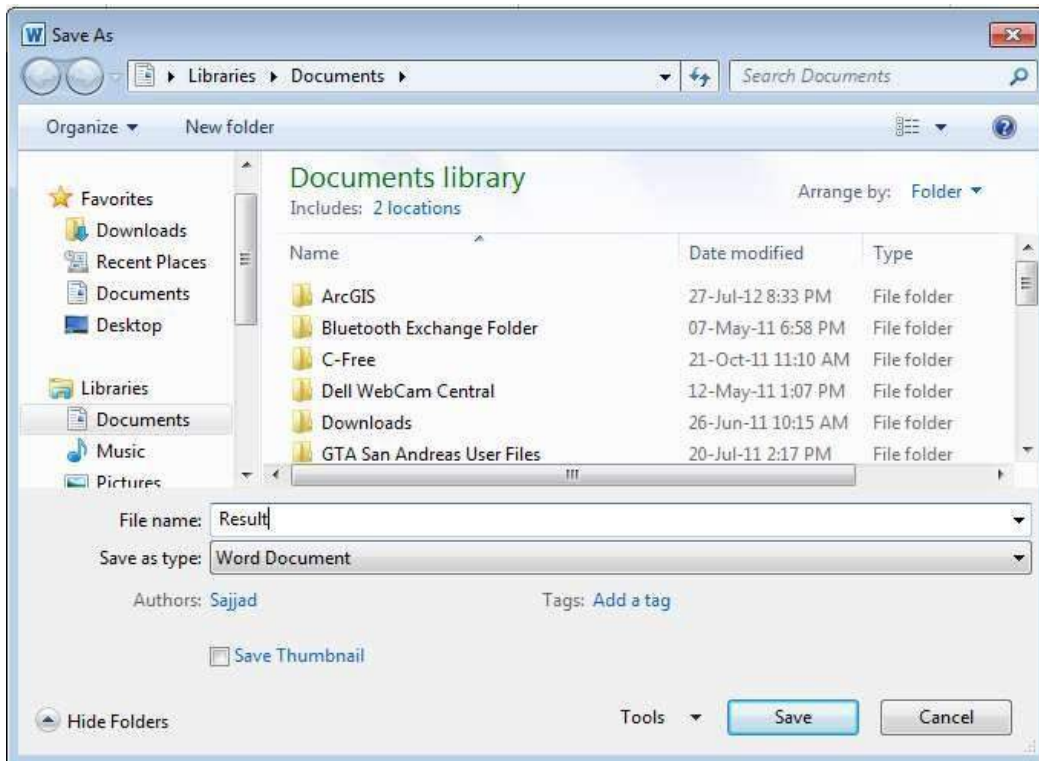
Fig.3-11 Save As dialog box

5. Click **Save**.
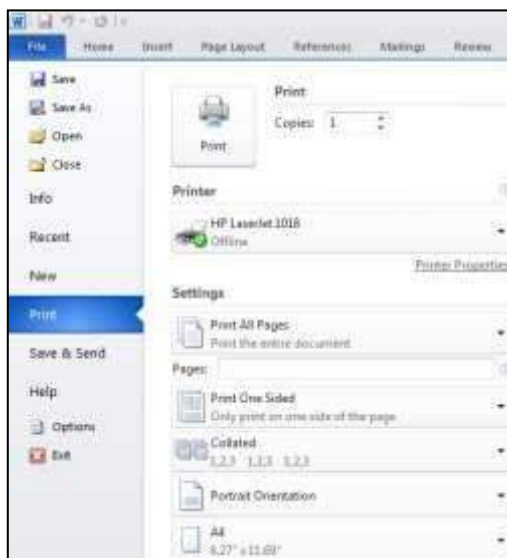
Save icon

Fig.3-12 printing a document

Save As option is used when changes have been made in an existing file and the user wants to save the new version of the document with a different file name.

Another way to save a document is, click the **Save** icon on the Quick Access Toolbar and give the new document a file name.

Printing a Document

The following are the steps to print a document.

1. Click the **File** tab.

2. Select **Print**.

3. Change the print settings shown in Fig.3-12 if required and click **Print**.

3.1.3 INSERTING AND EDITING TEXT

To insert text in a document, type it using the keyboard. The text will appear at the insertion point. When typing a paragraph, there is no need to press the Enter key at the end of the line. When the user reaches the right margin, Word will automatically position the insertion point at the beginning of the next line. The user should only press the Enter key when he wants to end a line of text, start a new paragraph or insert a blank line. Shortcut keys for cursor movement are shown in Table 3-13.

Cursor Movement	Shortcut Key
Beginning of the line	Home
End of line	End
Top of the document	Ctrl + Home
End of document	Ctrl + End

Table 3-13 Shortcut keys for cursor movement

Selecting Text

To move or copy words, sentences or paragraphs to another location in the document, first select the text and then use cut-and-paste or copy-and-paste technique. Commands shown in Table 3-14 are used for selecting various items in a document with mouse.

Tip: To search text in a document, press Ctrl+F, type the search text in the box and press Enter.

Item to Select	Mouse Command
Characters	Drag through characters
Single word	Double-click the word
Words	Drag through words
Sentence	Press and hold down Ctrl key and click anywhere in the sentence
Line	Move the mouse pointer to the left of the line until it changes to a right-pointing arrow and then single click
Paragraph	Move the mouse pointer to the left of the paragraph until it changes to a right-pointing arrow and then Double-click
Entire document	Move the mouse pointer to the left of the document until it changes to a right-pointing arrow and then triple-click
Block of text	Click at the beginning of the text to be selected. Move the mouse pointer to the end of the selection and hold down Shift key and then click or drag through the text.
Graphic	Click the graphic

Table 3-14 Mouse commands for selecting items

Copying and Moving Text

The following are the steps to copy or move the first two sentences of the paragraph shown in Fig.3-15.
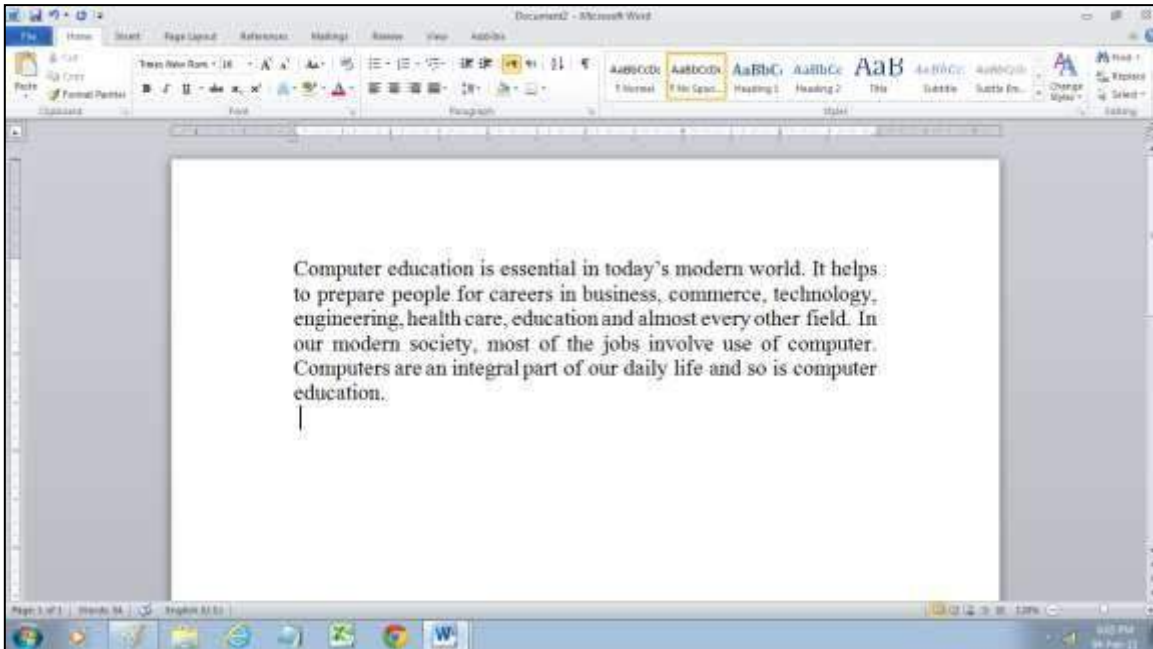
Fig.3-15 Paragraph in Word window

1. Select the text that is to be copied or moved as shown in Fig.3-16
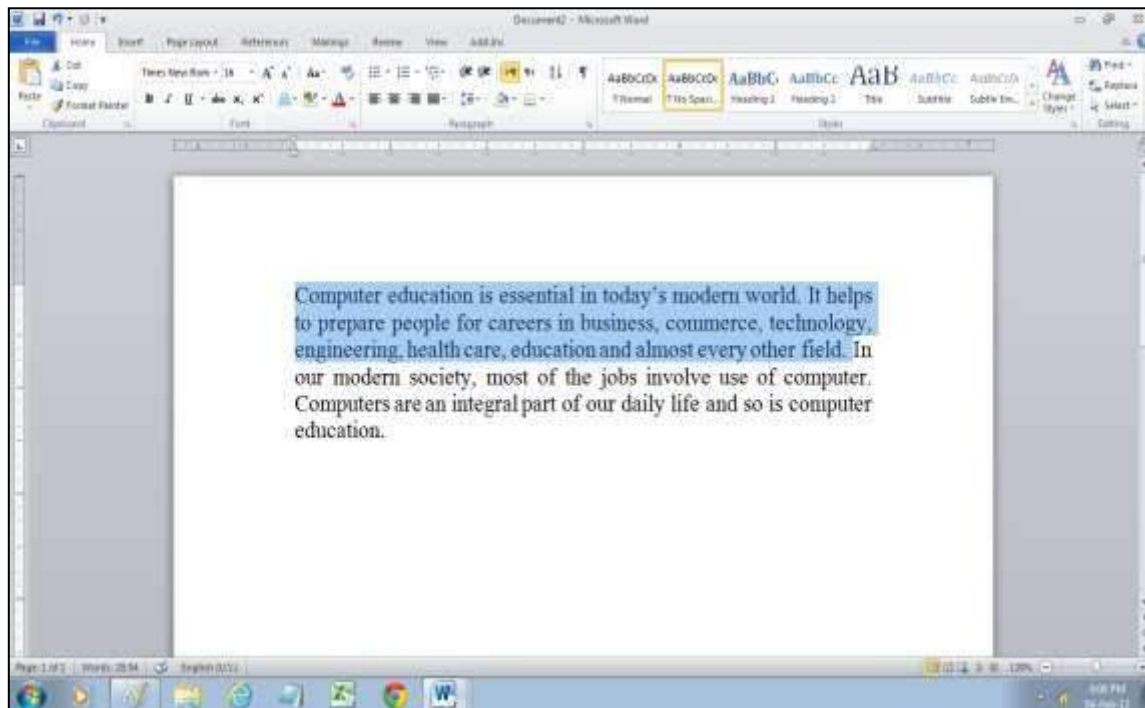
Fig.3-16 Text selected for copying

2. Click **Copy** or **Cut** in the **Clipboard** group of **Home** tab as shown above.

3. Position the mouse pointer at the location where you want to copy or move the text.

4. Click **Paste** in the **Clipboard** group. Copied text is shown in Fig.3-17.
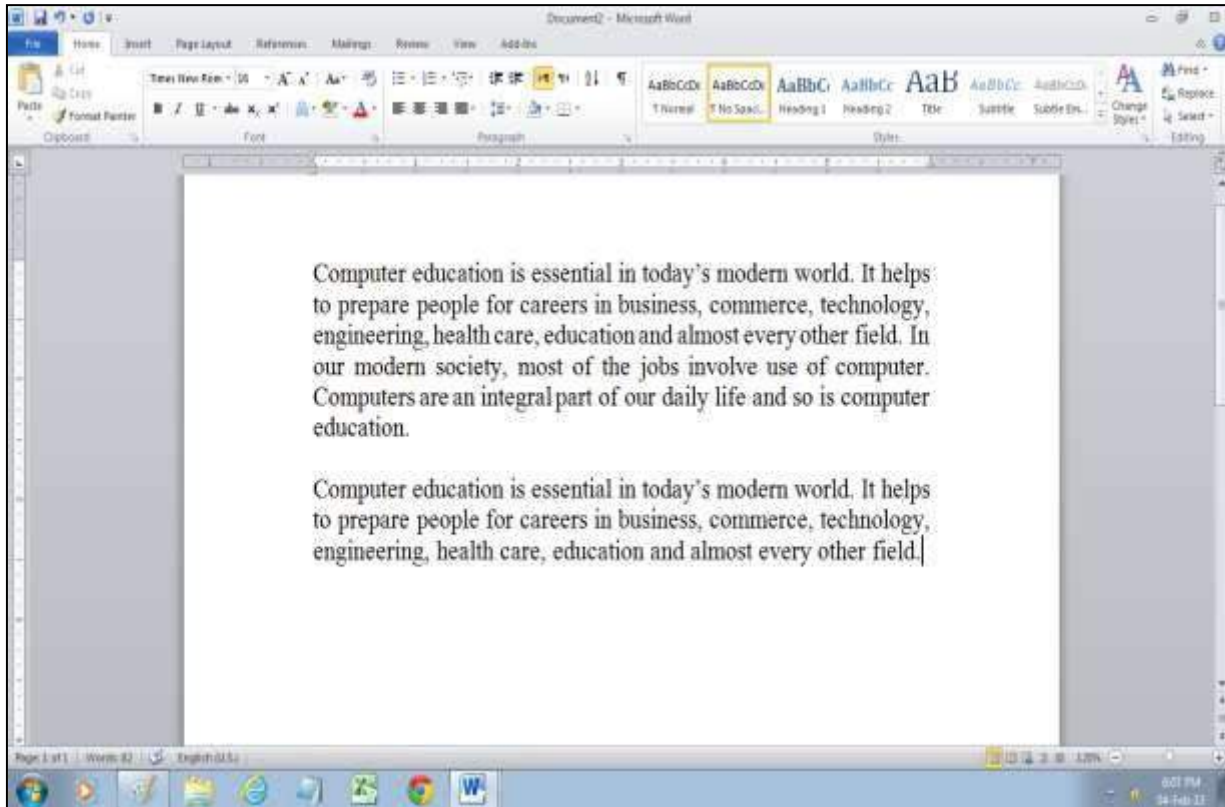
Fig.3-17 Text copied at the end of paragraph after leaving one blank line

There is another method for copying and moving text using shortcut keys. The steps for this are given below.

1. Select the text.
2. Press **Ctrl+C** for copying or **Ctrl+X** for moving text.
3. Position the mouse pointer to the location where you want to copy or move the text.
4. Press **Ctrl+V** for pasting the text.

There is also a third method for copying and moving text. The following are the steps for this method.

1. Select the text as shown in Fig.3-18.
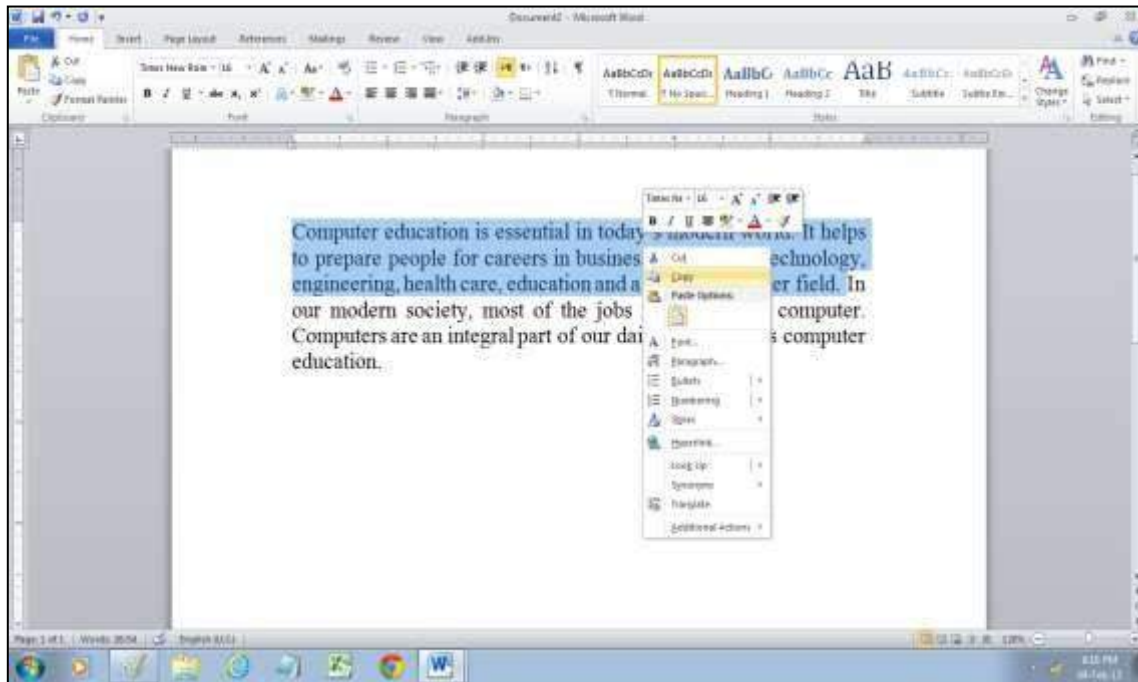
Fig.3-18 Shortcut menu for copying or moving text

2. Right click anywhere inside the selected text to display the shortcut menu.
3. Click **Copy** or **Move** in the shortcut menu as shown in Fig.3-19
4. Move the mouse pointer where you want to copy or move the text.
5. Right click and then click **Paste** in the shortcut menu.

Deleting Text

To delete text, select the text using any of the methods described earlier and then press **Delete** key.

3.1.5 MINIMIZE/MAXIMIZE RIBBON

Arrow to Minimize/Maximize Ribbon
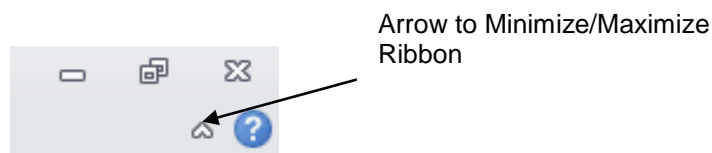
Fig.3-19 Minimizing or maximizing Ribbon

To minimize the Ribbon for more screen space, click the arrow in the upper-right corner of the Ribbon as shown in Fig.3-19. When Ribbon is minimized, click on a tab to display it. The Ribbon will disappear again when it is not in use. To maximize the Ribbon, click the arrow again.

3.1.6 INSERTING SYMBOLS

The following are the steps to insert symbols or special characters in documents.
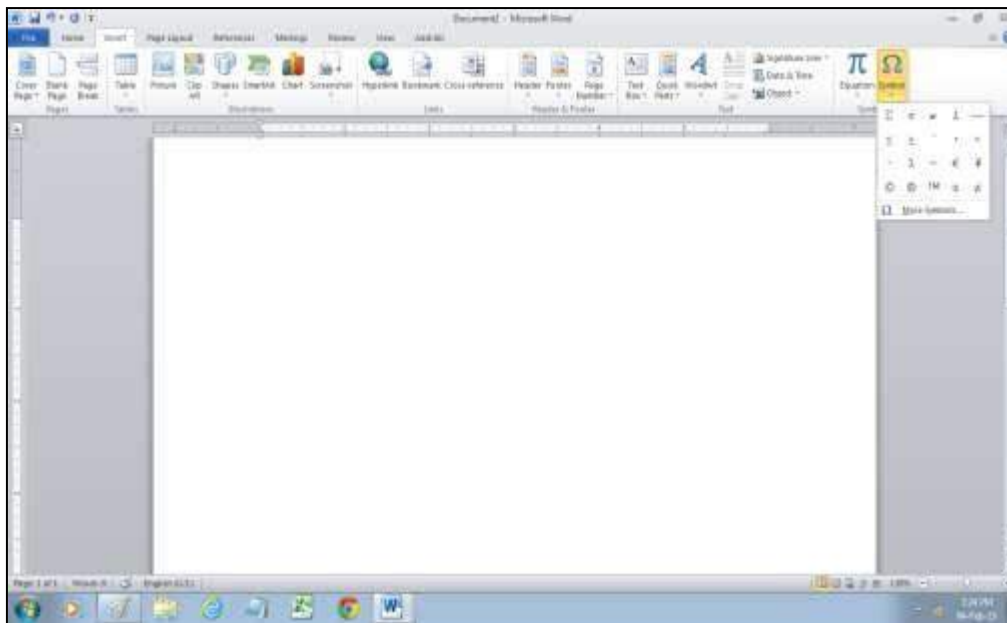
Fig.3-20 Inserting symbols in document

1. Click **Insert** tab.
2. Click **Symbol** which is at the right end of ribbon. A group of symbols will be displayed as shown in Fig.3-20.
3. Click the symbol that is to be inserted in document. The symbols will be inserted in the document as shown in Fig.3-21.
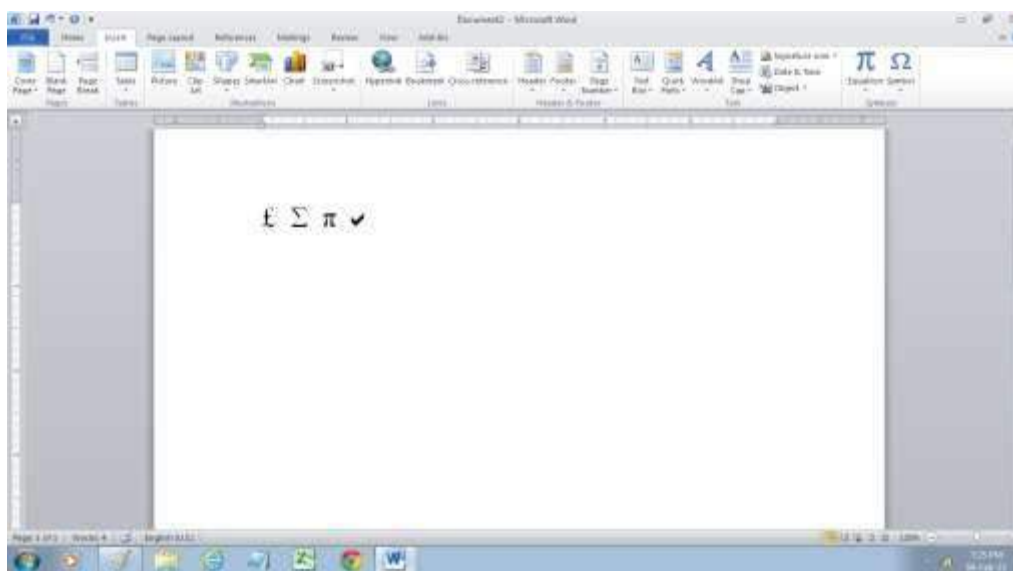
Fig.3-21 Symbols inserted in document
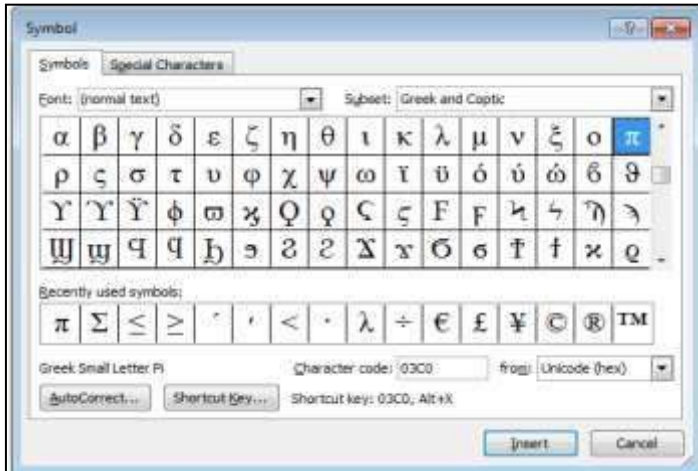
Fig.3-22 Symbol dialog box

To display more symbols, click **More Symbols** in the S**ymbol** menu. A new dialog box will open with two tabs, **Symbols** and **Special Characters** as shown in Fig.3-22. Now, select the symbol and click the **Insert** button.

3.1.7 INSERTING EQUATION

Word allows user to insert common mathematical equations or build up his own equations using a library of symbols.

The following are the steps to insert built-In equation.

1.   Click **Insert** tab.

2.   Click **Equation** button on the Symbols group.

3.   Select the type of equation you want to insert as shown in Fig.3-23.

To following steps allow the user to insert his/her own equation.

1.   Click **Insert** tab.

2.   Click **π** button on the **Symbols** group. This will open the **Design** tab shown in Fig.3-24 that allows inserting common mathematical equations or build equation using a library of math symbols.

Built-In

Area of Circle

$$A = \pi r^2$$

Binomial Theorem

$$(x+a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}$$

Expansion of a Sum

$$(1+x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \cdots$$

Fourier Series

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L} \right)$$

π   Insert New Equation

π   Save Selection to Equation Gallery...

Fig.3-23 Inserting equation
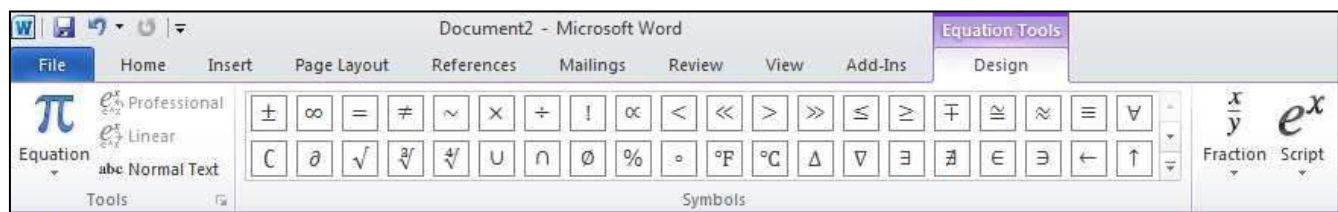
Fig.3-24 Design tab for inserting equation

3.1.8 FORMATTING TEXT, PARAGRAPH AND PAGE

Formatting Text

Formatting text means changing the font type, size, style, color and effects of text.

Changing the Font Type and Size of Text

Open the **Home** tab and click the arrow on the right side of the currently selected font type as shown in Fig.3-25 and choose another font type. To change the font size, click the arrow on the right side of the font size and select a font size from the drop-down list or

Font type   Font size

Fig.3-25 Changing font type and font size

type a new font size. To change the font type or size of existing text, select the text and then make the changes.

Changing Font Styles and Effects

The following are the steps for changing font styles and effects.

1. Click the **Home** tab.

2. Click the dialog box launcher on the lower-right corner of the **Font** group. This will open the **Font** dialog box shown in Fig.3-21. Now, the user can change font styles and effects of text.

Some changes that are available in the **Font** dialog box can be made directly from the **Font** group in **Home** tab.

The following are the steps to clear the text formatting.

1. Select the text you want to clear the formatting.

2. Click the **Home** tab.

3. Open the **Styles** dialog box and select **Clear all** as shown in Fig.3-26.
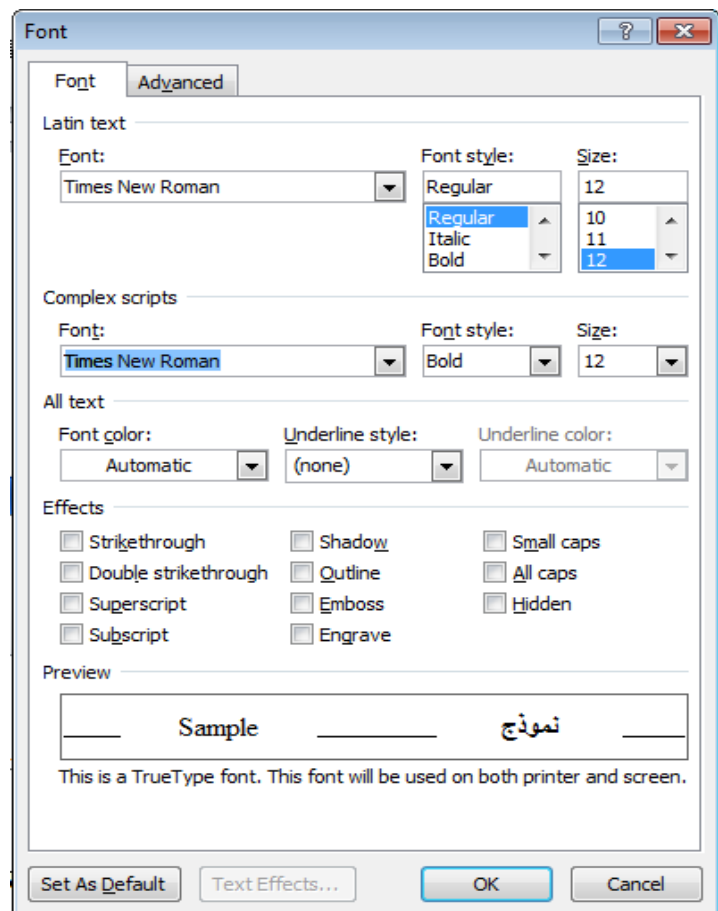
Fig.3-26 Font dialog box
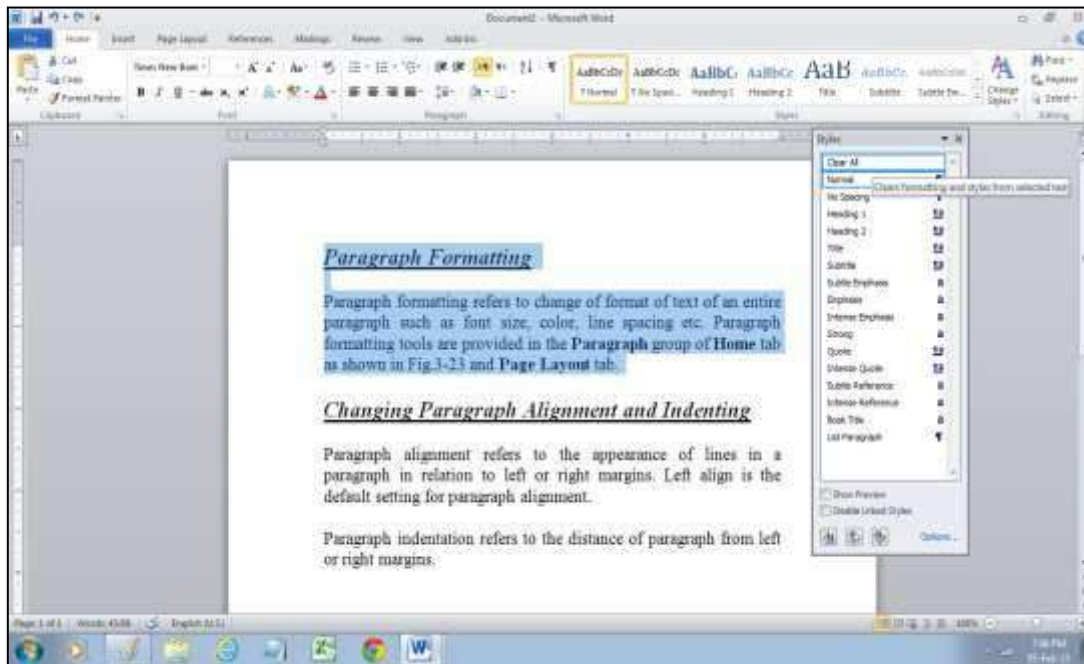
Fig.3-27 Style dialog box

Paragraph Formatting

Paragraph formatting refers to change of format of text of paragraph such as font size, color, line spacing, alignment etc. Paragraph formatting tools are provided in the **Paragraph** group of **Home** tab as shown in Fig.3-27 and **Page Layout** tab.

- **Changing Paragraph Alignment and Indenting**
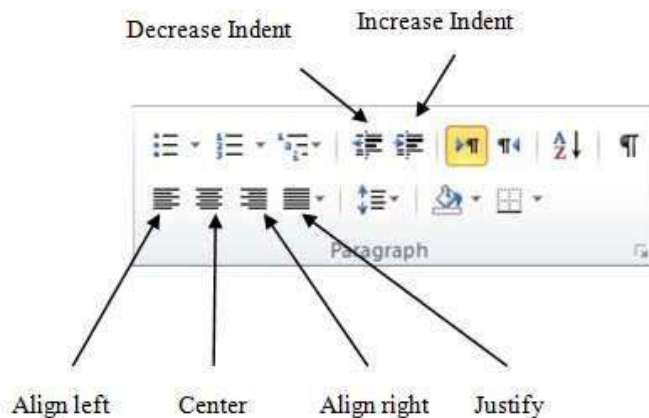
Fig.3-28 Paragraph alignment and indenting

Paragraph alignment refers to the appearance of lines in a paragraph in relation to left or right margins. Left align is the default setting for paragraph alignment.

Paragraph indentation refers to the distance of paragraph from left margin.

Select the paragraph to change the alignment and then select an alignment from the **Paragraph** group on **Home** tab as shown in Fig.3-28.

Align left: It will align the text to the left margin.

Center: It will center the text within the left and right margins.

Align right: It will align the text to the right margin.

Justify: It will align the text both to the right and left margins.

To increase paragraph indent, click the **Increase Indent** button shown in Fig.3-23, in the **Paragraph** group on **Home** tab. To decrease the paragraph indent, click the **Decrease Indent** button. Increasing indentation will move the paragraph to the right side by one tab position. Decreasing indentation will move the paragraph to the left side by one tab position.

- **Changing Spacing between Paragraphs and Lines**

The following are the steps for changing spacing between paragraphs and lines.

1. Select the paragraph or paragraphs.
2. Click **Home** tab.
3. Open the **Paragraph** dialog box shown in Fig.3-29 by clicking the small arrow at the bottom right corner of the **Paragraph** group.
4. Make the required changes.
5. Click **OK** to apply the changes.

Fig.3-29 Paragraph dialog box

Page Formatting

Page formatting refers to formatting that affects the entire page such as changing page orientation, margins, page numbering, header and footer, etc. Page formatting commands are included in the **Page Layout** tab on the **Ribbon**. These are in the **Themes**, **Page Setup** and **Page Background** groups as shown in Fig.3-30.

Commonly used page formatting commands include changing theme, margins, orientation, page size and background.

Fig.3-30 Page Layout tab

- **Document Theme**

Themes change the overall appearance of the entire document, including colors, fonts and effects.

The following are the steps to apply a theme.

1. Click the **Page Layout** tab.
2. Click the **Themes** button in the **Themes** group.
3. Select a theme to apply from the menu shown in Fig.3-31. If the user does not like the selected theme, he can select another one. To remove a theme from the document select Office theme.

- **Page Margins**

Page Margins refer to the amount of blank space that appears at the top, bottom, left and right edges of a document.

Fig.3-31 Applying a theme to a document

The following are the steps to set margins.

1. Click the **Page Layout** tab.
2. Click **Margins** button.
3. Select margins from the menu that appears as shown in Fig.3-32.
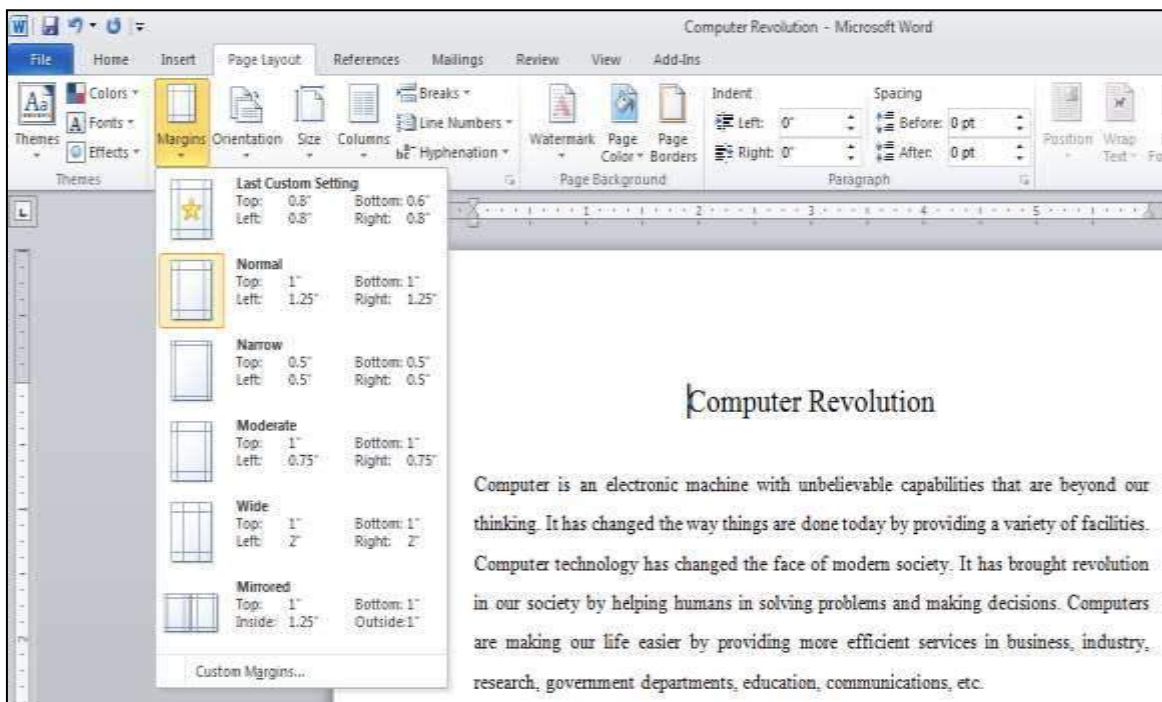
Fig.3-32 Setting page margins

- **Page Orientation**

Page orientation refers to the way rectangular page is oriented for viewing. There are two types of page orientations which are portrait and landscape. In portrait orientation, the height of display is greater than width. In landscape orientation, the width of display is greater than height.

The following are the steps to apply a page orientation.

Fig.3-33 Applying page orientation

1. Click **Page Layout** tab.
2. Click **Orientation** button in the **Page Setup** group.
3. Select **Portrait** or **Landscape** orientation as shown in Fig.3-33

- **Page Size**

Page size refers to the height and width of page.

The following are the steps to set page size.

1. Click **Page Layout** tab.
2. Click **Size** button in the **Page Setup** group.
3. Select a page size from the menu shown in Fig.3-34.

- **Page Background**

The **Background** group has three items to set for the document
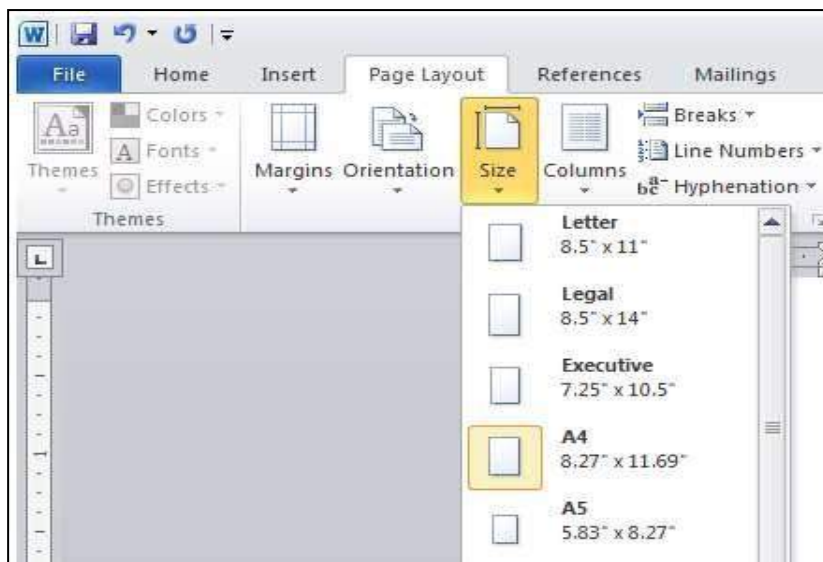
Fig.3-34 Selecting a page size

which include **Watermark**, **Page Color** and **Page Borders**. **Watermark** inserts dim text behind the content of the page. **Page Color** sets the page background color and **Page Borders** option inserts or changes the border around the page.

The following are the steps to set watermark

1. Click **Page Layout** tab.
2. Click **Watermark** command in the **Page Background** group.

3. Click **Custom Watermark** from the menu shown in Fig.3-35. User can also select a watermark that is displayed in the menu if it fulfills the requirement.
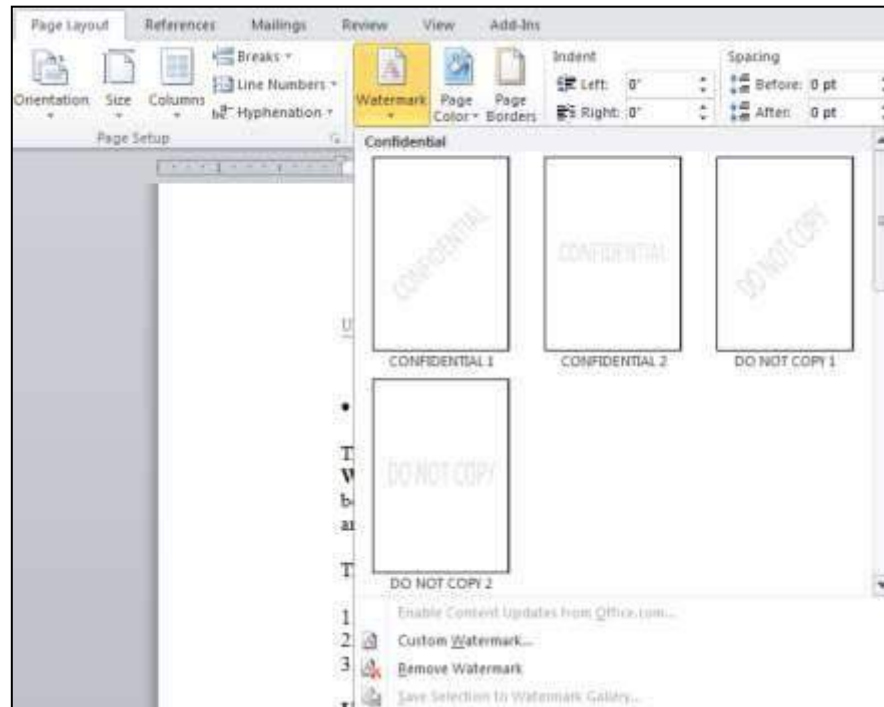
Fig.3-35 Creating a watermark

4. Type the text for watermark as shown in Fig.3-36
5. Click **Apply** and then click **Close** to close the dialog box.
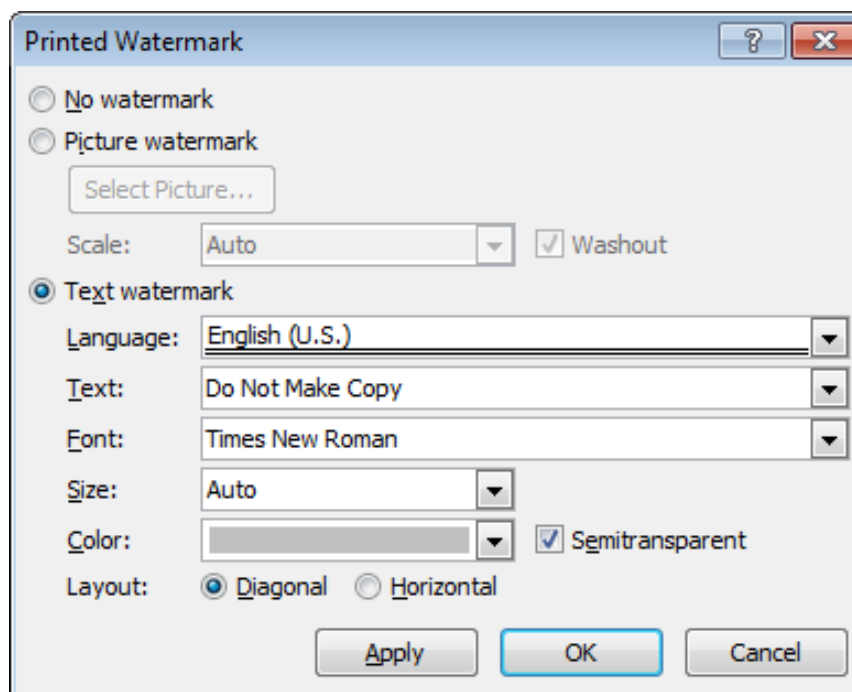
Fig.3-36 Dialog box to create watermark

The following are the steps to set page color.

1. Click **Page Layout** tab.

2. Click the **Page Color** command.

3. Select a page color from the menu shown in Fig.3-37

    The following are the steps to set page border.

1. Click **Page Layout** tab.

2. Click the **Page Borders** command in **Page Background** group.

3. Select a page border style from the **Borders and Shading** dialog box shown in Fig.3-38

Fig.3-37 Setting a page color

3.1.9 INSERTING PAGE BREAKS AND SECTION BREAKS

A page break is a marker that tells Word program that the contents which follow are to appear on a new page. Word automatically inserts a page break when the user reaches the end of a page. Page break is inserted in document when user wants to add a new page to the document.

A section break also inserts a new page but it allows the user to change the page format without having any effect on the formatting of

Fig.3-38 Selecting a page border style

the previous pages. For example, section break can be used to break a document into sections having different header and footer for each chapter of a book.

The following are the steps for inserting page break and section break.

1. Click the **Page Layout** tab.

2. Click the **Breaks** icon to open the drop-down menu shown in Fig.3-39.

3. To insert a page break click the first option under the **Page Breaks** heading and to insert a section break click the first option under the **Section Breaks** heading.

Fig.3-39 Breaks drop-down menu

3.1.10 INSERTING HEADER, FOOTER AND PAGE NUMBER

Header refers to information that appears at the top of a page and footer refers to information that appears at the bottom of a page. The type of information that may appear in the header or footer includes book title,

document title, chapter number and title, page number, company name, etc.

The following are the steps for inserting header or footer.

1. Click the **Insert** tab.
2. Click the **Header** or **Footer** in the **Header & Footer** group shown above to open the drop-down menu.
3. Select a predesigned header or footer from the drop-down menu shown in Fig.3-40. Header or footer will appear in the document and the **Design** tab will appear in the **Ribbon** as shown in Fig.3-41.
4. Type the information in the header or footer.
5. After entering the information, click **Close Header and Footer** in the **Design** tab.

Fig.3-40 Inserting a header

To edit the information in the header or footer Double-click anywhere on the header or footer and make the changes.
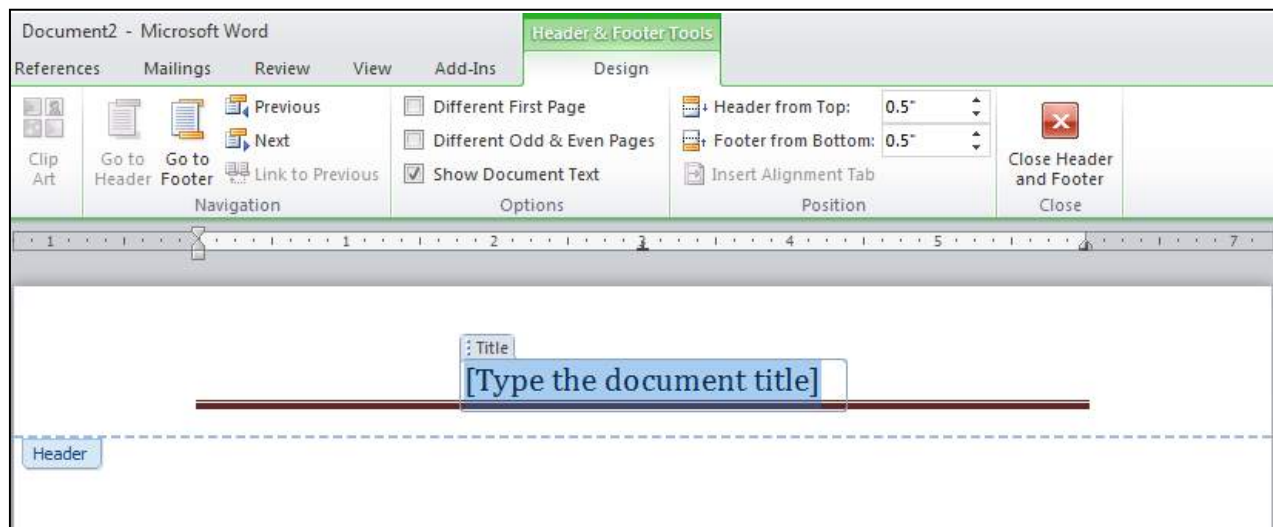
Fig.3-41 Entering information in header

Inserting Page Numbers

The following are the steps for inserting page numbers in documents.

1. Click the **Insert** tab.

2. Click **Page Number** in the **Header & Footer** group. A drop-down menu will appear.

3. Move the mouse pointer on **Top of Page** or **Bottom of Page** command. This will open a submenu as shown in Fig.3-42.

4. Select an option from the submenu. Page number will be inserted in the document and **Design** tab will appear on the **Ribbon**.

5. Set the value for Header from Top or Footer from Bottom in the **Position** group of **Design** tab if required.

Fig.3-42 Inserting page number at the bottom of page

6. Click the **Close Header and Footer** button on the **Design** tab.

3.1.11 INSERTING AND POSITIONING PICTURE

The following are the steps for inserting a picture in a document.

1. Place the cursor where to insert the picture.

2. Click **Insert** tab.

3. Click **Picture** command in **Illustrations** group. The **Insert Picture** dialog box will appear as shown in Fig.3-43.

4. Browse and select the picture file to insert and click **Insert** button.
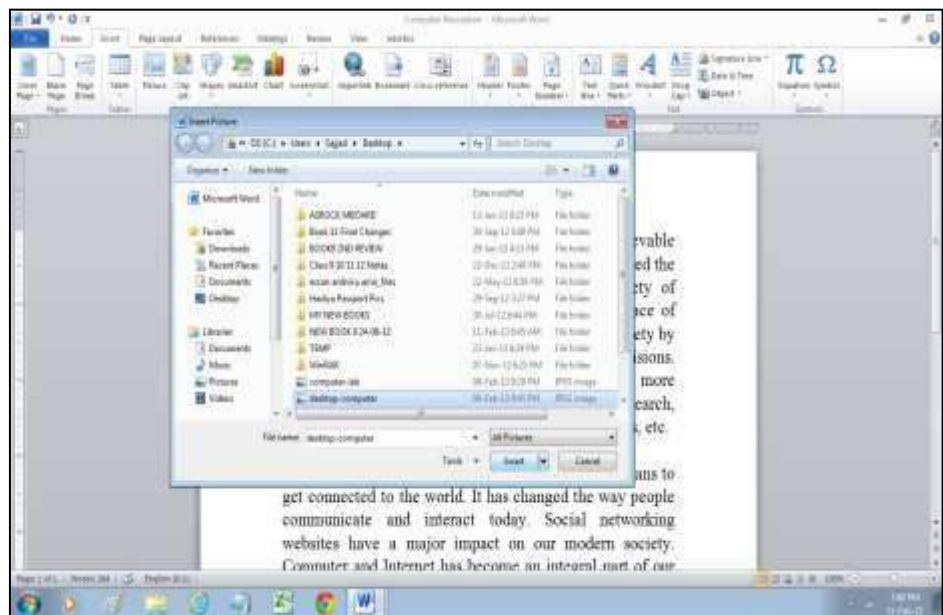
Fig.3-43 Insert Picture dialog box

Positioning Picture within a Page

The following are the steps for positioning picture on page.

1. Click the picture that is to be positioned. **Format** tab will appear on the screen.

2. Click **Position** command on the **Arrange** group.

3. Select a position from the menu. Top right corner is selected for positioning the picture in Fig.3-44.
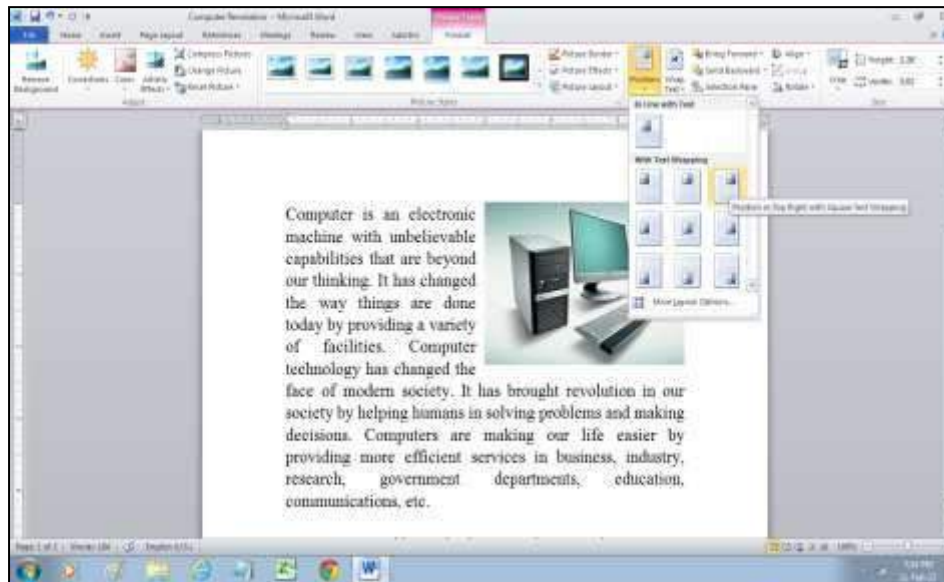
Fig.3-44 Positioning a picture within a page

4. Picture positioned at top right corner of page is shown in Fig.3-45.
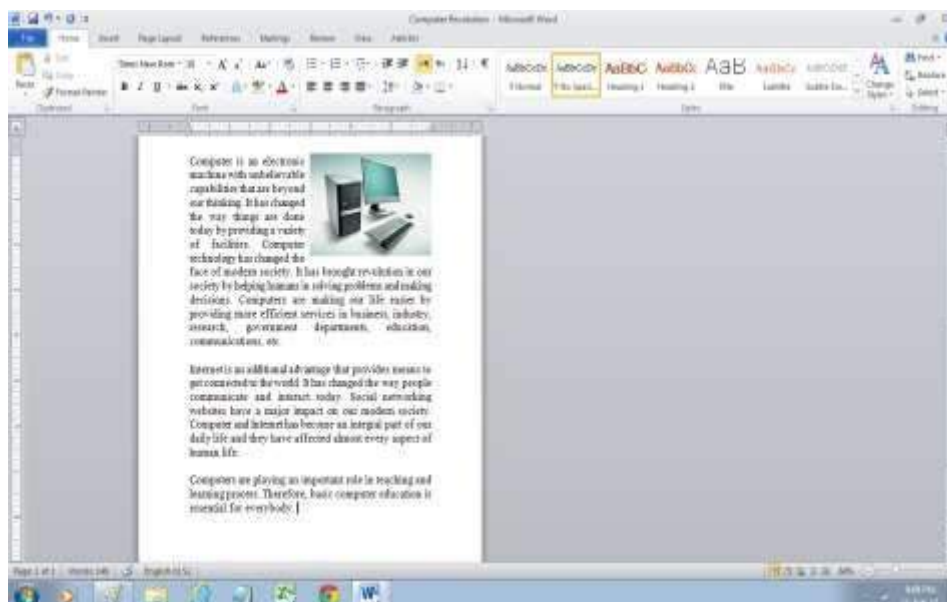
Fig.3-45 Picture positioned at top right corner of page

3.1.12 INSERTING WORDART

WordArt is a text modifying feature in Word to create decorative effects such as shadow, colors, outlines, 3D effects, changing shape of text, etc. as shown in Fig.3-46. It is also possible to convert existing text into WordArt.

Fig.3.46 Text created with WordArt

The following are the steps to insert WordArt in a document.

1. Click the **Insert** tab.
2. Click **WordArt** in the **Text** group.
3. Select character style from the drop-down menu shown in Fig.3-47. **Format** tab will appear on the Ribbon.
4. Type the text in the text box shown in Fig.3-48.
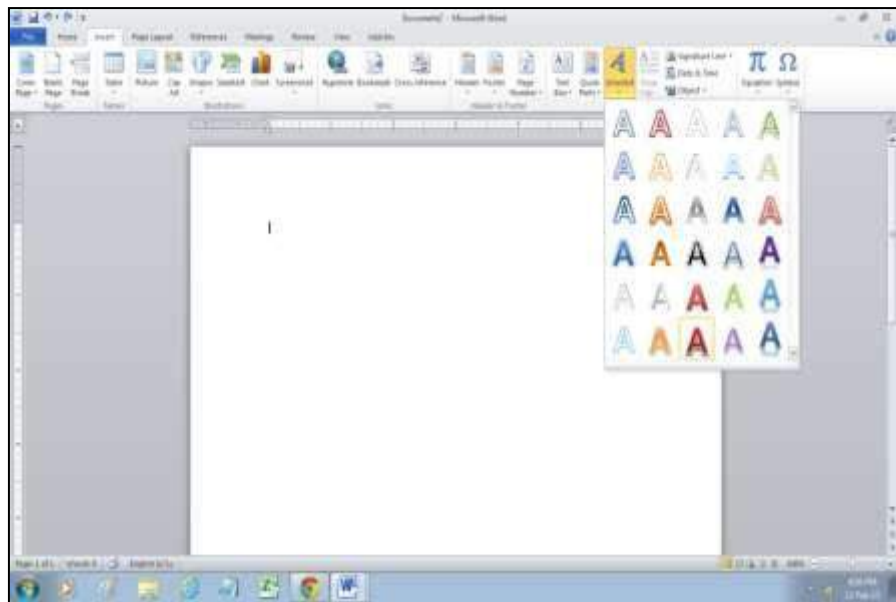
Fig.3-47 Inserting WordArt
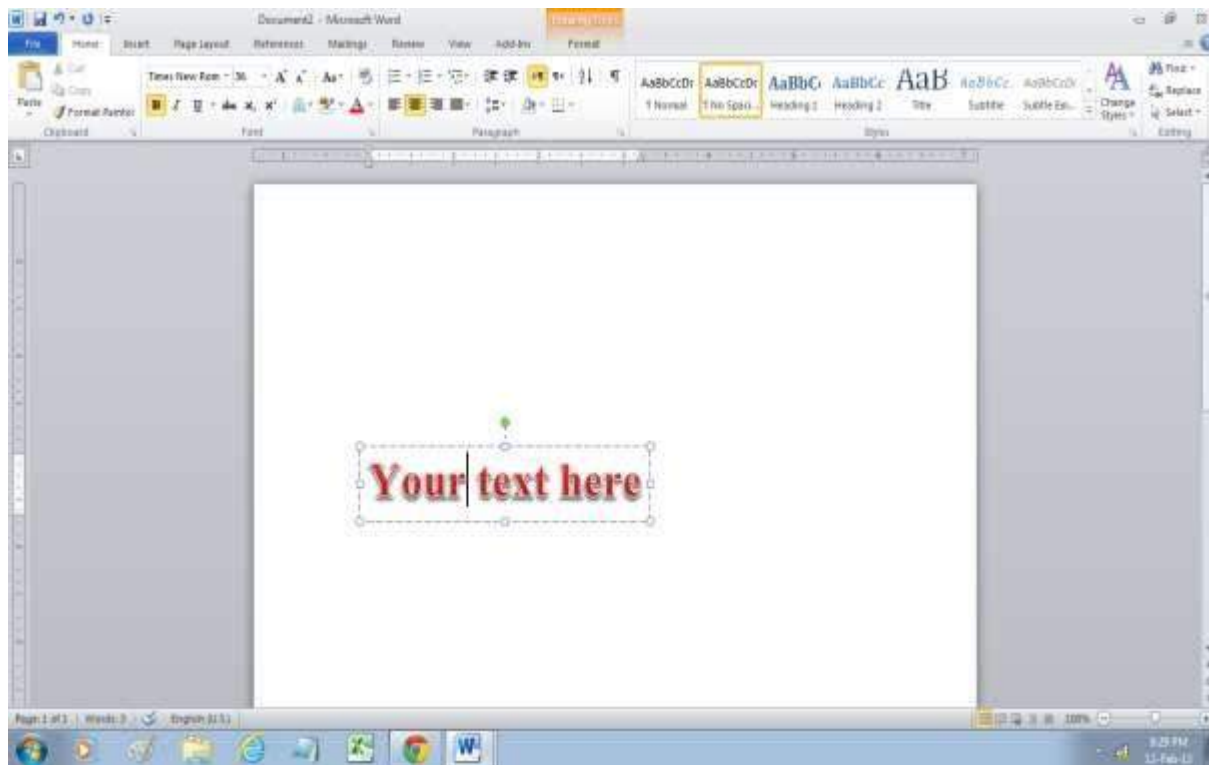
Fig.3-48 Entering text in WordArt

5. Click **Text Effects** command in the **WordArt Styles** group.
6. Move the mouse pointer over **Transform** and select a text effect from the submenu as shown in Fig.3-49.
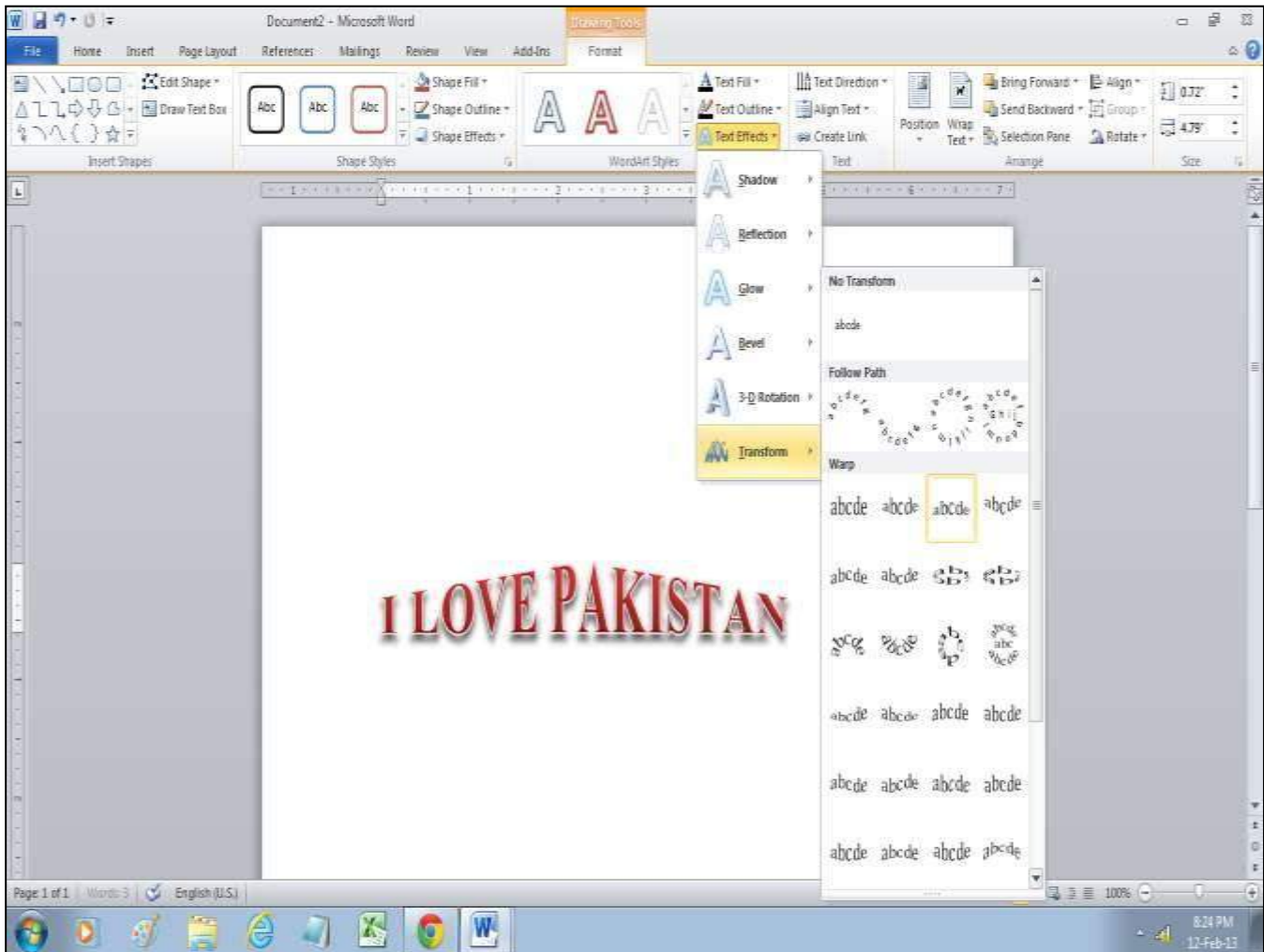
Fig.3-49 Applying text effect

3.1.13 CREATING AND FORMATTING TABLE

A table consists of rows and columns. The intersection of a row and a column is called a cell. Text is entered in the cells. Before inserting a table in a document, user should know the number of rows and columns required. This is called the dimension of the table. User can easily add more rows or columns as required. In table dimension, the first number is the number of columns and the second number is the number of rows. For example, a 5x4 (five by four) table means it has 5 columns and 4 rows.

Inserting Table in a Document

The following are the steps for inserting a 5x4 table.

1. Click **Insert** tab.

Tip: Another way to insert table is, click **Insert** tab, click Table and then select **Insert Table**. Specify the number of rows and columns in the dialog box and click OK.

2. Click **Table** command in the **Tables** group as shown in Fig.3-50.
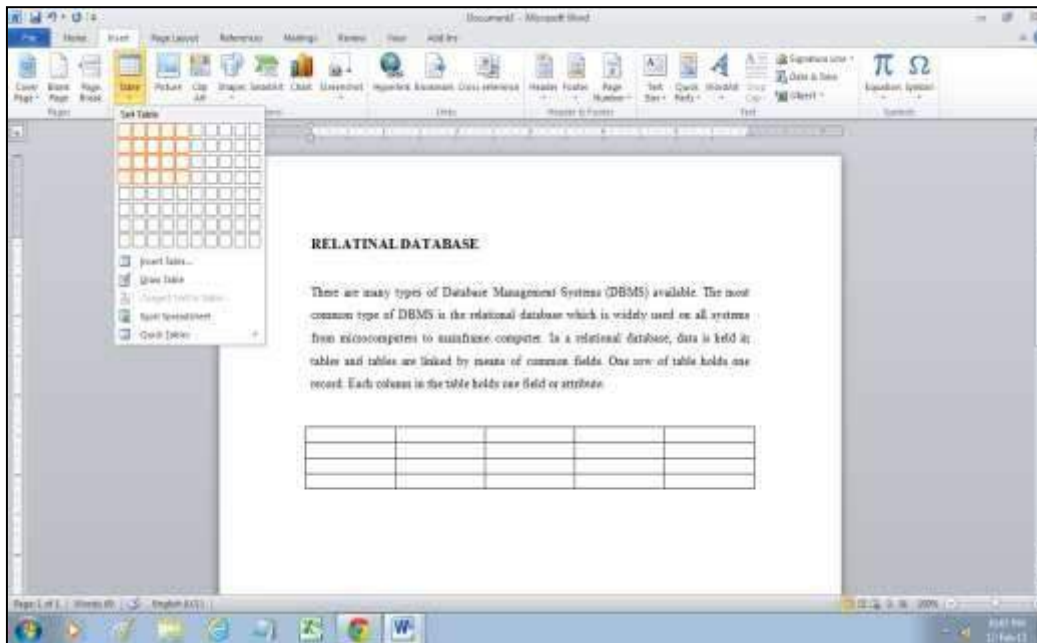
Fig.3-50 Inserting a 5x4 table in a document

3. Position the mouse pointer on the cell in the fourth row and fifth column and click. A blank table consisting of 4 rows and 5 columns will be inserted in the document.

4. Now, user can enter data in the cells.

A 5x4 table with data is shown in Fig.3-51.
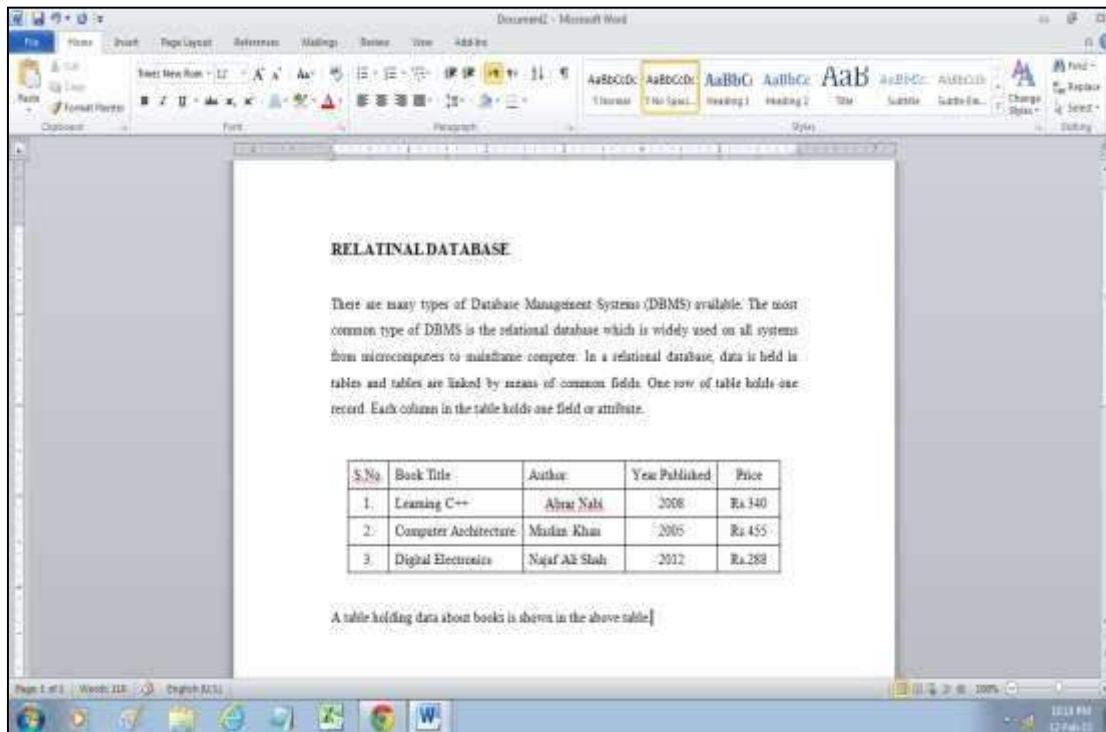
Fig.3-51 Data entered in a 5x4 table

Adding and Deleting Rows or Columns

The following are the steps for adding and deleting rows or columns.

1. To insert a row, click in the cell below or above which a blank row is to be inserted. To insert a column, click in the cell to the right or left of which a blank column is to be inserted. **Design** and **Layout** tabs will appear on the Ribbon.

2. Click the **Layout** tab.

3. Click the command in the **Rows & Columns** group shown in Fig.3-52 to insert a row or column. If you want to delete a row or column click the **Delete** command in the **Rows & Columns** group. Select the **Delete Rows** or **Delete Columns** from the drop-down menu. User can also delete the entire table by selecting **Delete Table**.

　　User can delete multiple rows or columns by selecting them by dragging and then clicking the **Delete** command.
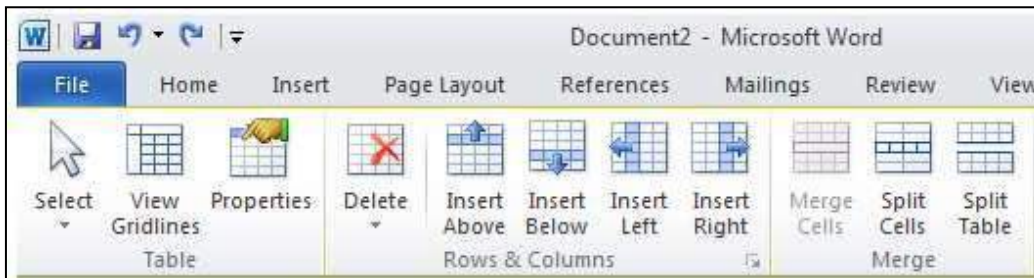
Fig.3-52 Adding or deleting rows and columns

Resizing Rows and Columns

Following are the steps for resizing row or columns.

1. Click in any cell of row or column to change the height or width.

2. Click **Layout** tab as shown in Fig.3-53.
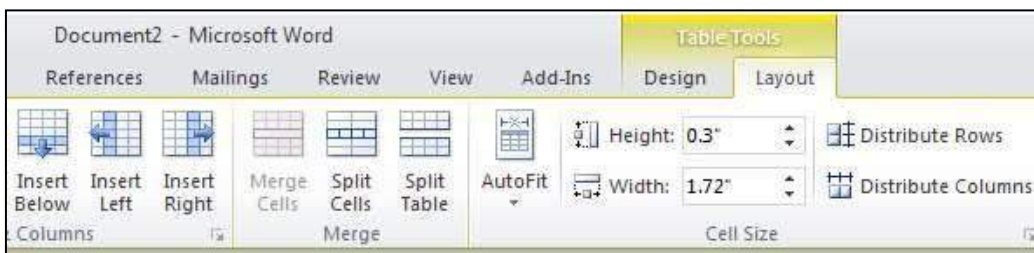
Fig.3-53 Resizing row and column size

3. Resize row height or column width in the **Cell Size** group.

　　To resize multiple rows or columns, first select multiple rows or columns. Last three rows of table are selected for resizing in Fig.3-54. Table after resizing the last three rows is shown in Fig.3-55.

Fig.3-54 Selection of multiple rows for resizing
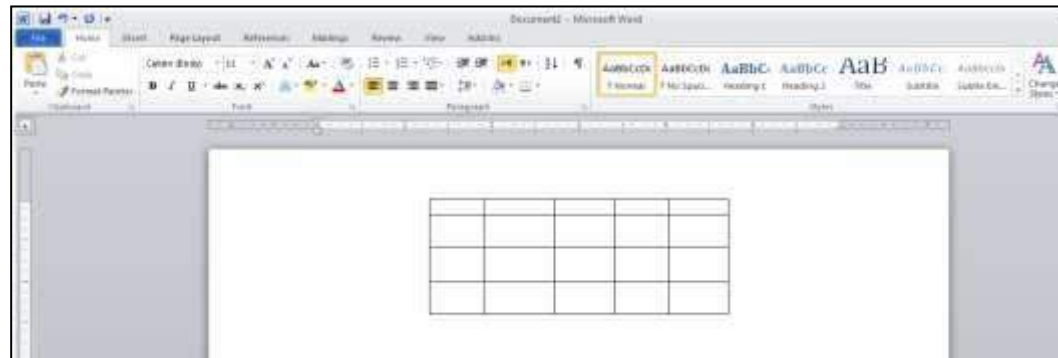
Fig.3-55 Table after resizing the last three rows

Adding or Changing Border Lines and Shading

The following are the steps for adding or changing border lines and shading.

1. Select the cells
2. Click the **Design** tab.
3. Open the **Border** drop-down menu in the **Table Styles** group and select a border as shown in Fig.3-56.
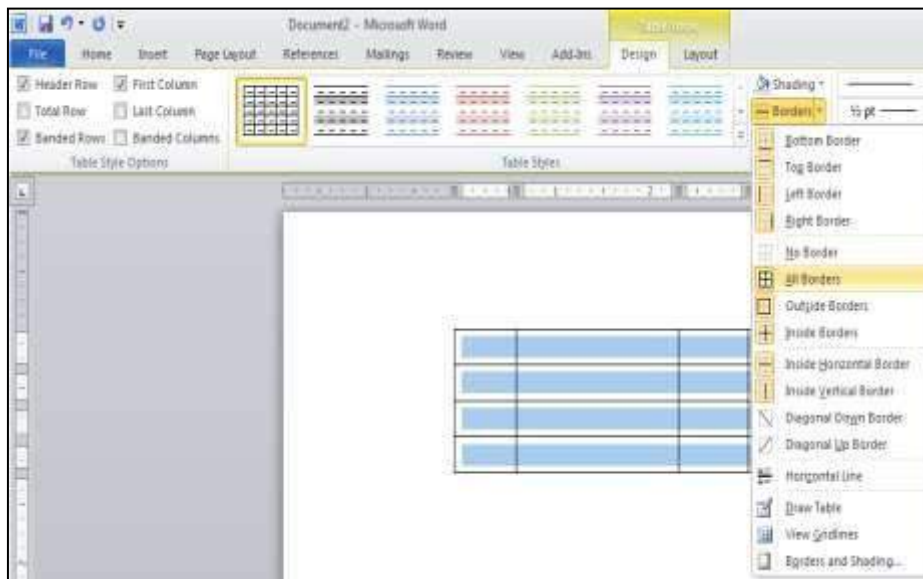
Fig.3-56 Changing border lines of a table

4. For shading, open the **Shading** drop-down menu in the **Table Styles** group and select a shading color as shown in Fig.3-57.
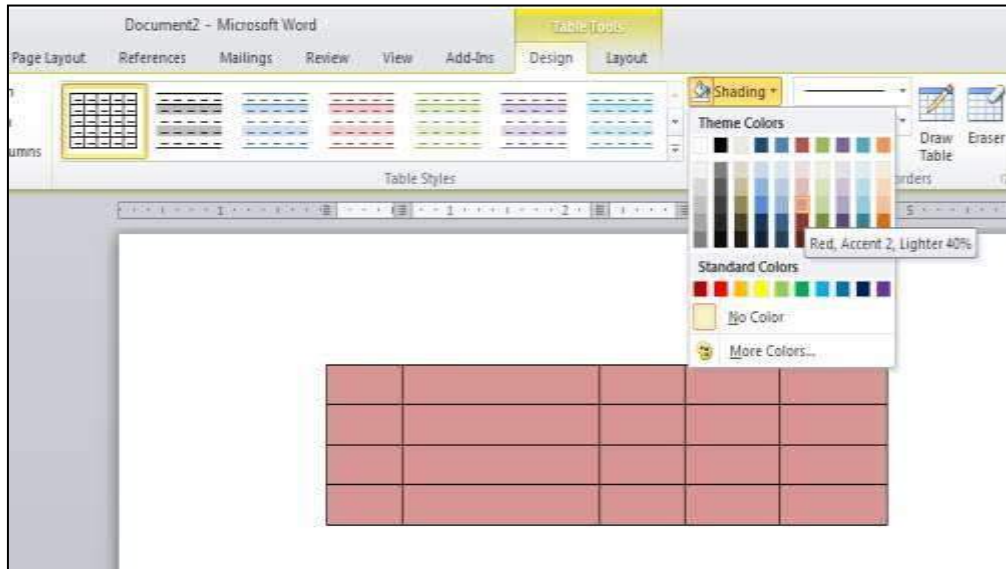
Fig.3-57 Selecting a shading color for a table

Merging and Splitting Cells

1. Select the cells for merging or splitting.
2. Click the **Layout** tab.
3. Click **Merge Cells** command in the **Merge** group as shown in Fig.3-58. Table after merging the selected cells is shown in Fig.3-59. For splitting cells, click the **Split Cells** command in the same group and enter required values in the **Split Cells** dialog box and click **OK**.
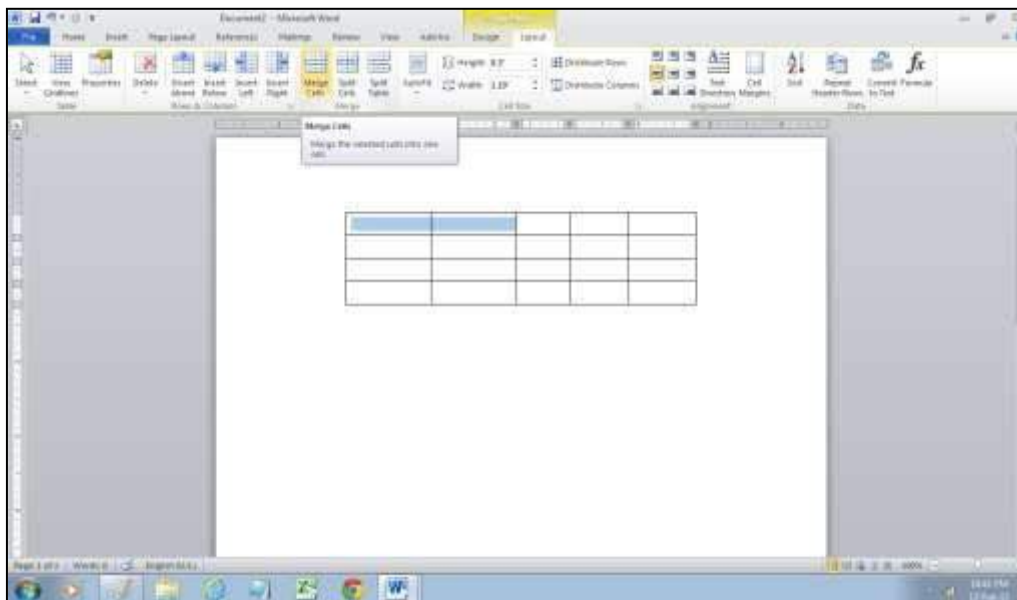
Fig.3-58 Selecting cells for merging
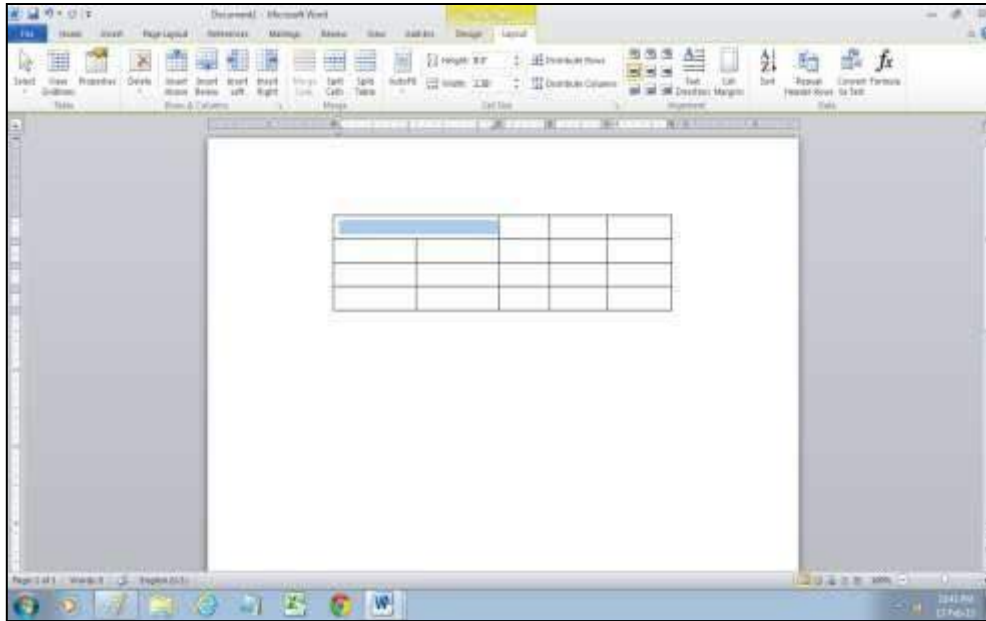
Fig.3.59 Table after merging two cells

3.1.14 CHANGING MARGINS

The following are the steps for changing margins.

1. Click **Page Layout** tab.
2. Click **Margins** in the **Page Setup** group.
3. Select margins from the drop-down menu as shown in Fig.3-60 or click **Custom Margins** and set the required margins in the **Margins** tab of **Page Setup** dialog box.
4. Click **OK**.

A page with **Normal** margins and **Narrow** margins is shown in Fig.3-61.
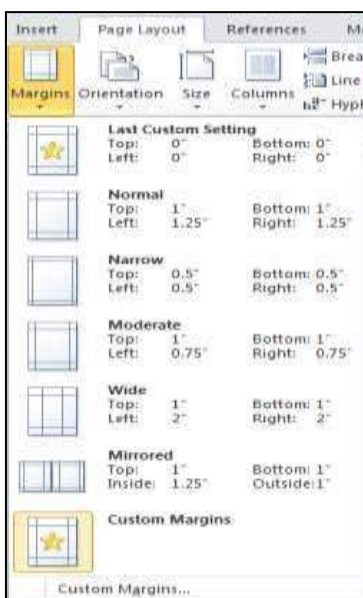
Fig.3-60 Changing margins
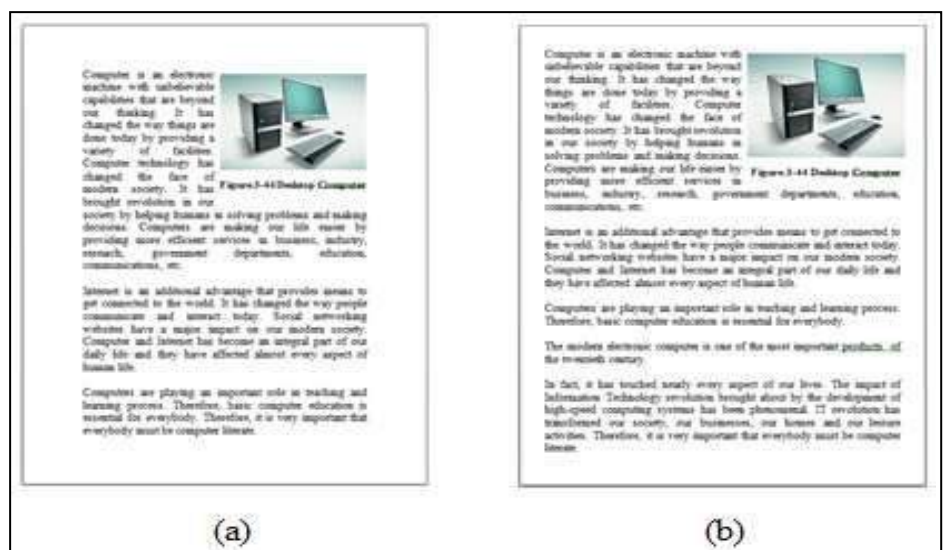
Fig.3-61 (a) Page with Normal margins (b) Page with Narrow Margins

3.1.15 USING HYPERLINK

Hyperlink is text in a Web page or document that links to another Web page or another place in the same document when the user clicks on it.

The following are the steps to create a Hyperlink.

1. Select the text that is to be displayed as Hyperlink as shown in Fig.3-62.
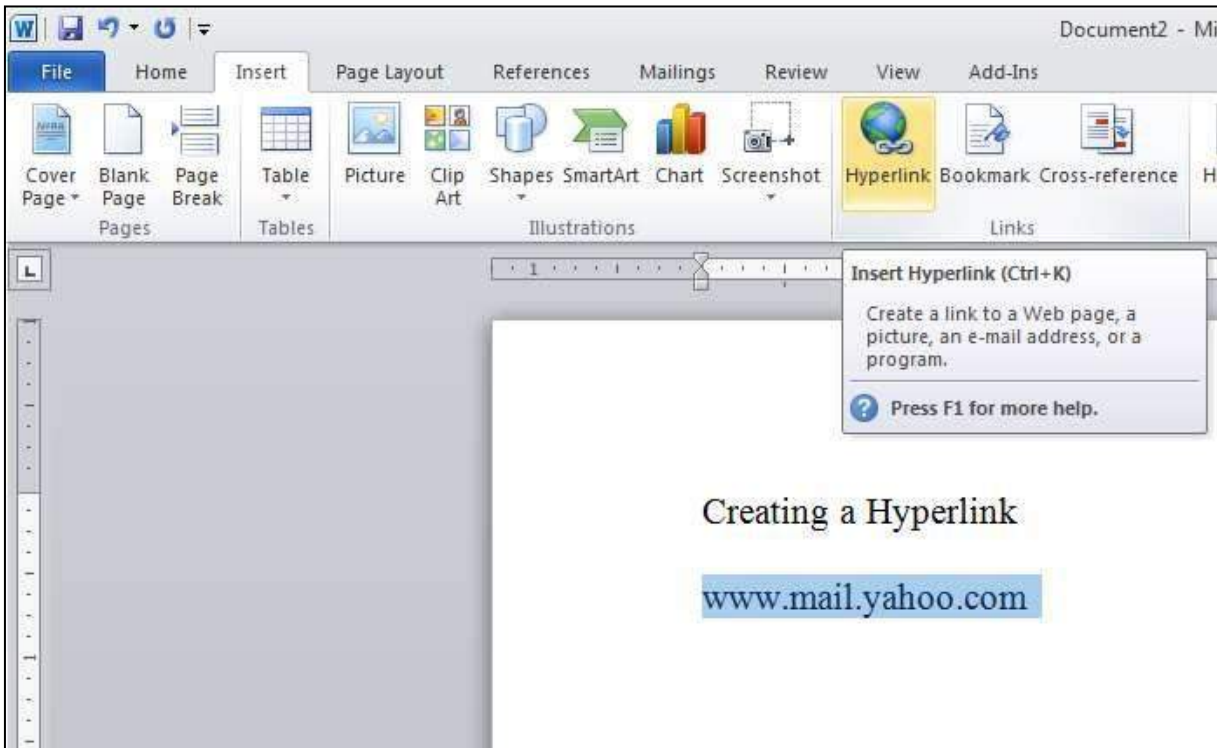
Fig.3-62 Inserting a Hyperlink

2. Click the **Insert** tab.
3. Click **Hyperlink** in the **Links** group as shown in Fig.3-63.
4. Click **OK**.

There is also an easy way to create a Hyperlink to Web page. Type the Hyperlink text and press Spacebar or Enter key.

Hyperlink appears in blue color and underlined. To open the Web page, position the mouse pointer over the Hyperlink and press the Ctrl key while clicking the mouse button.

The text format of Hyperlink can be formatted to regular text, that is, it should not be in blue color or underlined. To remove the text format of Hyperlink, Right-click the Hyperlink and select **Remove Hyperlink** from the shortcut menu.

3.2 SPREADSHEET

Spreadsheet is used to store, organize, calculate and present numerical data in an easily understandable format.

3.2.1 INTRODUCTION TO SPREADSHEET

A spreadsheet is a grid of rows and columns in which user enters numbers and text. Spreadsheet programs are powerful multipurpose calculators, capable of everything from adding two plus two to solving problems that involve complicated calculations. Spreadsheet programs allow user to organize data, perform calculations, draw graphs of numeric data and develop professional looking reports.

A common spreadsheet program is Microsoft Excel. It is a part of Microsoft Office 2010 software. Therefore, use of Microsoft Excel 2010 will be explained.

Opening the Microsoft Excel Program

The following are the steps to open the Excel program.

1. Turn on the computer and click **Start** button.
2. Click **All Programs**.
3. Click **Microsoft Office** to display the submenu.
4. Click **Microsoft Excel 2010** to open the Excel program. The opening screen of Excel will appear as shown in Fig.3-63.

DO YOU KNOW?
Microsoft was founded by Bill Gates and Paul Allen in April, 1975.
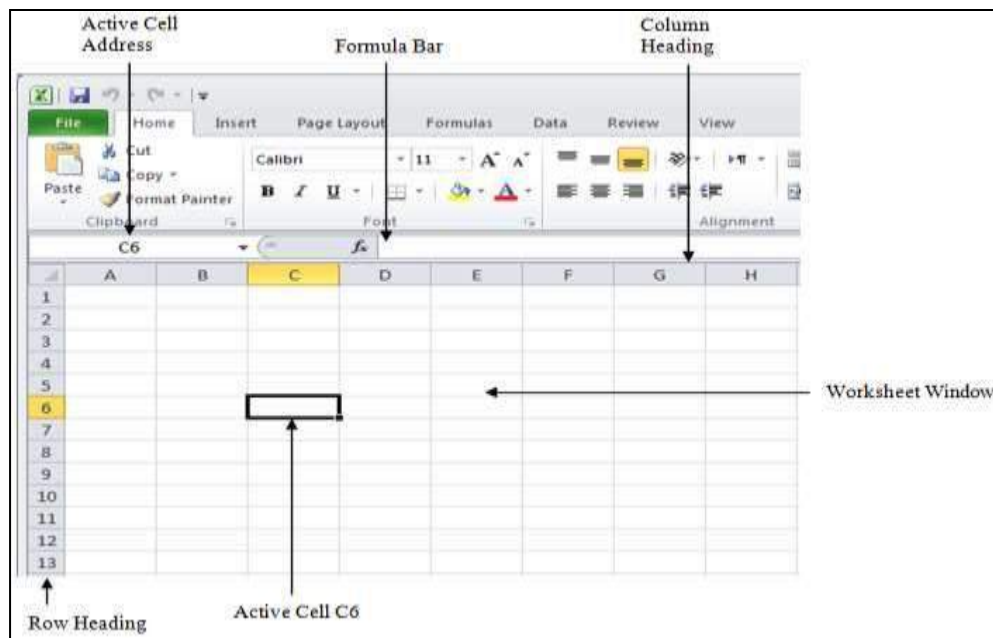
Fig.3-63 Opening screen of Microsoft Excel

Identifying Cells

The boxes formed by the intersection of individual rows and columns are known as cells. Cells are identified by the combination of their column letter and row number. For example, the sixth cell in the third column is known as cell C6. This is known as cell's address.

Cells are filled with odd numbers in Fig.3-66 by entering 15 in cell A3 and 17 in cell B3 and then dragging the fill handle to cell F3.
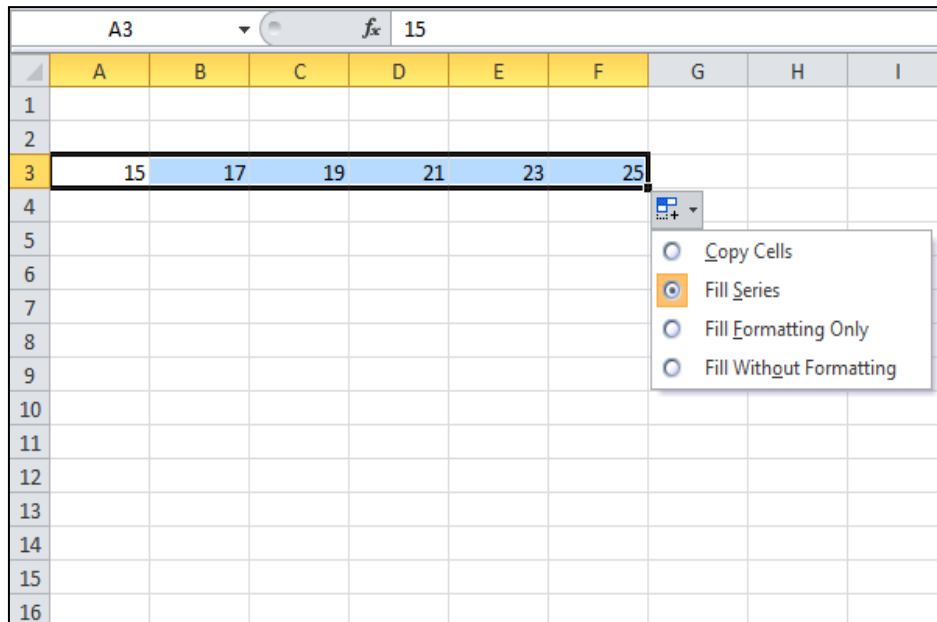
Fig.3-66 Filling cells with odd numbers in columns

Relative Cell Addressing

In Excel, cell addresses included in a formula or function are relative cell addresses. Relative cell address means when a formula is copied to other cells, the cell references in the formula change to reflect the formula's new location.
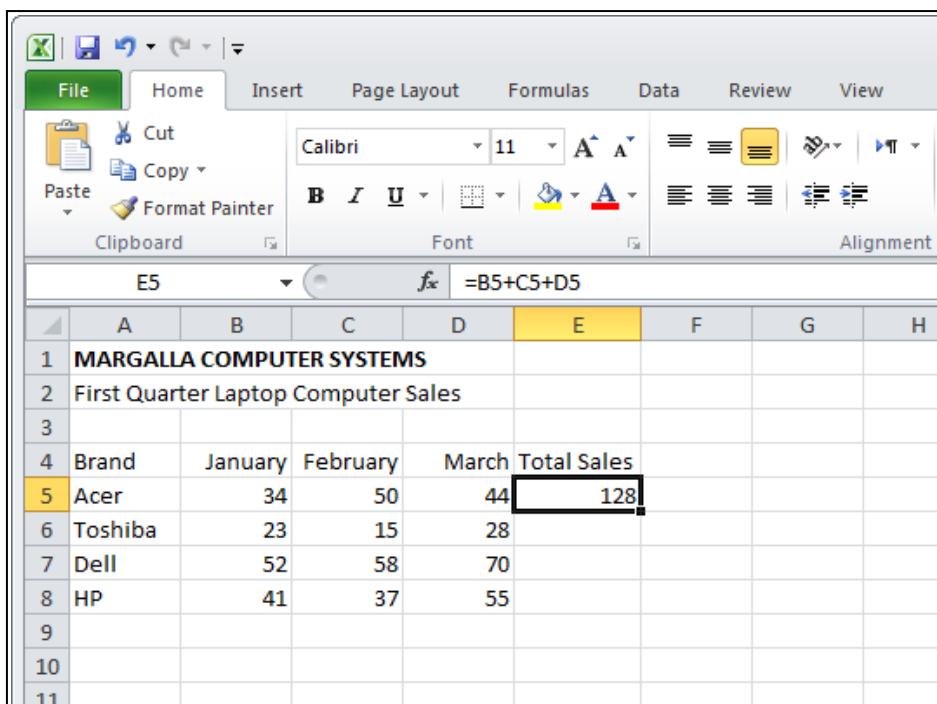

Fig.3-67 Entering formula in worksheet

To understand relative addressing, consider the worksheet shown in Fig.3-67.

- Enter the formula =B5+C5+D5 in cell E5 to calculate the total number of Acer laptop computers sold in the first quarter.

Fig.3-68 Copying formula to another cell

- Copy the formula in cell E6.
- The formula in cell E6 becomes =B6+C6+D6 as shown in Fig.3-68.
- The cell references have automatically changed based on the relative position of row and columns because relative cell addressing is used in formula in cell E5.
- Similarly, the formula will become =B7+C7+D7 in cell E7 and in cell E8 it will become =B8+C8+D8. This is what is required in this worksheet.

Absolute Cell Addressing

User can address a particular cell location no matter where the formula appears by using absolute cell address. Absolute cell addressing keeps a cell reference constant when copying a formula or function. Absolute cell addresses begin with a dollar sign in the formula, such as =C5 + D5.

Fig.3-69 Using absolute cell addressing in formula

In the worksheet of Fig.3-69, sales tax is calculated as 6% for software items. Absolute cell addressing is used for the cell C3 in the formula =C6*C3 in cell D6 for calculating sales tax because it should not change when the formula will be copied to cells D7, D8 and D9 as shown in Fig.3-70 .

Paste Special

Fig.3-70 Copying formula that has absolute addressing

Excel copies all the information in the selected range of cells when you paste data. Excel's Paste Special command allows many other options while pasting cells such as paste only formats of selected cells without contents or paste contents without formulas.

The following steps describe the use of Paste Special command.

1. Select the cell range to paste.

2. Open the **Paste** drop-down menu in **Clipboard** group of **Home** tab and select **Paste Special** as shown in Fig.3-71. **Paste Special** dialog box will open.

Fig.3-71 Using Paste Special command

3. Select an option from the **Paste Special** dialog box shown in Fig.3-72 and click **OK**.
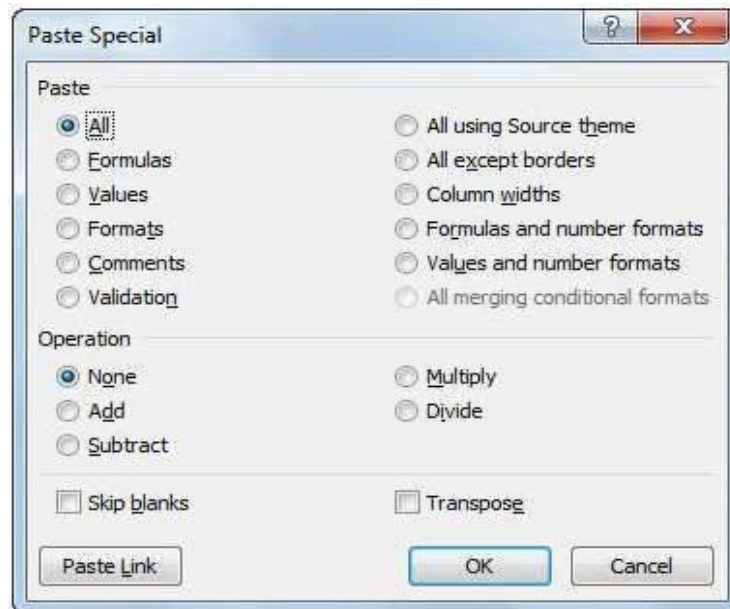
Fig.3-72 Paste Special dialog box

Fig.3-73 Formula in cell D6 is formatted

Fig.3-74 Formula in cell D6 is copied to cell D7, D8 and D9

Commonly used options of Paste Special dialog box are explained below.

All: Used to paste all the information in the selected cell range. This is same as normal paste command.

Formulas: Used to paste text, numbers and formulas without formatting.

The formula in cell D6 in the worksheet shown in Fig.3-73 is formatted. When this formula is copied to cells, D7, D8 and D9 using paste special, the format of cell D6 is not copied as shown in Fig.3-74.

Values: Used to convert formulas in the selected cell range to their calculated values and then apply the paste command.

Formats: Used to paste only the formatting of selected cell range without cell contents.

All except borders: Used to paste all the information in the selected range without copying any borders if used.

3.2.2 WORKING WITH FUNCTIONS AND FORMULAS

Working with Functions

Functions are built-In formulas in Excel that allow user to easily perform common calculations on data. Functions can be entered in a worksheet using keyboard, **Insert Function** command or **AutoSum** drop-down menu.

- **Using Keyboard to Find Average**

The following are the steps to calculate average sale for Acer laptop computer during the first quarter using the AVERAGE function.

1. Select cell E5 where the result will appear.
2. Type **=av** to display the Formula AutoComplete list as shown in Fig.3-75.

MAX	▼	× ✓ f_x	=av		
	A	B	C	D	E	F
1	MARGALLA COMPUTER SYSTEMS					
2	First Quarter Laptop Sales					
3						
4	Brand	January	February	March	Average	
5	Acer	34	50	44	=av	
6	Toshiba	23	15	28	f_x AVEDEV	
7	Dell	52	58	70	f_x AVERAGE	
8	HP	41	37	55	f_x AVERAGEA	
9					f_x AVERAGEIF	
10					f_x AVERAGEIFS	

Fig.3-75 Calculating average

3. Point to **AVERAGE** function and Double-click.
4. Select the range B5:D5 to insert it as argument to the **AVERAGE** function.
5. Press **Enter** key.

- **Using Insert Function command to Find the Highest Value**

The following are the steps to find the highest value.

1. Select cell B11 where the answer will appear.
2. Click **Insert Function** command shown in Fig.3-76. **Insert Function** dialog box will be displayed.
3. Select **MAX** in the function list and click **OK**.

4. Type B5:B8 in the **Number 1** text box of **Function Arguments** dialog box and click **OK**.
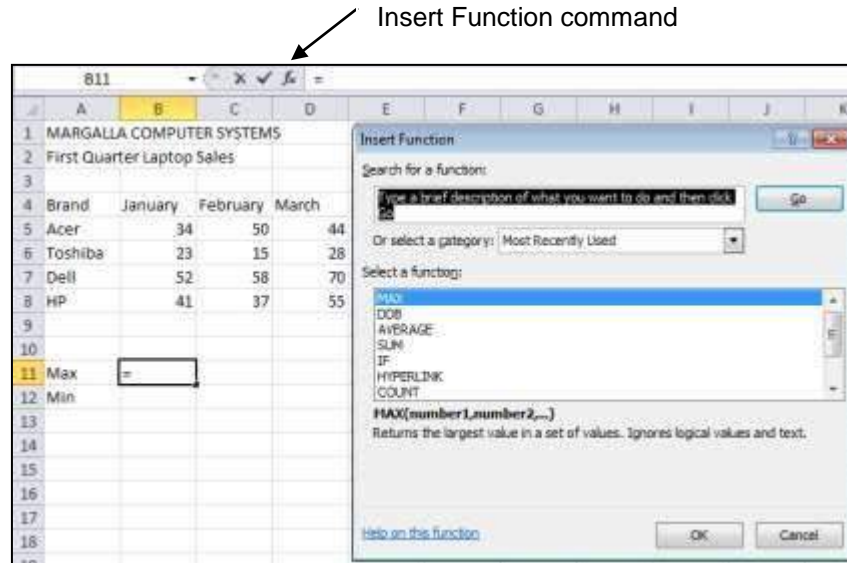
Insert Function command

Fig.3-76 Using Insert Function command to insert a function
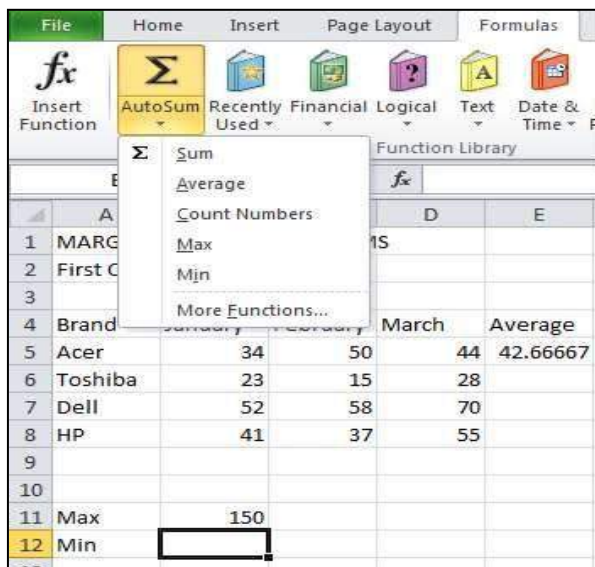

Fig.3-77 Using AutoSum command

*   **Using AutoSum Drop-down Menu to Find the Lowest Value**

    The following are the steps to find the lowest value in the range B5:B8 using **AutoSum** drop-down menu.

1. Select cell B12 where the answer will appear.
2. Click **Formulas** tab.
3. Open the **AutoSum** drop-down menu in the **Function Library** group as shown in Fig.3-77 and select **Min**.
4. Type the range B5:B8 and press **Enter**.

Working with Formulas

A formula is an expression that performs calculations. It consists of operators, constants and cell addresses. The standard operators used in Excel formulas are given in Table 3-78.

Arithmetic Operation	Excel Operator
Addition	+
Subtraction	.
Multiplication	*
Division	/
Exponent	^

Table 3-78 Arithmetic operators used in Excel

All the Excel formulas begin with equal sign (=) just like functions. For example, to multiply two numbers 4 and 7, the formula will be =4*7. User can also use cell addresses in formulas such as =(A4+B4)/5. This formula will first add the contents of cell A4 and B4 and then divide the sum by 5.

Following are the steps to calculate the total number of laptop computer sale for the months of January, February and March in the worksheet shown in Fig.3-79.

Fig.3-79 Using formula to find sum

1. Click cell B9 where the answer will appear.
2. Type the formula =B5+B6+B7+B8 as shown in Fig.3-73 and press Enter.
3. To calculate the total number of laptop computers sold in the months of February and March copy the formula from cell B9 to C9 and D9.
4. Click the cell B9, point to the fill handle and drag it through cell D9.

The user can also calculate the total number of laptop computers sold in January by performing the following steps.

1. Click cell B9.
2. Click **Formulas** tab.
3. Double-click the **AutoSum** command in the **Function Library** group.

Excel Automatically Recalculates Formula Results

Whenever the user changes the value in a cell, the result of the formula in which that value is used will be automatically updated. This feature known as automatic recalculation is one of the main advantages that spreadsheets have over calculators.

3.2.3 GRAPHICAL REPRESENTATION OF DATA

A chart is used to represent data graphically. Charts are very helpful in explanation and representation of data. A commonly used chart is the column chart. Therefore, creation of this chart will be described for the worksheet shown in Fig.3-80.

Fig.3-80 Half yearly sale of laptop computers

Creating a Column Chart

The following are the steps for creating a column chart.

Fig.3-81 Selected cell range for column chart

1. Select the cell range (source data) as shown in Fig.3-81 that you want to represent in the column chart.
2. Click **Insert** tab.
3. In the **Charts** group, open the drop-down menu of **Column** command.
4. Select a chart from the menu. For example, the chart on the top left corner of menu.
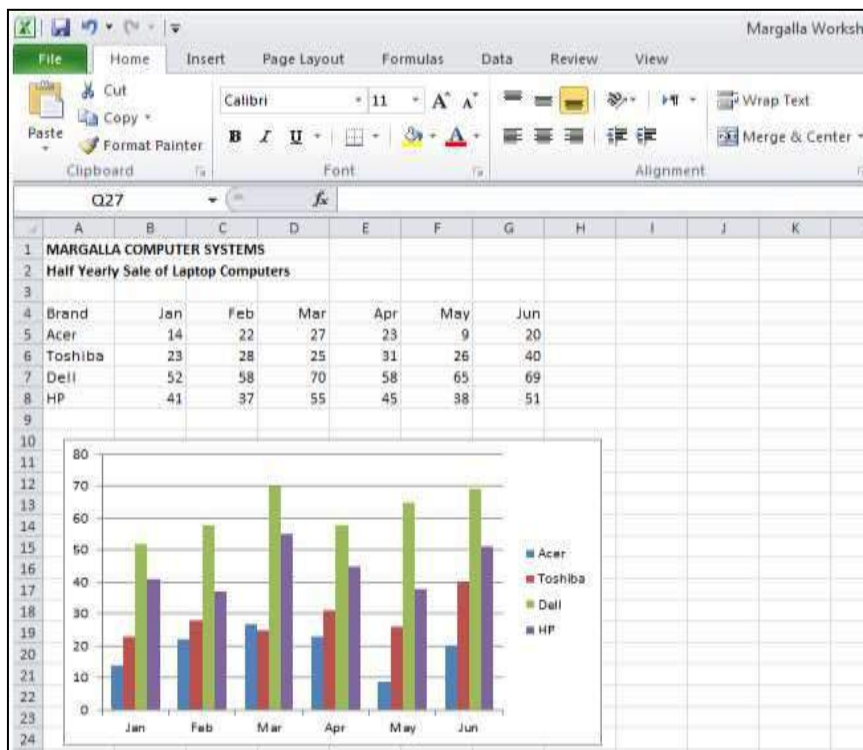
The chart shown in Fig.3-82 will appear on the screen.

Fig.3.82 Column chart

> **Tip:** To select a predefined chart style, click the chart that you want to format. This will display **Chart Tools**. On the **Design** tab, in the Chart Style group, select the chart style.

Following are the steps to give titles to the chart and horizontal and vertical axis to make it more meaningful.

1. Click anywhere in the chart to make the **Chart Tool** tabs appear in the **Ribbon**.

2. Click **Layout** tab as shown in Fig.3-83.

Fig.3-83 Layout tab of Chart Tools

> **Tip:** To only print the chart in a worksheet, click anywhere in the chart and give the print command.

3. Click **Chart Title** in **Labels** group and select **Above Chart**.

4. Type the chart title in the text box.

5. Click the **Axis Titles** command, select **Primary Horizontal Axis Title** and select **Title Below Axis**.

6. Type the horizontal axis title in the text box. In the same way give a title to the vertical axis. The resulting chart is shown in Fig.3-84
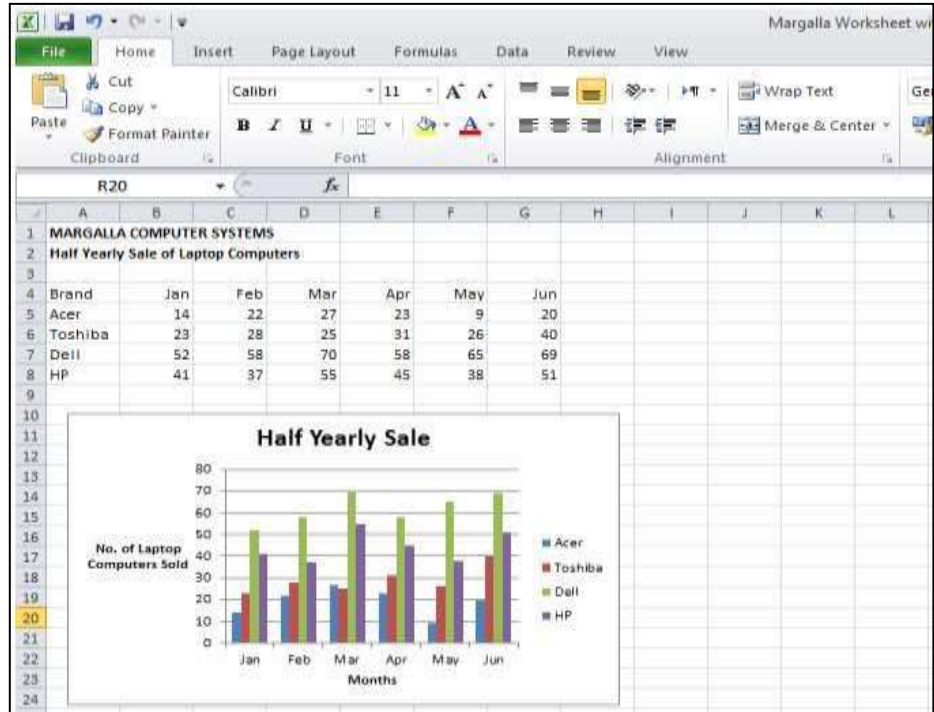

Fig.3-84 Column chart after labelling

3.2.4 MANIPULATING AND FORMATTING DATA

Filtering Data

Filtering data means displaying only the information that the user needs based on a condition. For example, user could filter a list of students for viewing who belong to a particular class. User could also filter a list of people whose ages are above 30.

The following are the steps to filter a list of students who belong to class IX.B.

1. Select the rows you want to filter including the header row as shown in Fig.3-85.

Fig.3-85 Data selected for filtering

2. Select the **Data** tab on the **Ribbon**.

3. Click the **Filter** command in the **Sort and Filter** group.

4. Drop-down arrows will appear in the header of each column.
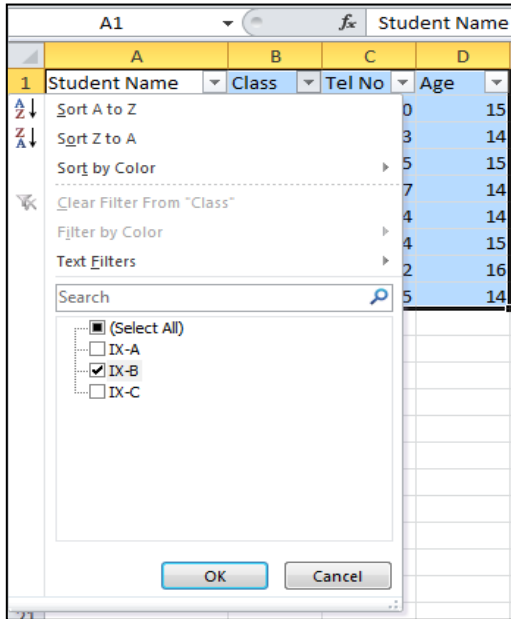
Fig.3-86 Selecting filter condition

5. Click the drop-down arrow for class column. The filter menu will appear as shown in Fig.3-86.

6. Uncheck the boxes next to (Select All), IX.A and IX.C.

7. Check the box next to IX.B.

8. Click **OK**. Only the information of students who belong to class IX.B will be displayed. The other data will be temporarily hidden.

The following are the steps to clear the filter.

1. Click the drop-down arrow in the Class column.

2. Click **Clear Filter From** "Class".

3. Click **Filter** Command in the **Ribbon**.

Data Validation

Data validation is used to control the values or the type of data that user enters into a cell.

The following steps will define criteria for entries in class column of student worksheet to IX.A, IX.B and IX.C. If the user enters any other data, an error message will appear.

1. Create a list of valid entries in the worksheet that contains the data IX.A, IX.B and IX.C.
2. Select all the cells in Class columns without the column header.
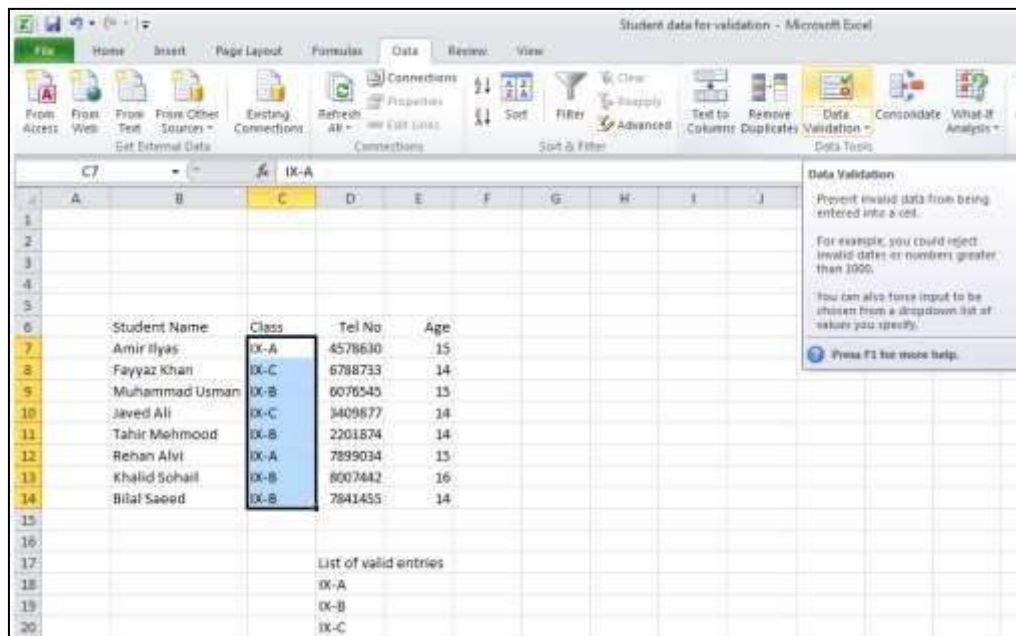3. Click the **Data** tab on the **Ribbon** as shown in Fig.3-87.

Fig.3-87 Using Data Validation command

4. Click **Data Validation** command in the **Data Tools** group. **Data Validation** dialog box shown in Fig.3-88 will appear.

5. Click the drop-down arrow below **Allow** heading and select List.

6. Click the button on the right side below **Source**.

7. Select the cell range that contains the list of valid entries and click **Close**.
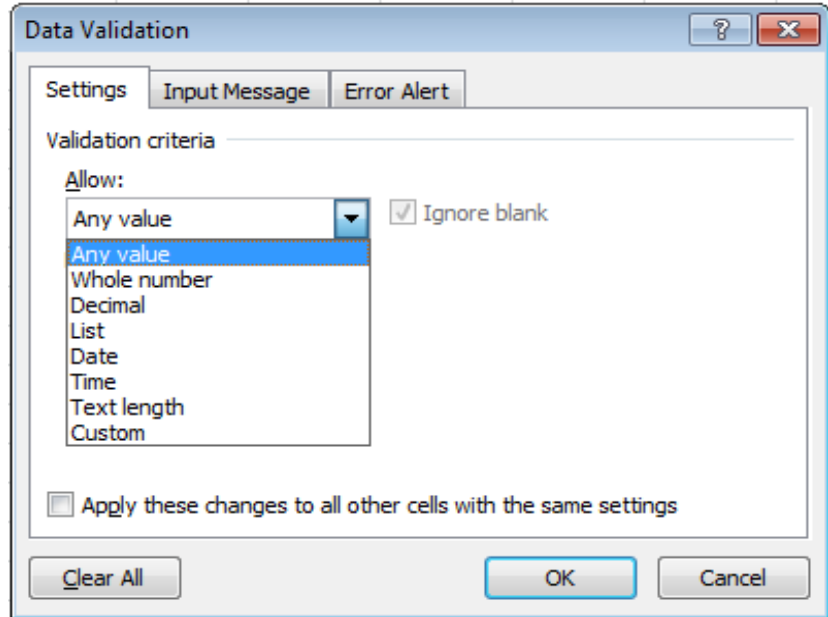
8. Click **OK** to apply validation.

Fig.3-88 Data Validation dialog box

As another example, restrict data entries in the Age column to ages between 13 to 17.

1. Select all the cells in Age column without the column header.

2. Click **Data** tab on the Ribbon.

3. Click **Data Validation** command in the **Data Tools** group. **Data Validation** dialog box will appear.

4. Click the drop-down arrow below **Allow**.

5. Select **Whole number** from the menu as shown in Fig.3-89.

Fig.3-89 Data Validation dialog box

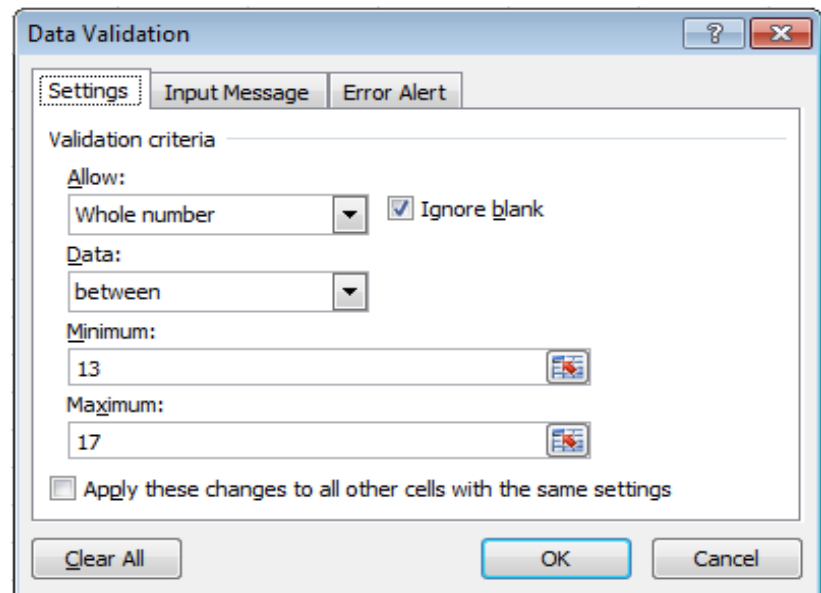6. Enter 13 for the minimum value and 17 for the maximum value.

7. Click **OK** to apply validation.

Protecting a Worksheet

When a worksheet is protected, other users can only view the information in it but changes cannot be made.

The following are the steps to protect a worksheet.

1. Click **Review** tab in the **Ribbon**.

2. Click **Protect Sheet** command in the **Changes** group.

3. Enter a password and click **OK**.

4. Reenter password to confirm and click **OK**.

Unlocking Cells

Generally the user would not like to prevent changes to the entire worksheet. The user may want to allow other users to make changes in worksheet data but prevent changes to titles and formulas. For this, unlock the cells in which data editing is to be allowed.

The following are the steps to unlock cells.

Fig.3-90 Format Cells dialog box

1. If your worksheet is protected, click the **Unprotect Sheet** command in the **Changes** group on the **Review** tab.
2. Select the cells you want to unlock.
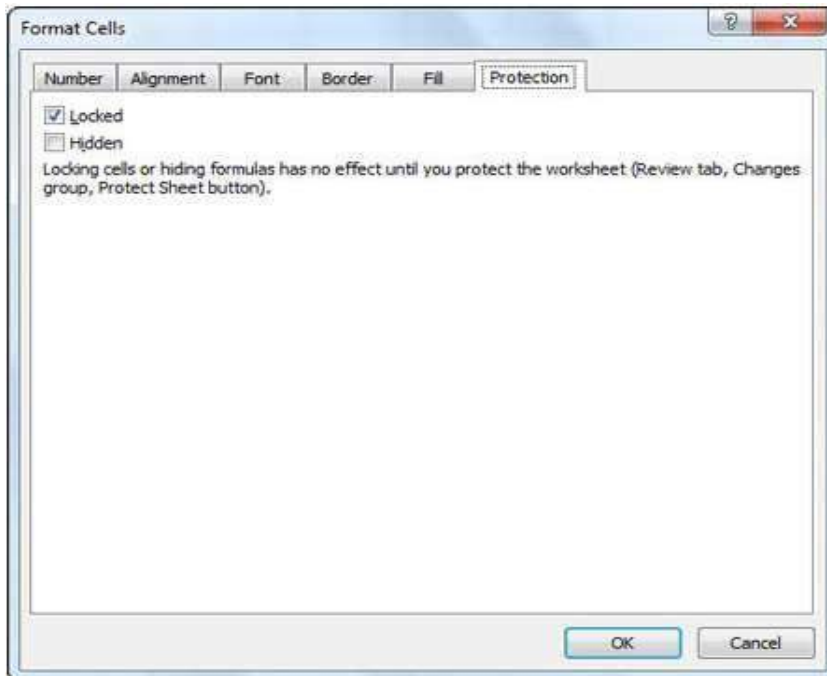3. Press Ctrl+1 to open the **Format Cells** dialog box and click the **Protection** tab as shown in Fig.3-90.

4. Click the **Locked** check box to remove its check mark and click **OK**.
5. Protect the worksheet as explained earlier.

Conditional Formatting

Excel provides commands to apply formatting to one or more cells based on the value of the cell. This is known as conditional formatting. User can apply one or more rules to cells such as if the value in the cell is less than 33 then color the cell red. The advantage of applying such rules is that the user can easily view which cells have value less than 33.

	A	B	C	D	E	F	G	H
1	Student Name	Maths	Comp	Phy	Chem	Eng	Urdu	Isl
2	Afzal Ahmed	42	55	50	48	67	60	47
3	Javed Khan	47	26	38	20	39	48	35
4	Ali Haider	22	30	43	36	51	44	33
5	Waseem Abbas	46	43	36	55	52	63	58
6	Nouman Ali	31	34	12	15	42	45	39

The following steps will color the text red with light red background in cells that have value less than 33 in the worksheet shown in Fig.3-91

Fig.3-91 Result sheet of students

1. Select the cells to which you want to apply conditional formatting.

2. Click **Home** tab on the **Ribbon**.

3. Click **Conditional Formatting** command in Styles group to open the drop-down menu and select **Highlight Cells Rules** as shown in Fig.3-92.
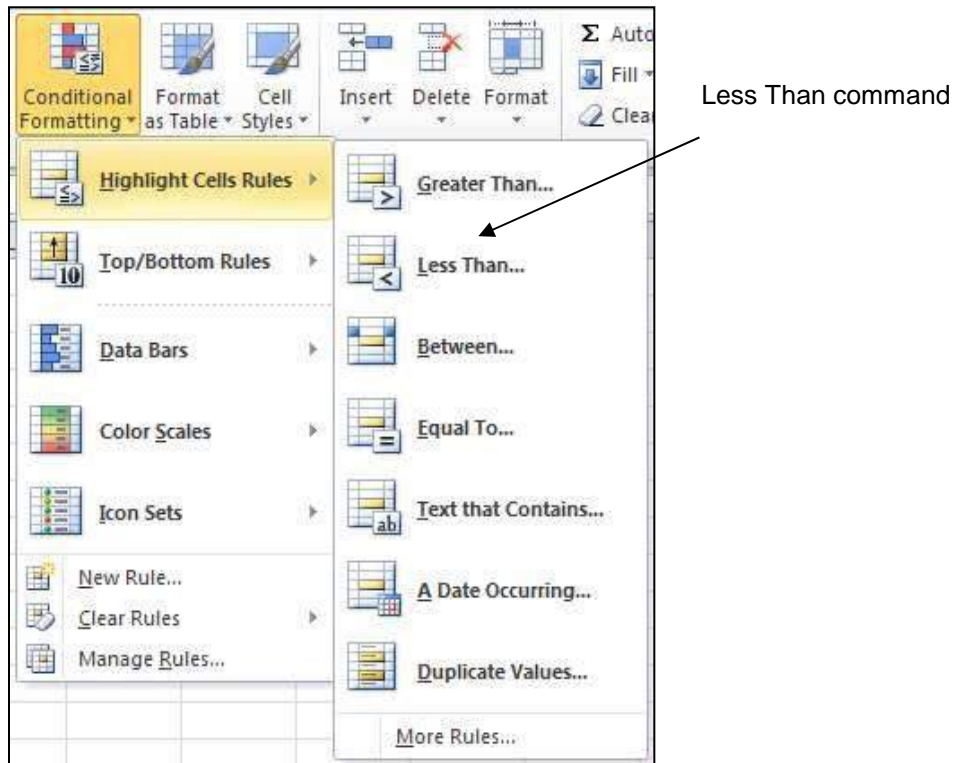

Fig.3-92 Conditional Formatting

4. Select **Less Than** in the submenu.

5. Enter 33 and select **Light Red Fill with Dark Red Text** in **Less Than** dialog box to view the failing marks in red color with light red background as shown in Fig.3-93.

6. Click **OK** to apply the formatting.

	A	B	C	D	E	F	G	H
1	Student Name	Maths	Comp	Phy	Chem	Eng	Urdu	Isl
2	Afzal Ahmed	42	55	50	48	67	60	47
3	Javed Khan	47	26	38	20	39	48	35
4	Ali Haider	22	30	43	36	51	44	33
5	Waseem Abbas	46	43	36	55	52	63	58
6	Nouman Ali	31	34	12	15	42	45	39

Fig.3-93 Worksheet after conditional formatting

3.3 URDU EDITOR

3.3.1 INTRODUCTION TO INPAGE URDU EDITOR

Fig.3-94 Opening Inpage Program

Inpage is widely used Urdu language editor introduced in 1994. It runs on Windows operating system and it is used for creating documents in Urdu/Arabic languages, etc. It provides all the standard formatting and editing tools available in word processors used for creating documents in English. It is easy to learn and use. Inpage allows user to create wide variety of documents such as letters, reports, books, magazines, newspapers and brochures in Urdu. Urdu word processing is now available in MS Word. That option may be used. Next year you may learn MS Word Urdu using the language bar in windows 7 onward. The language shift programming is called localization. It was done by National Language Authority Pakistan and Inksoft, Islamabad under the guidance of Dr. Attash Durrani.

Opening the Inpage Program

The following are the steps for opening the Inpage program.

1. Turn on the computer and click **Start** button.
2. Click **All Programs**.
3. Click **Inpage 2009 Professional** to display the submenu.
4. Click **Inpage 2009** as shown in Fig.3-94. The opening screen of **Inpage** will appear as shown in Fig.3-95.
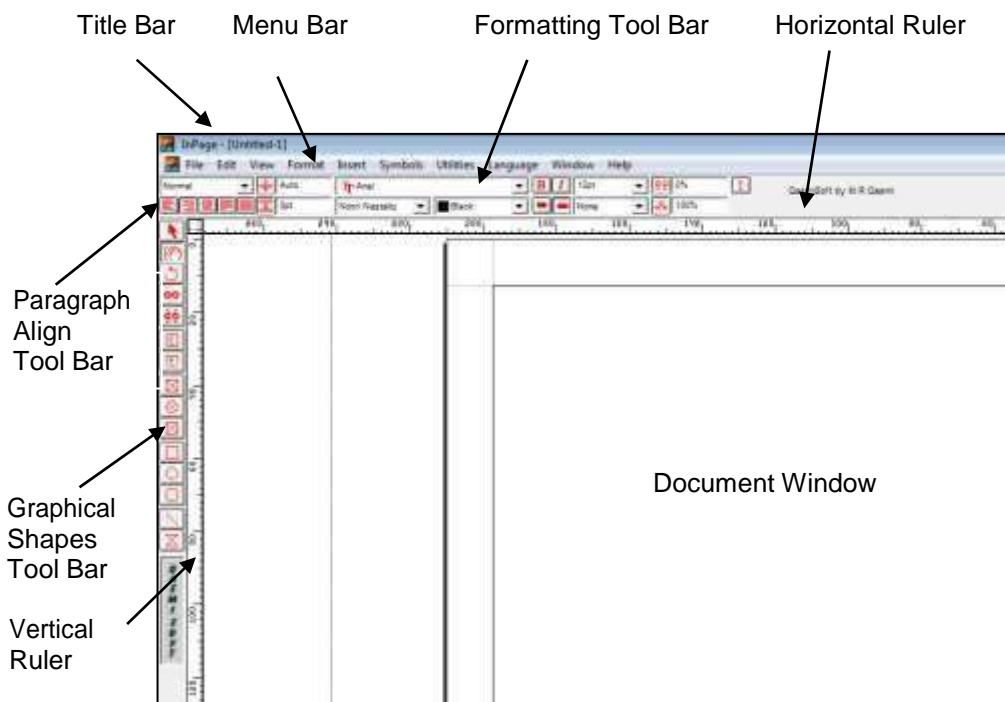

Fig.3-95 Opening Screen of Inpage Urdu Editor

3.3.2 MANAGING A DOCUMENT IN INPAGE

Creating a New Document

1. Click the **File** tab.

2. Click **New** in the pull-down menu as shown in Fig.3-96.

3. **New Document** window will appear as shown in Fig.3-97.

4. Set the **Page**, **Margins** and **Columns** setting and click **OK**.
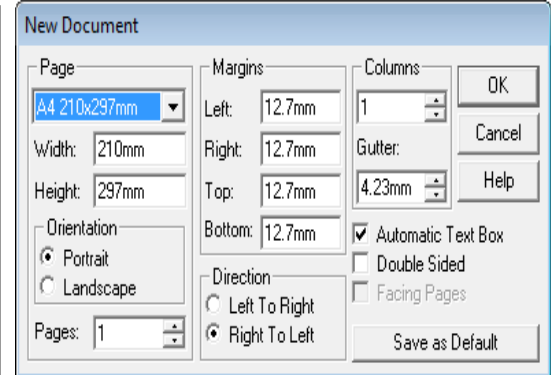
Fig.3-96 File tab

Fig.3-97 New Document window

5. Now, type the text in Urdu.

Selecting a Keyboard Layout

1. Click **Edit** to open the **Edit** pull-down menu.

2. aClick **Preferences** to open the submenu and select **Keyboard Preferences** as shown in Fig.3-98.

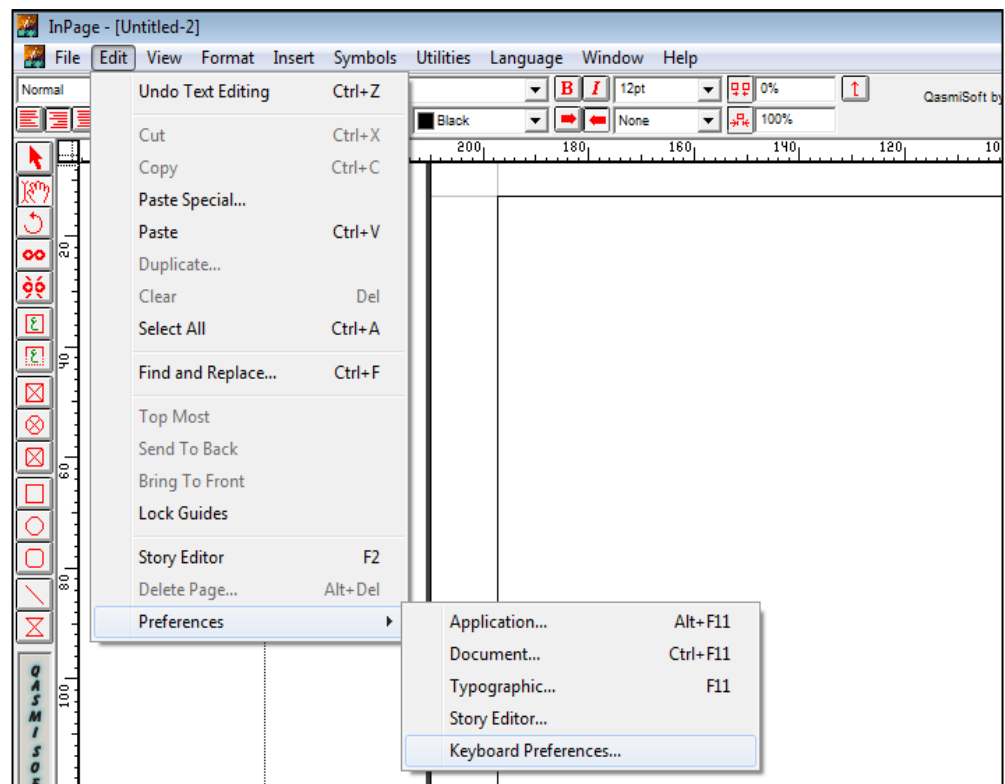3. Select a keyboard from the **Keyboard Preferences** window shown in Fig.3-99 and click
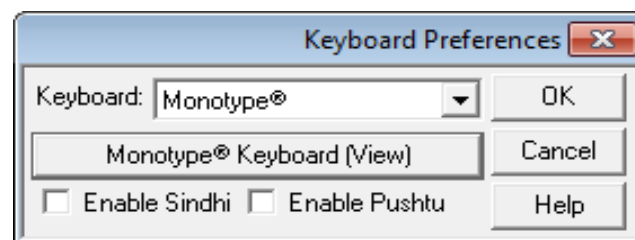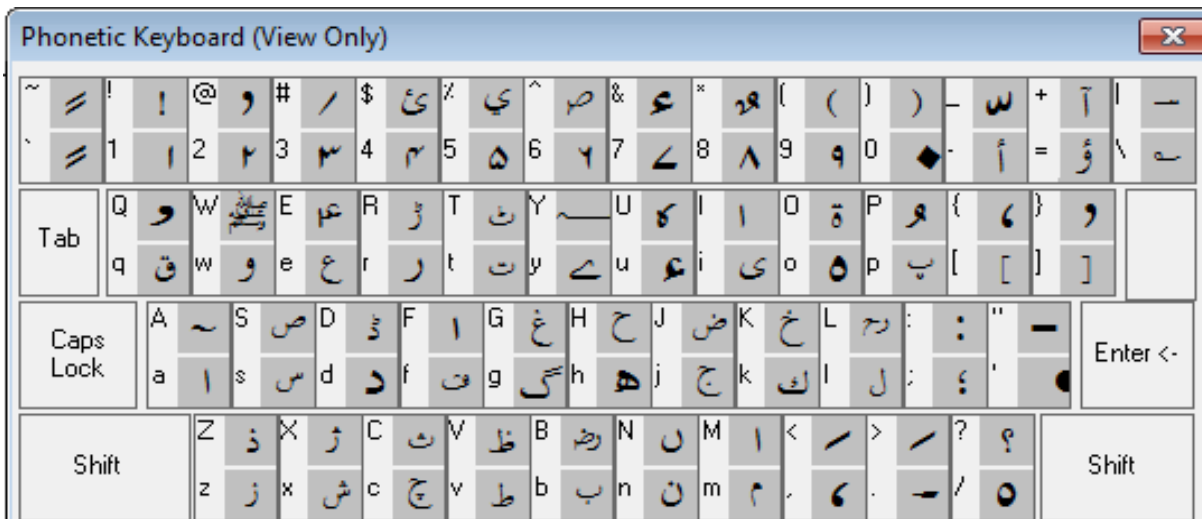
Fig.3-98 Selecting a keyboard layout

Fig.3-99 Keyboard Preference dialog box to select a keyboard

OK. User can also view the keyboard layout as shown in Fig.3-100 by clicking the view option.

(a)

(b)

Fig.3-100 Keyboard layout of (a) Monotype and (b) Phonetic Keyboard

Opening a Document

1. Click the **File** tab.

2. Click **Open**. The **Open Document** dialog box shown in Fig.3-101 will appear.

3. Select the document

4. Click **Open**.

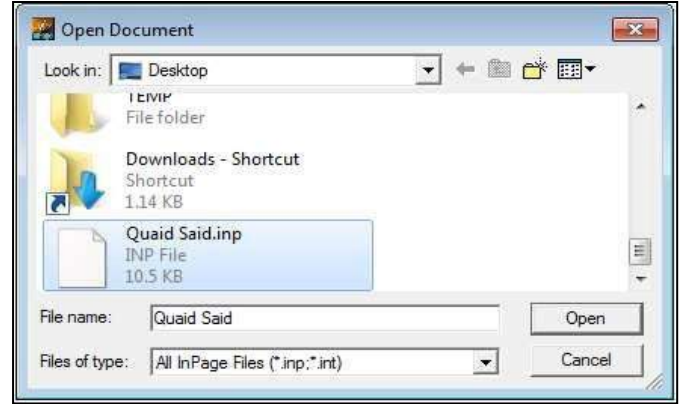An Urdu document prepared in Inpage program is shown in Fig.3-102.
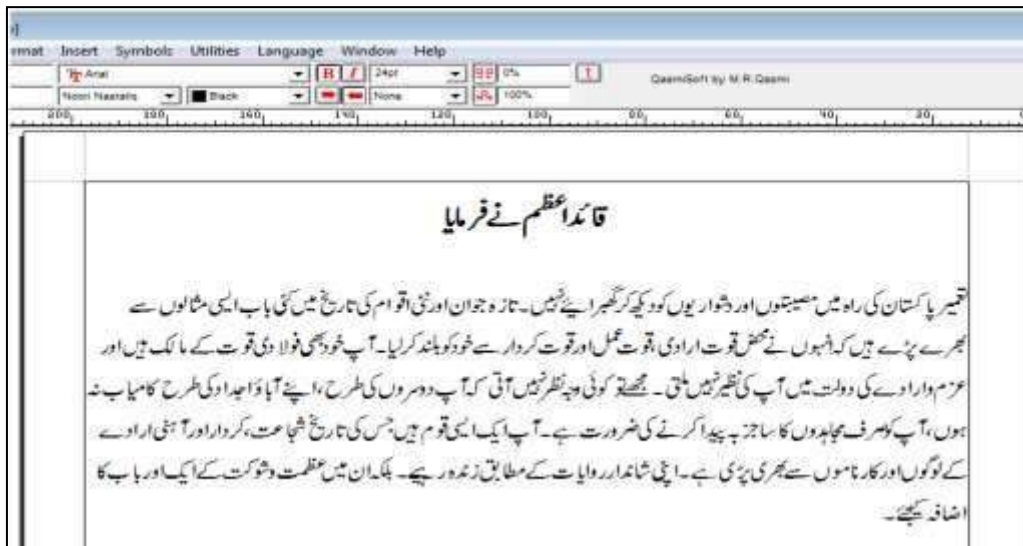

Fig.3-101 Open Document dialog box.

Fig.3-102 Urdu document

Saving a Document

1. Click **File** tab.
2. Select **Save** or **Save as**. **Save Document As** dialog box shown in Fig.3-103 will appear.
3. Select the folder where document is to be saved.
4. Give a file name to the document.
5. Click **Save**.

Fig.3-103 Save Document As dialog box

3.3.3 FORMATTING DOCUMENT

Copying or Moving Text

1. Select the text to copy or move by dragging the mouse pointer. The selected text will be highlighted.
2. Click **Edit** to open the **Edit** pull-down menu as shown in Fig.3-104.
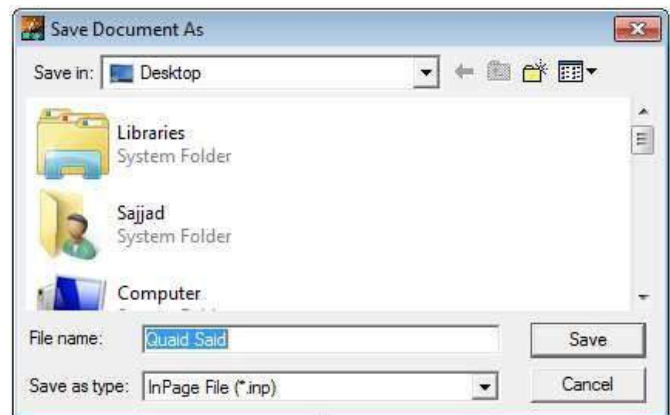3. Select **Copy** or **Cut**.

4. Position the mouse pointer at the location where the text is to be copied or moved.
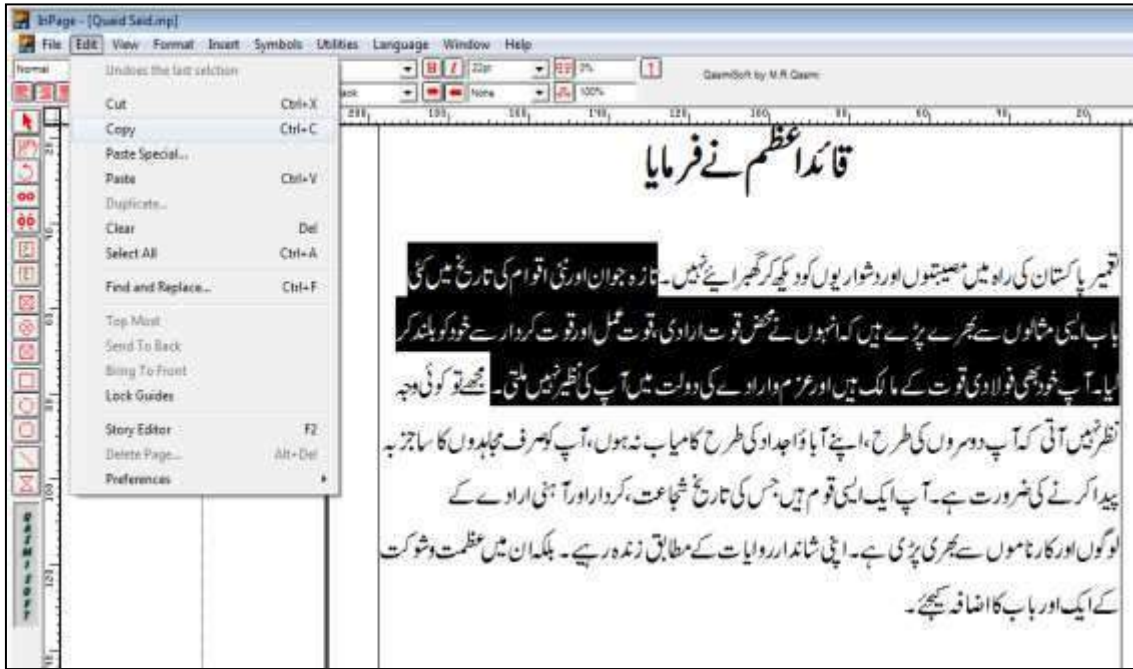5. Open the **Edit** menu and click **Paste**.

Fig.3-104 Text selected for copying

The shortcut commands **Ctrl+C**, **Ctrl+X** and **Ctrl+V** can also be used for Copy, Cut and Paste respectively.
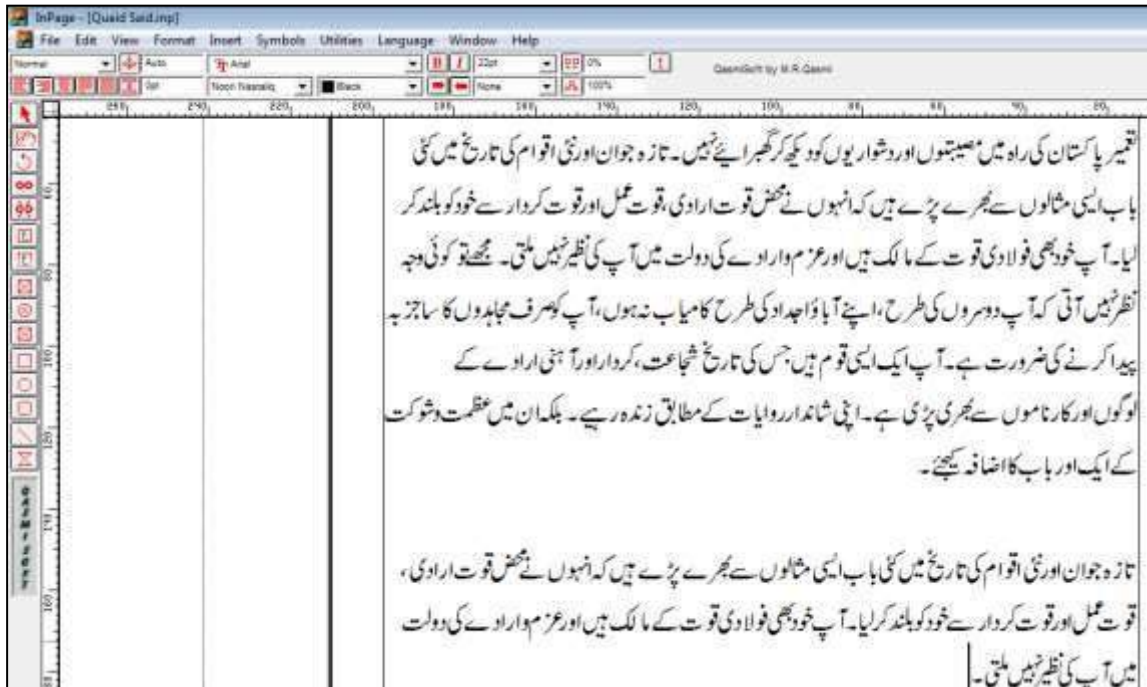

Fig.3-105 Document after copying the text
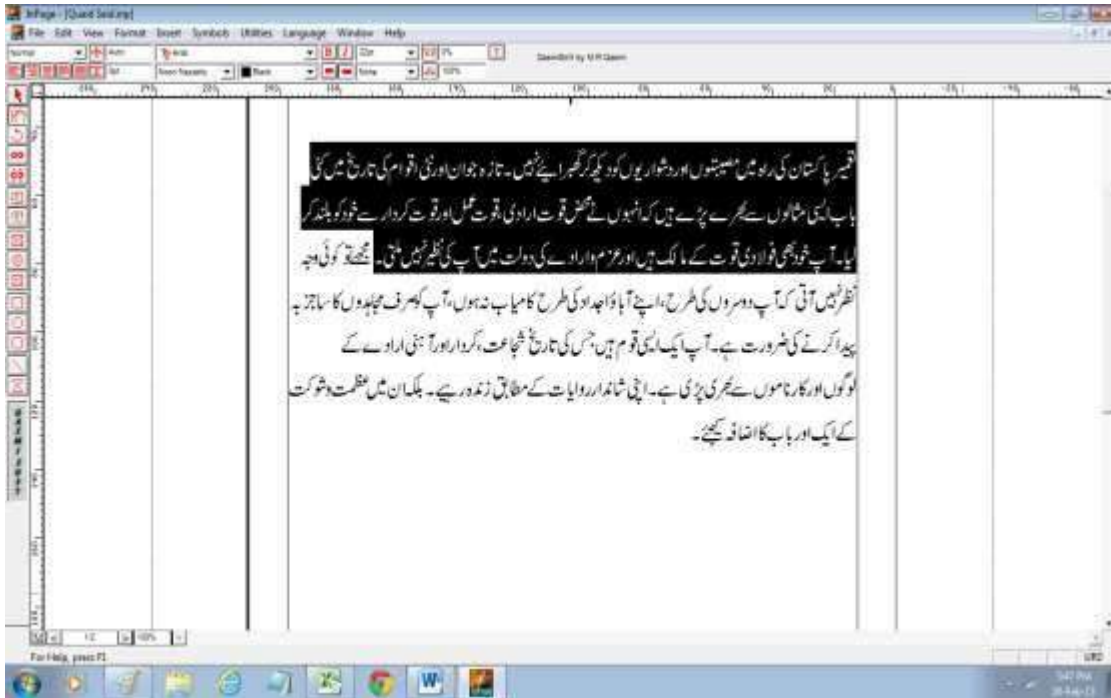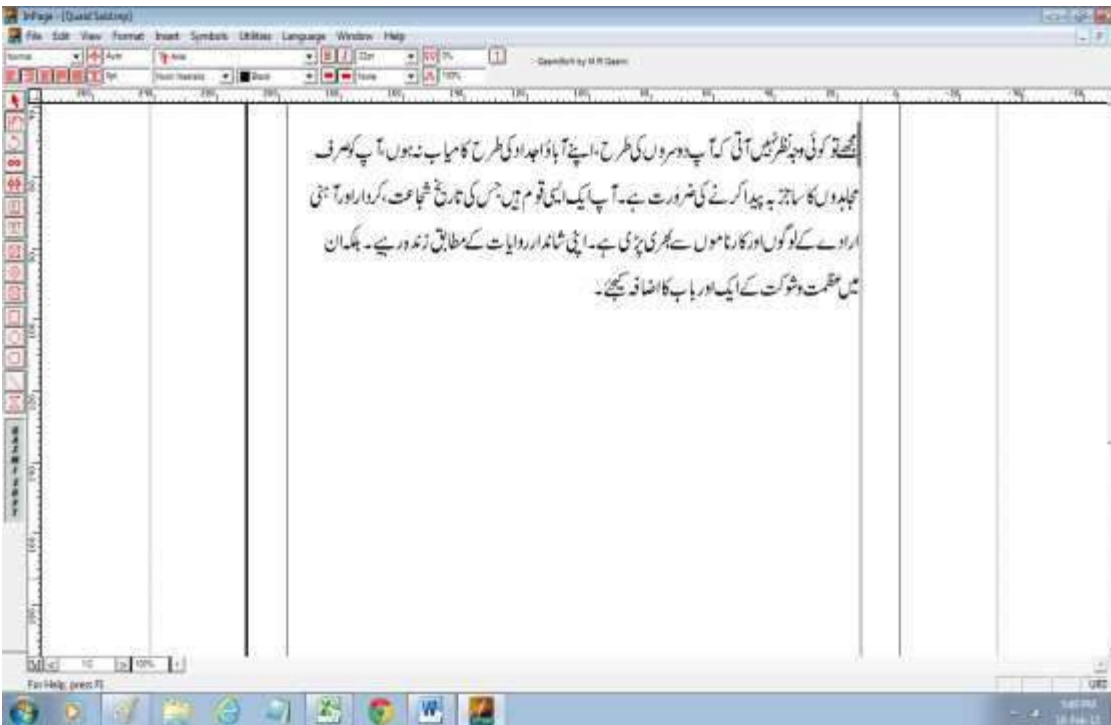
Changing Language

The following are the steps for changing to English language.

1. Click **Language** in **Menu Bar** as shown in Fig.3-108.

2. Click **Toggle Language.**

3. Perform the same steps to return back to Urdu typing.

Language Menu

Fig.3-108 Changing language

Formatting Text

Fig.3-109 Text Formatting Tools

Select the text and apply the appropriate commands given in Fig.3-109. Text with different formatting is shown in Fig.3-110.

Fig.3-110 Formatted text

Key Points

- Word processing refers to the use of computer to create, edit, format and print documents.

- A word processor is computer application software that is used for the creation of documents on computer.
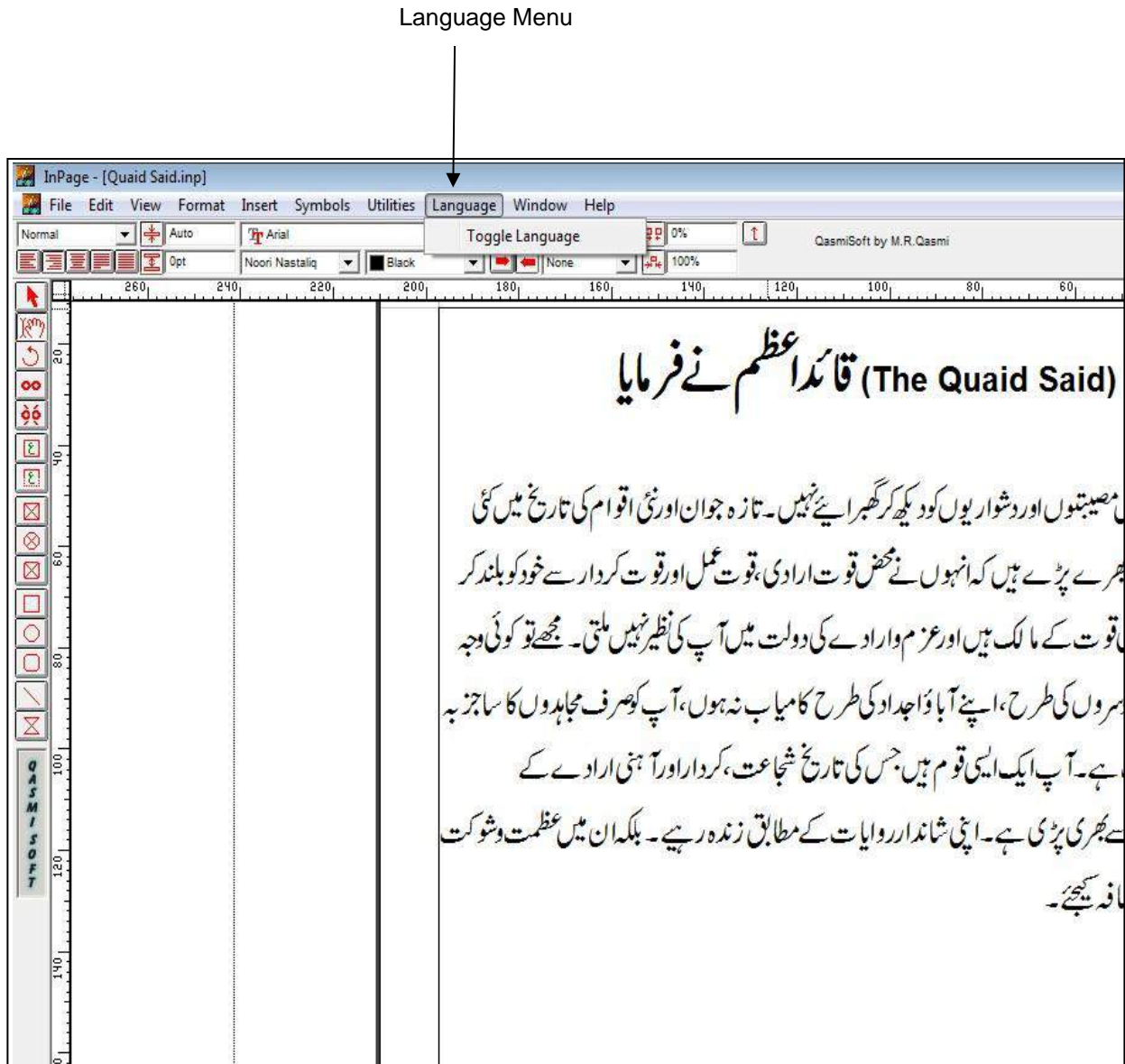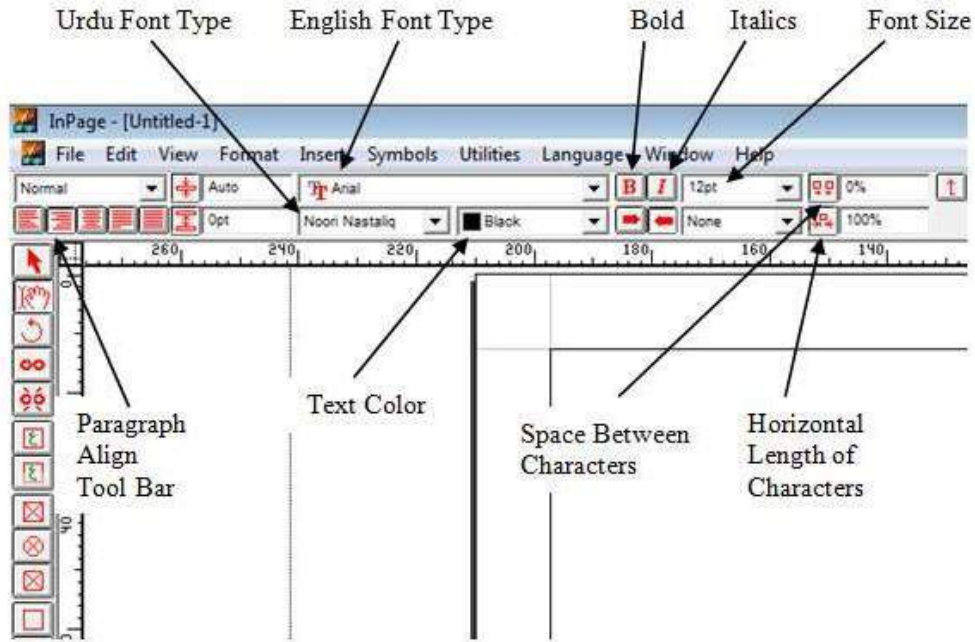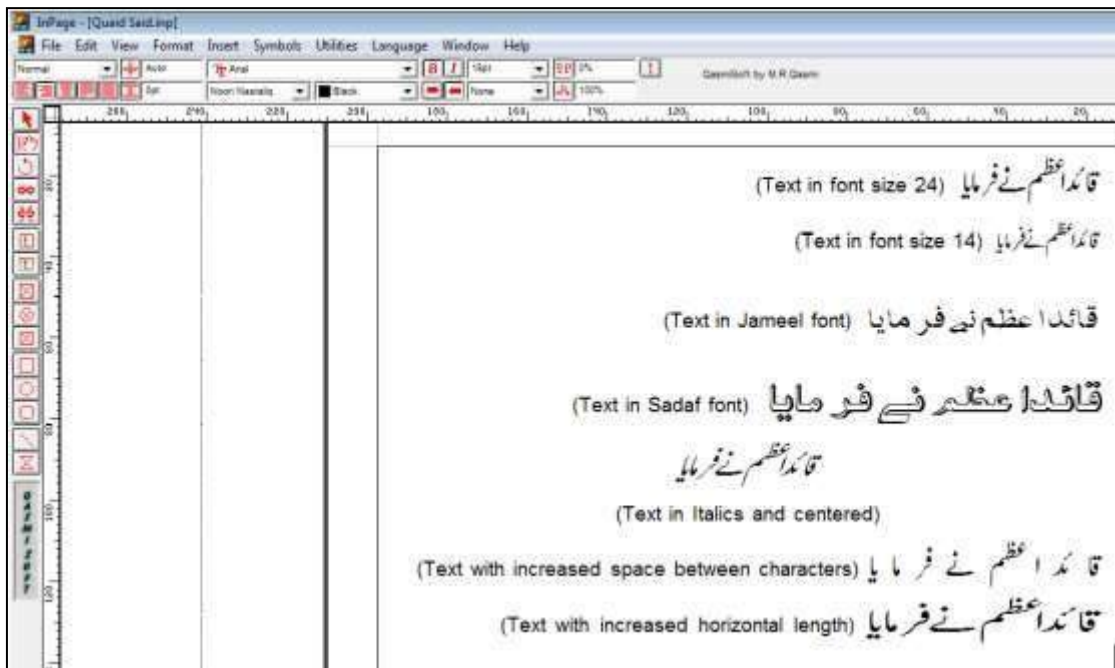
- Ribbon is located below the title bar of Word window and it consists of tabs, groups and commands. It provides access to commands that are needed while working on a document.

- Page break is a marker that tells Word program that the contents which follow are to appear on a new page.

- Section break inserts a new page but it allows the user to change the page format without having any effect on the formatting of the previous pages.

- Header refers to information that appears at the top of a page and footer to information that appears at the bottom of a page.

- WordArt is a text modifying feature in Word to create decorative effects such as shadow, colors, 3D effects, changing shape of text, etc.

- Hyperlink is text in a Web page or document that links to another Web page or another place in the same document when user clicks on it.

- Spreadsheet is a grid of rows and columns in which user enters numbers and text.

- A workbook consists of sheets, each of which is called a worksheet. Excel opens workbook with three sheets but user can add additional worksheets if required.

- Relative cell address means when a formula is copied to other cells in Excel, the cell references in the formula change to reflect the formula's new location.

- Absolute cell addressing keeps a cell reference constant when copying a formula or function.

- A chart is a used to represent data graphically. It helps in explanation and communication of the meaning of data in a worksheet.

- Filtering data means displaying only the information that is needed based on a condition.

- Data validation is used to control the values or the type of data that user enters into a cell.

- Conditional formatting means applying a particular format to one or more cells based on the value of the cell.

Exercise

Q1. Select the best answer for the following MCQs.

i. Which of the following software is used for creating professional documents?
   - A. Spreadsheet Software
   - B. Word processor
   - C. Typing Tutor
   - D. Both A and B

ii. Which of the following tab of Word Ribbon contains Clipboard group?
   - A. Page Layout
   - B. Insert
   - C. File
   - D. Home

iii. By default how many tabs are there in Word Ribbon?
   - A. 7
   - B. 8
   - C. 9
   - D. 10

iv. What is used for creating decorative effects in Word?
   - A. Paragraph formatting
   - B. Text formatting
   - C. Page formatting
   - D. WordArt

v. Which of the following tab contains the commands for creating charts in Excel?
   - A. Home
   - B. Formulas
   - C. Insert
   - D. Data

vi. Which of the following command in Excel allows the user to view only certain data in a worksheet based on a condition?
   - A. Data validation
   - B. Data filtering
   - C. Conditional formatting
   - D. Data manipulation

vii. Which of the following command in Excel restricts user from entering wrong data in cells of a worksheet?
   - A. Data validation
   - B. Data Filtering
   - C. Conditional formatting
   - D. Data manipulation

viii. Which of the following command is used to apply formatting to one or more cells based on the value of the cell?
   - A. Data validation
   - B. Data filtering
   - C. Conditional formatting
   - D. Data manipulation

ix. Which of the following shortcut keys are used for pasting selected text?
   - A. Ctrl+C
   - B. Ctrl+X
   - C. Ctrl+V
   - D. Ctrl+P

x. When the mouse pointer is at extreme left and changes to a right-pointing arrow, which of the following command is used in Word to select the entire document?
   - A. Double-click
   - B. Triple-click
   - C. Ctrl+Single-click
   - D. Shift+Single-click

Q2. Write short answers of the following questions.

i.   What is a word processor? Write some advantages of it over a typewriter.

ii.   Name any three types of documents which can be prepares in Word.

iii.   Differentiate between page break and section break.

iv.   Why header and footer are important in a Word document?

v.   What is the purpose of control buttons in Word window?

vi.   Why hyperlinks are created in Word document?

vii. Name any three areas of application of Excel.

viii. Differentiate between relative and absolute cell addressing in Excel.

ix.   What are the advantages of protecting an Excel worksheet?

x.   How graphical representation of spreadsheet data can be helpful in business.

Q3. Write long answers of the following questions.

i.   Which shortcut keys are used in Word to move cursor to the beginning of line, end of line, top of the document and end of the document?

ii.   Write the mouse commands used for selecting various items is a Word document such as single word, sentence, paragraph, etc.

iii.   Explain text and paragraph formatting in Word.

iv.   Describe the Paste Special command used in Excel.

v.   Describe how functions are used in Excel with examples.

vi.   Describe how formulas are used in Excel with examples.

Lab Activities

1. **Type the following text and apply the commands given at the end.**

   COMPUTER ETHICS

   Computer ethics is concerned with the moral guidelines for the ethical use of computer technology. It emerged with the invention of computer. It specifies what is right and what is wrong when using computer technology. The following are some important points of computer ethics.

   Computer should not be used to harm other people

   Computer should not be used to commit any type of crime

   Computer users should not create computer virus

   a. Center the title and make it bold

   b. Apply font size 16 to the title

   c. Justify the paragraph

    d. Underline and bold the words "Computer ethics" in the paragraph

    e. Apply italics and bold to the words "computer technology"

    f. Apply bullets to the last three lines

2. **Create weekly timetable of your class in Word and give title to it using WordArt.**

3. **Create the following worksheet in Excel and calculate sum and average using formulas.**

Expenses of 1st Quarter						
S.No.	Expense	Jan	Feb	Mar	Total	Average
1.	Salary	87000	102400	113800		
2.	Rent	2500	2500	2500		
3.	Utilities	3250	3500	3080		
4.	Transport	7830	6885	8940		
5.	Miscellaneous	4500	6708	7740		

4. **Create a column chart for expenses in the months of January, February and March for the above worksheet.**

5. **Create the following worksheet in Excel and enter marks in the subject columns in the range 0 to 75. Restrict data entries in the subject columns to the specified range using data validation command.**

S.No.	Student Name	Mathematics	Physics	Computer	Chemistry
1.	Abrar Nabi				
2.	Mumtaz Akbar				
3.	Muhammad Bilal				
4.	Javed Akhtar				
5.	Afzal				
6.	Muslim Khan				

6. **Write a leave application in Urdu using the Inpage Urdu editor.**