



Introduction to Computers

Computers are multi-purpose machines that can be used to solve variety of problems in different fields. Computers have changed the way we live, work and communicate. Computers are useful in industries, government, education, research as well as entertainment sectors. From routine business activities in a given area to a spectacular task, computers are applicable everywhere. That is why a computer is called multi-purpose machine.

Working of a Typical Computer

Just as a calculator calculates, a driver drives and a painter paints, computer computes. The computing here is not restricted to only mathematical computing but to a variety of logic based tasks. One only needs to systematically design step by step clear guidelines for the task to be solved. These guidelines generally written in simple English language are called **algorithm**. Computer once given proper set of instructions can perform operations like generating bills, reserving tickets, printing mark-sheets, printing business reports or communicating messages. Computer can also deal with audio, video, graphs and animations besides texts and numbers.

Once the computer is given data and step by step instructions, it then performs computations and generates result or performs an action as an output. The set of data and instructions provided by a user to the computer is called an **input**. Computer processes this input and presents results to the user. The result is called an **output**. Computer can remember these data, instructions and calculated results for future use by storing the details in memory. This simple flow of working of computer is shown in figure 1.1.

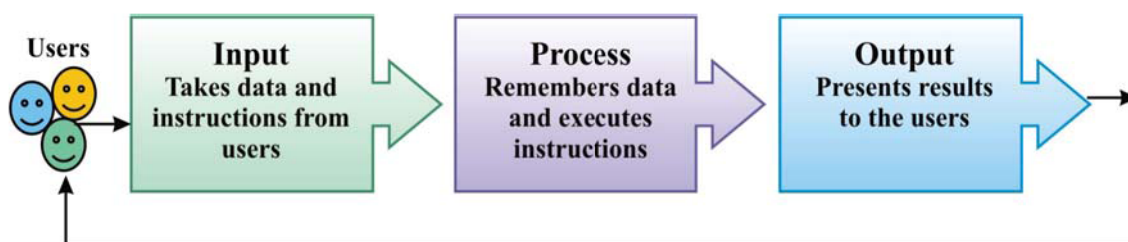


Figure 1.1 : Working of a Typical Computer

Further, it is not compulsory to repeat the instructions and enter large amount of data every time we use the computer. We can store the data and instructions within the computer itself in such a way that it can be understood by machine; that is, in machine readable language. Storing such set of instructions is useful for repetitive performance of the tasks. Once the set of instructions in machine readable format called program is stored in the computer, it can be used many times with different sets of data. This concept is known as **stored program concept**.

Following sample list presents some sample applications to highlight use of computers in different areas :

- Ticket reservations
- Bank operations
- Inventory management and manufacturing support
- Entertainments such as playing games, composing music and editing movies
- Teaching
- Financial Accounting
- Correspondence and publishing (composing newspapers, writing letters, books etc.)
- Space applications
- Robotics
- Email and chatting
- Website development etc.

Simple Model of a Computer

The simple model of a typical computer is based on the working of computer shown in the figure 1.1. As we have discussed, instructions are needed to make computers perform some actions. To obey instructions provided by the user and perform computations, a computer needs to have a mechanism to input. The input mechanism helps in feeding data as well as instructions into the computers. This mechanism is called **input unit**. Devices used for the input purpose are known as input devices. Typically input devices such as mouse and keyboards are used for this purpose.

Input provided through the input mechanism is stored in memory of the computer and further processed by a mechanism called **processing unit** or processor. Results are presented to the user through output mechanism called **output unit**. Typical output devices are monitor and printer. In short the input, memory, processor and output are the basic components of a typical computer.

Input Unit

The **input unit** provides a facility to enter data and instructions into the computer. Input mechanism supports many devices such as keyboard, mouse, joystick, barcode reader, universal serial bus (USB) devices, hard disk and compact disks (CDs). Different input devices take data in different forms and send it to the computer memory. For example, use of keyboard to enter data and instructions is very much similar to the use of a typewriter. Another way to input data is reading through barcode reader. Barcode reader is normally seen at superstore. Remember when you purchase a pack of biscuits, the shopkeeper uses a small device and presses a button on the device. With sound of a beep, the barcode printed on a tag of the biscuit pack is read and copied to the computer in order to generate bill. Mouse is also used to input data into computer. Mouse is a device that

controls movement of the pointer (also known as cursor) on the display screen. It is a small object with a few buttons (keys) which you can roll on a hard surface. As mouse is moving on the surface, the pointer on the display screen is also moved. A mouse must have at least one button. Most of the input devices convert the data into machine readable form.

Memory and Control Unit

Once input is collected via input devices, the input is needed to be stored into the computer memory. Computer memory retains data, instructions and processed output for a while (short duration) or for a long time. There are different types of computer memories. Some computer memories are capable of remembering the content for very short duration; say till the work is in progress and continuous supply of power is ensured. Such memory is called volatile memory. Such memory forms primary storage of a computer, hence it is known as **primary memory**. It is also called as temporary memory or main memory. The input from different devices goes first to the main memory and will be retained into the memory electronically. The content will remain in the main memory till the computer is switched off. When computer is switched off or reset, the content will be lost. To preserve the content for a long, we need **secondary** or **auxiliary storage**. The secondary storage memory is not volatile and content can be preserved for long time. Devices that use secondary memory are called secondary storage devices. Hard disk and compact disks are the most popular secondary storage devices. Unlike the primary memory, the secondary storage is non-volatile, slow (in comparison with primary memory), less expensive, and large in capacity.

As mentioned, once the data and instructions are entered into the memory, instructions are executed and result is prepared. As per the requirement of the user, the result is preserved in the memory or sent to the output unit. To execute instructions, the computer needs to perform some arithmetic and logical computations. The arithmetic and logical computations are performed by a unit called **Arithmetic Logic Unit** (ALU). Besides the ALU, there is a **Control Unit**, which manages execution of instructions and control operations of other components of the computer. ALU and control units together form **Central Processing Unit** (CPU), which is also called the brain of a computer. Some high speed (cache) memory can also be a part of the CPU.

Output Unit

The **output unit** is normally a visual screen called monitor. The monitor actually refers to a whole box of the visual output mechanism of a computer. Display screen is part of the monitor. Many times we use monitor and display screen as synonyms. The older monitors used to provide black, white and grey-shade outputs, which usually was the text and numbers. Presently, colour monitors that are capable of presenting variety of information such as high quality graphics and animations are available. To output sound, special devices such as speakers and headphones are used. To print the output printers are used. Optionally, output is directly published on the website or sent as a file via Internet. Basic components are shown in figure 1.2.

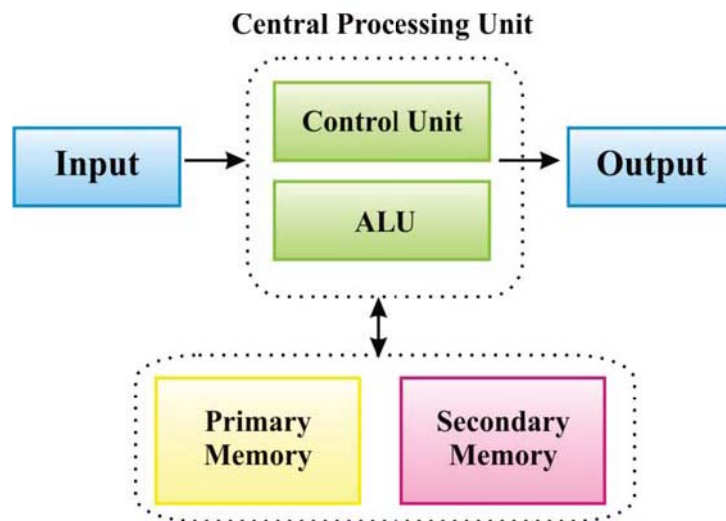


Figure 1.2 : Basic Components of Computer

The input, output and processing mechanism are discussed in detail in later chapters.

Characteristics and Advantages of a Computer

Computers are very useful because of their characteristics like automation, accuracy, long term storage, consistency, and programmability. These characteristics describe the efficiency of the machine to execute the given task. Hence, these characteristics are also known as efficiency oriented characteristics. These characteristics are described below:

Automation : Computer can automatically perform a given task. Once data and necessary instructions are stored into the computer memory, human intervention is not required. Some jobs such as searching from a large repository of data (or from Internet) are nearly impossible without such automation.

Accuracy : Computers are able to perform complex arithmetic and logical computations with the highest accuracy. Properly designed computers provide highly accurate results. However, it is obvious that garbage (bad) results are produced by garbage (bad) input entered knowingly or unknowingly. This is called **Garbage In Garbage Out** (GIGO).

Long term storage : Computers can store large amount of data in its secondary storage for long time. The stored content can be recalled easily on request. Unless specifically asked, the content will be preserved in the memory.

Ability to perform mechanical and repetitive tasks : computers are able to perform mechanical tasks in consistent manner. They do not possess human oriented limitations such as loss of interest, likings, and physical capacity.

Programmability : Computers can be programmed to execute predefined set of instructions. Writing program once and executing it many times saves lot of time and cost. The program once written can be modified later for the revised task. Therefore, computers are versatile to perform any activity, provided a step by step program is given.

Figure 1.3 demonstrates prominent characteristics of a computer.



Figure 1.3 : Characteristics of Computer

Software

So far, we have learnt that computer is a multi-purpose machine and cannot perform any task on its own. It needs data and step by step machine understandable instructions to perform the intended tasks. This set of instructions is called a program. Development of the program becomes easier if a step by step guideline to solve the given tasks called algorithm is designed. The logic prepared for getting the given task done using an algorithm is known as software. Software refers to organized collection of computer programs, data and related documentation (such as comments) about the computer programs. Figure 1.4 illustrates the components of software.

Hardware

Unlike software, the hard entities such as keyboard, mouse, central processing unit and other peripheral devices are considered as physical entities and hence called **hardware**. Hardware is a comprehensive term for all physical parts of a computer.

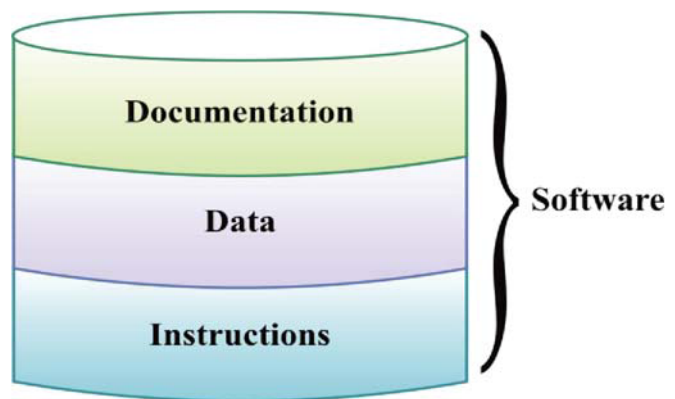


Figure 1.4 : Components of Software

Firmware

Software instructions many times come integrated along with hardware. Since such software is closely coupled with hardware, it is known as firmware. The software embedded with the hardware usually facilitates use and application of the hardware. It also provides utility to work with other hardware and communicate data when needed. Usually such firmware are developed by the hardware manufacturing company and provided free when one purchases the hardware. For example, washing machine, traffic lights, digital camera and microwave oven have some software

programs inbuilt in the devices. Later you will learn what type of memory is used for firmware designing.

Summary

Computers are machines that take data and instructions, store them into its memory and execute them on demand. In this chapter we saw working of typical computers. We learnt about different input, output and processing units with examples. Because of the characteristics like speed, accuracy, and storage capacity, computers are used for many applications. In this chapter we saw highlights of the important characteristics of computers along with some applications. Finally we discussed the concepts of hardware, software and firmware.

EXERCISE

1. List the basic components of a computer. Describe each in brief.
2. Draw a block diagram of a computer containing basic components of a computer. Explain the diagram.
3. What are the popular input devices ?
4. What are the popular output devices ?
5. Differentiate primary and secondary memory.
6. What is ALU ? Give full form and explain work of the ALU in one line.
7. What is CU ? Give full form and explain work of the CU in one line.
8. Which component is called brain of the computer ? Why ?
9. What are the characteristics of computers ?
10. Define software. What are the main components of software ?
11. Define hardware. Give two examples of hardware.
12. **Choose the most appropriate option from those given below :**
 - (1) Which of the following is the typical work flow of a computer ?
 - (a) Input, output and process
 - (b) Input, process and output
 - (c) Output, process and input
 - (d) Any of these
 - (2) Which of the following identifies the concept of a computer itself remembering the set of data and instructions to be executed ?
 - (a) Stored program concept
 - (b) Fixed source concept
 - (c) Automatic source concept
 - (d) Variable source concept
 - (3) Which of the following refers to a set of step by step instructions to perform a given task written in machine understandable format ?
 - (a) Program
 - (b) Algorithm
 - (c) Instruction
 - (d) Data

- (4) Which of the following devices converts the given data into machine readable form while entering data into the computer ?
- (a) Output (b) Input
(c) Memory (d) All of these
- (5) Which of the following does a computer memory retains ?
- (a) Data (b) Instructions
(c) Results (d) All of these
- (6) Which of the following memory types is costly, fast and limited in size ?
- (a) Primary (b) Secondary
(c) Temporary (d) All of these
- (7) What is the other name of primary memory ?
- (a) Non-volatile (b) Volatile
(c) Fragile (d) Non-Fragile
- (8) Which of the following are characteristics of secondary memory ?
- (a) Cheaper and slower than the primary memory.
(b) Cheaper and faster than the primary memory.
(c) Volatile and slower than the primary memory.
(d) Volatile and slower than the primary memory.
- (9) Hard disk and compact disks (CDs) are examples of which of the following device types ?
- (a) Primary (b) Secondary
(c) Temporary (d) None of these
- (10) Which of the following unit performs the arithmetic and logical computations ?
- (a) Arithmetic logic unit (b) Advanced mathematical logic unit
(c) Alternative logic unit (d) Logic unit
- (11) Which of the following unit manages execution of instructions and controls operations of other components of the computer ?
- (a) Memory (b) Input
(c) Control (d) Output
- (12) Which of the following does ALU and control units together form ?
- (a) Central processing unit (b) Control processing unit
(c) Memory (d) Input/Output unit

- (13) Which is an example of an output mechanism ?
- (a) Keyboard
 - (b) Barcode reader at superstore
 - (c) Printer
 - (d) Mouse
- (14) Which component of a computer is known as the brain of a computer ?
- (a) Input unit
 - (b) Output unit
 - (c) Central processing unit
 - (d) Memory unit
- (15) Which of the following is full form of GIGO ?
- (a) Garbage in garbage out
 - (b) Global input in global output
 - (c) Garbage out garbage in
 - (d) Get Input Get Output
- (16) Which of the following is a component of Software ?
- (a) Instructions
 - (b) Data
 - (c) Documentations
 - (d) All of these
- (17) Which of the following does the term hardware refers to ?
- (a) Soft parts of computers.
 - (b) Logical parts of computers.
 - (c) Physical parts of computers.
 - (d) Any of these

