

1

Know Your Computer

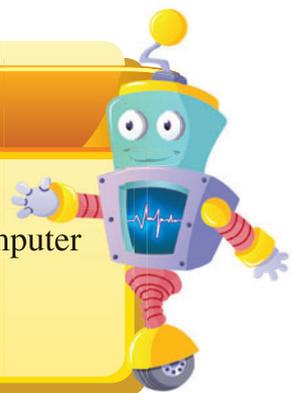
SNAP RECAP

1. Any raw data given to the computer using an input device is called input.
2. The raw data is manipulated by performing certain operations using the computer's processing device. This is called processing.
3. Output is the processed data given to the outside world using an output device.
4. Primary memory is also called internal memory. It is of two types: RAM and ROM.
5. Computer language is a set of commands or instructions that a computer understands.

LEARNING OBJECTIVES

You will learn about:

- | | |
|--------------------------------|--|
| 1. early calculating devices | 4. functional components of a computer |
| 2. evolution of computers | 5. categorisation of software |
| 3. classification of computers | |



Introduction

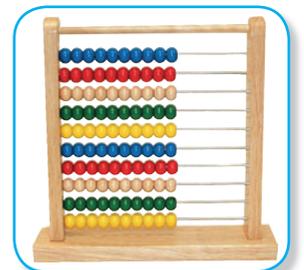
A computer is an electronic device which accepts data from the user, processes it and gives the desired output. It is a machine capable of performing calculations with the help of mechanical computing device. The evolution of computers started way back in the late 1930s. Computers at that time used binary language for its operations.

Early Calculating Devices

A few calculating devices used prior to the development of computers are discussed here.

Abacus

Abacus, the first calculating machine, was developed in China. It is used to count numbers and perform simple calculations such as addition and subtraction.



Abacus

Napier's Bones

Napier's Bones was developed by Sir John Napier in 1616. The device was used to perform calculations involving addition, subtraction, multiplication and division. It was named so as the numbers were carved on bones or strips of wood.

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

Napier's Bones



Pascaline

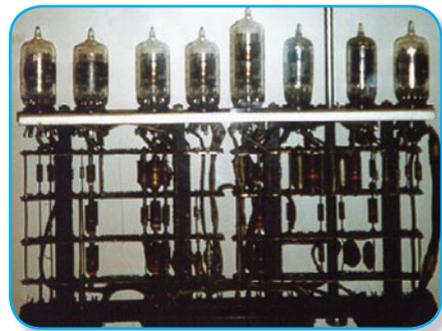
Pascaline

Pascaline, one of the first mechanical calculators, was invented by Blaise Pascal in 1641. Though it could perform only subtraction and addition, yet it became very popular.

Evolution of Computers

From everyday task to moving satellites in space, computers have revolutionised almost everything in our society. The development of computers has been classified into generations. Let us learn about them now.

First generation computers – Vacuum tube based computers



First generation computers

In the evolution of computers, the first generation was characterised by the use of vacuum tubes. The first generation computers were built to solve physics equations using electronic vacuum tubes as the switching components. These used **machine language**. *A machine language is a low-level programming language and is written using long strings of 0s and 1s for computing.* Machine language varies with the computer used.

The first generation computers were expensive and bulky. The vacuum tubes did not support multitasking. Programs written in machine language were cumbersome and difficult to remember.

FACT FILE



The UNIVAC and ENIAC computers are examples of first generation computing devices. The UNIVAC was the first commercial computer.

Second generation computers – Transistor based computers

In the 1960s, transistor based computers replaced vacuum tubes which marked the second generation of computers. Transistors made computers smaller and cheaper. They also made computers energy efficient, but the transistors were subjected to damage because of the emission of large amount of heat from the computer.

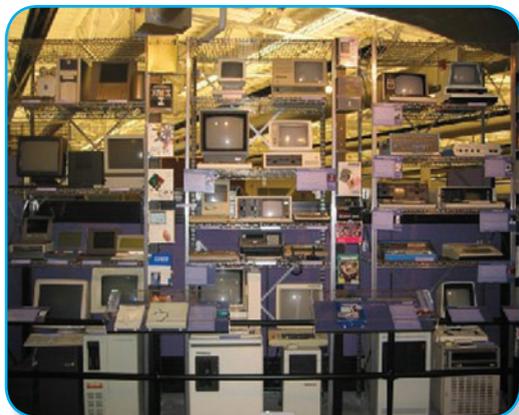
Computers belonging to this generation used punched cards for input. They used **assembly language** which is a low-level programming language. An assembly language is based on the english alphabet. The instructions are written in the form of codes. Assembly language is machine dependent, and has to be written based on the configurations of the computer.



Second generation computers

Third generation computers – Integrated Circuit based computers

The integrated circuit based computers marked the third generation of computers. Small



Third generation computers

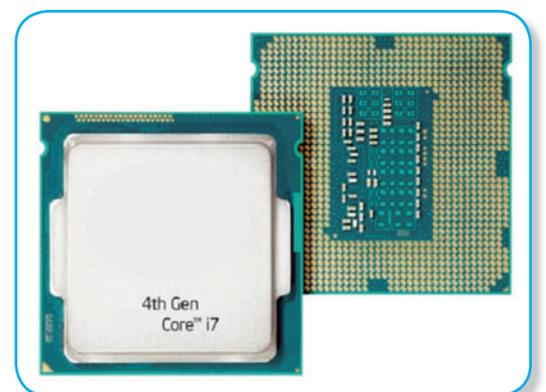
transistors were placed on silicon chips, called semiconductors, which increased the speed and efficiency of computers.

The third generation computers were based on **high-level languages**. A high-level language uses the english alphabet and mathematical symbols. It is easy to use and understand. It is not machine dependent. The programs written in high-level language are called **source programs**. For example, Fortran, COBOL, BASIC, C, C++, Java are a few examples of high-level languages.

Fourth generation computers – Microprocessor

Introduction of microprocessors was the hallmark of fourth generation computers. They facilitated automation of industrial process and office. Around 1970, this technology of placing thousands of integrated circuits onto a single silicon chip, that made up a microprocessor, was made available.

Microprocessor is compact and easy to maintain. It has a high processing speed. However, it has limitations on the size of data.



Microprocessor

Fifth generation computers – Artificial Intelligence

The development of fifth generation computers is underway. They are going to be based on the principles of artificial intelligence and natural language recognition. This technique will be used to design robots.

Developers are aiming at developing computers capable of organising themselves. So, the evolution of computers still continues.

Classification of Computers

On the basis of their size and speed, computers are generally classified as follows:

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

Microcomputer

Microcomputer, was earlier, a commonly used term for personal computers. A personal computer assemblage consists of CPU, computer memory (primary and secondary) and various input and output devices. Only one person can use it at a time. It is slow and has relatively less storage capacity as compared to a minicomputer or a mainframe computer. It is commonly used in classrooms, homes, banks, universities, etc.

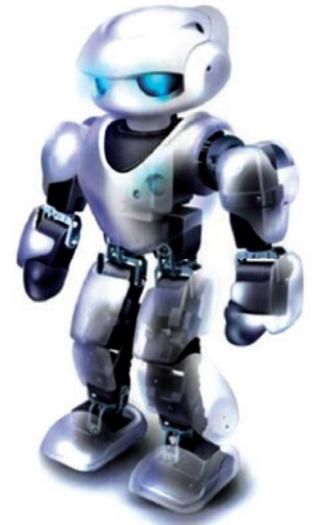
There are various kinds of microcomputers available nowadays. Let us study about them here.

Desktop: It is a microcomputer designed to fit comfortably on top of a desk, typically with the monitor in front and the system unit on the side.

Laptop: It is a portable microcomputer. You can keep it on your lap. Nowadays, laptop computers are more commonly called **notebook** computers.

Tablet: It is a mobile computer. It offers the users a touchscreen environment that may or may not be accompanied by a stylus (a pointing device). They are available in a variety of sizes and have a built-in/virtual keyboard.

Smartphone: It is a mobile phone built on a mobile OS. It has enhanced features as compared to an ordinary mobile phone like compact digital cameras, GPS, web-browsers, Wi-Fi, broadband facility, etc.



Fifth generation computers



Desktop



Laptop



Tablet



Smartphones

Minicomputer

A minicomputer is much larger than microcomputer and also much more expensive. It thus lies between microcomputers and mainframe computers and are often referred to as **midrange computers**. It possesses most of the features found on a mainframe computer, but on a limited scale. It can still have many terminals, but not as many as the mainframe. It can store a large amount of information, but again usually not as much as the mainframe. It uses an enhanced instruction set to facilitate scientific processing and commercial applications. Medium and small businesses and colleges typically use minicomputers.



Minicomputer

Mainframe computer

Mainframe computers are very large, often filling an entire room. They can store an enormous amount of information, and perform many tasks simultaneously. They can communicate with many users at the same time and are very expensive. Mainframe computers usually have several terminals connected to them. These terminals look like small computers but they are only devices that are used for sending and receiving information from the actual computer using wires. Terminals can be located either in the same room with the mainframe computer, or they can also be in different rooms, buildings, cities, etc. Large businesses, government agencies, banks and universities usually use mainframe computers. Big hospitals, airline reservation companies, and many other big companies prefer mainframe computers because of their capability of retrieving enormous data.



Mainframe computers

Supercomputer

Supercomputer is one of the many types of modern computing machines which are big, powerful and are capable of doing very speedy calculations. It is because of their high speed processing ability that supercomputer systems are used in animation graphics, weather forecasting, nuclear research work, petroleum research works, crypt analysis, molecular modelling and the likes.

The difference between the mainframes and supercomputers is that while mainframe machines are primarily used for a number of purposes, supercomputers are designed to serve a singular purpose.



Supercomputer

ACTIVITY

- A. Find out the places where the supercomputers and the mainframe computers are used.
- B. A microprocessor is a multipurpose, programmable device that takes input and provides output. Intel 4004 is the world's first commercially available microprocessor. It was the first complete CPU on one chip. Intel Corporation designed it.
 Take the help of the Internet and find out more about microprocessors.

Functional Components of a Computer

The functional components of a computer are (Fig. 1.1):

1. Input devices
2. Central Processing Unit
3. Output devices



Fig. 1.1 Functional components of a computer

Note: The input and output devices attached to a computer are called computer peripherals.

Input devices

Data is accepted by a computer through the input devices attached to it. The standard input device is a keyboard. Examples of other input devices are Joystick, Mouse, Web camera, Magnetic Ink Character Recognition Reader, Optical Mark Recognition Reader, Optical Character Recognition, Light Pen, Touchscreen, Smart Card Reader, Digital Reader, etc.

You have already read about some of the commonly used input devices in earlier classes. You will learn about a few more here.

Bar code reader: It is used by a computer to scan and identify the product or item codes in the supermarkets, book stores, and many other places. The code for each item, be it the price code, item code, etc. is a unique combination of vertical bars and can be identified by a bar code reader.



Barcode



Bar code reader

FACT FILE

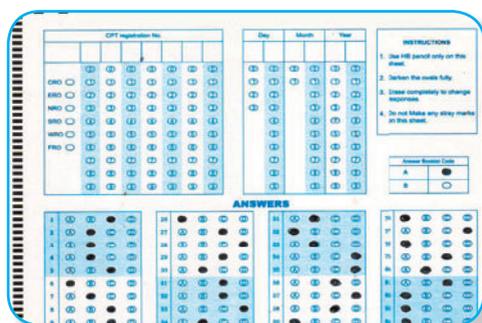


QR Codes (Quick Response Codes) are special barcodes that can be read using QR reading devices, mainly installed as an application on smartphones. These codes link the user directly to text, emails or websites.

Magnetic Ink Character Recognition (MICR) Reader: It reads the special characters printed using a special magnetic ink on cheques, etc. Cheque number, bank code and branch code are printed on cheques using magnetic ink, making them difficult to forge. The MICRs scan this information and are thus capable of sorting cheques.



Magnetic Ink Character Reader



An OMR sheet

Optical Mark Recognition (OMR) Reader: It is used for recognising a pre-specified space on a paper that is marked by a pencil or pen. It is commonly used for marking the answers on examination sheets.

Central Processing Unit

The Central Processing Unit (CPU) is the control centre of a computer. It guides, directs and governs its performance. It is known as the brain of the computer. The CPU has three components which are responsible for different functions. These are discussed here.

Arithmetic Logic Unit (ALU): The ALU performs all the arithmetic and logical operations within a computer. This part provides the arithmetic and decision making capability to a computer.

FACT FILE



Every computer contains an internal clock that regulates the rate at which instructions are executed and synchronises all the different computer components. The CPU requires a fixed number of clock ticks (or clock cycles) to execute each instruction. The faster the clock ticks, the more instructions the CPU can execute per second. Clock speeds are expressed in megahertz (MHz) or gigahertz (GHz).

Control Unit (CU): The CU controls and guides the interpretation, flow and manipulation of all data and information. The CU sends control signals until the required operations are done properly by the ALU and memory.

Another important function of CU is program execution, that is, carrying out all the instructions stored in the program. The control unit even controls the flow of data from input devices to memory and from memory to output devices.

Memory Unit (MU): MU is that part of the computer where the data is stored and is accessible to CPU. The various measurement units of computer memory are given here.

1. **Bit:** A bit means a binary digit, that is, there are only two possibilities for each digit, either 0 or 1. A bit is an elementary unit of the memory.

A number of bits together when combined in different ways are used for storing data in a computer.

2. **Byte:** A group of 8 bits is called a byte. One byte is the smallest unit which can represent a meaningful data item or a character in a computer. Memory is generally measured in terms of bytes.

3. **Nibble:** A group of 4 bits is called a nibble.

Note: The computer memory can also be expressed in other units and their interrelationship is given below:

1 byte	= 8 bits	1024 terabyte (TB)	= 1 petabyte (PB)
1024 bytes	= 1 kilobyte (KB)	1024 petabyte (PB)	= 1 exabyte (EB)
1024 kilobyte (KB)	= 1 megabyte (MB)	1024 exabyte (EB)	= 1 zettabyte (ZB)
1024 megabyte (MB)	= 1 gigabyte (GB)	1024 zettabyte (ZB)	= 1 yottabyte (YB)
1024 gigabyte (GB)	= 1 terabyte (TB)		

The computer memory is basically of two types: primary memory and secondary memory (Fig. 1.2).

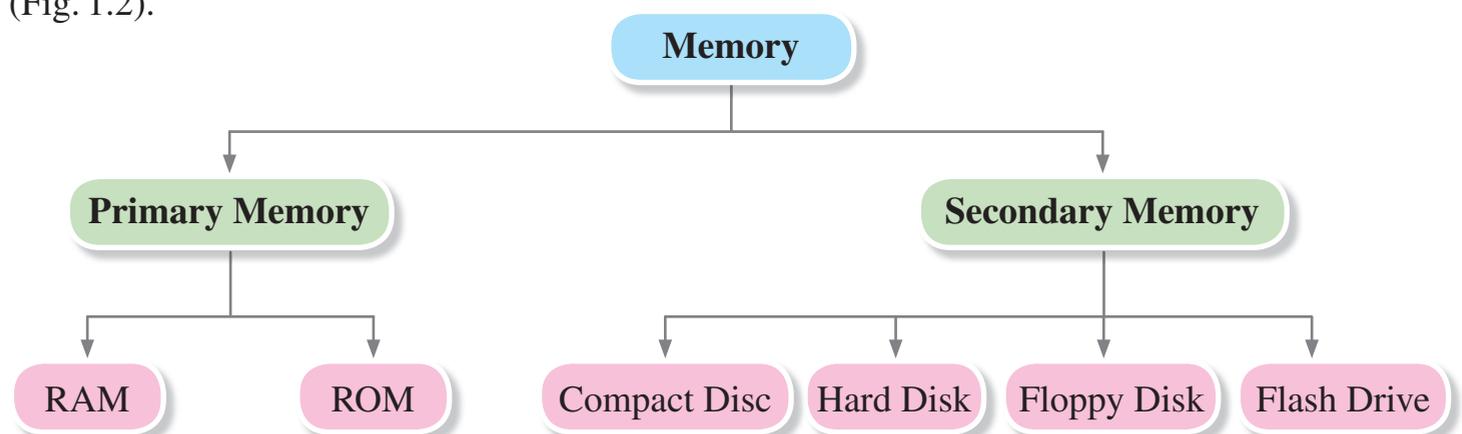


Fig. 1.2 Memory Unit

Primary memory

Primary memory is the basic requirement of a computer. It determines the size and number of software that a computer can store. Primary memory stores two types of programs: system software and application software. You will learn more about them later in this chapter.

Moreover, the primary memory limits the amount of data that a computer can process. CPU can use this memory directly while processing information. On the basis of volatility of storage of data, primary memory is classified into volatile (RAM) and non-volatile (ROM). See Table 1.1.

Table 1.1 *Difference between RAM and ROM*

RAM	ROM
1. RAM stands for Random Access Memory.	1. ROM stands for Read Only Memory.
2. It is a temporary memory.	2. It is a permanent memory.
3. It is volatile in nature, that is, the information stored in RAM is designed to clear when the computer is not on.	3. It is a non-volatile memory, that is, the information stored in ROM is not cleared when the computer is not on.
4. It is the main internal storage area that a computer uses to run programs and store data. It is also called read/write memory.	4. It is a built-in computer memory that can be read by a computer but cannot be modified. It is a memory unit that can only be read from.

Secondary memory

Secondary memory is also known as auxiliary memory. It is used for storing data or programs on a temporary or on a permanent basis. The secondary memory is available in the form of storage devices. For example, floppy disk, hard disk, compact disc, flash drive, etc.

The CPU cannot access secondary memory directly while processing information. The data is transferred to the primary memory when required. The computer uses its input and output devices to access data stored in the secondary memory.



Storage devices

FACT FILE

Cache memory can be used for increasing the capacity of the primary memory and to make the processing faster.

Output unit

Output devices are used for getting information from a computer. For example, Visual Display Unit (VDU) or monitor is an output device that displays the information on the screen. The information shown on a display device is called **soft copy**. You can also obtain information from a computer on a physical medium such as paper, transparency film, etc. with the help of a printer. Printed information is called **hard copy**.

Now, let us learn about a few more output devices.

Liquid Crystal Display (LCD) projector: Output from a computer can be also viewed on a large screen or flat surfaces other than the monitor using an LCD projector. It is used for showing PowerPoint presentations in many organisations.



LCD projector

Plotters: These are the output devices used for making high-quality graphics, charts, diagrams, maps, etc. Plotters use an ink jet or ink pens to create the desired output on paper.

There are different type of plotters available. The three basic types of plotters are discussed here.

1. *Inkjet plotter:* It sprays small droplets of ink onto a piece of paper thereby creating an image.
2. *Flatbed plotter:* The pen or the inkjet moves in horizontal and vertical directions over a fixed horizontal flat surface on which paper is mounted.
3. *Drum plotter:* It uses a drum revolver or roller to move the paper and the pen or the jets of the ink during the printing process. The paper is placed over the drum which is then rotated. The pen is moved along the horizontal or vertical direction to print the output.



Inkjet plotter



Flatbed plotter



Drum plotter

ACTIVITY

- A. Make a list of the latest input and output devices available in the market these days.
- B. Have you heard about a flash drive? What is its use?
- C. Make a list of storage devices available in the market.