high-speed processing ability that supercomputer systems are used in graphic animation, weather forecasting, nuclear research works, petroleum research, crypt analysis, molecular modelling, etc.

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 single purpose.

Supercomputer

ACTIVITY

A. Search for more information about application areas of minicomputers, supercomputers and mainframe computers. Document your findings using MS Word. Ensure that you have included at least five applications for each type of computer.

B. Make a chart of early calculating devices along with their inventors and their uses.

Functional Components of a Computer

The functional components of a computer are shown in the diagram below.

| Input Unit | → | Central Processing Unit (CPU) | → | Output Unit |

Functional components of a computer

The input and output units attached to a computer are called computer peripherals.

Input unit

Data is accepted by a computer through the input unit connected to it. The standard input device is a keyboard. Examples of other input devices are joysticks, mice, web cameras, Magnetic Ink Character Recognition Readers (MICR), Optical Mark Recognition Readers (OMR), Optical Character Readers (OCR), touchscreens, smart card readers, digital readers, etc.

You have already read about some of the commonly used input devices in earlier books. Some other input devices are described below.

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

*Bar code reader*

FACT FILE

Quick Response (QR) 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: This reads the special characters printed using a special magnetic ink. 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 therefore capable of sorting cheques.

Magnetic Ink Character Reader
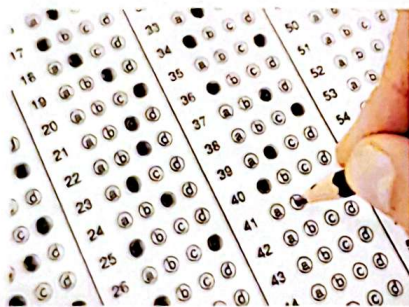
An OMR sheet

Optical Mark Recognition (OMR) reader: 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.

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

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 completed by the ALU and the memory.

Another important function of the 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 the input devices to memory and from memory to the output devices.

Memory Unit (MU): The MU is that part of the computer where the data is stored and is accessible to the 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 computer memory.

   A number of bits when combined together 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 character in a computer. Memory is generally measured in terms of bytes.

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

> 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) | | |

FACT FILE

1 kilobyte is equal to 1024 bytes and not 1000 bytes as it is 2 raised to the power 10.

The computer memory is classified as shown in the diagram below.
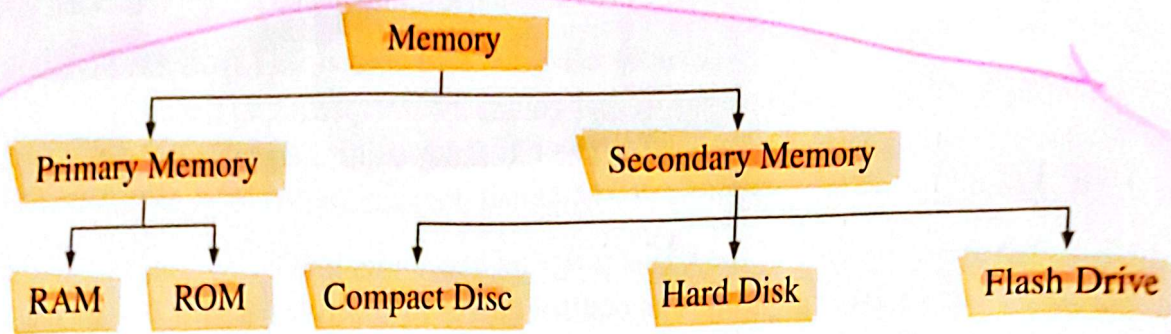
The Memory Unit

Primary memory

Primary memory is the basic requirement of a computer. It determines the size and number of software applications 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.

Primary memory limits the amount of data that a computer can process. The CPU can use this memory directly while processing information. On the basis of volatility of storage of data, primary memory is classified into volatile memory (RAM) and non-volatile memory (ROM) as shown in the table below.

Differences between RAM and ROM

Random Access Memory (RAM)	Read Only Memory (ROM)
1. Temporary memory.	1. Permanent memory.
2. Volatile in nature, that is, the information stored in RAM is designed to clear when the computer is turned off.	2. Non-volatile memory, that is, the information stored in ROM is retained even when the computer is turned off.
3. The main internal storage area that a computer uses to run programs and store data. It is also called read/write memory.	3. 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.

Secondary memory

Secondary memory is also known as **auxiliary memory**. It is used for storing data or programs on a temporary or permanent basis. The secondary memory is available in the

form of storage devices. For example, hard disks, compact discs (CDs), flash drives, 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.
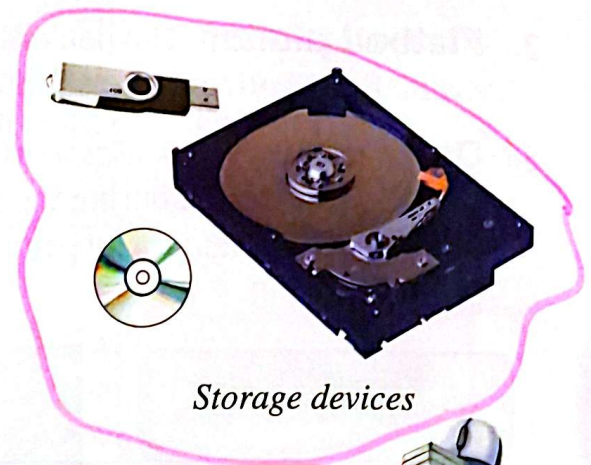
Storage devices

Output unit

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

Other output devices are described below.

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


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 required output on paper.

There are different types of plotter available. The three basic types of plotter are:

1. **Inkjet plotter**: This sprays small droplets of ink onto a piece of paper and creates 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**: This 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.
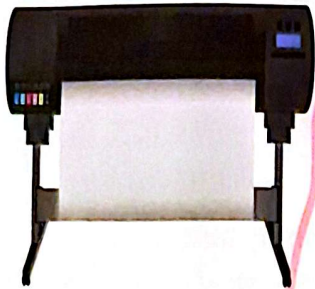
| Inkjet plotter | Flatbed plotter | Drum plotter |

ACTIVITY

A. Make a list of the latest input, output and storage devices available.

B. What are flash drives used for? Find out the range of their storage capacities.

C. Using the internet, find out the various storage capacities of RAM available.

Categorisation of Software

Software is a set of programs that runs a computer system. Computer software is stored and executed (run) with the help of computer hardware. Major categories of software that form part of a computer system are discussed here.

FACT FILE

Computers work on the theory of GIGO (Garbage In Garbage Out). It means that wrong input will give the wrong output.

System software

System software is a program that manages and supports the resources and operations of a computer system while it executes various tasks such as the processing of data

and information, controlling the hardware components and allowing users to use the application software. In other words, system software is a bridge between the computer system hardware and the application software. An Operating System (OS) is an example of system software.

System software controls the internal computer operations. It can be further classified into two categories.

(1-a) Operating System (OS): An operating system is software which acts as an interface between the user and the computer (that is, all computer resources). It is an important component that controls all other components of the computer system. Without an operating system, a computer will not work. Some of the most commonly used operating systems are Windows, DOS, UNIX, etc.

(1-b) Language translators: These are used to translate programming languages. There are three types of language translators.

i *Compiler*: Translates the high-level language program into machine language. It converts the entire program in one go and reports all the program errors along with their line numbers. For example, C language uses a compiler. The translated program is called the **object program** or the **object code**.

ii *Interpreter*: Translates a program written in high-level language into machine language by converting and executing it line by line. If there is an error in any line, the interpreter reports it immediately and the program cannot continue until it is fixed. However, it is a smaller program than a compiler. For example, BASIC uses an interpreter as the translator.

iii *Assembler*: A language translator that converts a program written in assembly language into machine language.

② Application software

Application software is a set of programs necessary to carry out operations for a specified application. These are the programs written by programmers to enable computers to perform a specific task. Various application software and their examples are given below.

Application Software	Example(s)
• Word processors	• MS Word
• Presentation tool	• MS PowerPoint

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• Spreadsheet package	• MS Excel, Lotus 123
• Database management system	• MS Access, Sybase
• Business software	• Inventory management, payroll system, financial accounting, hotel management, etc.
• Image/video editing	• GIMP, Photoshop, Windows Movie Maker, etc.

6) Utility software

Utilities are application programs which assist a computer by performing housekeeping functions like backing up disks, or scanning/cleaning viruses or arranging information. They ensure the smooth functioning of a computer.

Some important utilities are:

- the text editor used for creating and editing text files

- backup utility that facilitates the backing-up of disks

- compression utility that facilitates compression of files

- disk defragmentation utility that attempts to minimise the fragmentation on the disk

- and anti-virus software that ensures a virus-free environment.

FACT FILE

The open source application software provides the source code along with the .exe file so that users can make changes in the code to suit their requirements. The open source substitute of MS Office is OpenOffice.

ACTIVITY

A. Make a list of commonly used utility softwares.

B. Read more about open source application softwares.

C. Make a chart on the evolution of computer languages. Classify them based on whether they use a compiler or an interpreter.

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Software

System
Software

Application
Software

Operating
System

Language
translator

Utilities

Word
processor

Spread
Sheet

Data
base