1 Computer Fundamentals

Learning Outcomes

By the end of the chapter, the students will be able to:

- define computer memory
- understand the storage capacity of a computer
- differentiate between primary memory and secondary memory
- explain the use of different secondary storage devices

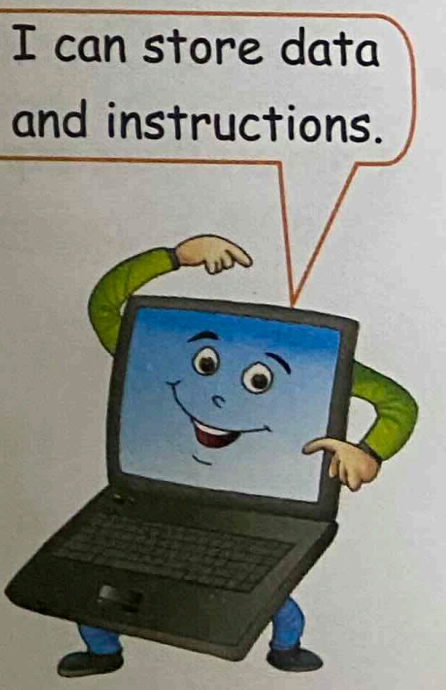
Warm-up

CRITICAL THINKING

The table on the left shows names of some items that you commonly see in your classroom. Read the words twice or thrice. Now, cover the table with your hand or a piece of paper. Try to recall the items and write their names in the table on the right. How many words were you able to memorise correctly?

Desk	Chalk	Board
Clock	Chair	Books
Pencils	Ruler	Notebooks

Computer memory refers to the storage area of the computer where all the data and instructions are stored. There are two types of computer memory, namely, primary memory and secondary memory. The primary memory is like a blackboard where the information is retained for a short period of time and secondary memory is like a notebook where the information once written is retained permanently. The basic units to measure the storage capacity of computer memory are bits and bytes. The other units are KB, MB, GB, and TB. Let us first discuss these units, and then we will discuss the various types of computer memory.



STORAGE CAPACITY

(The term storage capacity refers to the amount of data that can be stored in a storage device. The more memory a computer has, the more information it can store. The commonly used units to measure the size of computer memory are described below.

- **Bit:** The data entered into a computer are first converted into 0s and 1s for the computer to understand. The digits 0 and 1 are called binary digits (abbreviated as bits). A bit is denoted by 'b'. It is the smallest unit of information.
- **Nibble:** It is a collection of four bits.
- **Byte:** It is made up of eight bits of information, such as 00000000 or 10101010. It is denoted by 'B'. The byte is the amount of memory required to store a single character. For example, four bytes are required to store the word play. All specifications related to the computer's memory are represented in terms of bytes.
- **Kilobyte:** It is equal to 1024 bytes. It is denoted by KB or simply K.
- **Megabyte:** It is equal to 1024 kilobytes. It is denoted by MB or simply M.
- **Gigabyte:** It is equal to 1024 megabytes. It is denoted by GB or G.
- **Terabyte:** It is equal to 1024 gigabytes. It is denoted by TB.

The table given below summarises the various memory units with their associated values.

Term	Symbol	Value
Bit	b	0 or 1
Byte	B	8 b
Kilobyte	KB	1024 B
Megabyte	MB	1048576 B or 1024 KB
Gigabyte	GB	107341824 B or 1024 MB
Terabyte	TB	1099511627776 B or 1024 GB

Let's Check

CRITICAL THINKING

Convert these expressions to the memory units indicated.

a. 5 bytes = ..40.. bits

b. 1 KB = ..1024.. bytes

c. 2048 KB = ..2.. MB

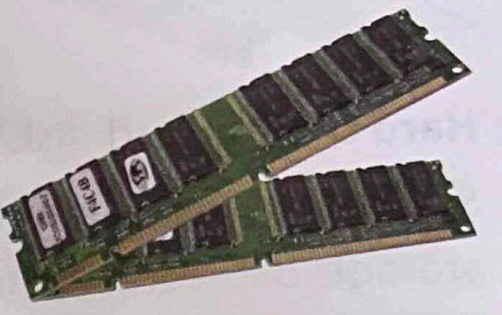
d. 4096 MB = ..4.. GB

e. 10 TB = ..10240.. GB

PRIMARY MEMORY

The primary memory is also called the main memory. It is located inside the CPU. It consists of RAM (Random Access Memory) and ROM (Read Only Memory).

RAM (Random Access Memory): The RAM stores the data on which the CPU is currently working. Information can be read from and written onto the RAM. However, the RAM is volatile in nature which means that the information stored in it remains as long as the power is switched on. As soon as the power is switched off, the information contained in it is lost. So, we have to copy data from the RAM to a secondary storage device. The storage capacity of the RAM affects the performance of a computer too—the more the capacity of the RAM, the faster the computer can work.



The RAM is further classified into static RAM and dynamic RAM. The static RAM (SRAM) retains its contents as long as the computer is on. The dynamic RAM (DRAM) loses its contents after a short duration of time even if the computer is on.

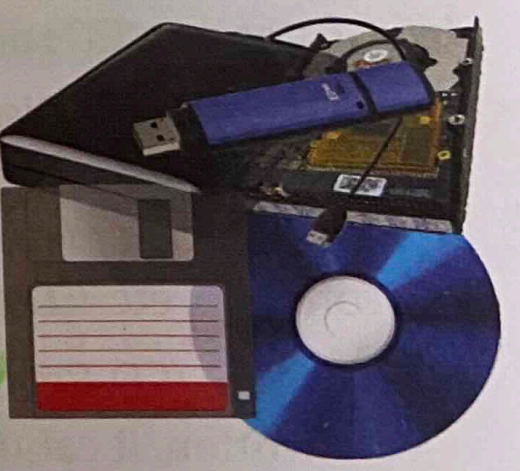
Did You Know?

Dr Robert Dennard invented the one-transistor DRAM in 1966.

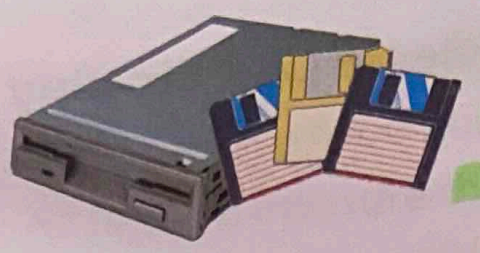
ROM (Read Only Memory): The ROM is a special type of memory that holds instructions for starting up the computer. It loads up the operating system and tells the computer what components are plugged into it. The data is written onto the ROM at the time of manufacturing. Once written, it cannot be deleted or modified. The ROM is non-volatile in nature, that is, the data is not lost even if the computer is switched off.

SECONDARY MEMORY

The primary memory of a computer can store only a limited amount of information on a temporary basis. Therefore, additional memory, called the secondary memory, is required to store a large amount of information on a permanent basis. The secondary memory, also known as the auxiliary memory, is non-volatile in nature. The information on the secondary memory can be transferred to the primary memory as and when required for processing. Some of the secondary storage devices are floppy disk, hard disk, external hard drive, optical disc, Blu-ray disc, and pen drive.



Floppy Disk: A floppy disk is a removable storage device that was used earlier but now has become obsolete. It was used to transfer small files from one computer to another. To read



from and write to the floppy disk, a floppy disk drive was needed which was a part of the unit in the earlier systems. Floppy disks were available in two sizes—3.5 inches and 5.25 inches. The 3.5-inch floppy disk could store 1.44 MB data and 5.25-inch floppy disk could store up to 1.2 MB data.

Hard Disk: A hard disk is a very important part of the computer. It can store thousand times more data than that of any other secondary storage device. It is sealed in a metallic box called the hard–disk drive, which is fixed in the system unit. It stores data in rotating discs known as platters coated with a magnetic material. The hard disk holds the operating system of the computer (such as Ubuntu), application programs (such as LibreOffice Writer, LibreOffice Calc, etc.) and your data files. These days, hard disks with a storage capacity of around 1 TB are available in the market.

External Hard Drive: An external hard drive is a small, reliable and very useful storage device. It is similar to the hard disk in terms of internal structure and function. However, the difference between the two is that a hard disk is enclosed inside the CPU cabinet, while an external hard drive is connected to the computer system through a USB cable. It has a huge storage capacity ranging from 20 GB to several TBs. It can also be carried anywhere. Due to these features, the external hard drive has become quite popular nowadays. External hard drives are available in two sizes—2.5 inches and 3.5 inches.

4e3

Optical Disc: An optical disc is a flat, circular plastic disc. It is capable of storing a large amount of data. It can be easily carried from one place to another. CDs and DVDs are examples of optical discs.

- CD (Compact Disc): A CD is also a removable storage device that can store up to 700 MB of data. The CD is currently the most popular way for storing a wide variety of images, videos, software, etc. CDs are classified into two types:
  - CD-R (CD-Recordable): Data can be written on them only once. Once the data is written, it cannot be deleted.
  - CD-RW (CD-Rewritable): Data can be written, erased, and rewritten a number of times.

A CD-ROM drive is used to read data from a CD and a CD writer is used to read as well as write data on a CD. A CD-RW drive is used to write data on blank CDs and to delete, modify, or add data on an already written CD-RW.

- DVD (Digital Versatile Disc): A DVD is similar to a CD. It can hold about 25 times more data than a CD. It can store around 3 GB to 4 GB of data. At a glance, a DVD can easily be mistaken for a CD, as both are circular plastic discs and are of the same size. DVDs are also classified into two types:

  - DVD-R: Data can be written on them only once.
  - DVD-RAM: In this, data can be written, erased, and rewritten many times.

To read the content from a DVD, a DVD-ROM drive is required. A DVD writer allows you to read data from as well as write data on DVDs.

Blu-ray Disc: A Blu-ray disc (BD) is the new generation optical storage device that looks similar to a CD or a DVD but its storage capacity is much larger. The name Blu-ray disc is derived from the blue-violet laser which is used to read from and write to this kind of disc. The use of blue laser makes the storage capacity of a Blu-ray disc ten times more than that of a DVD; a single Blu-ray disc can store about 25 GB of data. Moreover, a Blu-ray reader is required to read from or write to these discs. Like CDs and DVDs, Blu-ray discs are also available in different formats—BD-ROM, BD-R, BD-RW, and BD-RE.

Pen/Flash Drive: A pen/flash drive, also known as a thumb drive, is a removable storage device that is frequently used nowadays to transfer large volumes of data from one computer to another. The physical size of a pen drive is small enough to fit into a pocket. This makes the pen drive a portable storage device. In addition, its storage capacity is much higher than other storage devices such as CDs, DVDs, etc. Today, pen drives with different storage capacities (1 GB, 2 GB, 4 GB, 16 GB, 32 GB, 64 GB, and so on) are available in the market. It is connected to the computer via the USB port.

Points to Remember

- Computer memory refers to the storage area of a computer where all the data and instructions are stored.
- Storage capacity refers to the amount of data that can be stored in a storage device.
- The commonly used units to measure the size of computer memory are bit, nibble, byte, kilobyte, megabyte, gigabyte, and terabyte.
- The primary memory of the computer consists of RAM and ROM.
- The secondary memory stores a large amount of information permanently.
- Some of the secondary storage devices are floppy disk, hard disk, external hard drive, optical disc, Blu-ray disc, and pen drive. However, floppy disks are not in use these days.

Exercises

INFORMATION LITERACY

1. Tick (✓) the correct option.

a. A collection of four bits is called a
   i. bit ii. nibble iii. byte iv. kilobyte

b. Which new-generation optical storage device looks like a CD and DVD?
   i. Red-ray disc ii. White-ray disc iii. Blu-ray disc iv. None of these

c. Which of the following memories can store a large amount of data on a permanent basis?
   i. RAM ii. ROM iii. DRAM
   iv. Secondary memory

d. Which of the following is used to write data on a blank CD?
   i. CD-RW drive ii. CD-WR drive iii. DVD-RW drive iv. DVD-WR drive

e. A rotating disc inside the hard disk is known as
   i. platter ii. plotter iii. both i. and ii. iv. none of these

CRITICAL THINKING

2. Fill in the blanks.

a. The ....ROM..... is a special type of memory that holds instructions for starting up the computer.

b. A ....pen drive..... is a small, portable storage device that is used to transfer large volumes of data from one computer to another.

c. External hard drives are available in two sizes: ....2.5..... and ....3.5..... .

d. The ....CD-ROM..... drive is used to read data from CD.

e. A ....bit..... is the smallest unit of information that is used by a computer.

f. A group of eight bits makes a ....byte..... .

CRITICAL THINKING

3. Write T for true and F for false.

a. The data stored on ROM is lost when the computer is switched off. F

b. The secondary memory stores a large amount of data permanently. T

c. 1 TB of memory is equivalent to 1024 GB. T

d. An optical disc can be carried easily from one place to another. T

e. A pen drive holds less data than a floppy disk. F

f. An external hard drive is connected to the computer system through a USB cable. T

4. Answer the questions.

INFORMATION LITERACY

a. What is meant by computer memory?

b. Name the two types of computer memory. Explain each of them briefly.

c. Why is the secondary memory important?

d. What do you understand by the storage capacity of a computer?

e. Write short notes on these devices.

i. Blu-ray disc ii. Hard disk iii. Optical disc iv. Pen drive

f. Write the differences between the following.

i. RAM and ROM ii. Bit, nibble, and byte

iii. CD-R and CD-RW iv. DVD-R and DVD-RAM

g. Give the full form of the following abbreviations.

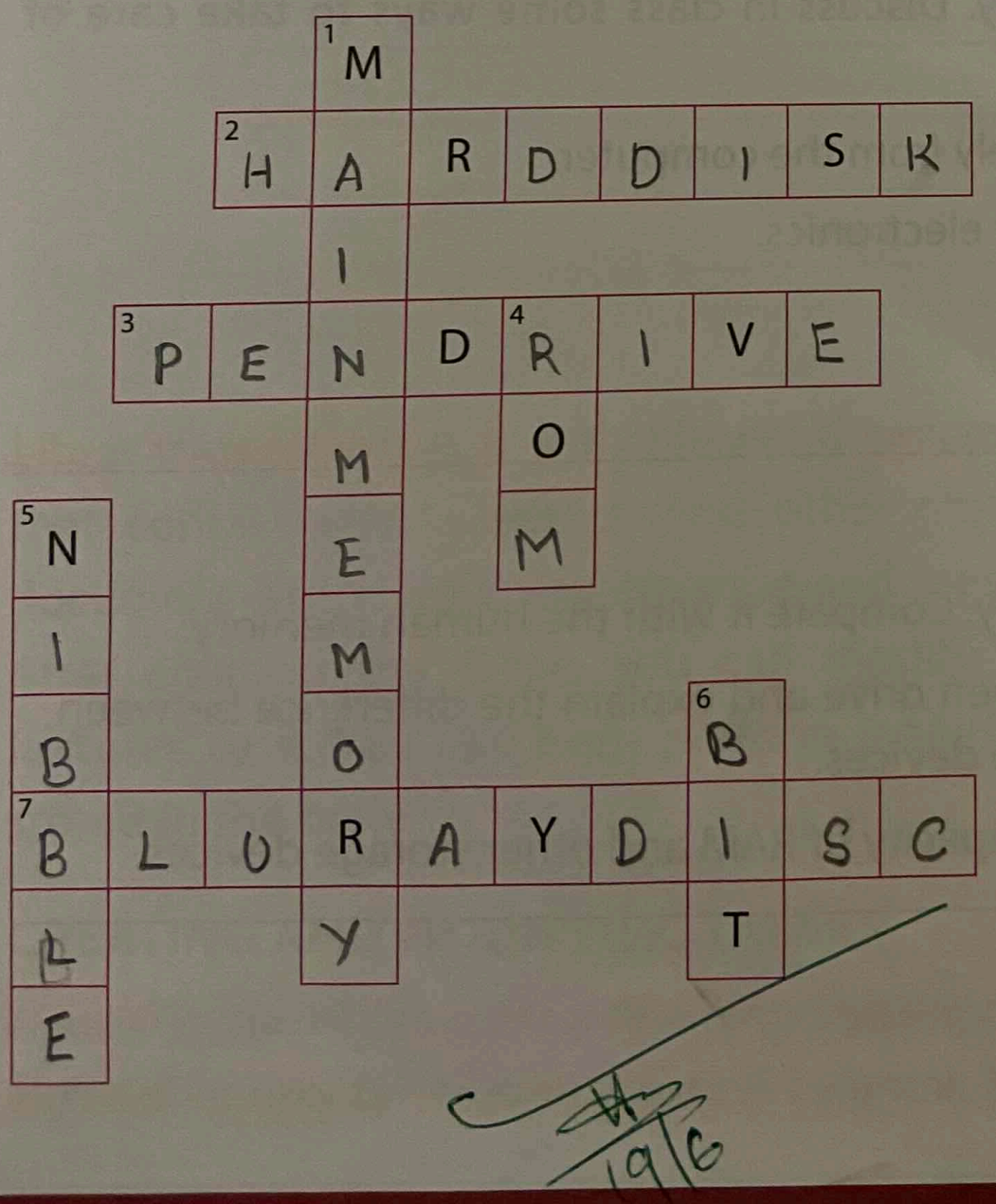
i. RAM ii. ROM iii. b iv. B

v. GB vi. MB

Activity

CRITICAL THINKING

Complete the crossword with the help of given clues.



Clues

1. Another name for primary memory.
2. The main storage device of a computer.
3. A portable device small enough to fit into your pocket.
4. A type of memory that holds instructions for starting up the computer.
5. A collection of four bits.
6. The smallest unit of information that can be stored on a computer.
7. A new-generation optical storage device.

EXPERIENTIAL LEARNING • ICT SKILLS

Lab Activity

1. Make a list of the storage capacity of the RAM and the hard disk of the computers in your computer lab.
2. With the help of your teacher, learn how to insert or remove a pen drive in the computer.

ART-INTEGRATED LEARNING

Project

Collect and paste pictures of the various storage devices on a sheet of chart paper and make a collage. Include some latest storage devices too.

CRITICAL THINKING • INFORMATION LITERACY

Let's Explore

How many bytes are required to store the following words in computer memory?

a. Fish = 4 bytes

b. School = 6 bytes

c. Morning = 7 bytes

d. Bye = 3 bytes

e. Computer = 8 bytes

f. Secondary = 9 bytes

COLLABORATION • COMMUNICATION • LIFE SKILLS & VALUES

Let's Discuss

We should use the storage devices carefully. Discuss in class some ways to take care of your storage devices. For example:

- Always remove your storage devices safely from the computer.
- Do not place the devices on top of other electronics.
- Store devices at room temperature.

Teacher's Corner

- Explain the need for computer memory. Compare it with the human memory.
- Show the students a CD, DVD, and a pen drive and explain the difference between them. Show them how to handle these devices.
- Show how to determine the storage capacity of RAM and other storage devices.