

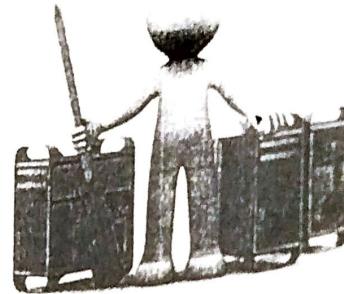
# Chapter 1

# Computer Systems

## Introduction

This chapter introduces a thorough understanding for what computers are, how they work, and how people use them. It gives a brief idea about the important terms and concepts included in this course.

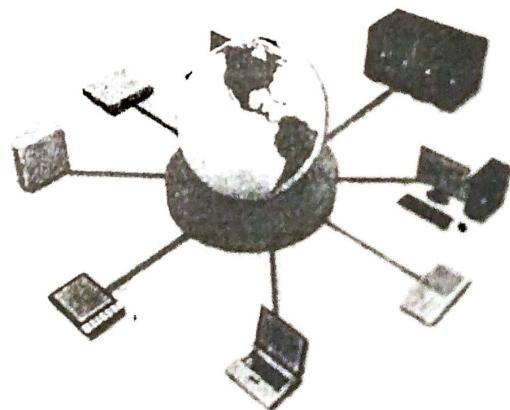
The main components of the computer and a brief outline for the hardware and software are introduced.



### The general objectives of this chapter:

After completing this chapter, you will be able to do the following:

1. Define a computer and describe its primary operations.
2. List some important milestones in computer evolution.
3. Identify the major parts of a personal computer, including input, processing, and output, storage, and communications hardware.
4. Define software and understand how it is used to instruct the computer what to do.
5. List the six basic types of computers, giving at least one example of each type of computer and stating what that computer might be used for.



# Architecture Components

The basic components of a computer system are:

## 1. Hardware:

- Processes data by executing instructions.
- Provides input and output.

## 2. Software:

- Instructions executed by the system.

## 3. Data:

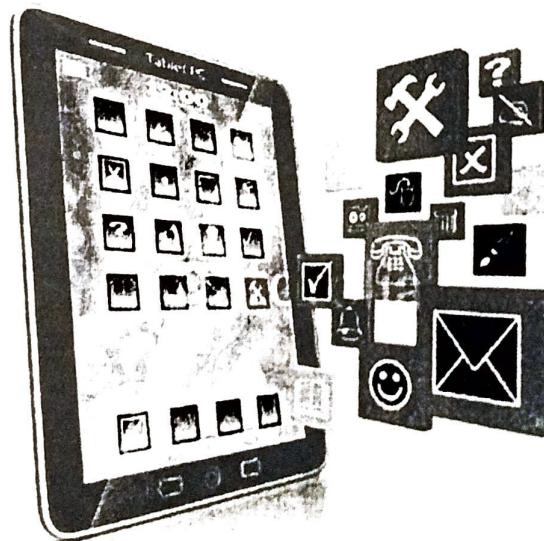
- Fundamental representation of facts and observations.

## 4. Communications:

- Sharing data and processing among different systems.

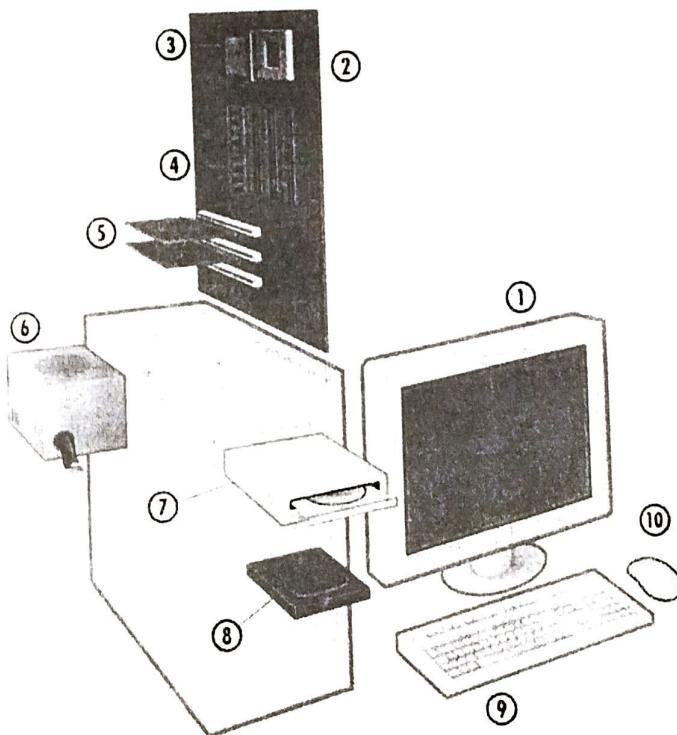
## 5. People ware:

- Software engineers, programmers, users, computer professionals, system analysts, etc.



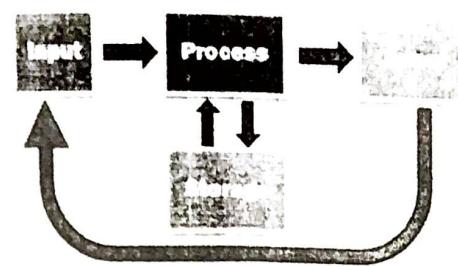
## Hardware Component

The hardware is the physical parts of a computer, i.e., the parts you can touch. Hardware components can be internal (located inside the system unit of the computer) or external (located outside the system unit and connected to the system unit via a wired or wireless connection). The main hardware components are:

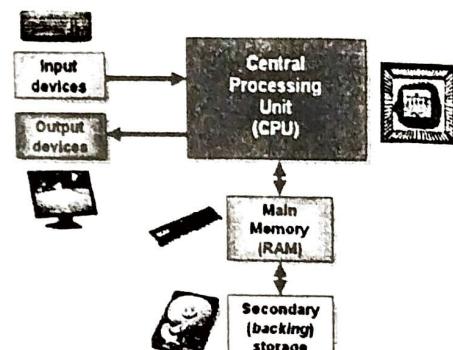


1. Monitor
2. Motherboard
3. CPU
4. RAM
5. Expansion cards
6. Power supply
7. Optical disc drive
8. Hard disk drive
9. Keyboard
10. Mouse

- **Input/output devices:**
- **Storage Devices:**
- **CPU:**
  - ALU: arithmetic logic unit.
  - CU: control unit.
  - Interface unit.
- **Memory:**
  - Short-term storage for CPU calculations.
- **Communication devices:**



Feedback  
Input process Output diagram

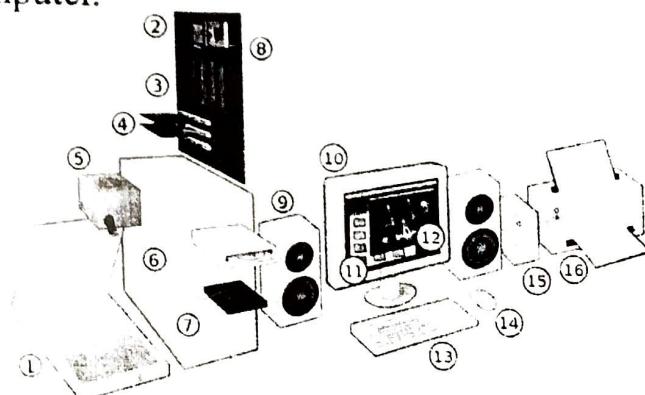


Computer hardware components

*These components will be explained throughout this lecture notes.*

## Typical Personal Computer System

The following Figure illustrates the basic hardware components of a personal computer.



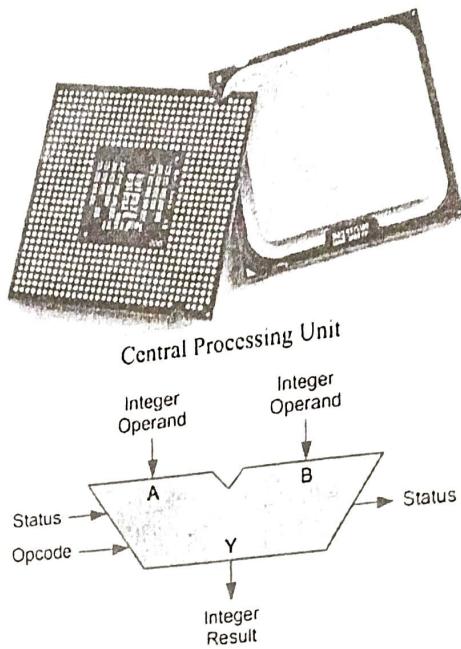
- |   |                          |
|---|--------------------------|
| 1. Scanner                                | 9. Speakers              |
| 2. CPU (Microprocessor)                   | 10. Monitor              |
| 3. Memory (RAM)                           | 11. System software      |
| 4. Expansion cards (graphics cards, etc.) | 12. Application software |
| 5. Power supply                           | 13. Keyboard             |
| 6. Optical disc drive                     | 14. Mouse                |
| 7. Storage (Hard disk or SSD)             | 15. External hard disk   |
| 8. Motherboard                            | 16. Printer              |

## Introduction to Computers

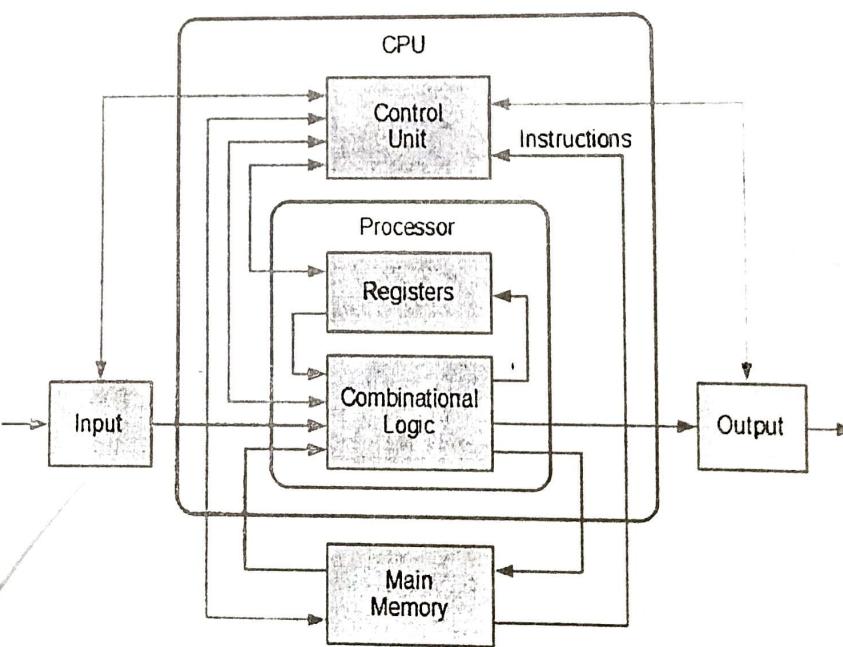
**CPU: Central Processing Unit**

The central Processing unit (CPU) consists of the following components:

- ALU (arithmetic logic unit):
  - Performs arithmetic and Boolean logical calculations.
- CU (control unit):
  - Controls processing of instructions.
  - Controls movement of data within the CPU.
- Interface unit:
  - Moves instructions and data between the CPU and other hardware components.
- Bus:
  - bundle of wires that carry signals and power between different components.



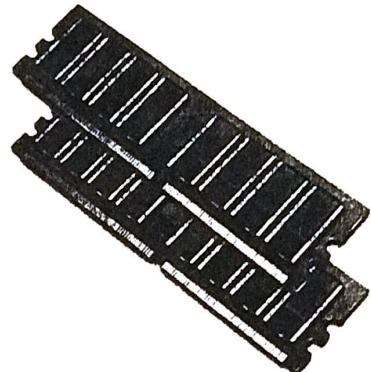
*Symbolic representation of an ALU  
and its input and output signals*



*Block diagram of a basic uniprocessor-CPU computer. Black lines indicate data flow, whereas red lines indicate control flow; arrows indicate flow directions.*

## Memory:

- Also known as primary storage, working storage, and **RAM** (random access memory).
- Consists of bits, each of which hold a value of either 0 or 1 (8 bits = 1 byte).
- Holds both instructions and data of a computer program (stored program concept).

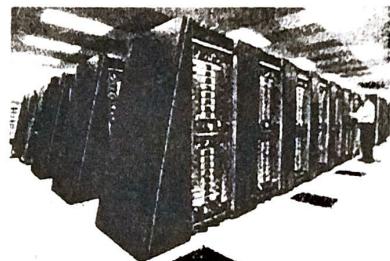


RAM memory module

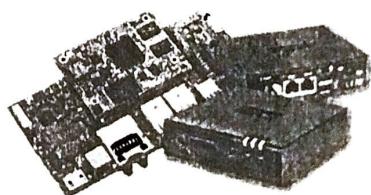
## Types of computer systems

Computers are classified into six categories, according to physical size, processing power, and price.

- Supercomputers.
- Mainframes.
- Minicomputers (midrange servers).
- Microcomputers (personal computers).
- Mobile devices.
- Embedded computers.



Supercomputers



Embedded computers



Mobile devices

## 1. Supercomputers

- **Size:**

Supercomputers are the most powerful and most expensive type of computer.

- **Used for:**

The applications that require extraordinary speed, and processing capabilities such as, controlling missile guidance systems and satellites, forecasting the weather, exploring for oil, and assisting with some kind of scientific research.

- **Operated by:**

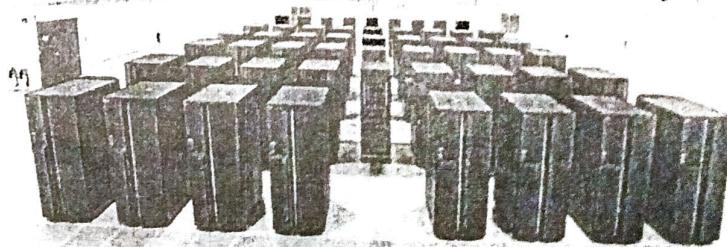
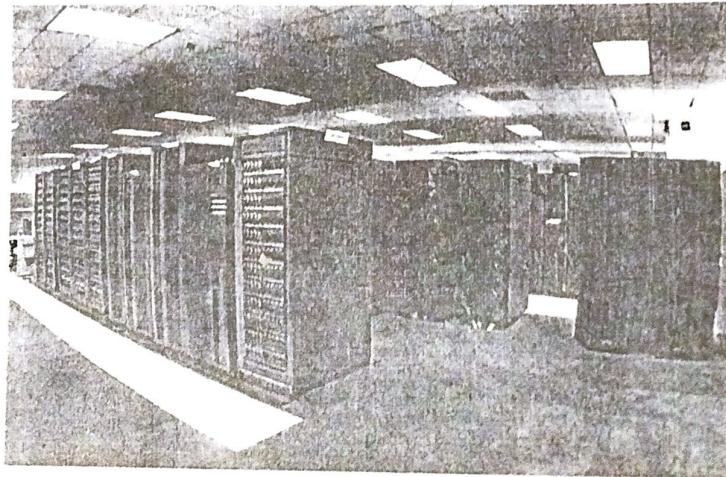
They are operated by specialists.

- **Cost:**

It costs several million dollars.

- **Accommodation:**

Occupies about 5200 square feet.



Supercomputers

## 2. Mainframes

- **Size:**

Mainframe computers are large machines that carry out different tasks for several people at the same time.

- **Used for:**

Mainframe computers execute millions of instructions per second.

Used to process very large volumes of data.

- **Operated by:**

They are operated by specialists so that ordinary users have only limited access to them.

- **Cost:**

They are very expensive, costing £100,000 upwards.

- **Accommodation:**

They are accommodated in specific rooms designed for the mainframe.

- **Users:**

insurance companies, banks, airlines.



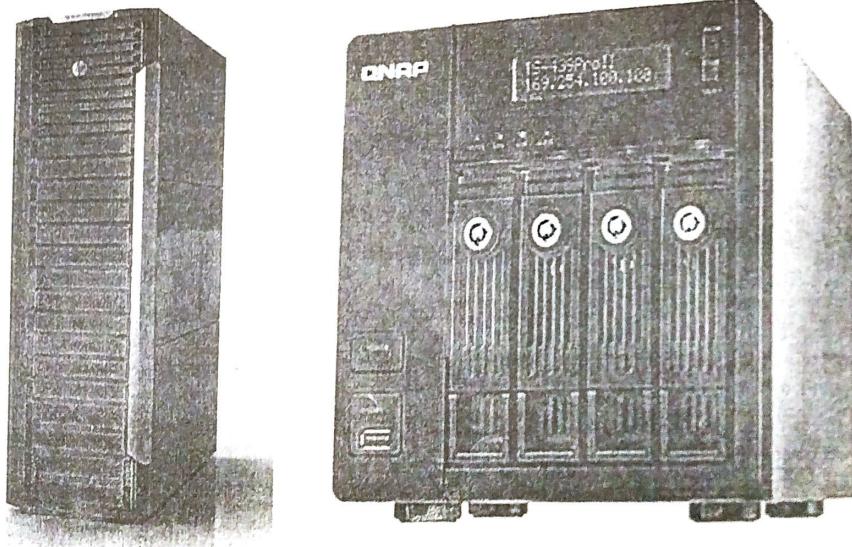
Mainframes

### 3. Minicomputers (midrange servers)

- **Size:**  
A desk-sized computer.
- **Used for:**  
doing powerful jobs once only done by mainframes.
- **Operated by:**  
personnel specifically trained in an application.
- **Cost:**  
Costs less than a mainframe but is powerful enough to do many jobs which only mainframes could do in the past.
- **Accommodated:**  
In an office environment.
- **Users:**  
medium-sized organizations or departments of large companies.

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Note:



Midrange servers

## 4. Microcomputer (personal computers)

- **Size:**

A small computer with a central processing unit based on a microprocessor.

- **Used for:**

The least powerful but most widely used type of computer. It can be designed to be used on a desk-top or carried.

- **Operated by:**

anyone requiring modest computing facilities.

- ✓ **Cost:**

Cheap.

- ✓ **Accommodated:**

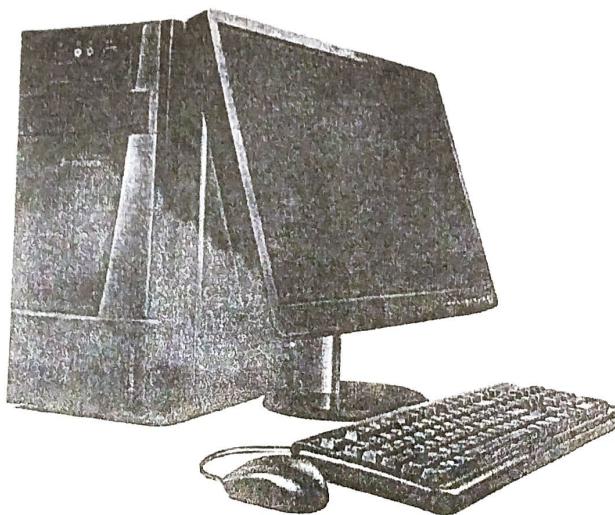
Usually found in a home.

- ✓ **Users:**

Depends on the type of task.

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Note: .....



Personal computer

## 5. Portable computers (Mobile devices)

- **Size:**

they are the computers that are designed to be carried around easily (in a briefcase or pocket) depending on their size.

- **Used for:**

students, individuals buying a new home computer, and many business.

- **Operated by:**

individuals.

- **Cost:**

Cheapest type of computer.

- **Accommodated:**

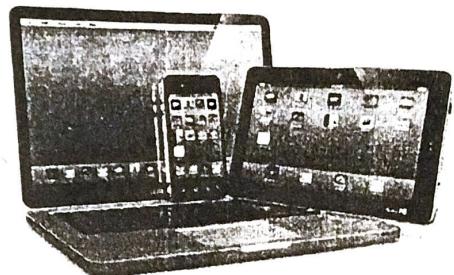
Usually found with individuals.

- **Users:**

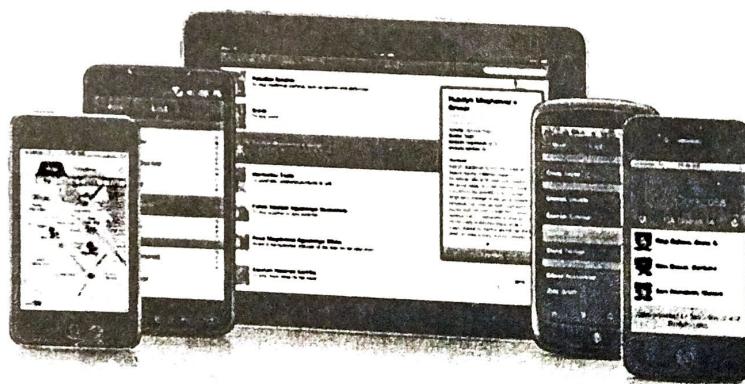
Depends on the type of task.



Mobile devices



There are many types related to the portable computers such as: notebook or laptop computers, tablet computers, netbooks (mini-notebooks), ultra-mobile PCs (UMPCs) or handheld computers.

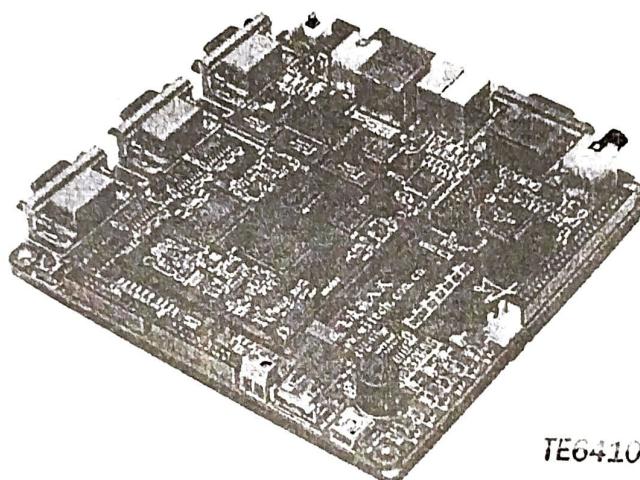


Types related to the portable computers

## 6. Embedded computers

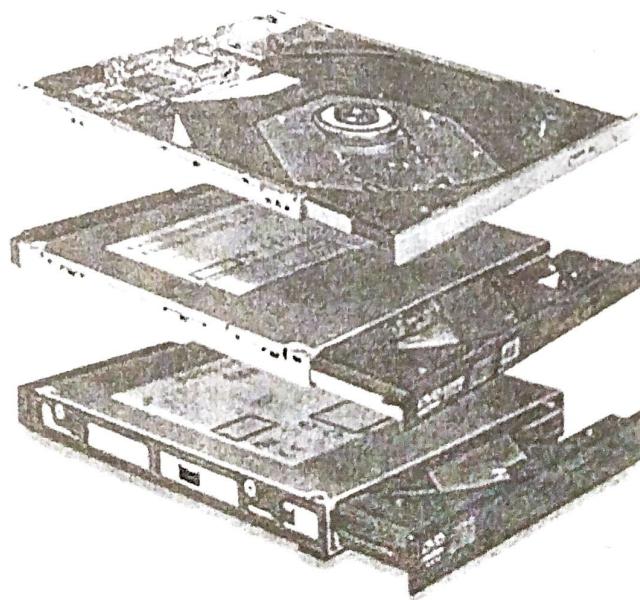
It is a tiny computer embedded into a product designed to perform specific tasks or functions for that product. For example; the embedded computers in the household appliances such as dishwashers, microwaves, ovens, coffee makers,... as well as into other objects such as answering machines, DVD players and televisions. Cars also use many embedded computers.

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Embedded computer



DVD players

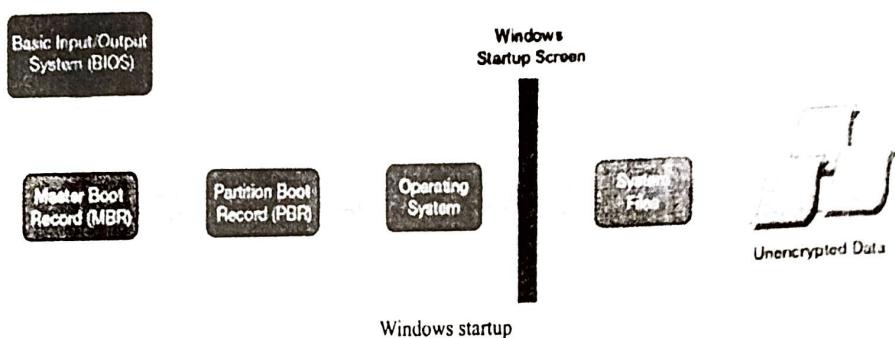
Note

## Starting the Computer

The step-by-step booting process:

1. The BIOS (basic input/output system) and setup program.
2. The power-on-self-test (POST).
3. The operating system loads.
4. System configuration.
5. System utilities loads.
6. Users Authenticated.

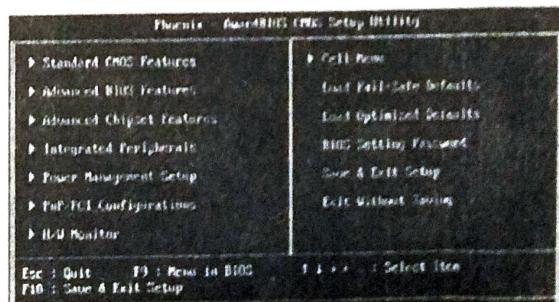
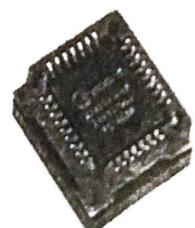
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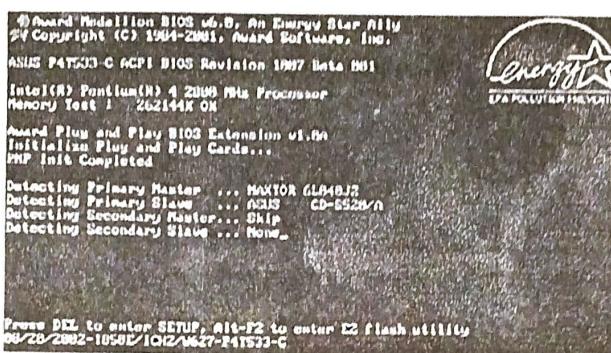
### Step 1: The BIOS and Setup Program

- **ROM** (read only memory): Permanent and unchanging memory.
- **BIOS** (basic input/output system): The part of the system software that includes the instructions that the computer uses to accept input and output.
- **Load**: To transfer from a storage device to memory
- ROM loads BIOS into the computer's memory.
- **Setup program**: A special program containing settings that control the computer's hardware.
- The program can be accessed while the BIOS information is visible.



## Step 2: The Power-On-Self-Test (POST)

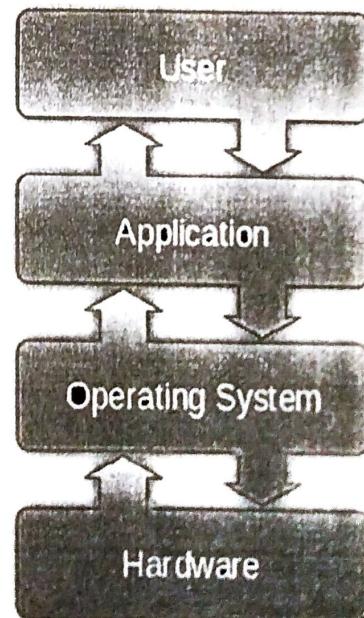
- **POST (power-on-self-test):** A series of tests conducted on the computer's main memory (random access memory or RAM), input/output devices, disk drives, and the hard disk.
- **BIOS conduct a Power-On-Self-Test (POST):** to check the input/output system for operability.
- **The computer:** will produce a beeping sound and an error message will appear on the monitor if any problems are encountered.



POST Screen

## Step 3: The Operating System (OS) Loads

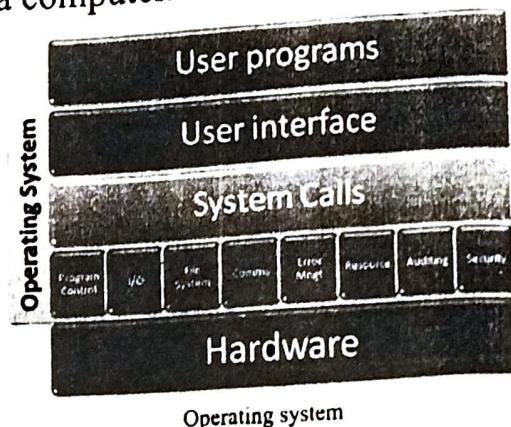
- **BIOS:** searches for the OS.
- **Settings in the CMOS (complementary metal oxide semiconductor):** determine where to look for the OS.
- **The operating system's kernel:** is loaded into the computer's memory.
- **The OS:** takes control of the computer and begins loading system configuration information.



The Operating System Loads

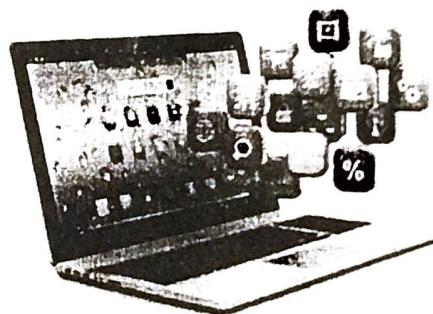
## Step 4: System Configuration

- **Registry:** A database that stores information about peripherals and software.
- **Peripheral:** Device connected to a computer.
- **Driver:** A utility program that makes peripheral devices function properly.
- **The system:** is configured from the operating system's registry.
- **Drivers:** are loaded into memory.



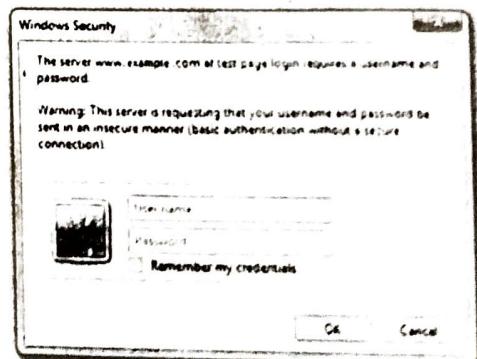
## Step 5: System Utilities Loads

- System utilities are loaded into memory.
- Volume control.
- Antivirus software.
- PC card unplugging utility.



## Step 6: Users Authentication

- Authentication or user login occurs.
  - User name
  - Password
- The user interface starts, enabling user interaction with computer programs.



## Abbreviations

<b>Abbreviation</b>	<b>Definition</b>
CPU	Central Processing Unit
ALU	Arithmetic Logic Unit
CU	Control Unit
RAM	Random Access Memory
UMPCs	Ultra Mobile PCs
BIOS	Basic Input/Output System
POST	Power On Self Test
ROM	Read Only Memory
OS	Operating System
CMOS	Complementary Metal Oxide Semiconductor

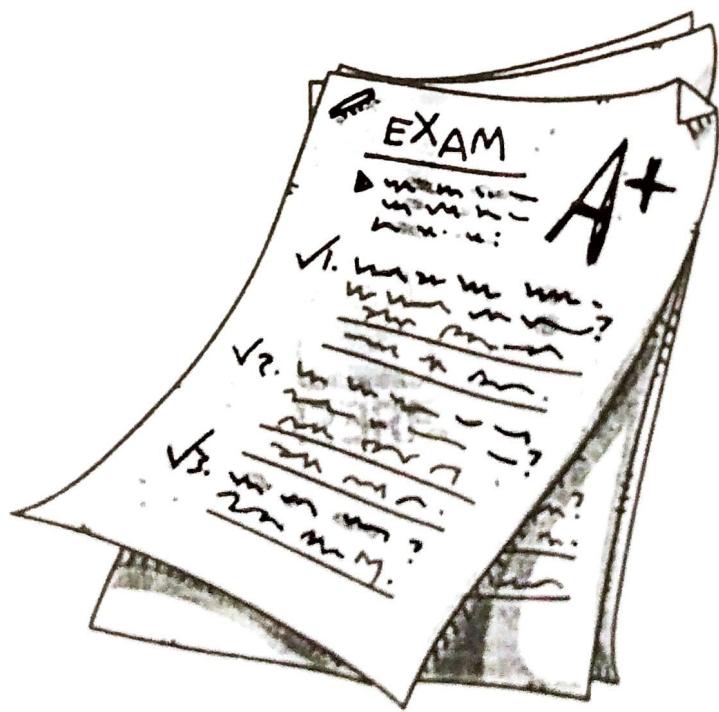
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# Exercises



**1- Circle T if the statement is true, F if the statement is false.**

- a) T F A mouse is one common input device.
- b) T F Software includes all the physical equipment in a computer system.
- c) T F A computer can run without an operating system if it has good application software.
- d) T F One of the most common types of home computers is the midrange server.

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**2- Write the best answer in the space provided.**

- a) ..... is the operation in which data is entered into the computer.
- b) Electronic messages sent over the Internet that can be retrieved by the recipient at his or her convenience are called .....

