

Introduction to Computer

Objectives

➤ **Main objectives:**

1. To learn about computer and its characteristics and features.
2. History of computer and its different generations.
3. Comparing different types of computers.

➤ **Secondary objectives**

After studying this chapter, the student is expected to master the following knowledge and skills:

1. To know what is the computer.
2. To distinguish different computer properties.
3. To list the computers features and capabilities.
4. To compare the computers capabilities to humans.
5. To learn about the different uses of the computer.
6. To distinguishes different stages and generations of computers.
7. To list the distinctive characteristics of each generation.
8. To compare between the different types of computers.



1 - 1 Introduction to computers

Computer is the most used device today, whether at homes, schools, universities, or research institutions, as well as in companies, bodies, factories, and various workplaces. Computer is also used to facilitate human work and to help in implementing many functions and tasks with high efficiency and without boredom. Moreover, it has affected the development of all sciences and knowledge, and added more discoveries. Currently, all developed machines and devices have become more connected to computer, as they are working in coordination with it and under its control. Computer has also become a reliable repository for storing files, instead of papers and books. That saved a lot of time and effort as well as speed in retrieving data, information, and directly reaching the required results.

Skill 1 - 1

Defining of computer and determining its main characteristics.

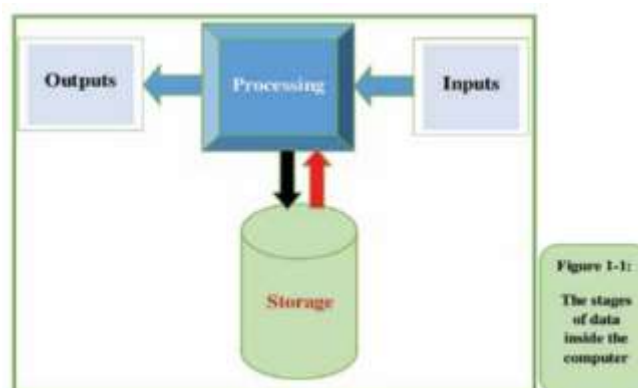


1- 2 Definition of computer

There is no specific and agreed definition for the computer, but there are many definitions that explain how a computer works and express its main characteristics. We can agree in defining the computer as:

“An electronic device that receives data (inputs) and processes it by performing a set of operations (mathematical and logical) at high speed and infinitely accurate along with the ability to store huge amounts of data and information and retrieve them (outputs) when needed according to specific conditions”.

The data passes through several stages inside the computer, from entering it using the input units to its exit through the output units. Figure 1-1 shows the different stages through which data passes through the computer.



1- 3 Computer Characteristics

The computer is characterized by the following features:

- It consists of many parts connected to each other, which work as one unit.
- Depends on receiving inputs (data) through special devices (input units).
- It processes data using special instructions (computer software), which directs it to implement the required operations (mathematical and logical operations).
- Displays information resulting from processing operations using multiple methods and by special devices (output units).
- Stores massive amounts of data and information with high-capacity storage media (volumes).
- It can communicate with other devices to form a network of computers, which allows the sharing of data, programs, information and various resources (computer networks).

1 -4 Comparison between computers and humans

There are many aspects that the computer has proven its ability to do better than humans, and these are:

1. Performing mathematical operations

The computer can perform millions of mathematical operations, and solve complex equations with great accuracy and super speed measured in parts of a second, and it is not compared to the limited human capabilities in this field because of its errors, omissions or boredom.

2. Data storage

The computer has proven its superior ability to store and process a huge amount of data in a way that made one almost completely dependent on it for storing important data and information as an alternative to the traditional measures previously used such as paper records; examples include preserving

employee data in a company, citizens in a country, or subscribers to a telecommunications company, etc.

3. Retrieve information

The importance of data storage appears in the computer's ability to retrieve information very quickly and under specific conditions that the user sets for the retrieval process. The computer can search huge amounts of data to retrieve specific information to which the search terms apply. In addition to the enormous speed of the computer, the search may not take parts of a second. For example, the search for data of a subscriber in the Communications Authority using the phone number as a search condition. Here, the computer searches for the data of this person among millions of subscribers, and the result of the search is the private record (data set) for this subscriber only.

4. Accurate repetition

One of the most important things that distinguishes a computer from a person is its ability to perform certain operations repeatedly for hundreds and possibly millions of times without getting bored or error. For example, a computer can print hundreds of copies of the same paper without getting bored or having errors between the first edition and the last edition. Also in auto factories, the robot (robotic arm) is used efficiently to assemble cars, which is a boring, routine mechanical process that involves many operations that collect hundreds of cars in the same way daily.

In spite of all the previous features of the computer, the human being has always been and will always be superior to the computer because of the mental and sensory capabilities God has bestowed on him and the computer cannot approach it, because at the end it is just a human-made machine with limited capabilities. Among the advantages of the human being that distinguish it from

the computer:

1. The ability to think freely.
2. The ability to solve problems and judge events with experimental experience, which helps a person make a decision about what to do in the future.
3. Creativity and innovation, as it is the human being who invented and developed the computer continuously.
4. The ability for continuous self-learning.
5. Movement and flexibility compared to limited robotic capabilities.

Skill 1 - 2

Human-computer comparison.



Table 1- 1 summarizes the main differences between human capabilities and the computer.

Table 1- 1 The difference between a person and a computer

comparison points	Human	Computer
speed	His speed is medium or slow.	Its speed is enormous.
Accuracy	Makes mistakes and subject to oversight.	It is very accurate.
Exposure to danger	His life cannot be risked to face bad conditions like nuclear radiation.	Easy to endanger.
Affected by external conditions	Is influenced by emotion and external influences.	It performs its tasks automatically and is not affected by external conditions.
Mental capacities	Is characterized by reason and creativity.	It does not think, but he executes tirelessly.
Running cost	The cost of hiring expert human beings is expensive.	The cost of using the computer is low.
Storage capacity	Human has limited memory and data storage.	It has an enormous capacity to store large amounts of information and data.

Skill 1 - 3

Distinguishing between different stages and generations of computers.



1- 5 Stages of computer development

1- 5- 1 The first stage: the early historical stage

In this stage, attempts to develop machines that help in performing mathematical operations in an easier way. These attempts started since the year 2000 BC, which witnessed the emergence of the first machine to help dealing with numbers. It was considered an easy manual method for counting and calculation, which is the Abacus counter (as in Figure 1- 2) developed by the Chinese. This counter is still being used to develop children's math skills.



Figure 1-2:

Counting
machine
(counter)
(Abacus)

Also spread in the beginnings of the twelfth century AD the use of Indian and Arabic counting systems, which was characterized by its emphasis on the value of each number according to its location within the number (weight of the number). The Arab counting system was distinguished by the presence of zero, unlike the Roman counting system, which did not contain zero.

12-5- The second stage: the emergence of mechanical and electromechanical computers

1643AD: The invention of a semi-automatic mechanical calculating machine by the French scientist Blaise Pascal to use for adding and subtracting numbers. This machine consisted of 8 metal disks where decimal numbers were engraved on the perimeter of each of them at regular distances. The disks could be managed and rotated to perform addition and subtraction operations. Figure 1 -3 shows a model of this machine.

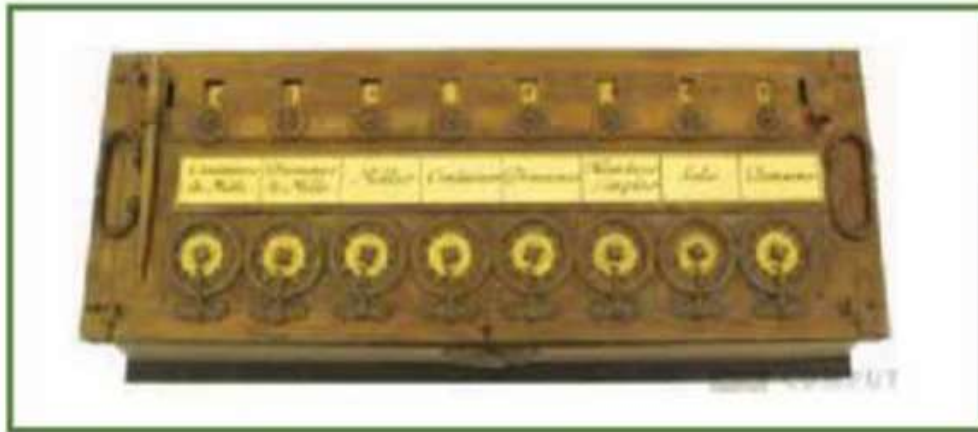


Figure 1-3

**Pascal
computing
machine**

1693AD: Development of Pascal computing machine and making several improvements and additions by the scientist Libbies to be able to perform multiplication operations(Figure 1- 4).



Figure 1-4:

**The
upgraded
version of
Pascal
Machine 1**

1805AD: The French scientist Joseph Marie Jacquard invented weaving machines programmed through a successive set of punched cards used as a program for automatic patterned silk weaving (Figure 1- 5).

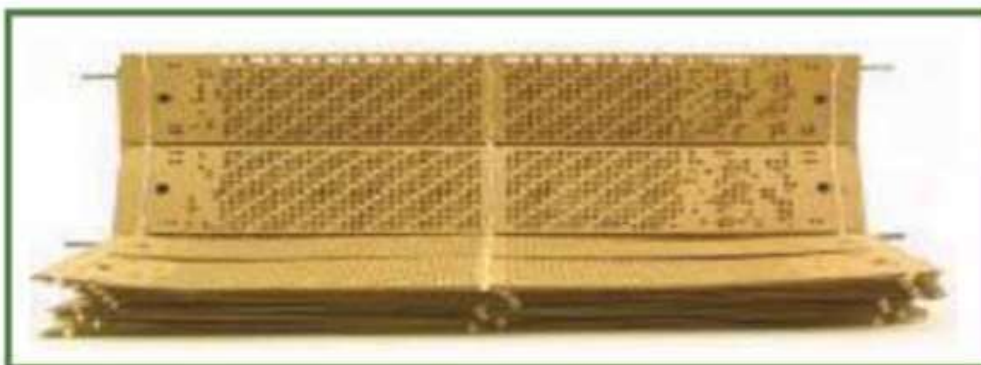
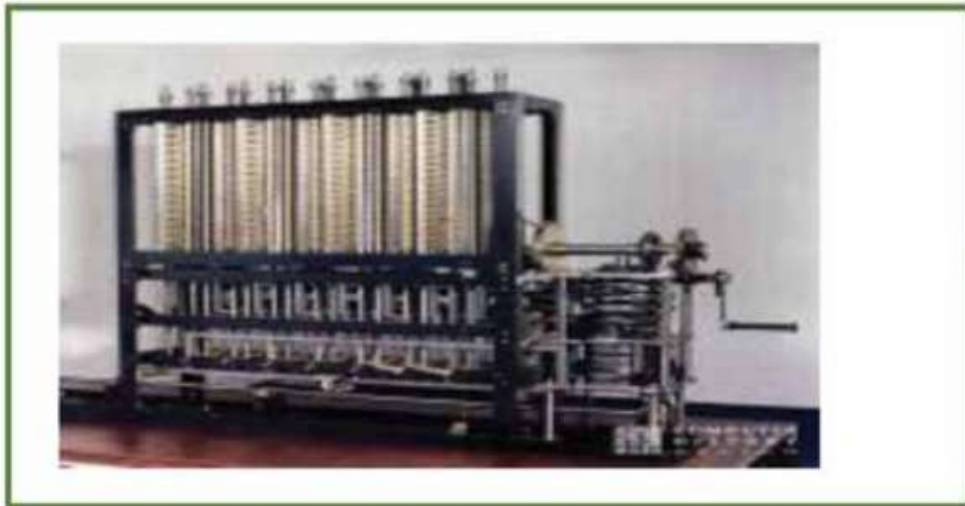


Figure 1-5:

**Perforated
cards**

1830AD:English scientist Charles Babbage invented a mechanical calculator (Figure 1- 6) that was able to perform mathematical operations and some

other operation such as logarithms, and trigonometric percentages of angles. Babbage is considered the real father of the modern computer. He is the first to invent the idea of the stored program and divide his computer into functional units similar to the idea of partition used in modern computers.



:Figure 1-6

**Babbage's
mechanical
calculator**

1887AD: American scientist Hermann Hollerith made a punching machine and tabulation machine, which was used to make a census of the population in the United States of America.

1890AD: A company was established to produce tabulation machines, and this company expanded and later joined with other companies, which led to the emergence of the famous (IBM) company.

1944AD: Aiken and Grace Hopper, with assistance and support from IBM, were able to develop and produce the first computer (an electromechanical calculator) called Mark-1 (Figure 1 -7)

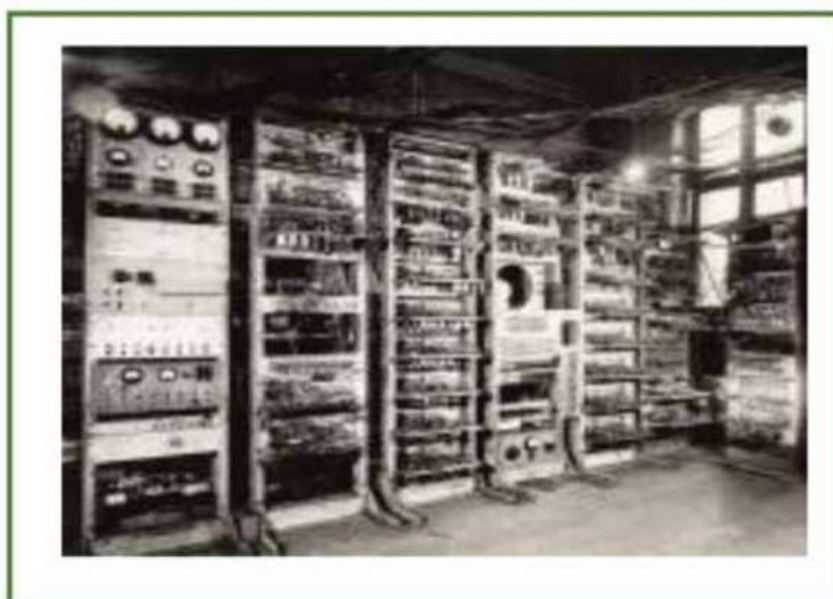


Figure 1-7:

**The first
electromec
hanical
calculator**

Mark-1

13-5- The third stage: modern computer generations

The development of the computer has passed, since its appearance and till now, in many stages and generations, which express the continuous development and progress in the design of the device and its various accessories. The computers that have emerged since the late 1940's and to our days could be divided into generation groups. Each group possesses common characteristics. Such that, it was manufactured of the same technological basis, and has also appeared within specific time periods. Modern computer development can be divided into five generations:

First: the first generation (1945 - 1958) - vacuum tubes

The design of this generation's calculators is based on the use of vacuum tubes (Figure 1-8). These tubes used a lot of electric energy and resulted in high temperatures, and thus required continuous cooling operations. The size of these computers was very large, and the cost is high, in addition to being heavy in weight. The first computers of this generation were the computer called ENIAC, then the computer appeared EDVAC, followed by the computer EDSAC and finally the computer called UNIVAC.



:Figure 1-8

**Vacuum
valves -
computer
ENIAC**

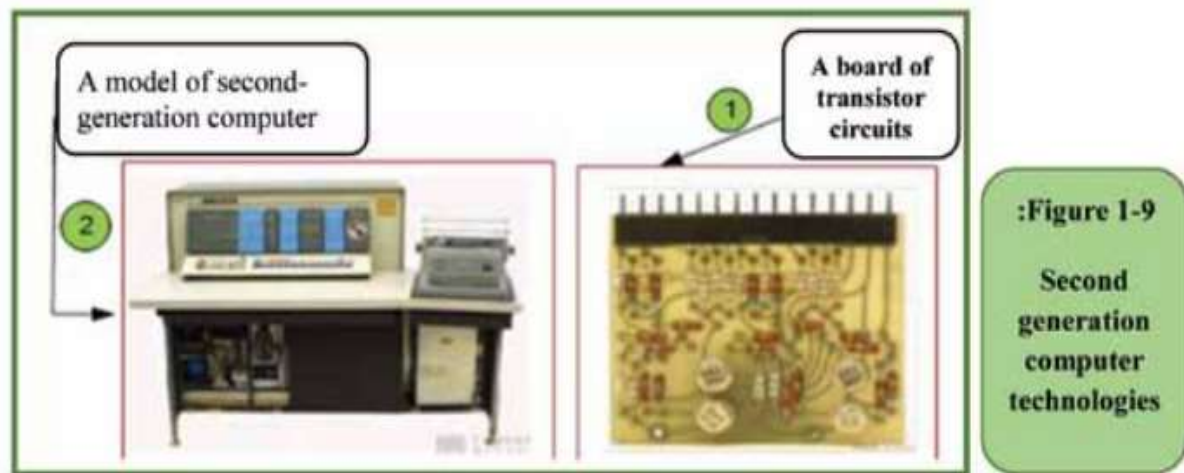
First-generation computer features

- The use of vacuum tubes technology in design and construction.
- The size of these computers was very large and weighed heavily.
- It consumes large quantities of electricity and generates large amount of heat.
- It performs operations with a slow speed (1020- thousand operations per second).

- It used machine language (based on binary system 0 and 1) in writing programs, and therefore the programs were very complex.
- Magnetic cylinders were used as a means of entering data into the computer, and rudimentary printing machines to get results.

Second: the second generation (1959 - 1964) - the transistor

In this generation, the transistor technology was used as a substitute for vacuum tubes which were smaller and longer in life and did not consume high electrical energy. This helped produce faster and smaller computers (Figure 1 -9). External storage media was used as a secondary memory, too. This was the beginning period for appearance of some high-level programming languages.



Second-generation computer features

- The use of transistor technology in design and construction.
- The size of these computers is smaller than the first generation.
- It executes operations at high speed (hundreds of thousands of operations per second).
- Use of magnetic tapes and magnetic disks as a secondary memory.
- The emergence of some high-level programming languages, such as Fortran and Cobol.

Third: The third generation (1964 - 1970) - Integrated circuits

In this generation, the integrated circuit technology made of silicon wafers was used in the manufacture of computers. Accordingly, it has become much smaller than its predecessors, with a huge increase in speed, which is now measured by the number of operations per nanosecond. Memory capacity increased further. Medium computers that share a group of terminals with one large and central

computer, also appeared, Figure 1- 10, showing samples of computers from that generation.



Third-generation computer features

- The use of integrated circuit technology in design and construction.
- It is much smaller than its predecessor and has a lower production cost.
- It increased its speed a lot and became measured with nanoseconds.
- Fast input and output devices as well as color screens appeared.
- Increase the main memory capacity. It reached 8 million bytes on some devices.
- The emergence of some high-level programming languages, such as "PL /1", "Algol68" and "Lisp".

Fourth: The fourth generation (1970 - 1995) – microprocessors

In this generation, the microprocessor appeared, which represented a major revolution in the world of computer design. As processor-building technologies evolved and their speed increased tremendously, the production of much smaller, faster and cheaper computers becomes available.

Figure 1- 11 shows examples of a group of computers that appeared in this generation that are smaller than previous generations.



Fourth-generation computer features

- The emergence of very small processor technology.
- Computers were characterized by small size and low cost.
- Significant increase in speed, reaching hundreds of millions of operations per second.
- Read Only Memory (ROM) and Random Access Memory (RAM) appeared.
- Operating systems have evolved a lot and personal computers have emerged.
- Use floppy disks and hard disk to store data.
- The beginning of the emergence of computer networks.
- The emergence of many high-level programming languages, such as C, Pascal, C ++ and Prolog.

Fifth: The fifth generation (1995-until now) - portable smart devices

The fifth generation is the current and continuous generation until now. The computers of this generation provide a significant increase in productivity, as multicore processors appeared, and computer speeds increased to very high capabilities. This generation is also considered the basis for the communications era and the communication revolution, as the Internet has emerged and communications have increased significantly. Personal computers, laptops, handsets, and other related devices have also spread, as shown in Figure 1- 12.



Figure 1-12

**Models of
fifth
generation
computers**

Fifth generation computers features

- The emergence of multi-core processors, which led to a huge increase in speed.
- Increased storage capacity, and the emergence of new storage media such as CDs and Flash memory.
- The development of visual operating systems, such as the Windows operating system, and the emergence of visual programming languages that have facilitated the design and programming of applications such as Visual Basic and others.
- The development in the field of networks and the emergence of the Internet.
- The advent of artificial intelligence and the development of robotic technologies.

Introduction to Computer (2)

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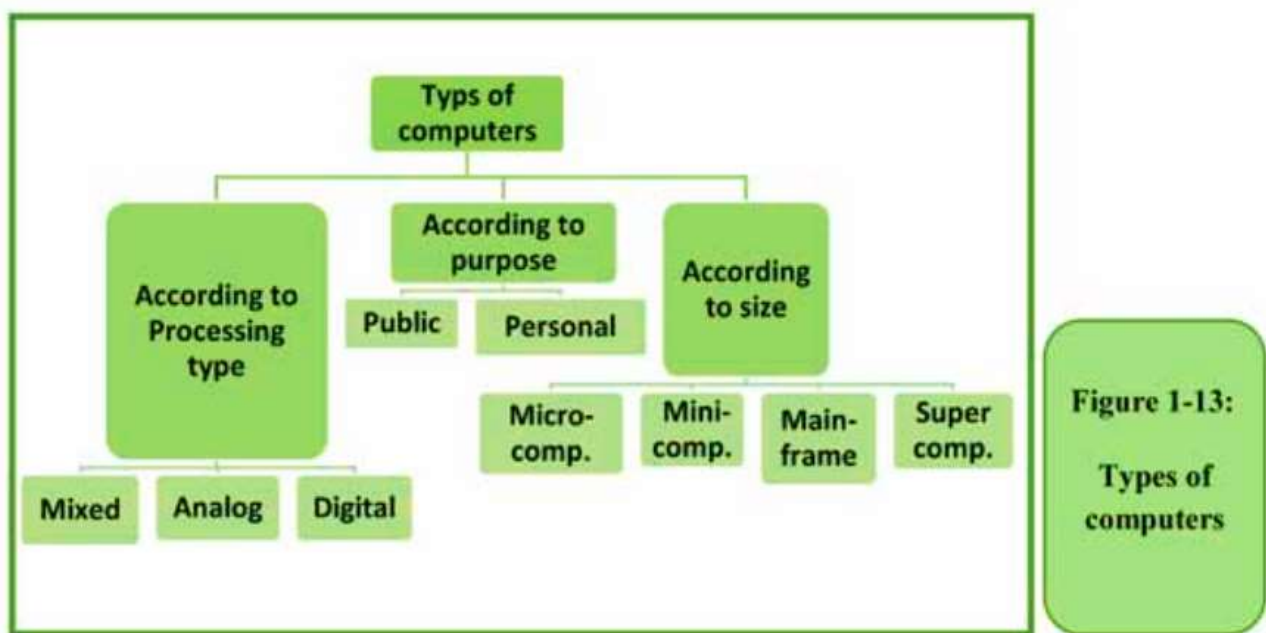
Skill 1 - 4

Distinguish between different types of computers.



1 -6 types of computers

Computers can be divided in many ways, depending on the standard seen when partitioning, and there are many criteria, as shown in Figure 1- 13.



1 -6- 1 Types of computers by size

Computers have evolved over time and their sizes have changed from giant and super-power to lesser sizes with a significant increase in capabilities. The division by size includes the following types:

First: Supercomputers

It is the largest computers, with special capabilities in either processing operations or storage capacity, and it is considered a highly advanced technology. Until recently, it was the preserve of the major countries only due to its huge potential. These computers are used in research centers such as the NASA Space Center, the US Department of Defense, and others, as well as in dangerous experiments such as nuclear tests. It is worth noting that the Kingdom of Saudi Arabia has succeeded in achieving a world record through the computer “Shaheen

2” which is located at King Abdullah University of Science and Technology (Figure 1- 14),And who reserved his place on the list of supercomputers for the ten most powerful devices in the world, and is considered the first in the Middle East. Shaheen II is currently used in modeling research projects for engines, atmospheric dynamics, and renewable energy networks.



Figure 1-14:

**Super
Computer
Shaheen**

The characteristics of Supercomputers

- It has hundreds of thousands of processors working together (up to more than 100,000 processors).
- Super computers are measured with a scale called FLOPS and its multiples.
- It may speed more than 1000 trillion operations per second.
- It consumes very large amounts of electricity.
- It needs special cooling systems that result in huge temperatures.
- The cost of operating and cooling the system is very large (the cost of operating one device may exceed \$ 4 million annually).
- Most modern supercomputers use the Linux operating system or modified versions of it specifically to suit the capabilities of the device.
- Uses special and unconventional software technologies to exploit supercomputer speeds (running thousands of processors at the same time).
- The supercomputer weighs hundreds of tons and occupies a very large space.
- Pure gold or diamonds may go into the design of supercomputers.

Second: Mainframe computer

Also known as central computers, this type of computer has been designed to serve the purposes of large corporations such as banks, factories, airlines, ministries, and major government agencies (Figure 1 -15). This type of computer is distinguished by its huge ability and high speed in processing a huge amount of data flowing to it from other devices where it can deal with information very quickly, which makes it suitable to connect a network of computers on a large scale, and it may be at the level of an entire city, large company, country or A continent or even the entire world.



Figure 1-15:
Mainframe
computer
models

The characteristics of Mainframe

- It can run more than one operating system on the same device.
- It can operate more than one virtual machine, which is known as virtual machines.
- One large computer can substitute for hundreds of servers.
- It is used in giant institutions such as banks, airlines and others.
- It can serve thousands of users at the same time.
- Has huge processing capabilities and high speeds.
- Serves a wide range of computers (company branches - city – whole continent).

Third: Minicomputers

The average computer is smaller than the previous computers, and this computer is often used in companies and government institutions that deal with a large number of customers in order to accomplish their administrative or other transactions, such as postal centers, social security and major commercial centers (Figure 1 -16).

The characteristics of Minicomputer

- Medium in size and smaller than the previous ones.
- Usually used as a service provider (server) for networks and the Internet.
- Designed to allow it to process multiple requests from different destinations.
- Adopts the Central Memory Unit, which is the subscription of several client computers in one central system unit.
- Any user can access the database stored on the central unit.
- It is used in major companies and government institutions to serve a large number of users.
- Any user can use the various sharable resources associated with this central unit (such as a printer, scanner, etc.).



Figure 1-16:

**Medium
computer
images**

Forth: Microcomputers

It is the smallest in terms of size among other forms of previous computers, and the least in terms of processing and storage capabilities. They are usually equipped with one or more microprocessors to increase their operating capacity. This type of device is sometimes called a Microcomputer. These computers are divided into:

1. Desktop

They are computers that are used to facilitate the implementation of work (for individuals and institutions), as they are suitable for placing them on an office in

the home or work. These computers have evolved and become highly capable and fast, and we cannot make this type portable as it is relatively large in size. Figure 1 -17 shows some examples of modern desktop computers.



Figure 1-17:

**Some
models of
desktop
computers**

2. *Portable computers*

They are small-sized computers (a few centimeters in height and width, and a few centimeters in length, see Figure 1- 18). These computers are usually used during travel because of the ease of transport and the integration of the display and keyboard on one unit, and it works with rechargeable batteries for use while moving. It is also considered a portable computer due to its light weight and being a single piece. It has been designed to perform all the functions of a desktop computer, which means that it can be used to run the same programs and deal with the same types of files.



Figure 1-18:

**Some
laptop
models**

3. *Personal Digital Assistant (PDA)*

It is a small-sized computer equipped with a special pen instead of the traditional keyboard, but some of the more expensive devices have a keyboard, and the pen is used to store and recall information. Also, it has many capabilities similar to all other personal computers and is equipped with a battery that is

charged to work for long hours, and is considered more expensive than the laptop because of its small size, ease of use. It is suitable for running many applications. It can also be connected to the Internet and is usually used by businessmen and sales representatives to save important addresses and appointments as well as to present their presentations. Figure 1 -19 shows models of some PDAs.



Figure 1-19:

**Personal
digital
assistant
models**

4. Tablets

It is a small portable computer (tablet) that works through the touch screen (the screen size usually ranges between 7 and 10 inches) and does not have a traditional keyboard. Its internal storage capacity varies between 16 and 128 GB and still increases by the time, an external memory can be added to raise its efficiency as well. It is characterized by lightweight, small size, ability to connect to the Internet either through mobile networks or Wi-Fi, providing visual effects to change the size of screens when browsing the Internet and switching between programs and applications. Figure 1- 20 shows examples of some Tablets.



Figure 1-20:

**Various
models of
Tablets**

The characteristics of Microcomputer

- Small in size and light in weight.
- Equipped with one or more microprocessors to increase its operating capacity.
- It is called the Microcomputer.
- It performs the same tasks as large computers, but slowly and with less information.
- It is characterized by its ability to process various types of data quickly and sufficiently to perform the various functions related to the business of individuals or institutions.
- Designed to perform various traditional computer functions such as writing, printing, browsing the Internet and designing images in addition to professional works such as montaging, writing programs, and others.
- There are many forms, including desktop, laptop, personal assistant, tablet, smart phone devices, etc.

1 -6- 2 Types of computers by type (processing method)

Computers are divided by type or method of internal processing of the data that they process into:

First: Digital Computer

They are the regular computers deployed in our daily life that perform operations by representing (converting) the data that they receive into a digital form. They represent all the inputs they receive (whether numerical, literal, sounds, etc.) into a digital form and then process these data according to the orders of a specific program. Thus, it depends on the numbers (the binary system) in implementing all of its operations. These computers are considered the most common and are used in all fields such as engineering, industrial, practical, commercial and social applications. All previous computers fall under this type.

Second: Analog Computer

They are computers that operate with special values that can be received automatically as they depend on receiving analog data, which is a special type of non-digital data that can be measured as natural variables such as electrical voltage, current intensity or air pressure. These measurements are processed inside the computer and the results are stored as standard or continuing analog quantities. Examples of such computers include heart rate monitors such as those in hospitals and temperature and humidity measuring devices at meteorological stations, as shown in Figure 1- 21.

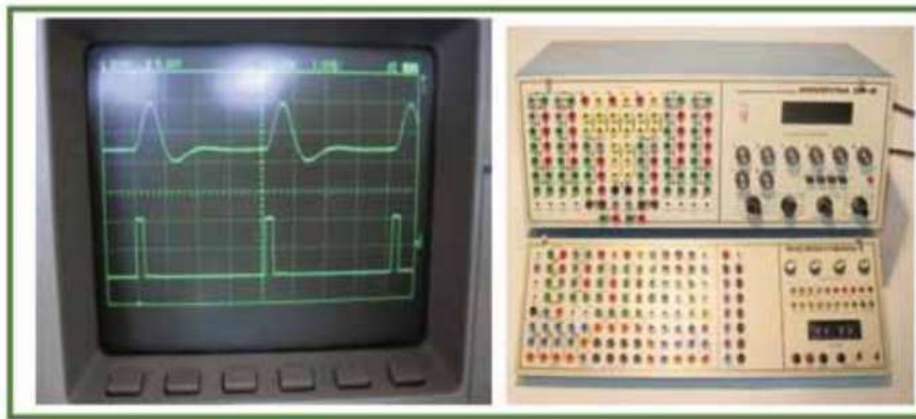


Figure 1-21:

**Some
analog
computer
models**

Third: Hybrid Computer

They are computers that combine the characteristics of the previous two types, analog and digital computers. They can automatically receive data in the form of measurements, similar to analog computers. They can also receive data in a separate entry form and run them in a numerical way, similar to digital computers, as shown in Figure 1-22. These computers are used in advanced applications such as medicine and space.

1 -6 -3 Types of computers according to the purpose

Computers can also be divided according to the purpose for which they can be used as follows:

First: General Purpose Computers

They are the most famous computers and are used by millions of users around the world that are used to run large and diverse groups of applications, whether industrial, scientific or commercial. These computers are used to run general applications such as text editing, design or performing calculations. Also, they can be used to run special applications such as students' data logging, store contents, customer records at banks, etc. The previously explained digital computers are general purpose computers.



Figure 1-22:

Some
models of
mixed
computers

Second: Special Purpose Computers

It is designed to serve specific purposes where it can perform a range of functions such as tracking and controlling missile and satellite tracks. One of the most popular special purpose calculators is a gaming computer because it only contains game software. Other areas in which special purpose computers are used are:

1. Directing and piloting aircraft.
2. Monitoring air and maritime traffic.
3. Directing missiles and satellites.
4. Monitoring manufacturing processes.
5. Managing data communication networks.

1 -6 -4 Types of computers according to the method of implementing the instructions

First: computers with serial processing

Normally, personal computers contain only one processor through which digital data is processed in a serial manner to solve different problems. The problem can be divided into a separate series of instructions and the implementation of these instructions in succession, one after another, on the same processor; and not more than one instruction is executed at a time.

Second: computers with parallel processing

On computers with parallel processing, the matter is very different, as it depends on its design to use more than one processor to perform many tasks at the same time in a simultaneous way to solve a specific problem or implement specific

instructions. This is done by dividing some instructions between more than one processor and they are executed in parallel together and simultaneously.

The software that is designed for computers with parallel processing depends on dividing the work between several processors working simultaneously in order to increase the amount of work done and shorten the time required to carry out these operations. However, recently, with the development of techniques for designing and manufacturing processors, it became possible for a single processor to perform many operations at the same time in parallel through the multiplicity of the processor cores (Multicore Processors). The use of parallel technology in designing software or hardware helps in achieving the following advantages:

High speed:

Parallel technology has been incorporated into the design of computers since the third generation. Supercomputers and mainframe use the concept of parallels on a large scale to increase speed and raise performance efficiency, which allows to increase the proportion of work and the number of users. The speed of computers has increased today to the extent that the speed of computer operations has reached huge limits that may reach the speed of light.

Reliability or reliability:

The use of more hardware and processors increases the reliability of the device. For example, the spacecraft guidance system relies on the use of three devices from computers that compare their results with each other. The vehicle can only operate with one device while the other two are in standby mode.

Decentralization:

The use of parallel technology makes control decentralized. Big companies can use a network of small computers in the headquarters and branches instead of using one large computer, which allows more control and control for the different branches.

1 -7 Types of computing

First: distributed system

Computing distributed from a group of computers that communicate with each other through a network connected to each other, where computers interact with one another in order to achieve a common goal. Computer programs that run on distributed systems are called distributed programs. In distributed computing, the problem is divided into small problems and then distributed to different computers

to solve this problem. Distributed systems are characterized by many advantages, including:

- There is no common clock between devices, as each device has its own pulse and is independent of other devices.
- There is no shared memory, but information is exchanged by passing messages between different devices.
- Ability to withstand failure, as there are many other devices to compensate and perform tasks.
- Capacity for horizontal expansion of the system architecture (network size, number of devices increased).
- Each device or node sees a small part of the system, and deals with a specific part of the problem.

Second: grid computing

Grid computing is the distribution of tasks (such as data storage) and the operations required to be implemented on a number of different computers located anywhere, depending on the need, via the Internet. Network computing helps you through your personal computer, despite its modest specifications, to perform complex and advanced mathematical and scientific operations, such as areas of space research, financial and economic analyzes, earthquakes, and others. It enables a personal computer or more to use the capabilities of high and advanced specifications (Supercomputer). It is an application of the concept of distributed computing.

Second: cloud computing

Cloud computing is a package of computer hardware and software resources, for example: space to store data, backup and self-sync, operating programs, applications, email and others. It is available to customers through the use of the web browser without the need to be secreted and without attention to its physical location in order to facilitate the user . There are many benefits to cloud computing, including:

1. Save costs for the user as there is no need to purchase and maintain the computer resources required.
2. Easy to access and deal with stored data anytime, anywhere.
3. Dealing with many of the applications and services available on the cloud easily whatever your computer capabilities.

Examples of cloud service:

- E-mail services such as: Gmail and Yahoo mail
- Drop Box Cloud Storage services, such as Google Drive
- Cloud Application, among which the most famous: Google Docs and Photoshop express
- Cloud Operating Systems such as Windows Azure and Amazon Web Services
- Google scholar.
- Google Book Search.
- Google Lab Search service.
- Google Document service.

Among the most important global companies that contributed to the spread of cloud computing: Amazon, Google, and Microsoft (Microsoft). That was by providing many services to users and creating and managing many applications used that meet the need of those who want to use the cloud.

Cloud computing requirements:

1. A personal computer.
2. Connect to the Internet.
3. Internet browser.
4. Subscribe to the cloud computing service. There are a number of free services that can be availed free of charge.

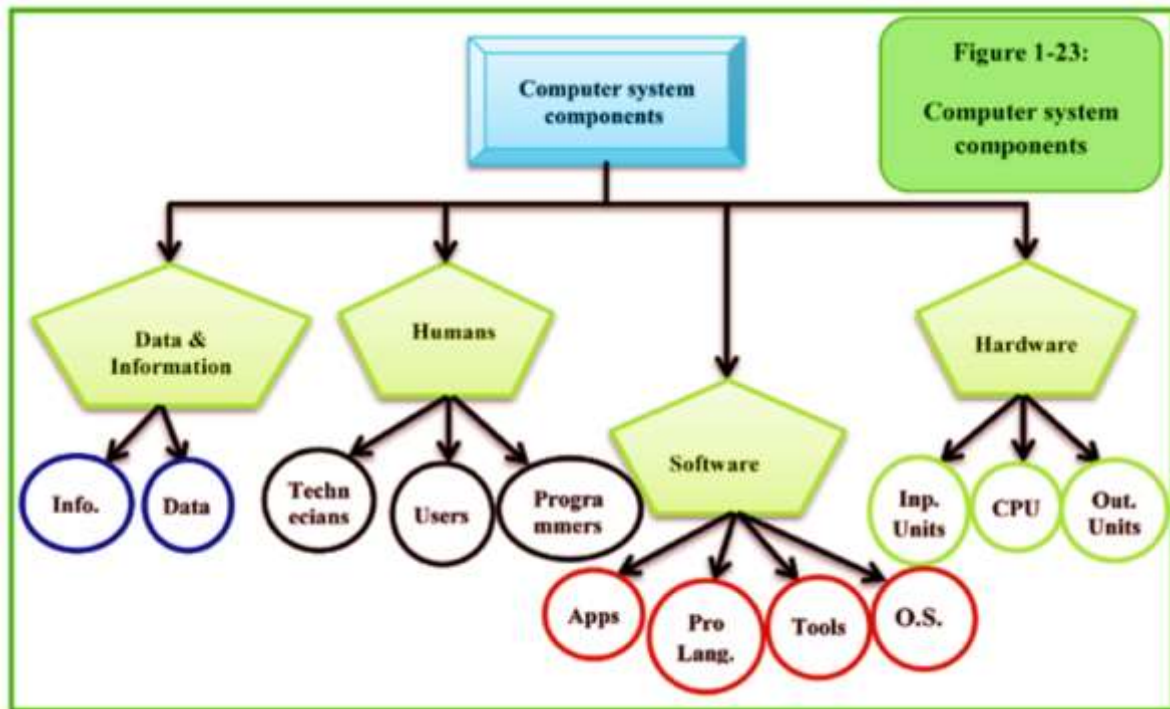
1 -8 Computer system components

The computer system consists of a group of components or elements that work together in harmony and integration in order to achieve the optimal exploitation of the capabilities of the device and meet the needs of the user, as it appears in Figure 1- 23 and includes:

First: Hardware

They are the physical devices that are connected to each other to form a computer as we know it, and are divided into:

- Input units: used to enter data for the computer.
- Output units: used to output data and information to the user.
- System unit: The main component includes many internal components, the most important of which are the motherboard and central processing unit (processor), as well as memory units (RAM, ROM) and hard disk .. etc.



Second: Software

It include all software that are run by the computer and includes the operating systems used to operate the device and its management, programming languages that can be used in building other software, the various applications used in the implementation of functions and tasks and the supporting tools that are used to protect and improve the work of the computer.

Third: Humans

They are the people who perform computer related work (programming and development - data entry and use of various programs - maintenance - ..etc). Also users: they are the people who deal with the computer and can be divided into three main sections:

a) End users

They can be called by users only for short, who run and use the programs on the computer.

b) Programmers

They are the people who write and design programs, as well as software developers who are working on developing new software. The interaction with the programs is done through the User Interface, through which data and instructions are entered and the information on the different output units is displayed.

c) Maintenance technicians

They are the persons responsible for computer maintenance, treatment and repair of any problems that may interfere with its work, whether it is hardware or software problems.

Fourth: Data and information

- The data is the raw material that is processed inside the computer, which is often in the form of various inputs (text - numbers - symbols - pictures - sound... etc), for example student's grades in different courses.
- As for the information, it is the product of processing and running data that gives added value to the user such as the student's total score or grade. It can be said that it is the output that the user wants to obtain.

Computer Hardware (2)

Objectives

➤ Main objectives:

1. Learn about the computer's Hardware.
2. Identify the factors that affect the computer's performance.
3. Learn about the numerical systems and data representation.

➤ Secondary objectives

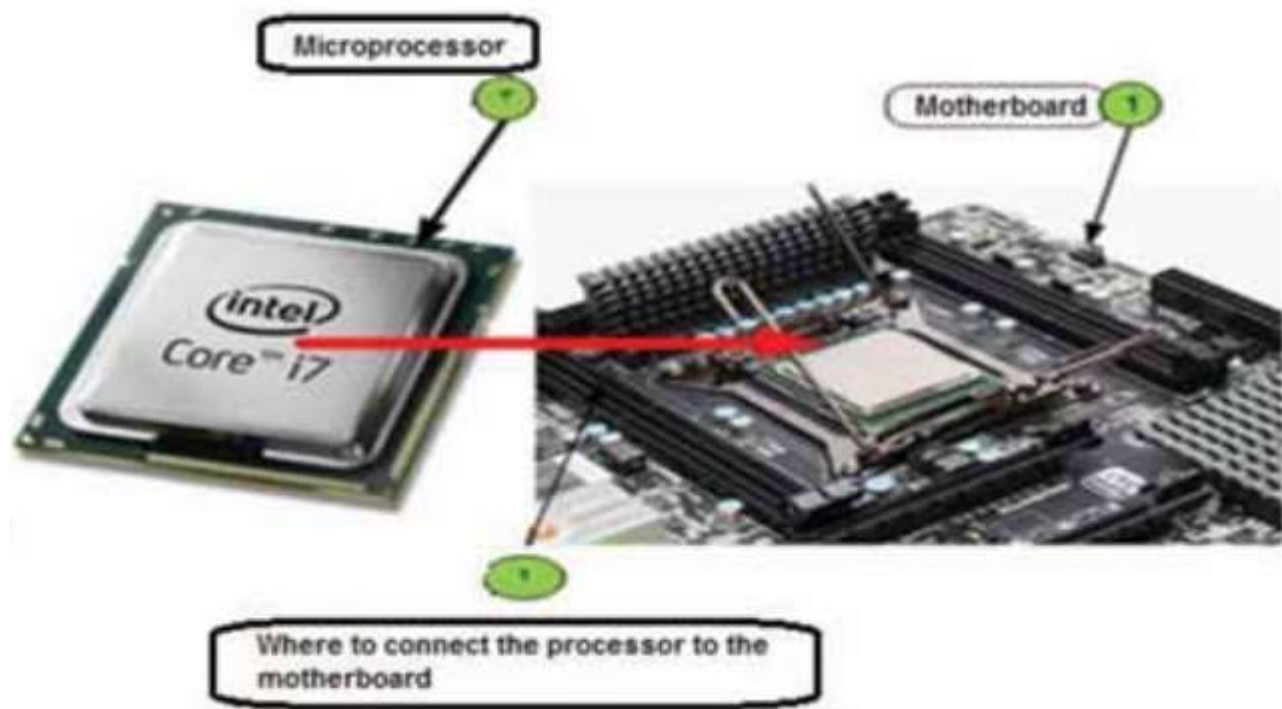
After studying this chapter, the student is expected to master the following knowledge and skills:

1. Classifies the computer's hardware components to internal and external.
2. Knows the CPU.
3. Shows the types of memory modules.
4. Learn about input and output units.
5. Learn about storage media.
6. Learn the components of the motherboard.
7. Learn how to measure computer performance.
8. Distinguish between types of numerical systems.
9. Can switch between numerical systems.
10. Learn how to represent data on a computer.
11. Learn about the different types of coding.
12. Determines the factors affecting the improvement of computer performance.



2- 5 Central Processing unit (CPU)

The Central Processing Unit-Processor-CPU is the most important part of a computer. It is considered the pulsed heart of the computer and is usually called a processor. It is a semiconductor chip on which millions of integrated circuits are placed. Figure 2- 9 shows the microprocessor and its connection location on the motherboard



It has become possible to provide the computer with more than one central processing unit, especially in network servers, supercomputers, and others. In addition, CPUs have more than one core for processing, which means that a single processor works like a group of processors working together at the same time.

Skill 2 - 11

Knowing about the characteristics of the processor.



2 -5- 1 Characteristics that distinguish the processor

1. Clock Speed

The computer's speed is estimated at the processor speed and measured in MHz and Gigahertz. Today, the computer speed is measured in GHz, for example, if it's 2GHz., that means it can perform a number of operations equivalent to two billion operations per second.

2. Coresnumber

In the past, the processor contained only one core that does all the work alone, but with the development of applications and the need to perform many tasks at the same time, a number of the core was added to the processor, which increased the processor speed, and new processors were issued with the following cores:

- Core i9
- Core i3
- Core i5 Mobile
- Core i5
- Core i7 Mobile
- Core i7

3. Processor Memory (Cache)

A temporary memory similar to the RAM, but it is much smaller and fixed in the processor itself. The secret of its importance is that the processor accesses it much faster than the RAM, and it is one of the things that affect the speed of the processor when working with many multiple tasks at the same time.

2 2-5-CPU components

1- Control unit

Control Unit (CU) is a group of electronic circuits responsible for managing all the operations necessary to implement the various orders, it works to transfer data to and from the arithmetic logical unit (ALU) , registers, main memory and input and output units.

2- Arithmetic logic unit (ALU)

3- The Arithmetic Logic Unit (ALU) is the unit responsible for all mathematical operations such as (addition, subtraction, multiplication, division, and raising of an exponent) and logical operations such as (positivity and negativity coefficients) within a computer, and it consists of a number of integrated circuits and recorders of various tasks4.- Registrars Registers are special storage locations with very high speeds that are proportional to the speed of the processor and any malfunctions in them.

• Registrars are divided into:

1. Data registrars: in which data are dealt with in terms of storage and logical and mathematical operations.
2. Address registrars: in which the different addresses are stored.
3. Cases Recorder: records the processor condition after executing a specific order.

• *The function of recorders:*

- 1- Control the implementation of the program.
- 2- Temporary retention of information and results.

4- Buses

Bus is a set of electronic lines through which exchanges are made between computer components. There are three buses inside and outside the processor, which are:

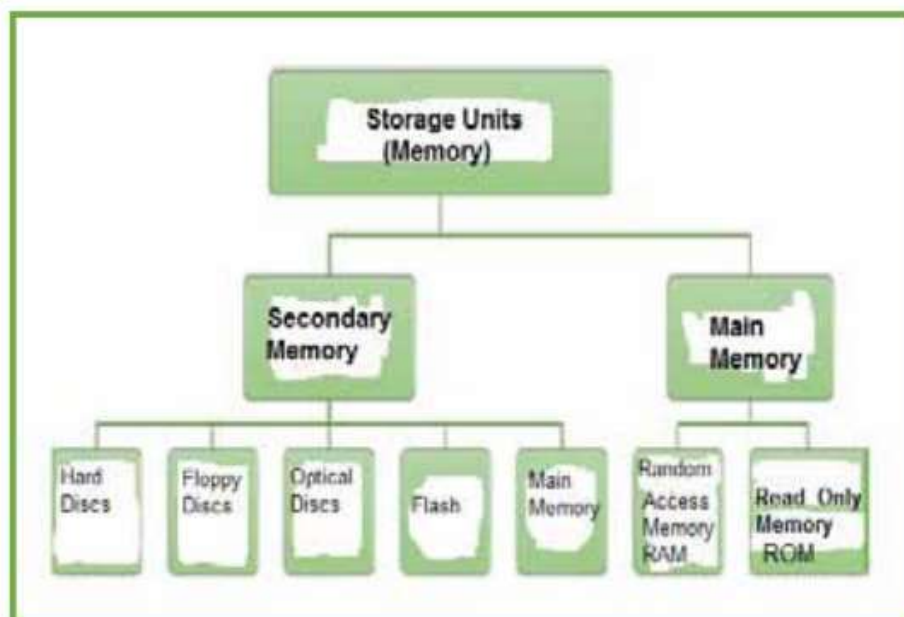
1. Address Bus: Used to assign addresses to different places in the memory or the input and output ports in order to transfer data from them, and the memory consists of a group of stores for each address. If the processor wants to read content stored in the memory, the address must be sent via the address bus.
2. Data Bus: is the data bus that transfers data from the processor to the units or vice versa. The number of wires per data bus changes according to the processor(64 ,32)
3. Control Bus: Consists of a set of wires whose function is to synchronize events in a synchronous manner and control memory and I/O units from the processor end. Control bus used to coordinate operations and communicate with external components.

Skill 2 - 12
Classification of storage units.



2 -6 Storage units (memory)

A group of electronic circuits that are used to save data and programs. Storage units are divided into two types, the basic memory and the secondary memory. Figure 2 -9 shows the primary and secondary storage types, and we will discuss these units in some detail.



**Figure 2-9:
Different types of
storage units**

2 -6- 1 Main memory is divided into two types

- Random Access Memory (RAM)
- Read Only Memory (ROM).

Firstly: Random Access Memory

Skill 2 - 13 Knowing about RAM.

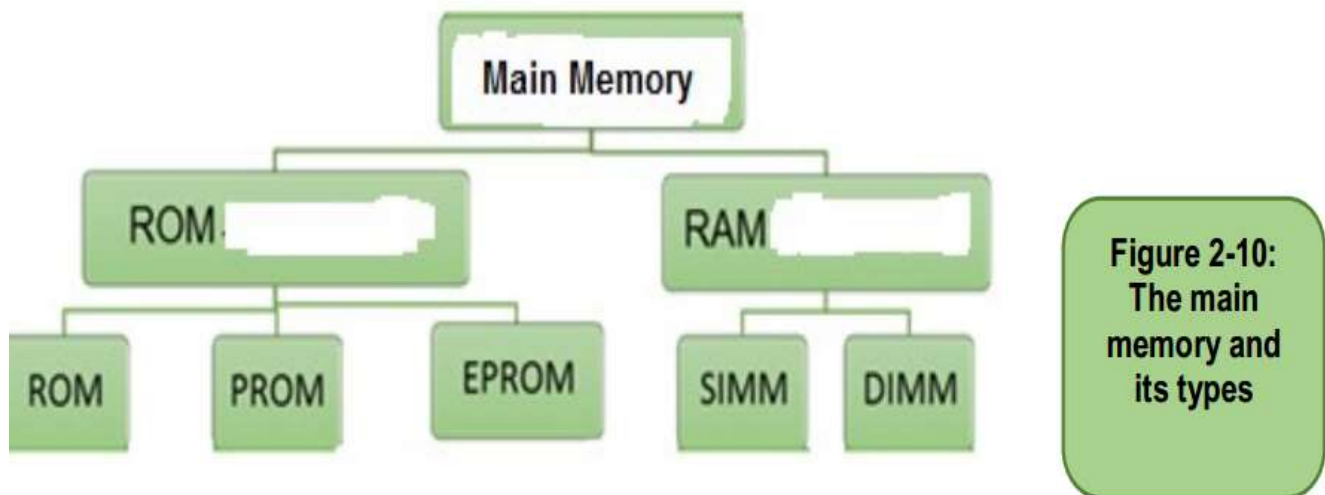


RAM is an abbreviation to (Random Access Memory), which is a memory in which data is stored in the computer and the storage of commands and programs necessary to process that data as well as storing the final results. Among the characteristics of random access memory are: read and write memory, lose all its contents once the power is off.

The random access memory is an essential part of which the computer cannot work without. The size and speed of this memory greatly affects the performance of the computer in general and programs in particular.

This memory consists of integrated electronic circuits, which consists of millions of cells that can store data temporarily (transistors and capacitors). Only one bit (BIT) can be stored in each memory cell, and the speed of memory is measured in unit of frequency, which determines the speed of data exchange between the memory and the rest of the associated computer parts. RAM size is measured in byte and its multiples or capacities.

Currently, the capacity (capacity) of one chip of RAM can reach 64GB or 128GB. Figure 2- 10 shows the RAM types.

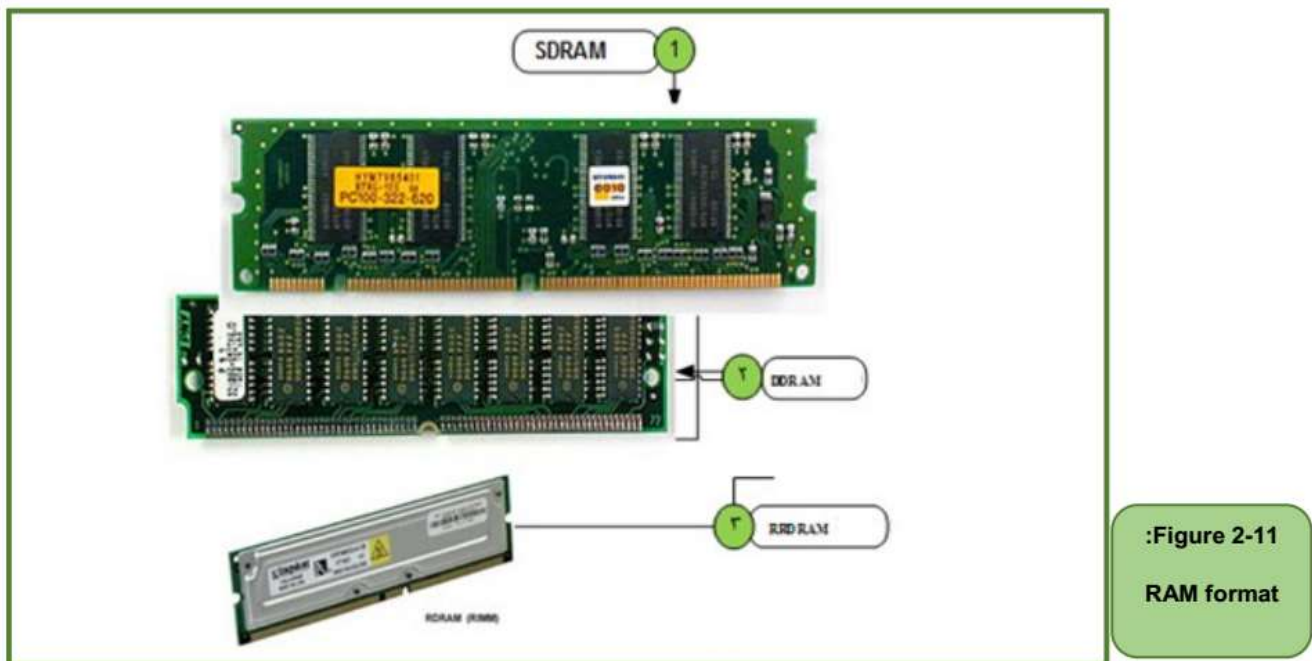


• *Types of RAM*

There are two main types of RAM: static random access memory (SRAM) and dynamic random access memory (DRAM), and there are also several other types of RAM.

1. Static Random Access Memory (S-RAM): a type of random access memory called Static RAM, or SRAM. It is called this name because its contents do not change over time, as it keeps its contents as they are as long as they are continuously fed, and SRAM memory is characterized by high speed, but it is defective in high cost, compared to DRAM
2. Dynamic Random Access Memory (D-RAM): called Dynamic RAM or DRAM, it loses its contents gradually over time and needs to rewrite the contents periodically. DRAM memory has the advantage of being able to be manufactured at high capacities and at low cost, and it is characterized by its consumption of electrical energy less than the SRAM. Therefore, DRAM is now widely used in PC's as Main Memory. The drawback of DRAM memory is that it loses its contents over time.

Currently, there are modern and advanced types of DRAM, such as Synchronous DRAM or Synchronous DRAM. As in recent years, the SDRAM itself has been developed into what is called DDR SDRAM or (Double Data Rate SDRAM). In this type of RAMs the memory speed is doubled using process of performing two operations of reading or writing in a single synchronization pulse, where one process is carried out at the upward edge of the synchronization pulse, and the other operation is at the downward edge of the synchronization pulse. Figure 211- shows some types of this memory.



:Figure 2-11
RAM format

Skill 2 - 14 Knowing about ROM.



Secondly: Read-Only Memory (ROM)

ROM is an electronic chip in which very important data is stored by the manufacturer, and no modification of its contents can be made except by special methods for some types. ROM is characterized by that it does not lose its contents by power outages, so some parts of the operating system and programs that are not allowed to be edit or delete it are stored on it. For this reason, it called the read-only memory and one of its tasks is to supervise the operation of the computer. Figure 211- shows the ROM types.

• Among the types of permanent memory are:

1. One-time programmed memory (ROM).
2. Programmable memory (PROM) which cannot be modified after programming it.
3. A programmable and erasable memory, that is, it can be erased and reprogrammed (EPROM).

Table 25- shows the most important differences between RAM and ROM:

Comparison scope	ROM	RAM
Writing Process	Programmed ROM while manufacturing is Written proof	Writing on it is done by the processor
Current Effect	ROM contents is fixed and not lost with power outages	Lost its contents when the power is off
Programming Possibility	Once by the manufacturer	Programmed as needed
Usages	To store some programs to boot the computer	For the computer's necessary operating programs and various programs



2- 6 -2 Secondary Memory (Secondary Storage Units)

Secondary storage units are special units for storing data, information and programs inside the computer. They are also called storage media. When entering any data into the computer, it must be saved as files in order to remain present when the computer is closed. Secondary storage units also evolved a lot with the development of the computer. Secondary memory divided into two types:

- Internal Storage: Example of Hard Disks
- External storage: Example of Flash memory and CDs.



Figure 2- 12 shows pictures of some types of secondary volumes widely spread, and Table 2 -6 shows the most important of these units with a brief description of each.

Storage Unit	Properties
(Floppy Disks)	Can hold a small amount of information and has two types: • 3.5 inches that accommodates 1.44 MB • 5.25 inches that accommodates 360 KB, 1.2 MB Each of its two types has its own player. It was used in the past.
Hard Disks	• Units for storing data and programs inside the computer. • Have a high storage capacity. • Their storage capacity varies to currently 2TB.
(CDROM) (DVDROM)	Considered one of the latest secondary storage media, as it relies on information recording technology using laser beams. CDs are divided into: • CD-ROM and DVD readers only. • Multiple writing and reading discs. RW.CD. • Disk capacities range from: • CD.R: The first species with a capacity of 700MB. • DVD: Type II with a capacity of 4.7GB.
(Flash memory)	One of the latest storage units. Small operator that connects to the computer through the USB port. Flash memory has high storage capacities, easy to use and move. Its capacity is available in different sizes ranging from 16GB to 2TB at the present time.

Skill 2 - 16

Knowing about the Motherboard



2- 7 Motherboard

Motherboard is also known as the Main Board and System Board. The motherboard is called this title because it connects all the physical devices that make up the computer from input and output units, processing unit, memory, and others. Its function is to pass data between the different units of the device through the data lanes and it has slots for connecting different cards, and the most famous motherboard manufacturers are Intel-ASUS - Gigabyte. Figure 2 -13 shows an image of the motherboard most important components.

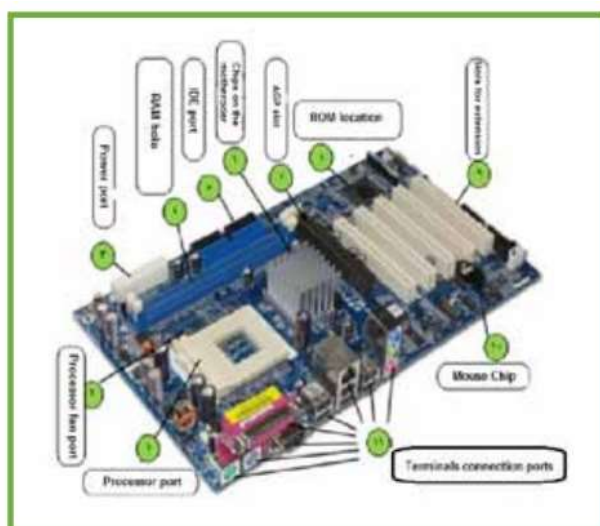


Figure 2-13:

The most important components of the motherboard

Table 2.7 Explains the function of the motherboard components.

Table 27- Main components of the motherboard

Port No	Name	Function
1	Processor socket	Used to connect the microprocessor (CPU).
2	CPU fan socket	Used to connect the processor's fan.
3	Power socket	Used to connect power to the motherboard.
4	RAM slot	A place to connect the RAM modules is usually 2 to 4 slots on the motherboard.
5	IDE socket	IDE (Intelligent Drive Electronics) socket used installation of hard and CD drives (usually two).
6	Chips on the motherboard	Integrated circuits installed on the motherboard by the manufacturer and it performs several functions.
7	AGP slot	AGP (Accelerated Graphics Port) expansion slot for screen card only. Not present on older boards and is characterized by high speed.
8	Read-only memory site	Installed on the motherboard and cannot be changed.
9	PCI Expansion Cracks	PCI (peripheral component interconnect) expansion slots are data transfer lines inside the motherboard and will be used to connect sound cards, modems, etc.
10	Slice of confusion	The basic input and output system and BIOS abbreviation for Gateway
11	BIOS	(Basic input output system), located on electronic chips and installed on the motherboard. Responsible for many functions, including those for computer boot process.

Computer Software (1)

Objectives

➤ **Main objectives:**

1. Learn about operating system software.
2. Learn about the utility software.
3. Learn about programming languages.
4. Learn about application software.

➤ **Secondary objectives**

After studying this chapter, the student is expected to master the following knowledge and skills:

1. Distinguish between different types of software.
2. Differentiate between types of system software.
3. Distinguish between types of operating systems.
4. Count the basic functions of the operating system.
5. Learn about different types of utility software.
6. Learn about the most important utility software and its functions.
7. Distinguish between different types of programming languages.
8. Differentiate between the types of different programming languages compilers.
9. Classifies different programming languages
10. Classifies application software.
11. Learn about the most important application software



3 -1 Introduction to software

The beginning of programming languages was before the manufacture of computers, they were small codes. In 1801, the scientist Joseph-Mary Jacquard invented the mechanical knitting machine, which was programmed and controlled by means of Punched Cards. These cards contain a set of holes representing the program. The British scientist Charles Babbage then used these cards in making the first mechanical computer. He called it the analytical machine in 1820 and the American scientist Herman Hollerith invented a census-based machine with these cards.

The term “software”, however, dates back to 1958 at the hands of scientist John W. Toke from Princeton University. At that time, most of programmers were women and were among the best university graduates who had been recruited, as men were preoccupied with war. The most famous one was Grace Murray Hopper, a mathematician who joined the US Naval Reserve during the war. She was credited with the appearance of the translator's repairman. Thereafter, the punch card technology continued to be used in programming until 1960, when the first high-level programming languages, Cobol and Fortran, appeared. The C languages, Prolog, and SQL then appeared in 1972. Not long after, Basic, which became one of the most popular programming languages, which was used in schools and universe programmers were sites in 1974. The language of C++ was developed in 1983. As for the Visual Basic and Python languages were in 1991, while Java and JavaScript were in 1995. In 2000, C-Sharp and Visual Basic.net appeared.

The period 1970-1980 witnessed major development in operating systems. The Unix operating system appeared in 1970 and still under development. DOS-11 appeared for personal computers in 1974, Apple DOS in 1978, Windows 1.0 in 1985, Linux in 2003, Windows Vista in 2007, Android in 2008, and Windows 8 in 2012.

As for databases dating back to 1963, IBM developed a system for dealing with databases for NASA. In 1970, the so-called Relational Data Model (RDBMS) emerged and was used in bank customer data. Then SQL, the standard language for querying, appeared in the relational data model by IBM. Then a group of companies specialized in databases such as Oracle and Informix appeared. Then Microsoft appeared through Access, which relied the SQL database management system and became one of the most famous database systems. With respect to the electronic tables, it made its first appearance in 1979. The Lotus 123 program from IBM then appeared, and then the Microsoft Excel program did.

For word processors, the beginning was in 1976 by the electric pencil word processor from IBM, followed by the program of the writer from Apple Writer in 1978. In 1979, the most famous word processing program Word stare merged and became very popular. The Microsoft Office appeared in 1990.

Skill 3 - 1

What is a software?



Software definition: it is a set of commands and instructions written in one of the special computer languages (programming languages), which directs the computer to implement a set of steps to solve a specific problem or implement a specific task.

The hardware does not work without the software. The software directs the CPU to receive data from the different input units, perform the required operations on them, and output the results and information to the different output units, as shown in Figure (3 -1).

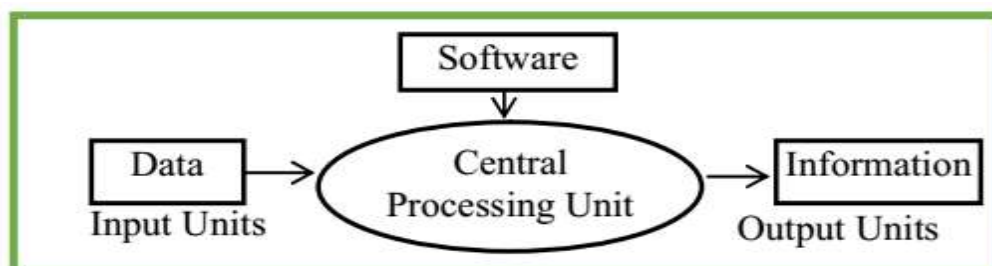


Figure 3-1:
The role of
software in
operating the
computer

The software represents the link between the human and the computer. There are now millions of software. So, due to its importance in our daily life and its rapid spread, in this chapter we will have a look at the software and its different types, with mentioning some examples.



3- 2 Types of software

The software can be classified as ownership, license, or use.

31-2- Types of software in terms of ownership and licensing

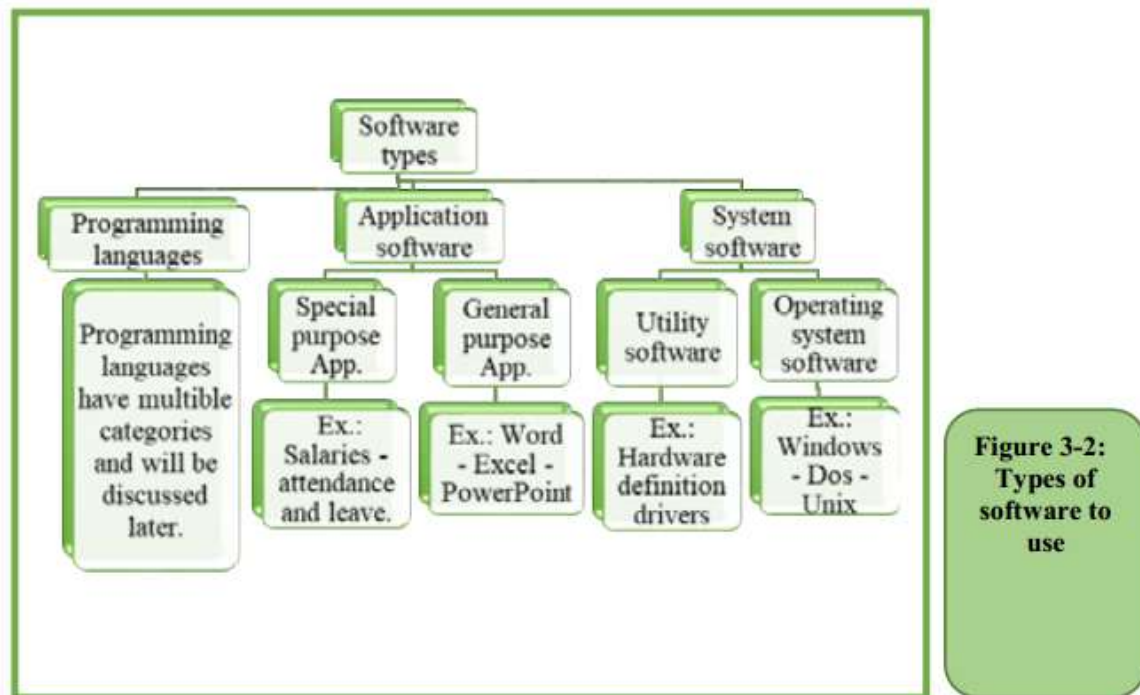
Software can be classified in terms of ownership and licensing into four types as shown in Table 3 -1.

Table 3 -1 Software Types of Ownership and License

Type	Description
Closed Source Software	It is non-free software and licensed under the law of protecting intellectual property by preventing copying, printing, publishing and amending. So, the licensee is only entitled to use, while Source Code is not provided, such as Microsoft Corporation (Windows, Office,..).
Opened Source Software	It is software that allows the addition and modification to source code, which is available with this software. This type of software is not for profit and developed by a group of volunteer programmers, such as Shortcut video editing software and Liber Office application package similar to Microsoft Office.
Shareware	It is software that allows free use for a specific trial period. After the end of the period, the trial program will either stop working completely or partially, or start sending spam to the user; for example, Adobe Photoshop 8 and WinZip.
Freeware	It is software that allows free copying, downloading and distribution. They are often from non-profit organizations such as universe sites; for example, File zip and Mp3tag.

3 -2 -2 Types of software in terms of use

Software is divided in terms of use into three basic types, as shown in Figure (2 -3).



Below is the detail of these types.

Skill 3 - 3
Distinguishing between types of systems softwares.



3 -3 Systems software

Systems software definition: It is a set of software that controls the operation and management of computers, peripherals and other programs efficiently and easily, and takes advantage of all components to implement the needs of the user. It is developed by computer manufacturers or other international companies. Systems software can be divided into two types:-

- Operating System Software
- Utility Software These types are explained below.

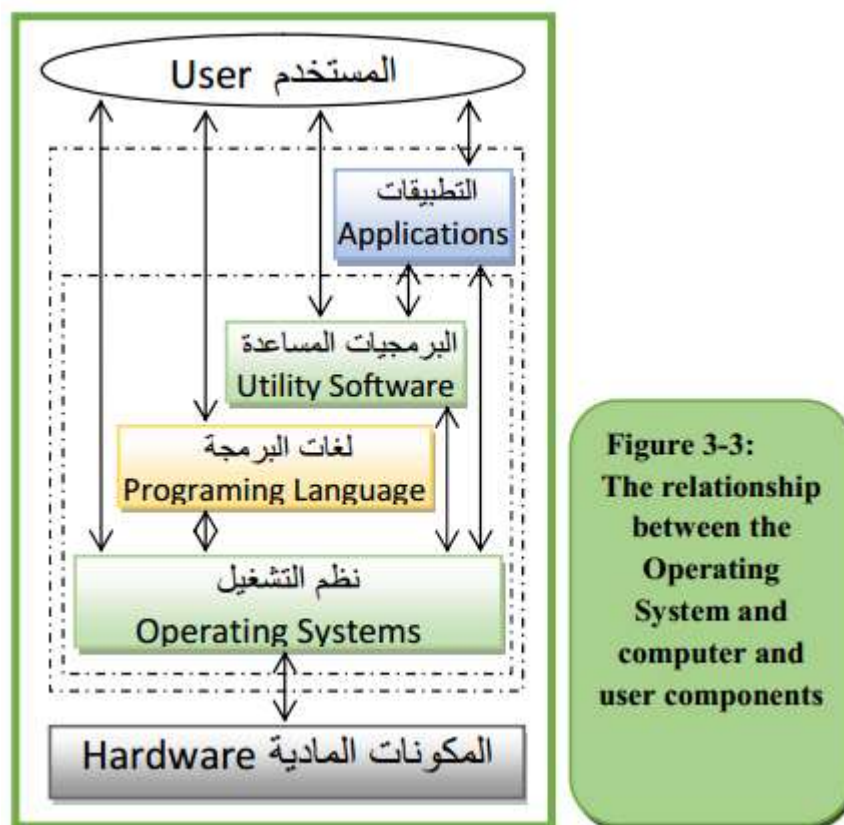
Skill 3 - 4
Learning about the operating system and enumerating some of its basic functions.



3-3 -1 Operating systems

One of the most important basic software that a computer needs in order to operate is the Operating System (OS).

Operating system definition: A set of programs responsible for operating and managing all computer sand physical components of the computer, as well as providing an interface (communication) between the user and these components. The operating system can be considered the general manager of the computer. It receives data and commands from the user or from other software and then stores them temporarily and sends them to the processor for processing and implementation, and then takes the results from the processor and sends them to storage units or to different output units. Without the operating system, the computer stops working completely. Figure (3- 3) shows the relationship among the operating system, computer, user software, and components.



First: the basic functions of the Operating System

The operating system has many functions, including: -

- ❖ **Operating the computer:** once the computer is started, the operating system loads most of its commands and functions to the Random Access Memory(RAM), which starts automatically by receiving commands, operating and managing the hardware and software components. It continues to work within memory until the moment of closure.

- ❖ **User Interface:** it is an interactive interface between the user and the computer hardware and software components.
- ❖ **Operations Management:** the operating system, through managing operations, performs many tasks, including: starting or stopping the execution of the process, and maintaining the sequence of operations that the user needs from its beginning to its end.
- ❖ **Input and output management:** this function includes many tasks, including: Providing access to input and output units when needed.
- ❖ **Memory management:** the operating system, through memory management, performs many tasks, including: knowing the portion of the memory used by whom of the users and from which program, allocating the required space from the memory to implement other programs, freeing the memory after completing the implementation of the software to use it again, and the optimal use of memory and utilizing it.
- ❖ **Processor management:** through this function, the operating system performs many tasks, including: allocating the processor or processors to perform the required tasks, scheduling tasks, setting and implementing priorities for the various operations, knowing the status of the operations that the processor performs and managing, and canceling the assignment of the processor when not needed.
- ❖ **Manage peripherals attached to the computer:** printer, scanner, modem, etc. These devices are managed through many tasks, including: checking and knowing all the devices connected to the computer, operating these devices and optimal coordination among them, allocating the operations that these devices will implement, and canceling the allocation after implementation.
- ❖ **File management:** file management is done through many tasks performed by the operating system such as: tracking files and knowing where to store and use them, Providing many operations such as copying, saving, opening, etc, and Knowing the software that you can run and benefit from.
- ❖ **Run other software** and link it to the user and computer components.
- ❖ **Securing and protecting data and software:** such as creating a username and password to protect the device, software and data; from who are not authorized to interact with the device.

- ❖ **Operation control:** operation is monitored through several tasks, including: determining the time between service request and hardware implementation, identifying the users of devices from both users and programs, and providing the user with reports on the operation of programs and data he uses.
- ❖ **System maintenance:** it is done through many procedures, including: detecting some errors as they happen, sending messages to the user or the system administrator to clarify the problem, and help with the solution.

Skill 3 - 5

Distinguish among types of operating systems.



Second: types of Operating Systems

There are many operating systems that differ from each other as a result of many factors, including: the difference of the producing company - the type of computer - the ability to run more than one program or process at the same time or not - the possibility of participation of a number of users or not and other factors. Therefore, there are many classifications of operating systems among them, examples are as in Table 3- 2.

Table 3-2 Types of Operating Systems

Classification	Description
Use and Ownership License	Free operating systems such as: Linux, Ubuntu.
	Non-free operating systems such as Windows, Mac.
Running more than one program or function	Single-Tasking systems perform one task as running one program at the same time as DOS.
	Multitasking: this type can run multiple applications or execute multiple orders at the same time using the Time Sharing method. These systems are the most used now.
Run and manage more than one processor	Single-Processing operating system such as operating systems for personal computers and smart devices
	Multiprocessing system: this system allows us to run more than one processor and coordinate between them at the same time as operating systems of supercomputers and mainframes(SUN OS).
One user or More are working	Single-User systems
	Multi-User systems
The type of computer in terms of size and use	Personal computer operating systems
	Servers operating systems and large devices
	Operating systems of small devices and smartphones

From the above one can conclude that there are many types of operating systems, including: -

1. Single-User Single-Task Systems

This system allows one user to run one program or perform one operation at the same time. If the user wants to run another program, the first program must be closed. For example, the DOS Operating System which is one of the oldest operating systems.

2. Single-User Multi-Task Systems

These systems allow one user to run more than one program at the same time, navigate and share data between them. These systems are the most used now, especially on personal computers and workstations, such as Windows and Mac OS.

3. Multi-User Single-Task Systems

These systems allow more than one user to run each of them one program at the same time or everyone to share only one program. These systems are used with mainframes or servers, and each user has an input unit (keyboard and mouse) and an output unit (screen). This system is based on time-sharing on users such as Windows NT. These systems are characterized by the ease and speed of data modification and protection, and users benefit from dealing with very fast devices. However, one of its disadvantages is that if the central computer or the server crashes, users stop working permanently, and the speed decreases as the number of users increases.

4. Multi-user Multi-Task Systems

These systems allow more than one user to run and execute more than one process at the same time. It is the most powerful operating system available and used in supercomputers, central and medium computers. It is characterized by the participation of users of all components of the computer at the same time as the Unix operating system.

5. Real-Time Systems

Real-time operating systems are distinguished from other systems by high speed (measured in microseconds or part thereof) in receiving data and performing the required tasks. It is used in applications where the time factor is very influential and may contain functions specific to the application or the field used in it. These systems have become used in many fields, including medical, industrial, scientific, airport control, and robotics as a result of the rapid and significant development of communications technology and automatic control. Its disadvantage is that it is expensive.

6. Network Operating Systems

Network operating systems are distinguished from other operating systems because they allow the management and sharing of networked devices, data, information, and programs to protect them from intrusion and others, as well as easy and fast access to the server or other devices. However, one of its disadvantages is the high cost of purchasing, operating, and maintaining the server; besides the server failure causes most of the network operations to stop. Examples of network operating systems include Microsoft Windows Server 2012, Unix, and Novell.

7. Distributed Operating System

Distributed operating systems work with multiple central or independent processors, where they manage these wizards, coordinate, and distribute tasks and operations among them. Also, they are characterized by high speed and efficiency as a result of assigning tasks to processors; and if a malfunction occurs in one of the processors, it does not affect the rest. One of its drawbacks is that it is very expensive.

8. Mobile and Smart Devices Operating System

These systems feature the provision of many services and applications such as calls, calls over the Internet, video calls, voice messages, web browser, e-mail, music player, support for social networking programs, and others.



Third: examples of Operating Systems

Currently, there are many operating systems, as mentioned before, some of which are for a personal computer, some are for networks, and some are for smart devices and smartphones. The most popular operating systems are Windows, Linux, Mac, Unix, Android, iPhone, and Windows Phone.

1. Windows

Windows operating systems have become the most widespread and used around the world because of its easy, simple, and multifunctional graphical user interface, as well as it supports running most applications and video games. However, one of its drawbacks is that it is not free. In this book, we will study Windows10 OS.

2. DOS

One of the first personal computer operating systems to work on IBM devices and Intel processors, which is an acronym for Disk Operating System. It emerged in 1981. It has the advantage that it allows the user to deal directly with computer components. Among its disadvantages is that it is a single-user single-task operating system, and also uses the linear interface method via the command page and keyboard, which results in many errors.

3. Mac

Mac OS is designed to deal with Apple Macs, as Apple produced it in 1984 to deal only with its devices, but recent versions such as 8 and 9 can run applications and programs compatible with DOS and Windows. It is the first operating system to provide a graphical user interface with full support for the Arabic language. It is the most powerful operating system that supports printing and desktop publishing services.

4. Linux

The Linux operating system, LINUX, is one of the most popular systems around the world. It is an open-source system with an easy graphical interface in most languages of the world, and it depends on the Linux operating system which is similar to it. The first version of Linux was in 1992, then various versions rolled out; the latest version was Linux3.9.6. It works on all types of computers (supercomputer, mainframe, central, personal, networks and smartphone devices). It is usually used in distributed systems networks. Its logo is the penguin.

5. Android

It is a special operating system for smart devices and tablets and is based on the Linux operating system. It was developed by a number of companies such as Google and others. The first release was Android1.0 in 2008.

6. IOS

An operating system for Apple mobile phones and devices, which is a multitasking operating systems. The current version is 7.