Ministry of Higher Education and Scientific Research
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Faculty of Exact Sciences and Natural and Life Sciences
Department of Mathematics and Computer Science

Computer Structure 1

Presented by: **Dr. NASRI/A**
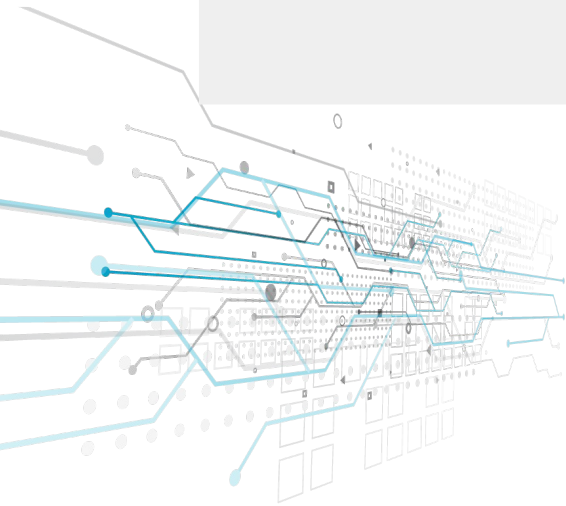nasri.ahlem1988@gmail.com
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Target audience	1st year mathematics student + 1st year Common core Mathematics and computer science students .
Prerequisite	Elementary mathematics.
Assessment method	Assessment method: Exam (60%), Continuous assessment (40%)

Outline:

Chapter 0 — **General Introduction and history:** Definitions, History and General Architecture of a Computer

Chapter 1 — **Numeral system:** Binary, Octal, Decimal, Hex

Chapter 2 — **Information representation :** Binary coding, Character representation and Numbers representation.

Chapter 3 — **Binary Boolean algebra:** Definition, Basic operators

Chapter 0: General Introduction and History

Outline:

1

Definitions

Computer Science;
Computer.

2

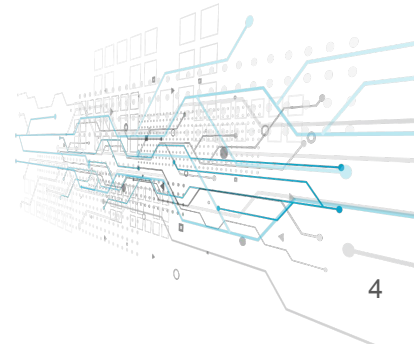**History**

Before the 20th century;
20th century;
21th century.

3

General Architecture of a Computer

Central Processing Unit (CPU);
Random Access Memory (RAM);
Units of Memory Capacity
Measurement

4

recap

Computer: is an automatic information processing machine that is capable of receiving, storing, processing, and outputting data and information under the control of a set of instructions, often referred to as programs or software.
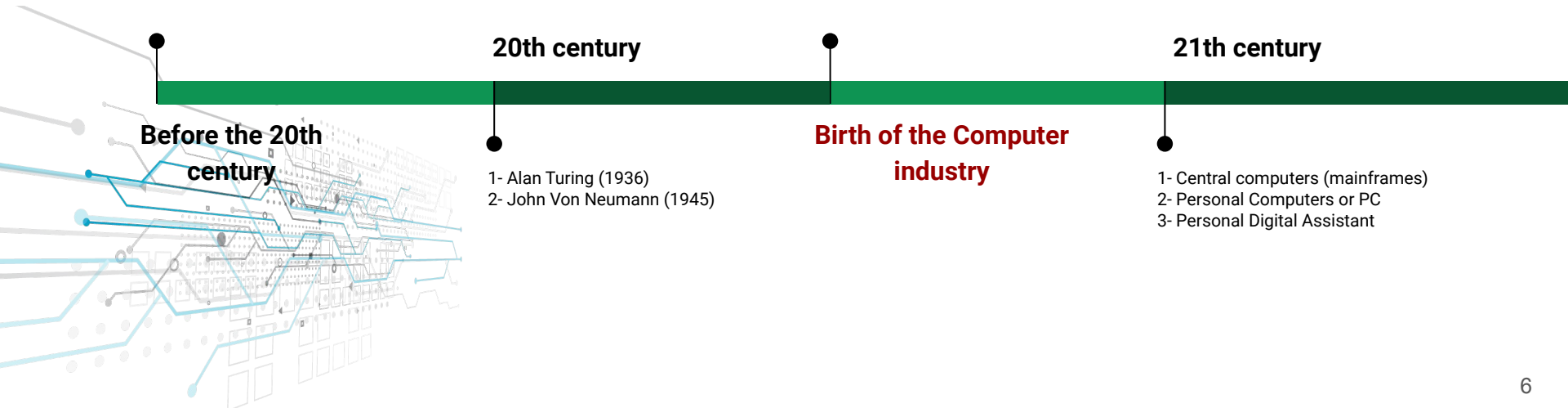
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┌──────────┐      ┌──────────────┐      ┌──────────┐
│  Inputs  │ ───> │  Processing  │ ───> │  Outputs │
└──────────┘      └──────────────┘      └──────────┘
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Computer science (Computing): "It is the science of **processing information automatically**".

❏ Using computer programs, algorithms, or automated systems to perform tasks related to information processing without **direct** human intervention.
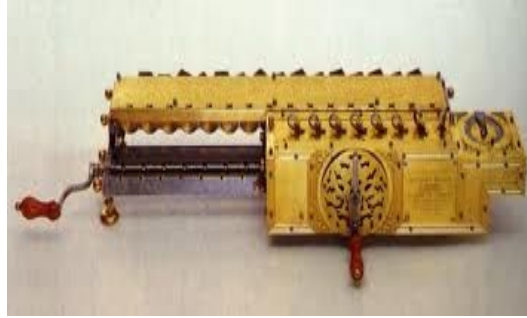
1- Blaise Pascal **(1642)**
2- Gottfried Leibniz **(1673)**
3- George Boole **(1854)**
4- Claude Shannon **(1984**

1- 1st generation (1950)
2- 2nd generation (1960)
3- 3rd generation (1970)
4- 4th generation (1980)

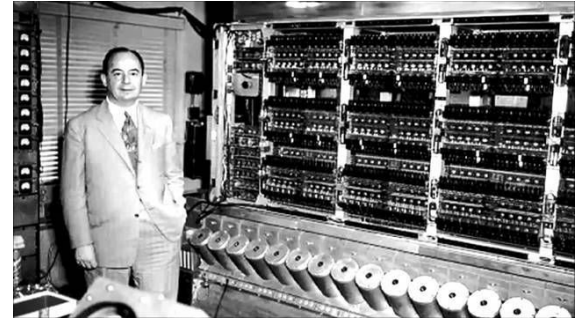**20th century**

21th century

Before the 20th century

1- Alan Turing (1936)
2- John Von Neumann (1945)

Birth of the Computer industry

1- Central computers (mainframes)
2- Personal Computers or PC
3- Personal Digital Assistant

The Pascaline

Leibniz's arithmetic machine

John von Neumann machine

Hardware:

Central Unit

Input devices

input

CPU

Control unit ⟷ Arithmetic logic unit

Output devices

output

data

data

Memory

Ram   Rom

resultant value
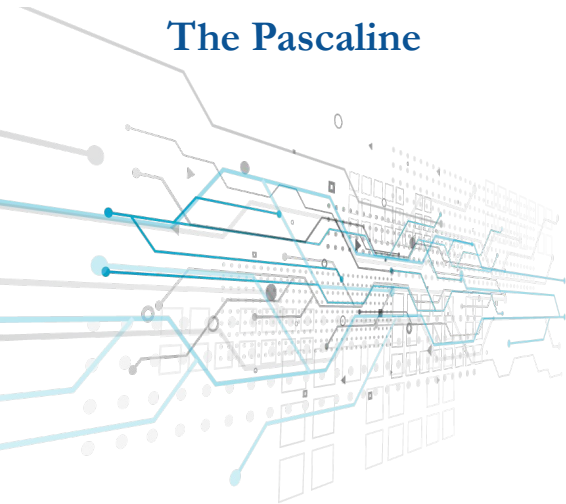
External storage
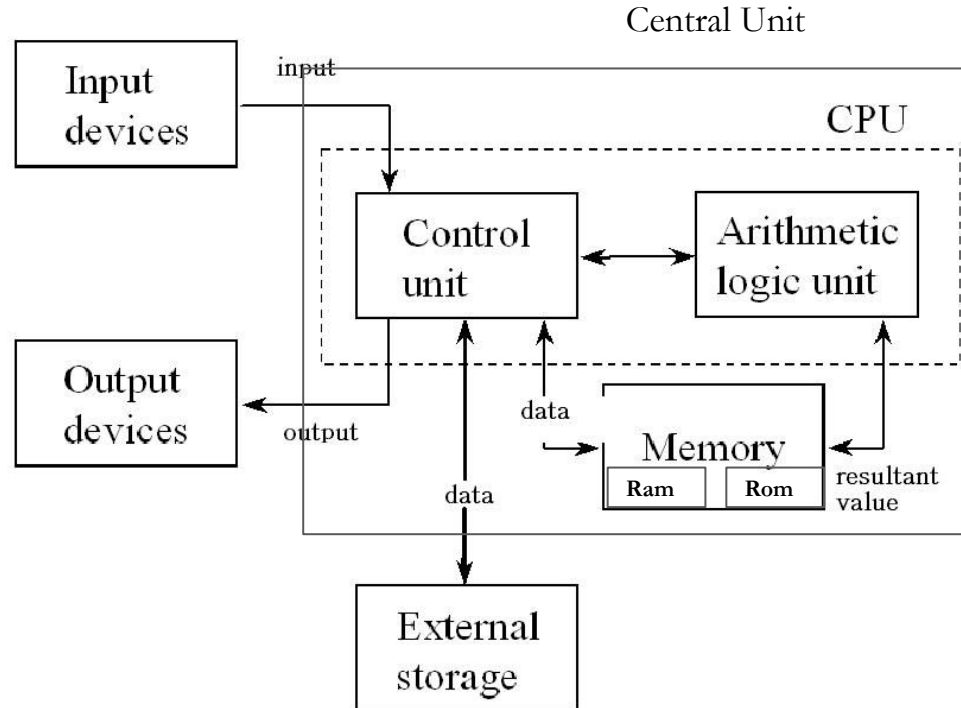
Central Processing Unit (CPU)	Arithmetic and Logic Unit (ALU)	responsible for performing arithmetic and logical operations on data, which are essential for the computer to execute various tasks and processes.
	Control Unit	responsible for managing and coordinating the operations of the entire processor.
	Registers	used to store and manage data that the CPU needs to access quickly during its operations
Central Memory	RAM	(Random Access Memory):Volatile Memory; can be read and written in a standard way
	ROM	(Read-Only Memory): Non-Volatile Memory, a memory that can only be accessed for reading.

| Buses	Data Bus	used to transmit data between the CPU, memory, and input/output devices. It allows for the transfer of binary data in both directions (read and write).
	Address Bus	used to transmit memory addresses. It determines the location in memory where data needs to be read from or written to.
	Control Bus	transmits a number of synchronization signals which ensure that the processor and the various online peripherals operate harmoniously.
External Storage	An external hard drive is a portable, standalone storage device that connects to the computer via USB, Thunderbolt, or other interfaces. It provides additional storage capacity. Ex: Solid-State Drive (SSD), USB Flash Drive, Memory Cards and SD Cards and Cloud Storage, … etc	

10

Peripherals	Input Peripherals	Keyboard, Mouse, Scanner, …
	Output Peripherals	Monitor (or Display), Printer, Projector, Speakers, …
	Input/Output Peripherals	Touchpad and Trackball, Modem, External memory
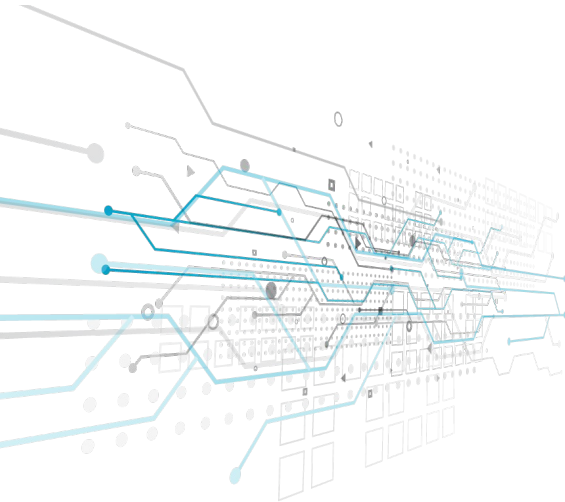
Software:

Operating system	the first point of contact between the computer and the user (human). It is software that consists of a set of basic applications required for the proper operation of the hardware: keyboard, screen, printer, and so on. Ex: Windows, Linux, IOS, Android, …
Apllications	a collection of programs that work together to give a service to the user. Microsoft Office, for example

Units of measurement:

Unit	Meaning
Byte, bit	**Capacity, size**: mainly used for memories (cache, RAM, disks).
Bit / second	**Speed** (bps) bit per second. used to calculate the speed of uploading.
Hertz	**Frequency**: number of events per second. Used for CPU Bus Frequency, Screen Refresh Rate, RAM Bus Frequency.

Units of measurement:

Units	value	in bytes
Byte	8 bits	1
Kb: kilo-Byte	1 024 Bytes	2^{10} bytes
Mb: mega-Byte	1 024 KB	2^{20} bytes
Gb: giga-Byte	1 024 MB	2^{30} bytes
Tb: tera-Byte	1 024 GB	2^{40} bytes

unit	value	in bps
Byte/second	8 Bps	2^{10} bps
Kbps: kilo-bit/ second	1 024 bps	2^{10} bps
Mbps: mega-bit/second	1 024 Kbps	2^{20} bps
Gbps: giga-bit/second	1 024 Mbps	2^{30} bps

unit	value	in Hertz
KHz: kilo-Hertz	1 000 Hz	10^{3} Hz
MHz: mega-Hertz	1 000 KHz	10^{6} Hz
GHz: giga-Hertz	1 000 MHz	10^{9} Hz

Q1: What is a computer science ?

Q2: what are components of a computer ?

Q3: 1 GB= ? B / 10^6 B =?   MB