01 Central Processing Unit

- Computer is like a kitchen in a hotel, and the Central Processing Unit is like a chef in that kitchen.
- As a chef prepares food, the Central Processing Unit processes data in the computer and converts them into information.
- As the food preparation speed depends on the speed of the chef, the speed of the computer depends on the speed of the Central Processing Unit.
- A dual-core processor is like having a kitchen with two chefs preparing two meals, so two things can be prepared at the same time.

1.1 Let's identify the Central Processing Unit

The Central Processing Unit – (CPU) can be identified as a digital circuit that processes data according to given instructions. Whatever task performed by the computer, in all such instances, the Central Processing Unit runs in the background.

The main function of the processor is to execute instructions stored in a computer programme. That is, it gets data and processes them according to given instructions.

Figure 1.1 - Central Processing Unit

While the Central Processing Unit can't be observed from the outside, it is positioned (fixed) on the motherboard, inside the system unit.

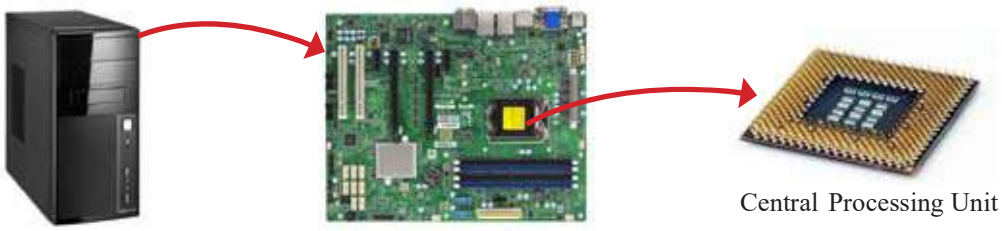


Figure 1.2 - Location of the Central Processing Unit

1.2 Let's identify the Components of the Central Processing Unit

The Central Processing Unit consists of three main components.

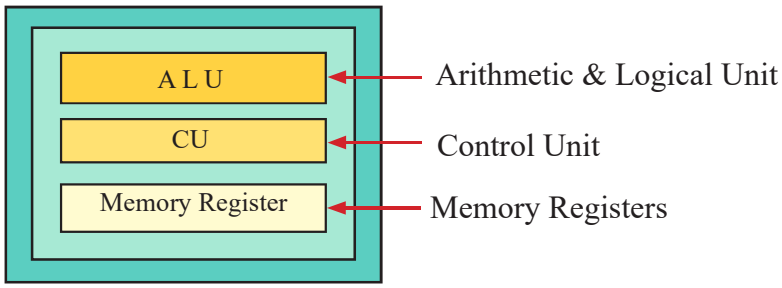
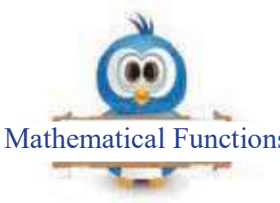


Figure 1.3 - Main components of the Central Processing Unit

1.2.1 Arithmetic and Logical Unit

Mathematical and logical functions are performed in the Arithmetic and Logical Unit. The functions of this unit can be further divided into two main sub-functions.



Mathematical Functions

Mathematical calculations such as addition, subtraction, multiplication and division.

Eg : 2 + 3 = 5

Logical Functions

Logical operations such as comparison of two numbers.

Eg : 3 > 2

1.2.2 Control Unit

The Control Unit communicates between manipulates and controls the hardware connected to the computer. It also performs tasks such as controlling input and output data, ensuring that data is sent to right place at the right time and being alert whether relevant signals are successfully received.

1.2.3 Memory Registers

It temporarily stores data and instructions that are being used by the Central Processing Unit. The storage capacity of the memory registers is very low when compared with other memory devices like hard disk. However its data access speed is very high.

Activity 1 - see Workbook 1.1

1.3 Let's learn about the evolution of Central Processing Unit

The Central Processing Unit of a computer system can be divided into four generations based on the electronic technology used to manufacture it.

1. First Generation (vacuum tubes)
2. Second Generation (transistor)
3. Third Generation (integrated circuit)
4. Fourth Generation (microprocessor)

While the above classification of the Central Processing Unit is a simple classification only for your understanding in grade 7, in many cases, the evolution of the Central Processing Unit has been shown in different generations in diverse ways too.

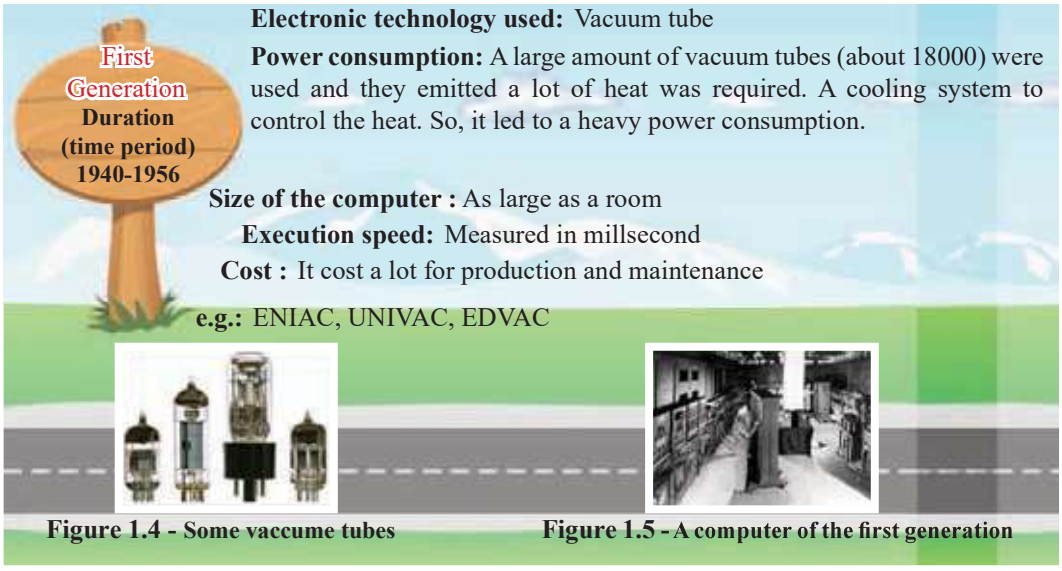


Figure 1.4 - Some vaccume tubes

Figure 1.5 - A computer of the first generation

Second Generation
Duration (time period) 1956 – 1963

Electronic Technology used: Transistor

Power consumption: Less power consumption when compared with the first generation computers.

Size of the computer : Smaller size when compared with the first generation

Execution speed: Measured in micro second

Cost : It costs a lot for purchasing

e.g.: IBM 7030, CDC 1604

Figure 1.6 - Some transistors

Figure 1.7 - A computer of the second generation

Third Generation
Duration (time period) 1964 – 1971

Electronic Technology used: Integrated circuit

Power consumption: Less power consumption when compared with the second generation

Size of the computer : Smaller size when compared with the second generation

Execution speed: measured in Nano second

Cost : It cost less for purchasing when compared with the second generation

e.g.: IBM 360, CDC 6600

Figure 1.8 - An intergrated circuit

Figure 1.9 - A computer of the third generation

Fourth Generation
Duration (time period) from 1971 to date

Electronic Technology used: Microprocessor

Power consumption: Less power consumption when compared with the third generation

Size of the computer : Smaller size when compared with the third generation

Execution speed: MIPS – Million of Instructions Per Second and picosecond.

Cost : It costs less for purchasing when compared with the third generation

e.g.: Modern computers that are in use.

Figure 1.10 - A microprocessor

Figure 1.3 - Some computers of the fourth generation

mille second 1 = 0.001 second

micro second 1 = 0.000001 second

nano second 1 = 0.000000001 second

pico second 1 = 0.000000000001 second

Speed of the Central Processing Unit

Speed of the Central Processing Unit also known as clock speed is the number of instructions executed in a second. The unit used to measure the speed of the Central Processing Unit is hertz (Hz).

In modern computers, the unit megahertz (MHz) or gigahertz (GHz) is used to measure the speed of the Central Processing Unit.

Kilo hertz 1 Kz = 1000 Hz

Mega hertz 1 Mz = 1000 000 Hz

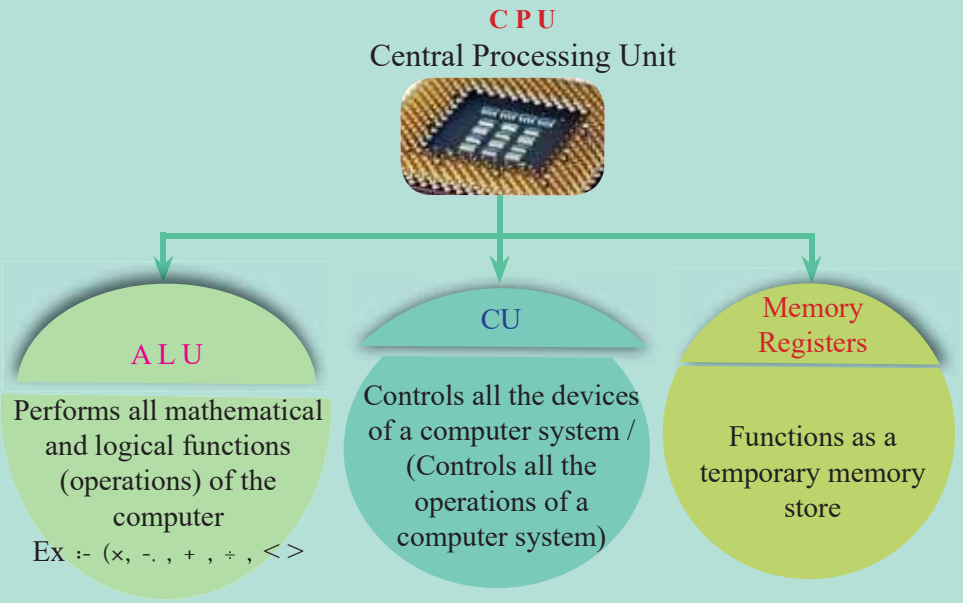
Giga hertz 1 Gz = 1000 000 000 Hz

Activity 2 - see Workbook 1.2

Summary

- (CPU) can be considered as the brain of the computer.
- There are two main components of the Central Processing Unit.
  - Arithmetic and Logical Unit (ALU)
  - Control Unit (CU)

Additionally, memory registers too belong to the Central Processing Unit.



- Speed of the Central Processing Unit increased gradually with the evolution of the computer.
- Computer can be divided into four generations based on the electronic technology used in the Central Processing Unit.
  1. First Generation (vacuum tubes)
  2. Second Generation (transistors)
  3. Third Generation (integrated circuits)
  4. Fourth Generation (microprocessors)