The purpose of the CPU – The fetch - execute cycle:

A computer is an electronic device which takes input, processes data and delivers an output.

The fetch – execute cycle:

- Fetches the next instruction from the RAM
- Brings it back to the CPU

- Decodes/understands the next instruction and works out what it needs to do

- It executes the instruction
- Goes back to the RAM for more information
- Perform calculations
- Store information into RAM

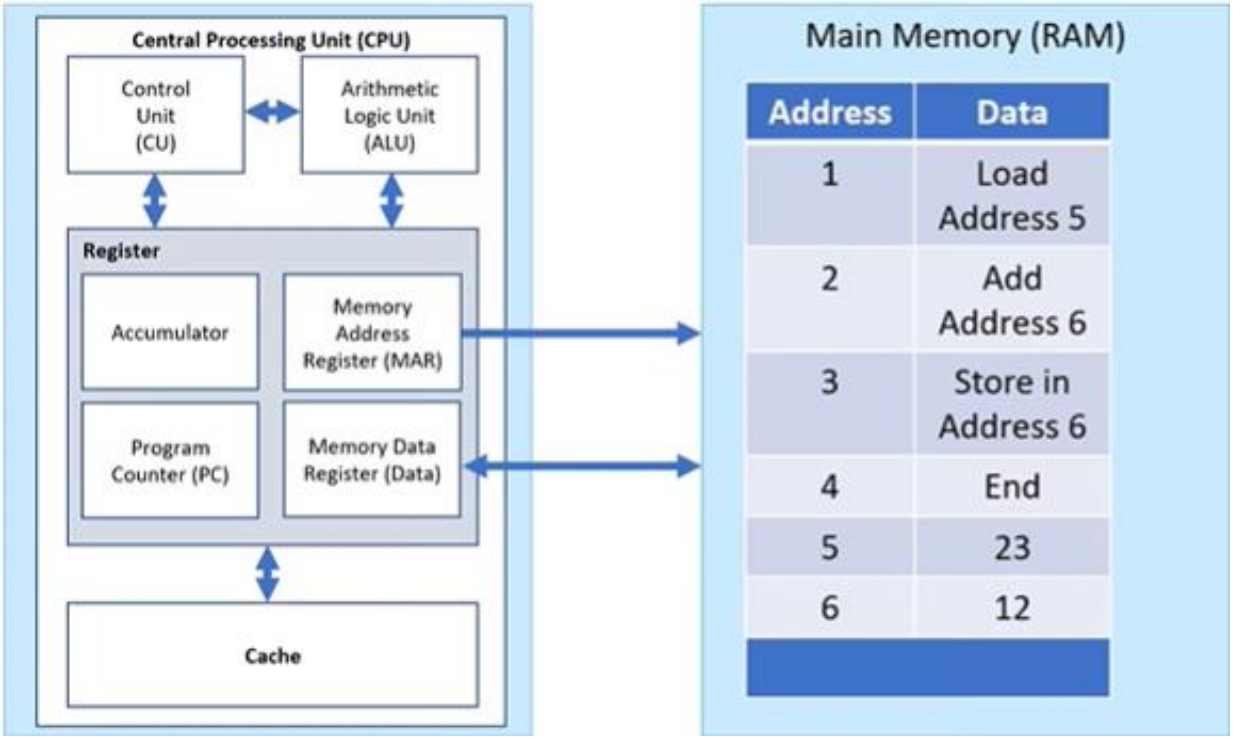
1GHz (Giga hertz) = 1 billion cycles per second

CPU components and their function:

Components of the CPU:

- Arithmetic Logic Unit (ALU) – Carries out calculations and makes logical decisions
- Control Unit (CU) – Monitors hardware, manages I/O signals and manages the FDE cycle
- Cache – Provides fast access to frequently used data located onboard the CPU
- Registers – Super fast pieces of onboard memory

Von Neumann Architecture:



Registers:

- Program Counter (PC) – Holds the address of the next instruction to be executed and increments its contents by one
- Memory Address Register (MAR) – Holds the address of where data is to be fetched or stored
- Memory Data Register (MDR) – Holds the data fetched from, or to be written to memory
- Accumulator (ACC) – Holds the results of calculations

Fetch – execute cycle:

- Program counter is checked
- Address found in PC is used by MAR which is then used to fetch data from RAM and bring it into MDR
- PC increments its contents by one

- CU decodes instructions

- We might head back to RAM and fetch data and add it to the ACC, or jump to another instruction, or write data held in the ACC into RAM

Common characteristics of CPU:

Clock speed:

- Measured in Hz
- Number of FDE cycles which can be executed per second

Cache size:

- Temporary storage of data
- Located very close or onboard the CPU
- Stores frequently used data
- Fast access compared to RAM

Number of cores:

- A core is another processing unit
- A core has the same things as CPU
- Multiple programs can be ran at the same time with more number of cores

- CPU cores have to communicate with each other which takes time and some programs may not allow you to use multiple cores

If you want a fast computer, you will need to keep a balance of everything. Increasing one thing does not change it as much.

Embedded systems:

An embedded system is a computer system with a dedicated function within a larger mechanical and electrical system.

(A computer system that is built into another device)

Examples of embedded systems:

- Traffic lights
- Washing machine
- Freezer
- Digital clock
- Coffee machine
- Kettle