
# PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

## Hardware and Software

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PCPS Theory Anchor - 2024
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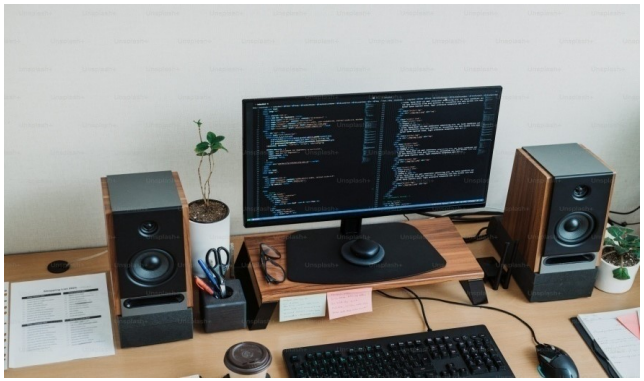
## Digital Computer

- Computer capable of solving problems by processing information expressed in **discrete form.**
- It operates on data, including magnitudes, letters, and symbols, that are expressed in binary code—i.e., using only the two digits 0 and 1.
- By manipulating combinations of binary digits, it can perform mathematical calculations, organize and analyze data, control industrial and other processes, and simulate dynamic systems such as global weather patterns.

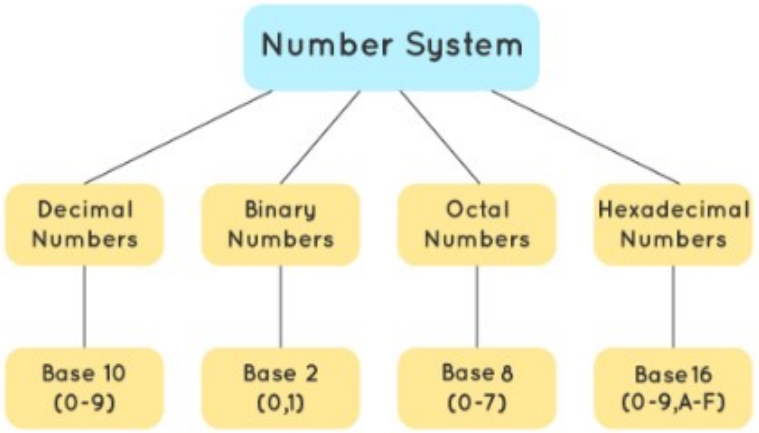


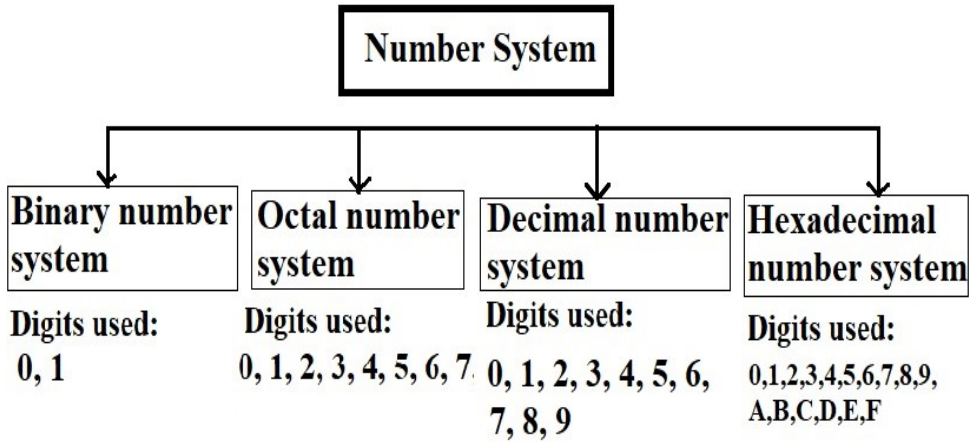
A desktop computer sitting on top of a wooden desk photo – Computer science Image on Unsplash

## Number System


- Number systems in mathematics are used to express numbers in various forms and are understood by computers.
- Defined as the representation of numbers by using digits or other symbols in a consistent manner.
- A number is a mathematical value used for counting and measuring objects, and for performing arithmetic calculations. Numbers have various categories like natural numbers, whole numbers, rational and irrational numbers, and so on.
- The **value of any digit in number can be determined by a digit, its position in the number, and the base of the number system.**

## Number System




Number Systems - Definition | Types of Number Systems in Maths | Conversion (cuemath.com)

## Number System – Binary Number System


- **Binary number system (Base - 2)**

  For representing numbers in **base 2**, there are two possible digits (0, 1) in which each column value is a power of two*:*

| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |

**0 + 64 + 32 + 0 + 0 + 0 + 2 + 1 = 99**

# Computer Hardware

## Central processing unit (CPU)

The "brain" of a computer system. **Interprets and executes instructions.**

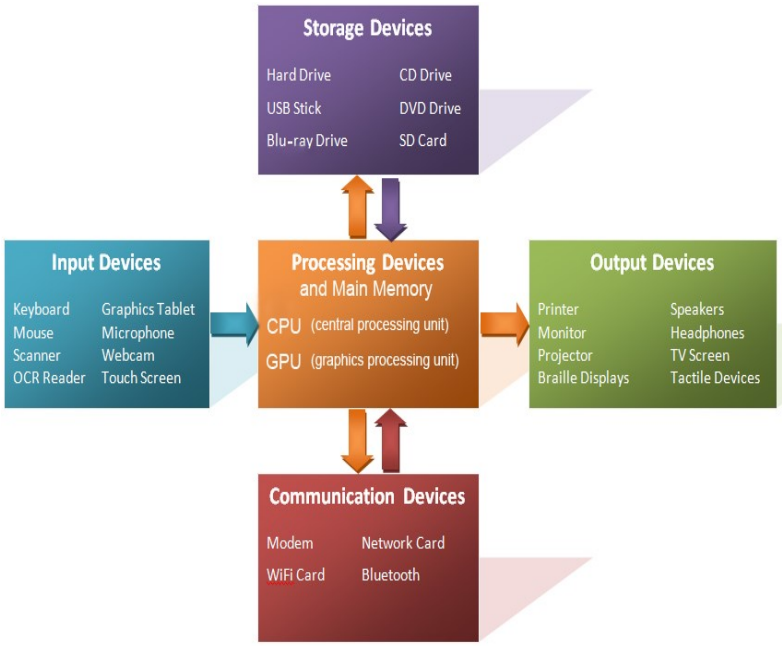
## Main memory

A Memory where **currently executing programs reside**. It is **volatile**, the contents are lost when the power is turned off.

## Peripheral components

Input devices, Output devices and Buses

## Communication devices



## Secondary memory

Provides **long-term storage of programs** and data. **Non-volatile**, the contents are retained when power is turned off. Can be magnetic (hard drive), optical (CD or DVD), or flash memory (USB drive).

## Computer Hardware

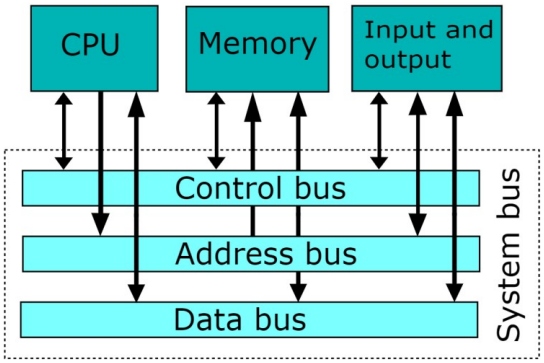
**Input Devices** – mouse, keyboard, scanner, microphone etc.

**Output Devices** – monitor, printer, projector, speakers etc

**Buses** – **Communication system that transfers data between components** inside a computer, or between computers.

- Internal Bus (System Bus: CPU and main memory)
- External Bus (Expansion Bus: printer and the computer)

**Communication devices** - Modem, WiFi card etc



## Computer Software


**A set of program instructions**, including related data and documentation, that can be executed by computer.

- **System software:** Intrinsic to a computer system.

- **Application Software:** Specific purpose software which is used by user for performing specific task.

## Computer Software

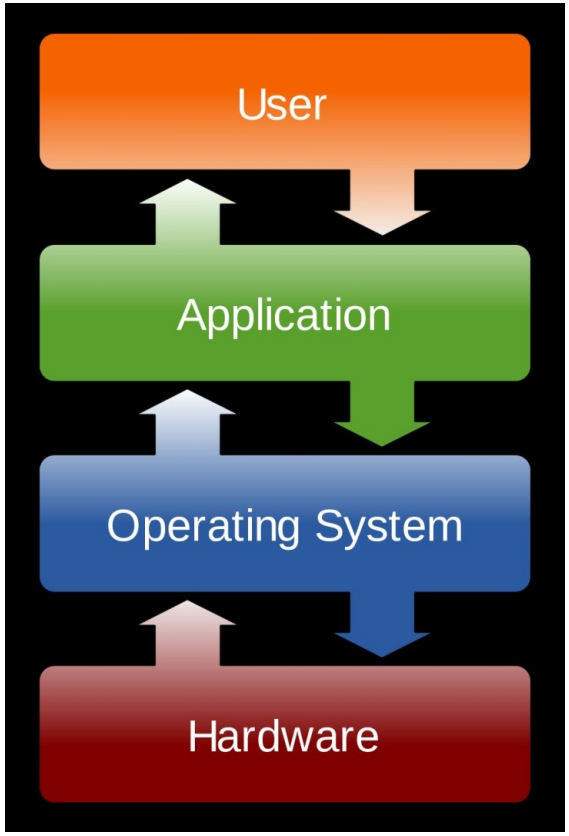
- The first computer programs ever written were for a mechanical computer designed by **Charles Babbage** in the mid-1800s.
- **Ada Lovelace** was the person who wrote these programs.
- She is referred to as "**the first computer programmer**."

Ada Lovelace

## Operating System

A software that **manages and interacts with the hardware** resources of a computer.

Because an operating system is **intrinsic to the operation** of a computer, it is referred to as **system software**.



## System Software vs Application Software


| S.No. | System Software | Application Software |
|---|---|---|
| 1. | System software is used for operating computer hardware. | Application software is used by user to perform a specific task. |
| 2. | System software is installed on the computer when operating system is installed. | Application software is installed according to user's requirements. |
| 3. | In general, the user does not interact with system software because it works in the background. | In general, the user interacts with application software. |
| 4. | System software can run independently. It provides a platform for running application software. | Application software can't run independently. They can't run without the presence of system software. |
| 5. | Some examples of system software are compiler, assembler, debugger, driver, etc. | Some examples of application software are word processor, web browser, media player, etc. |


# THANK YOU

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