

Introduction to Algorithms and Programming

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1. Definition of Algorithm

An algorithm is a set of sequential steps designed to solve a specific problem or to perform a particular task.

An algorithm is the result of breaking down a specific problem into simple operations that can be executed through several sequential steps.

2. Computer Characteristics

The computer has several features that make it powerful and useful, such as its processor, memory, and storage.

These components allow the computer to perform tasks quickly and accurately with minimal effort and almost no errors.

- **Processor (CPU):** The processor is the “brain” of the computer. It executes the instructions of programs. Its speed determines how fast operations are performed.
- **RAM (Random Access Memory):** RAM is the temporary memory that stores data and instructions while the computer is running. It is fast but volatile, meaning that data is lost when the computer is turned off.
- **ROM (Read-Only Memory):** ROM contains essential instructions for starting the computer (boot process). Its content is permanent and cannot be modified easily.

- **Hard Disk (HD):** The hard disk is the main storage device used to store data, programs, and the operating system permanently.

3. From Algorithm to Program

Once we design an algorithm, we can transform it into a program using a programming language. The computer then executes this program step by step to solve the problem.

4. Definition of a Program

A program is a set of instructions written in a programming language that a computer can execute to perform a specific task.

5. Definition of Programming

Programming is the process that translates an algorithm into an executable program using a specific programming language to solve a specific problem.

6. Definition of Programming Language

A programming language is a set of words and symbols that provides a way to express instructions and data structures.

7. Examples of Programming Languages

Python, Java, C, C++, C#, JavaScript, PHP, Ruby.

8. Historical Note

Programming languages started to appear in the 1950s (like Fortran and COBOL).

Python was created by Guido van Rossum in 1991 and has become one of the most popular languages today.

9. Why Python is the Most Used Language Today

Characteristics of Python:

- **Easy to Learn and Use:** Python has simple and readable syntax, similar to natural language.
- **Interpreted Language:** It runs directly without the need for compilation.
- **High-Level Language:** It hides complex details like memory management.
- **Portable:** The same code can run on different operating systems (Windows, macOS, Linux).
- **Object-Oriented:** Supports classes and objects for better code organization.
- **Extensive Libraries:** Python provides a large collection of built-in and external libraries.

- Open Source: Python is free to use, modify, and distribute.
- Dynamic Typing: You don't have to declare variable types explicitly (dynamic memory allocation).

10. Example: Algorithm to Sum Three Integers

Algorithm:

```
begin
read(Nb1)
read(Nb2)
read(Nb3)
Result  $\leftarrow$  Nb1 + Nb2 + Nb3
write(Result)
end
```

Python Program Equivalent:

```
Nb1 = int(input())
Nb2 = int(input())
Nb3 = int(input())
Result = Nb1 + Nb2 + Nb3
print(Result)
```
