

What is Programming?

Programming is the process of giving instructions to a computer in a language it understands.

Computers themselves only understand **machine code**, so programming languages allow humans to write instructions more easily.

Programming is used for:

- Automation
- Web development
- **Cybersecurity**
- Data analysis
- System administration

Real-world examples:

- ATMs
- Browsers
- Mobile apps
- Network scanners (Nmap, etc.)

Why Programming Matters

Programming allows you to:

- Solve problems
- Automate repetitive tasks
- Build software
- Understand how computers actually work
- Strengthen cybersecurity skills (scripting, automation)

It is a foundational skill for modern IT and cybersecurity professionals.

Compilers vs Interpreters



Compiler

A **compiler** converts the entire source code into machine code **before** the program runs.

Characteristics:

- Produces a standalone executable
- Faster execution
- Errors found before running

Examples:

- C
- C++
- Go
- Rust



Example:

hello.c

```
#include <stdio.h>

int main() {
    printf("Hello, world!\n");
    return 0;
}
```

```
# compile
gcc hello.c -o hello
# run
chmod +x hello
./hello
# Result: Hello, world!
```

Interpreter

An **interpreter** executes code **line by line**.

Characteristics:

- More flexible
- Easier to test small parts
- Slower execution
- Errors show up while running

Examples:

- Python
- JavaScript
- Ruby



Example:

hello.py

```
print("Hello, world!")
```

```
# run
python hello.py
# Result: Hello, world!
```

Algorithms – Introduction

An **algorithm** is a step-by-step procedure to solve a problem.

Characteristics of good algorithms:

- Clarity
- Efficiency
- Consistency
- Finite steps

Common examples in daily life:

- Sorting items
 - Making tea
 - Following a recipe
 - Unlocking your phone
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Algorithm Examples

Real-life algorithm example (Making Tea):

1. Boil water
2. Place tea bag in cup
3. Pour water
4. Wait 3-5 minutes
5. Remove tea bag
6. Drink

Pseudocode example:

```
input number
if number > 0:
    print("Positive")
else:
    print("Non-positive")
```

Create a Simple Algorithm – Activity

Write an algorithm for:

1. Logging into a website
2. Buying a product online
3. Starting a computer

Goal: describe steps **clearly** so that even a computer could follow them.

Installing Python

Check whether Python is installed:

```
python3 --version
```

Install on Linux (Debian/Ubuntu):

```
sudo apt update  
sudo apt install python3
```

Install on macOS (Homebrew):

```
brew install python
```

Install on Windows:

- Use Microsoft Store
- Or download installer from [python.org](https://www.python.org)

Enter interactive mode (REPL):

```
python3
```

Exit REPL with:

```
exit()  
# or press Ctrl+D on Linux/macOS
```

Running Python Code

Run a script file:

```
python3 script.py
```

Simple script example (`hello.py`):

```
print("Hello, world!")
```

Then run:

```
python3 hello.py
```
