WHAT IS A PROGRAM?

by
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A program is a sequence of instructions that specifies how to perform a computation.

A few basic instructions appear in just about every language:

1. input: Get data from the keyboard, a file, or some other device.
2. output: Display data on the screen or send data to a file or other device.
3. math: Perform basic mathematical operations like addition and multiplication.
4. conditional execution: Check for certain conditions and execute the appropriate sequence of statements.
5. repetition: Perform some action repeatedly, usually with some variation.

Natural languages are the languages people speak, such as English and French. They were not designed by people they evolved naturally.

Formal languages are languages that are designed by people for specific applications such as mathematical notations.

Formal languages tend to have strict rules about syntax. Syntax rules come in two flavours, pertaining to tokens and structure.

- Tokens are the basic elements of the language, such as words, numbers and operators.
- Structure of a statement is the way the tokens are arranged.

Programming languages like Python are formal languages designed to express computations.

Formal languages have some important advantages over natural languages:

1. No ambiguity
2. More concise
3. literalness

“Python is unambiguous”

Programs have only one meaning, no ambiguity. If the output is not what you expected, it means you did not implement properly what you meant.

Programming is error-prone. Three kinds of errors can occur in a program: syntax errors, runtime errors, and semantic errors.

Syntax error: Python can only execute a program if the syntax is correct; otherwise, the interpreter displays an error message.

Python Interpreter

```
>>> (1 + 2)
3
>>>  1 + 2)
SyntaxError: invalid syntax
>>>
```

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Semantic errors are errors where the program run successfully to completion, however in some cases it will not generate the right solution.

Semantic errors are the most challenging to find and debug (resolve).

“A computational process, in a correctly working computer, executes programs precisely and accurately”

In other words, correctly working computers will always do what you tell them to do. So if a program doesn’t work it is YOUR fault.

Python Programming Language

The programming language you will learn is Python, a high-level language.

Loosely speaking, computers can only execute programs written in low-level languages, also referred as Machine Language or Assembly Language.

So programs written in a high-level language must be processed before they can run.

Two kinds of programs process high-level languages into low-level languages: interpreters and compilers.

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An interpreter reads a high-level program and executes it. It processes the program a little at a time, alternately reading lines and performing computations.

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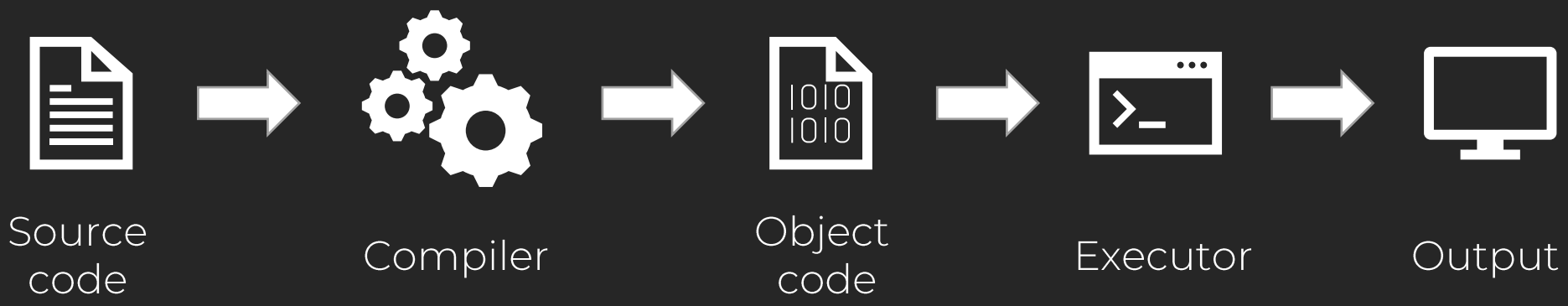
A compiler reads the program and translates it completely before the program starts running. In this context, the high-level program is called the source code, and the translated program is called the object code or the executable.



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>>> 1 + 1
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Bonjour le Monde!
>>>
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In script mode, you store code in a file and use the interpreter to execute the contents of the file, which is called a script. By convention, Python scripts have names that end with **`.py`**.

helloworld.py

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print('Bonjour le Monde!')
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To execute the script, you have to open a terminal to run the interpreter.

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```

Terminal

```
C:\Code>
```

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Then you have to tell the interpreter (python) the name of the file to execute.

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Now that we have a better understanding of what programs and programming languages are, the next step is to learn the Python syntax.