

Chapter 1 : Introduction to Python

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1 Introduction

Programming is the art of instructing computers to perform specific tasks. At the core of a computer program, an **algorithm** serves as a systematic set of steps or instructions designed to solve a computational problem. So, while an algorithm provides the strategy, a program brings that strategy to life in a formal language that computers can comprehend.

Python programs are typically composed of a sequence of instructions, which can include definitions, such as defining variables, and commands, like print statements and other executable instructions.

2 Print

The print statement is a fundamental tool for displaying information and results in programs during development and debugging. It is particularly useful for quickly checking the values of variables or printing messages to understand how exactly your code is executing. The basic print statement looks as follows :

```
print("Hello World!")
```

You can check the output generated by the above command and some additional features in the following program : [print.py](#) uploaded to GitHub.

3 Variables

Variable is a name associated to a value. You can think of it as a label assigned to a piece of data. Variable names are associated to data values through the **assignment** operator “=”. For example :

```
name = "Avi"  
print("My name is " + name + ".")
```

It is important to choose variable names appropriately to enhance the readability of the program. Variable names can contain uppercase letters, lowercase letters and digits. However, they cannot start with a digit. The special character underscore is allowed as well. Python variable names are case sensitive, so `Avi` and `avi` are separate names.

3.1 Comments

A good way to enhance readability of your code is to add comments explaining what your code is doing. Text following the `#` symbol is considered a comment, and therefore not **interpreted** by Python.

Finally, there are a small number of reserved keywords with built-in meanings that cannot be used as variable names. For example `class`, `print`, `if`, `else` and so on.

4 Data Types

Variables in Python are **dynamically typed**, meaning you don't need to declare their type explicitly beforehand. The Python interpreter infers the data-type based on the value assigned. The following are some of the basic data-types in Python :

- **int** : Represents integers, positive and negative.
- **float** : Represents numbers with decimal points.
- **string** : Sequence of characters, enclosed in single or double quotes.
- **boolean** : Represents boolean values `True` and `False`.
- **None** : Represents the absence of a value or a null value.

Unlike many programming languages, Python has no type corresponding to a **character**. Instead, it uses strings of length 1. The built in function **type()** can be used to find out the type of any data value. For example `type(3)` and `type(3.0)` will output the result `"int"` and `"float"` respectively.

Concepts in this section are illustrated through the [variable.py](#) program on GitHub.

5 Operators

We have already come across the assignment operator used to define variables above. The following is a summary of operators in Python.

5.1 Arithmetic Operators

Arithmetic operators are used to perform mathematical operations. These include:

- **Addition (+)** and **Subtraction (-)**
- **Multiplication (*)** and **Division (/)**
- **Modulus (%)** and **Exponentiation (**)**

The arithmetic operators have the usual mathematical precedence. The order of evaluation can be changed by using parentheses to group sub-expressions. For instance, $(x + y) * 2$ first adds x and y and then multiplies the result by 2.

5.2 Logical Operators

Logical operators are used to combine or negate Boolean values. These include:

- **And** (*and*)
- **Or** (*or*)
- **Not** (*not*)

5.3 Comparison Operators

Comparison operators are used to compare values and return a Boolean result. These include:

- **Equal to** (`==`)
- **Not equal to** (`!=`)
- **Greater than** (`>`)
- **Less than** (`<`)

Concepts in this section are illustrated through the [operators_expressions.py](#) program on GitHub.

6 User Input

In Python, you can use the `input()` function to take user input from the keyboard. The `input()` function reads a line from the user and returns it as a string. For example :

```
text = input("Type anything : ")
print(5 * text)
# If user input : 5, Output : 55555
```

By default, `input()` always returns the user input as a string. If you need to work with numerical values, you should convert the input to the appropriate data type. For example :

```
num = int(input("Type any integer : "))
print(5 * num)
# If user input : 5, Output : 25
```

The above is an example of **type-casting**, also called type-conversion and is used often in Python code. We use the name of a type to convert values to that particular type, as shown in the example above. The above program : [user_input.py](#) is uploaded to GitHub for more clarity.