

Intro to programming 1

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2023-09-19

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 - **Comprehensive Toolkit:** Ideal for data science, modeling, and experimental design.
 - **Research Community:** Thriving community with specialized tools for cognitive sciences.
(<https://www.frontiersin.org/articles/10.3389/fninf.2015.00011/full>)

Survival rules for programming

- 1 Try by yourself before seeking solutions.

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- 7 Always review error messages carefully.

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- 4 There is always a manual.
- 5 Have you read the fucking manual ?
- 6 Not yet ? Then read it.
- 7 Always review error messages carefully.
- 8 Only then, consider asking ChatGPT for help.

Books & ebooks

- Gérard Swinnen: Apprendre à Programmer avec Python 3 (5e edition)
<http://inforef.be/swi/python.htm>
- Al Sweigart: How to automate the boring stuff with Python (2e edition)
<https://automatetheboringstuff.com/>
- Al Sweigart: Invent Your Own Computer Games with Python (4e edition)
<http://inventwithpython.com/invent4thed/>
- Allen B. Downey: Think Python <http://greenteapress.com/thinkpython2/>

Resources 2/2

Online course & Mooc

Openclassrooms

- <https://openclassrooms.com/fr/courses/7168871-apprenez-les-bases-du-langage-python>
- <https://openclassrooms.com/en/courses/6902811-learn-python-basics>

Mooc de l'Inria

- <https://www.my-mooc.com/fr/mooc/python-des-fondamentaux-a-lutilisation-du-langage/>

Udemy

- Udemy: Python programming for absolute beginners:
<https://www.udemy.com/python-programming-for-absolute-beginners/>

Code Academy

- Code Academy: Learn Python module: <https://www.codecademy.com/learn/learn-python>

Other

- Python 3: des fondamentaux aux concepts avancés du langage: <https://lms.fun-mooc.fr/>

Terminal cheat sheet

- Bash commands to navigate directories

```
pwd
```

```
ls folder
```

```
cd folder1/subfolder2
```

```
cd ..
```

```
cd ~
```

Terminal cheat sheet

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 - Print Working Directory. Print the path of the current directory

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- Moving into folder1 and subfolder2 at once.

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- “Tab” to use the auto-completion

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- Going back to the root directory

```
cd ~
```

- “Tab” to use the auto-completion
- Many more bash commands to use...

Writing and running a program with python

- Open sublime
- Write:

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

```
## Hello !
```

- Save the file as *hello.py*
- Open a terminal and navigate to the folder where you have saved your program and run the command: `python hello.py`

Variables and data in python I

- A variable is a named container for a particular set of bits or type of data (like integer, float, string etc. . .)

```
x = 10  
print(x)
```

```
## 10
```

Variables and data in python I

- A variable is a named container for a particular set of bits or type of data (like integer, float, string etc. . .)
- Declaring variables

```
x = 10  
print(x)
```

```
## 10
```

Variables and data in python II

- Naming variables

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 - Use alphanumeric characters and underscores (but no numbers or underscores as the first character).

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 - Variables can contain digits but must not consist solely of digits and cannot start with a digit.

Variables and data in python II

- Naming variables
 - Use alphanumeric characters and underscores (but no numbers or underscores as the first character).
 - Avoid using reserved keywords.
 - Variables can contain digits but must not consist solely of digits and cannot start with a digit.
 - Variables are case-sensitive; uppercase and lowercase letters are distinct.

Variables and data in python II

- Naming variables

- Use alphanumeric characters and underscores (but no numbers or underscores as the first character).
- Avoid using reserved keywords.
- Variables can contain digits but must not consist solely of digits and cannot start with a digit.
- Variables are case-sensitive; uppercase and lowercase letters are distinct.
- There is no length limit for variables.

```
x = 10  
print(x)
```

```
## 10
```

```
abc = 2  
print(abc)
```

```
## 2
```

```
_ = 5  
print(_)
```

```
## 5
```

Variables and data in python III

- Naming variables
 - Use alphanumeric characters and underscores (but no numbers or underscores as the first character).
 - Avoid using reserved keywords.
 - Variables can contain digits but must not consist solely of digits and cannot start with a digit.
 - Variables are case-sensitive; uppercase and lowercase letters are distinct.
 - There is no length limit for variables.

```
'''python
1x = 10
print(x)
'''
```

```
'''
## invalid decimal literal (<string>, line 1)
'''
```

```
'''python
a bc = 2
print(abc)
'''
```

```
'''
## invalid syntax (<string>, line 1)
'''
```

Variables and data in python IV

- Different types of variables: Primitive types

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 - integers

```
x = 10
print(type(x))

## <class 'int'>
```

Variables and data in python IV

- Different types of variables: Primitive types

- integers

```
x = 10  
print(type(x))
```

```
## <class 'int'>
```

- float

```
y = 5.5  
print(type(y))
```

```
## <class 'float'>
```

Variables and data in python IV

- Different types of variables: Primitive types

- integers

```
x = 10  
print(type(x))
```

```
## <class 'int'>
```

- float

```
y = 5.5  
print(type(y))
```

```
## <class 'float'>
```

- string

```
z = "test"  
print(type(z))
```

```
## <class 'str'>
```

Variables and data in python IV

- Different types of variables: Primitive types

- integers

```
x = 10  
print(type(x))
```

```
## <class 'int'>
```

- float

```
y = 5.5  
print(type(y))
```

```
## <class 'float'>
```

- string

```
z = "test"  
print(type(z))
```

```
## <class 'str'>
```

- boolean

```
w = True  
print(type(w))
```

```
## <class 'bool'>
```

Numeric data et operations 1/2

- Differences between integers and floats
- Arithmetic operators $+$ $-$ $*$ $/$ $\%$
- Exercise : calculate and print the result of this operation

$$\frac{15}{3 + 2} - \left(\frac{\frac{100}{4}}{5}\right) * 2$$

Numeric data et operations 2/2

- Differences between integers and floats
- Arithmetic operators + - * / %
- Exercise : calculate and print the result of this operation

$$\frac{15}{3+2} - \left(\frac{\frac{100}{4}}{5}\right) * 2$$

```
x = 15/(3+2) - (100/4/5)*2  
print(x)
```

```
## -7.0
```

Strings 1/3

- Use to store text (most of the time)
- Strings are declared with double quotation marks (" ") or single quotation marks (' '). Be careful when printing a string already stored in a variable. Examples:

```
animal = "Dog"  
course = 'Intro to programming in python'  
  
print(animal)
```

```
## Dog
```

```
print("animal")
```

```
## animal
```

Strings 2/3

- String can easily be concatenated with the operator +

```
greetings = "Hello"  
presentation = "My name is"  
name = "Henri"  
print( greetings + presentation + name)
```

```
## HelloMy name isHenri
```

- Exercise: insert white space between the words.

Strings 2/3

- String can easily be concatenated with the operator +

```
greetings = "Hello"  
presentation = "My name is"  
name = "Henri"  
print( greetings + presentation + name)
```

```
## HelloMy name isHenri
```

- Exercise: insert white space between the words.

```
greetings = "Hello"  
presentation = "My name is"  
name = "Henri"  
print( greetings + ' ' + presentation + ' ' + name)
```

```
## Hello My name is Henri
```

```
space = ' '  
print(greetings + space + presentation + space + name)
```

```
## Hello My name is Henri
```

- Functions working with strings:

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 - **len()** calculate the length of a function. Example:

```
greetings = "Hello"  
print(len(greetings))
```

```
## 5
```

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- **len()** calculate the length of a function. Example:

```
greetings = "Hello"  
print(len(greetings))
```

```
## 5
```

- **replace()** can replace a pattern in a string. Example:

```
greetings = "Hello"  
print(greetings)
```

```
## Hello
```

```
print(greetings.replace('e', 'a'))
```

```
## Hallo
```

- Functions working with strings:

- **len()** calculate the length of a function. Example:

```
greetings = "Hello"  
print(len(greetings))
```

```
## 5
```

- **replace()** can replace a pattern in a string. Example:

```
greetings = "Hello"  
print(greetings)
```

```
## Hello
```

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print(greetings.replace('e', 'a'))
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```
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- ...

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Booleans

- A boolean is a relatively simple variable but can sometimes be challenging to work with.
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- A boolean is a relatively simple variable but can sometimes be challenging to work with.
- It can have only two values **True** or **False**
- It is used usually to store the truth value of logic. Example:

```
Is_it_Weekend = False  
print(Is_it_Weekend)
```

```
## False
```

- A program typically executes sequentially, moving from top to bottom.

Program flow 1/4

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- But some instructions can change the flow. For examples *if* and *for* loops

Program flow 1/4

- A program typically executes sequentially, moving from top to bottom.
- But some instructions can change the flow. For examples *if* and *for* loops
- **if** will test a conditional comparison. If the condition is true, we can execute certain lines of code; if it's false, those lines of code may not be executed (though other code may still be executed). Example 1:

```
Weekend = False
if Weekend == True :
    print("Let's do nothing and chill")
else:
    print("Time to go to work")
```

```
## Time to go to work
```

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- **if** will test a conditional comparison. If the condition is true, we can execute certain lines of code; if it's false, those lines of code may not be executed (though other code may still be executed). Example2 :

```
string = "This string is long but not that long"

if len(string) < 10:
    print("This string has less than 10 character")
elif len(string) < 20:
    print("This string has less than 20 character")
elif len(string) > 30:
    print("That string is too long for me...")

## That string is too long for me...
```

- You can also define other alternatives with **elif**

Program flow 2/4

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- you can make use different ways to make your comparison: - **and** - **or** - **not**

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- you can make use different ways to make your comparison: - **and** - **or** - **not**
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- you can make use different ways to make your comparison: - **and** - **or** - **not**
- You can as well use comparative expressions: - **<** - **>** - **<=** - **==** tests for equality - **!=** tests for inequality
- Be careful **=** is not the same as **==**

```
age = 30  #(affectation)
```

```
age == 30  #(equality comparison that returns TRUE if correct)
```

```
## True
```

```
age == 31
```

```
## False
```

Program flow 3/4

- **for** loops iterate one or a set of operations multiple times.

Example 1:

```
for x in range(5):  
    print(x)
```

```
## 0  
## 1  
## 2  
## 3  
## 4
```

Program flow 3/4

- **for** loops iterate one or a set of operations multiple times.

Example 1:

```
for x in range(5):  
    print(x)
```

```
## 0  
## 1  
## 2  
## 3  
## 4
```

Example 2:

```
for i in range(5,10):  
    print(i)
```

```
## 5  
## 6  
## 7  
## 8  
## 9
```

- With **for** loops, you can observe that your program flow is not always unidirectional from the top to the bottom of your script.

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- Examine the program flow to observe how it transitions from one code section to another.

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- A **for** loop is used to iterate over the elements of a sequence (such as a string, tuple, set, list, or dictionary) or another iterable object.:

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- A **for** loop is used to iterate over the elements of a sequence (such as a string, tuple, set, list, or dictionary) or another iterable object.:
- It differs from other **for** keyword in other programming languages and works more like an iterator.

```
list1 = [1,2,3,0]
for x in list1:
    print(x)
```

```
## 1
## 2
## 3
## 0
```

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for x in list1:
    print(x)
```

```
## 1
## 2
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## 0
```

- It is almost similar to (which is much closer to the “traditional” for loop in programming)

```
list2 = [1,2,3,0]
for x in range(0,len(list2)):
    print(list2[x])
```

```
## 1
## 2
## 3
## 0
```

- Exercise 1: Write code that prints the string “All work and no play makes Jack a dull boy” 50 times
- Exercise 2: Write code that prints the squares of all integers between 1 and 100 using the *range* function.
- Exercise 3: Write code that iterates through integers from 0 to 100 but only prints the numbers 1, 50, and 100.
- Exercise 4: Write code that prints only even numbers between 0 and 100
- Exercise 5: Write code that computes the factorial of an integer using a loop (without using a function or recursion).