How to program with python™ programming language

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1. Introduction

Computer programming

Objectives:

- Learn to « think » from algorithms
- Translate the resulting reasoning into a computer program

Tools:

- Programming languages : Python
- Text editors : NotePad, SublimeText, Emacs, Python IDLE …
- Python environment : Unix console (Terminal), Python console …

1. Introduction

What is a computer program ?

- A source file
- A set of statements/declarations and instructions
- A set of librairies, dynamically or statistically loaded
- An executable machine file (bytecode)

You can generate :
- A program directly executable by a user
- A program requiring a virtual machine / interpreter
- An other program to run yours (such as Python core algorithm in a Java applet, run by a web browser)

1. Introduction

Respect of the lexical and synthetic rules

- The source program must respect the synthetic and medical rules of the programming language you are using :
    - respect of the reserved words (such as « `for` », « `if` », « `print` », « `len` », « `range` » .... in Python)
    - respect of the parenthesis : `()`, `{}`, `[]`
    - respect of the indentation
    - respect of the spaces
    - respect of upper and lower case
    - respect of the language specificities (such as « ; » at the end of each line in Java)

1. Introduction

Python programming language

- Developed since 1991 in Nederland by Guido van Rossum
- OpenSource and free
- Portable
- Python syntax quite simple but allow to build and manipulate complex datasets and evaluated programs
- Automatic memory management thanks to the `Garbage Collector`
- Can be interfaced with many other languages : Perl, Java (JPython), C/C++ (Cython), DataBases systems …
- Many librairies available : TKinter (GUI), NumPy, SciPy …

Note 1: all the following lines of code in these slides are in Python3.
Note 2: there are many ways to write a program, here are just one version among others

1. Introduction

Bibliography

- Official Python website: www.python.org
- https://www.learnpython.org
- https://www.codecademy.com/learn/learn-python

1. Introduction

My first Python program

Respect of the tradition : display « Hello World »

→ Open your favorite text editor
→ Write :

```
print(''Hello Word'')
```

→ Save the current file (`nameOfYourChoice.py`) in your working directory
Note : no spaces, @, #, ^, $, /, *, (, ;, %, é, à …. in a file name
→ Set your working directory in the console or Python interpreter
→ Write `python nameOfYourChoice.py` in the console or Python interpreter
→ See what’s happening into the console

2. Variables

The wonderful world of variables

What is a variable ?
- A piece of data from your program, stored on your computer
- An alphanumeric code that you link to a given piece of your program to use it multiple times (ex: store the result of an operation)

In Python :

```
nameOfTheVariable = valueOfYourChoice
```

Basic rules with variables :
- Only letters (upper and/or lower case) and/or numbers and/or underscore « _ » in a variable name
- No spaces, @, #, ^, $, /, *, (, ;, %, é, à …. in a variable name
- The name can not start with a number
- Python is case-sensitive: `AGE`, `aGe`, `age` and `AgE` are 4 different variables

2. Variables

The wonderful world of variables

Syntax conventions (it is up to you but stay coherent) :

my_age = 25 myAge = 25

Basic operation with a variable:

Write a program that displays the variable `age` at the number of your choice, then adds 2 to this value and displays the new value.

Do the same but with the ages multiplied by 2 instead.

2. Variables

The wonderful world of variables

Syntax conventions (it is up to you but stay coherent) :

my_age = 25 myAge = 25

Basic operation with a variable:

```
myAge = 25
print(myAge)
myAge = myAge + 2
print(myAge)
```

Do the same but with the ages multiplied by 2 instead.

2. Variables

The wonderful world of variables

Syntax conventions (it is up to you but stay coherent) :

my_age = 25 myAge = 25

Basic operation with a variable:

```
myAge = 25
print(myAge)
myAge = myAge + 2
print(myAge)

myAge_x2 = myAge * 2
print(myAge_x2)
```

2. Variables

The wonderful world of variables

Every programming language has some reserved keywords to manipulate the variables. In Python3 they are:

```
and         del         from        none
true        as          elif        global
nonlocal    try         assert      else
if          not         while       break
except      import      or          with
class       false       in          pass
yield       continue    finally     is
raise       def         for         lambda
return
```

→ That means no variable name with these words.

2. Variables

Types of variables

Python needs to know the type of the variable in order to know which operation can be done. Every data in Python has a type, if you want to verify, just write `type(nameOfYourVariable)`.

Numbers

Python supports 2 types of numbers :

- intergers (`int`) : 5
- floating point numbers (`float`) : 5.0

```
myIntNumber = 5
print(myIntNumber)
print(type(myIntNumber))
```

```
myFloatNumber = 5
print(myFloatNumber)
print(type(myFloatNumber))
```

2. Variables

Types of variables

Strings

For letters, words or sentences. Strings can be defined either with a single quote, a double quotes or a triple quotes.

```
mySingleString = 'hello!'
myDoubleString = "hello!!"
myTripleString = """hello!!!"""

print(mySingleString)
print(myDoubleString)
print(myTripleString)
```

2. Variables

Types of variables

Strings

For letters, words or sentences. Strings can be defined either with a single quote, a double quotes or a triple quotes.

Be careful with apostrophes :

```
myString1 = "Yes I'll do it !"
myString2 = 'Yes I\'ll do it !'
myString3 = 'Yes I'll do it !'      → error

print(myString1)
print(myString2)
print(myString3)
```

2. Variables

Exercise

You want the name and age of a person. Write a script to ask the user to enter his/her name and then his/her age. You will have to store age and name into variables and print them.

You will need the function `input()` that reads a line from input, converts it to a string and returns it.

Help :
- for the name (`string`) → `input()`
- for the age (`integer`) → `int(input())`

2. Variables

Exercise

You want the name and age of a person. Write a script to ask the user to enter his/her name and then his/her age. You will have to store age and name into variables and print them.

You will need the function `input()` that reads a line from input, converts it to a string and returns it.

```
print("Please enter your name")
name = input()
print("Please enter your age (in years)")
age = int(input())
print("Your name is", name, "and you are", age,
"years old.")
```

3. Lists

Basic utilisation

- Similar to arrays to collect ordered elements
- Contain any type of variable (`int`, `float`, `str`, `bool`, other lists …) and as many as you wish (just the limit of your computer memory)

- Declaration of an empty list : `l = []`
- Declaration of a list with values : `l = [val1, val2, val3]`
- Add a value to the list : `l.append(value)`
- Remove a value : `l.remove(value)`
- Length of the list : `len(l)`
- First element of the list : `l[0]` (→ In Matlab, first element at index 1 but in Python and many other programming languages, first element at index 0)
- Fourth element of the list : `l[3]`
- Last element of the list : `l[-1]`

3. Lists

Basic utilisation

Examples :

```
l = []
print(l)
l.append(10)
print(l)
l.append(14)
print(l)
print(l[0])
```

```
li = [4, 6, 7, 2]
print(li)
li.append(3)
print(li)
print(len(li))
print(li[2])
print(li[-1])
li.remove(4)
print(li)
```

3. Lists

Manipulations

```
myList = [[1, 3, 5], [4, 6, 1], [2, 9, 3, 8]]
print(myList)
print(myList[0][1])
```

```
myList[0][1]=10
print(myList)
myList.pop(1)
print(myList)
```

→ Here `pop()` suppresses the second element of the list and return it

4. Operations

Operators

- Affectation : `a = 3`
- Arithmetic : `+ - * + % **`
- Comparison : `< > <= >= == !=`
- Logic : `or and not`

Simple examples:

```
number1 = 5
number2 = 6
finalNumber = number1 + number2
print(finalNumber)

hello = "Hello"
world = "world"
finalHello1 = hello + world
finalHello2 = hello + " " + world
print(finalHello1)
print(finalHello2)
```

4. Operations

Operators

- Affectation : `a = 3`
- Arithmetic : `+ - * + % **`
- Comparison : `< > <= >= == !=`
- Logic : `or and not`

But :

```
number1 = 5
hello = "Hello"
helloNumber = hello + number1
print(helloNumber)
```

→ error message

4. Operations

Operators

- Affectation : `a = 3`
- Arithmetic : `+ - * + % **`
- Comparison : `< > <= >= == !=`
- Logic : `or and not`

Correct way :

```
number1 = 5
hello = "Hello"
helloNumber = hello + str(number1)
print(helloNumber)
```

→ `number1` is converted from `int` to `string` with the function `str()`

4. Operations

Operations on strings

- Concatenation (adding) : `"Hello" + " " + "World"`
- Repetition : `"hello" * 2` → `"hellohello"`
- Length of the string : `len(myString)`

Access by index :

```
myWord = "anything"
print(myWord[2]) → "y"
print(myWord[:2]) → "an"
print(myWord[2:]) → "ything"
print(myWord[2:4]) → "yt"
print(myWord[-3]) → "i"
```

4. Operations

Operations on strings

```
string1 = "abcdefg"
string2 = "cd"
print(string2 in string1)
```

→ True if `string1` contains `string2`

```
print(string2 not in string1)
```

→ True if `string1` does not contain `string2`

```
myWord1 = "10"
myNumber = int(myWord1)
myWord2 = "11.3"
myFloat = float(myWord2)
myNum = 12
myWord3 = str(myNum)
```

4. Operations

Operations on strings

Comparison

```
s1 = "blue"
s2 = "blue"
s3 = "Blue"

print(s1 == s2)
```
→ Returns 1 → True
```
print(s1 == s3)
```
→ Returns 0 → False

4. Operations

Operations on strings

Formatting with %

- `%s` for `string`
- `%d` for `int`
- `%f` for `floats`

```
name = "Mary"
age = 22
print("%s is %d years old." %(name, age))
```

5. Boolean operators

If / else / elif

To test a condition in order to control the following instructions to execute : if

Syntax

```
if (boolean test1):
    instruction if test1 is True
elif (boolean test2):
    instruction if test2 is True
else:
    instruction if test1 and test2 are False
```

Please respect the indentation !

5. Boolean operators

If / else / elif

Example

```
a = 4
 if (a%2 == 0):
    print("a is even")
else:
    print("a is odd")
```

5. Boolean operators

Exercise 1

- For the purpose of a public health survey, you have a population sample where each person is defined by two variables : `sex` and `height` (in cm)
- The variable sex can be either 0 for male, 1 for female
- The variable height is a full number
- To have someone in this study, there are conditions :
    - Height superior to 180 for a man ("M")
    - Height inferior to 160 for a woman ("F")

5. Boolean operators

Exercise 1

- For the purpose of a public health survey, you have a population sample where each person is defined by two variables : `sex` and `height` (in cm)
- The variable sex can be either 0 for male, 1 for female
- The variable height is a full number
- To have someone in this study, there are conditions :
    - Height superior to 180 for a man ("M")
    - Height inferior to 160 for a woman ("F")

```
print("Please, give a value for the sex (0 for M, 1 for F)")
sex = int(input())
print("Please, give a value for the height")
height = int(input())
```

5. Boolean operators

Exercise 1

```
print("Please, give a value for the sex (0 for M,
  1 for F)")
sex = int(input())
print("Please, give a value for the height")
height = int(input())

if ((sex == 1 and height<160) or (sex == 0 and
  height>180)):
      print("Welcome to the study")
else:
      print("Sorry, you do not fit the profile of
  the study")
```

5. Boolean operators

Exercise 2

You have some mice but you want only the ones that are more than 3 days old. Write a program where the age of the mouse is asked and if this age is more than 3 days, the mouse is selected.

```
print("Please give the age of your mouse in days")
age = input()

if …
```

5. Boolean operators

Exercise 2

You have some mice but you want only the ones that are more than 3 days old. Write a program where the age of the mouse is asked and if this age is more than 3 days, the mouse is selected.

```
print("Please give the age of your mouse in days")
age = int(input())
if (age > 3):
  print("This mouse is selected")
else:
  print("This mouse is too young")
```

5. Boolean operators

Exercise 2

You have some mice but you want only the ones that are more than 3 days old. Write a program where the age of the mouse is asked and if this age is more than 3 days, the mouse is selected.

```
print("Please give the age of your mouse in days")
age = int(input())
if (age > 3):
  print("This mouse is selected")
else:
  print("This mouse is too young")
```

Now you want to attribute a code to the selected animals ("F3" for females and "M3" for males) and then display the code of your mouse.

5. Boolean operators

Exercise 2

```
print("Please give the age of your mouse in days")
age = int(input())
print("Please give the sex of this mouse ('M' or 'F')")
sex = input()
if (age > 3):
   if (sex == "M"):
      code = "M3"
   elif (sex == "F"):
      code = "F3"
else:
    print("This mouse is too young")
print("The code of your mouse is", code)
```

5. Boolean operators

Exercise 2

```
print("Please give the age of your mouse in days")
age = int(input())
print("Please give the sex of this mouse ('M' or 'F')")
sex = input()
if (age > 3):
   if (sex == "M"):
      code = "M3"
   elif (sex == "F"):
      code = "F3"
else:
    print("This mouse is too young")
print("The code of your mouse is", code)
```

→ What if someone enters a wrong value ?

5. Boolean operators

Exercise 2 : handle errors

```
print("Please give the age of your mouse in days")
age = int(input())
print("Please give the sex of this mouse ('M' or 'F')")
sex = input()
if (age > 3):
   if (sex == "M"):
      code = "M3"
   elif (sex == "F"):
      code = "F3"
   else:
       print("Sorry, wrong code")
       code = "Undefined"
else:
   print("This mouse is too young")
print("The code of your mouse is", code)
```

5. Boolean operators

Exercise 2 : handle errors (other version)

```
print("Please give the age of your mouse in days")
age = int(input())
print("Please give the sex of this mouse ('M' or 'F')")
sex = input()
if (age > 3):
    if ((sex != "M") and (sex != "F")):
        print("You have to write 'M' or 'F' for the sex")
        code = "Undefined"
    else:
        if (sex == "M"):
            code = "M3"
        elif (sex == "F"):
            code = "A3"
else:
    print("This mouse is too young")
    code = "Undefined"
if (code == "Undefined"):
    print("No code affected")
else:
    print("The code of your mouse is", code)
```

6. Loops

While

Used to repeat an operation as many times as necessary (while the condition is True).

Syntax

```
while (condition):
    instruction 1
    instruction 2
    …
```

Note : Pay attention to the condition, you do not want an infinite loop !
Tips : If your program is blocked with an infinite loop, type CTRL+C to stop it (works with Windows, Linux or Mac).

6. Loops

While

Example : you want a program that displays the 7 multiplication table.
Try to write it without any loop.
Without the loop (option 1) :

6. Loops

While

Example : you want a program that displays the 7 multiplication table.
Try to write it without any loop.
Without the loop (option 1) :

```
print(" 1 * 7 =", 1 * 7)
print(" 2 * 7 =", 2 * 7)
print(" 3 * 7 =", 3 * 7)
print(" 4 * 7 =", 4 * 7)
print(" 5 * 7 =", 5 * 7)
print(" 6 * 7 =", 6 * 7)
print(" 7 * 7 =", 7 * 7)
print(" 8 * 7 =", 8 * 7)
print(" 9 * 7 =", 9 * 7)
print("10 * 7 =", 10 * 7)
```

6. Loops

While

Example : you want a program that displays the 7 multiplication table.

Without the loop (option 2) :

```
nb = 7
print(" 1 *", nb, "=", 1 * nb)
print(" 2 *", nb, "=", 2 * nb)
print(" 3 *", nb, "=", 3 * nb)
print(" 4 *", nb, "=", 4 * nb)
print(" 5 *", nb, "=", 5 * nb)
print(" 6 *", nb, "=", 6 * nb)
print(" 7 *", nb, "=", 7 * nb)
print(" 8 *", nb, "=", 8 * nb)
print(" 9 *", nb, "=", 9 * nb)
print("10 *", nb, "=", 10 * nb)
```

6. Loops

While

Example : you want a program that displays the 7 multiplication table.

With the loop :

```
nb = 7
i = 0 # Counter that will be incremented into the loop

while (i < 10):
        print(i+1, "*", nb, "=", (i+1)*nb)
        i += 1
```

Note : Do not forget to increment the counter `i` otherwise you will have an infinite loop.

6. Loops

While

You can exit a for/while loop without stopping your program with the keyword `break`.

Example

```
while 1: # 1 always true → infinite loop
    print("Press any key to continue, press 'q'
      to quit")
    letter = input()
    if (letter == "q"):
       print("End of the loop")
       break
```

6. Loops

While

You can skip the current block of instructions and return to the for/while loop with the keyword `continue`.

Example

```
# Print only odd numbers from 1 to 10
x = 0
while (x < 10):
    x += 1
    if (x % 2 == 0): # Check if x is even
        continue
    print(x)
```

Try with even numbers.

6. Loops

While

```
# Print only even numbers from 1 to 10
x = 0
while (x < 10):
    x += 1
    if (x % 2 != 0): # Check if x is odd
        continue
    print(x)
```

6. Loops

For

Used to iterate over a given sequence.

Syntax

```
for element in sequence:
    instruction
```

Here `element` is a variable created by the `for`, you do not have to instantiate it. It will be used only inside the loop, so you can used again the same name for an other loop (is the loops are not nested).

6. Loops

For

```
days = ["Monday", "Tuesday", "Wednesday"]

print("Days:", days)
for day in days:
      print("Day : ", day)

for i in range(len(days)):
      print("i=", i)
      print("days[", i, "]=", days[i])
```

6. Loops

For

Print all values between 0 and 9

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

The function `range()` creates a list a all full values between 0 and 9.
This function has different syntaxes :

- `range(numberOfValues)`
- `range(startValue, endValue)`
- `range(startValue, endValue, stepValue)`

```
for i in range(2, 10, 3):
    print(i)
```

6. Loops

For

We want to create a list of all squares values of integers between 0 and 20.
Help 1 : i^2 is `i ** 2` in Python
Help 2 : remember how to add a value to a list (section 3)

6. Loops

For

We want to create a list of all squares values of integers between 0 and 20.
Help 1 : i^2 is `i ** 2` in Python
Help 2 : remember how to add a value to a list (section 3)

```
myList = []
for i in range(21):
    tempValue = i ** 2
    print(i, "^ 2 =", tempValue)
    myList.append(tempValue)
print(myList)
```

6. Loops

For

You have 2 mice and you want their total weight of the last 2 days. Create a program with a list with your 2 mouse names, then the program will ask you to give the weight for each mouse, every day, and finally print the total weight for each animal.

6. Loops

For

You have 2 mice and you want their total weight of the last 2 days.

```
animals = ["mickey", "minie"]
days = 2
for animal in animals:
    result = 0
    for i in range(days):
        print("Give a weight for", animal, "at day", i)
        weight = eval(input())
        result = result + weight
    print("Total weight for", animal, "is", result)
print("Done")
```

Applications

Exercise: Basic operations

Write a program that asks the user to enter a float number and :
- if this number is strictly positive, multiply it by 10
- if it is strictly negative, divide it by 2
- otherwise, display an error message.

You will print the outcome result for the positive and negative floats.

Applications

Exercise: Basic operations

```
print("Please enter a float")
nb = float(input())
if (nb > 0):
   res = nb * 10
elif (nb < 0):
   res = nb / 2
else:
   print("Enter any number exept 0")
   res = "Undefined"
if (res != "Undefined"):
   print("The result is", res)
```

Applications

Exercise: Minimum

Write a program that asks the user to enter two numbers, finds the smaller one and displays the result.

Applications

Exercise: Minimum

```
print("Please enter the first number")
nb1 = float(input())
print("Please enter the second number ")
nb2 = float(input())

if (nb1 > nb2):
   smaller = nb2
else:
   smaller = nb1

print("The smaller number between", nb1, "and",
nb2, "is:", smaller)
```

Applications

Exercise: Find the maximum of 3 values

Write a program to ask the user to give 3 numbers and returns the maximum value.

Applications

Exercise: Find the maximum of 3 values

```
print("You will have to give 3 values ...")
print("Please give the first number")
nb1 = float(input())
print("Please give the second number")
nb2 = float(input())
print("Please give the third number")
nb3 = float(input())

maxValue = nb1
if (nb2 > maxValue):
   maxValue = nb2
if (nb3 > maxValue):
   maxValue = nb3

print("The maximal value is ", maxValue)
```

Applications

Exercise: Setup and thresholds

You want a program to help you to set the parameters sound intensity (in dB) and duration (in sec) of your experiment.
You have default values : defaultSound = 20 and defaultDuration = 30.
Write a program that ask you the current values for the sound the time and give the following instructions :
- if the sound intensity is inferior and the duration superior or equal to the default values : ask to stop the experiment
- if the sound is inferior to the default value : ask to increase the sound value
- if the duration is superior to the default value : ask to reduce the duration of the experiment
- if the duration is inferior to the default value and superior to 2 seconds : ask to restart
- otherwise : display that everything is ok

Applications

Exercise: Setup and thresholds

```
defaultSound = 20
defaultDuration = 30
minDuration = 2
print("Current value for the sound intensity (in dB) ?")
sound = float(input())
print("Current value for the duration (in sec) ?")
duration = float(input())

if ((sound < defaultSound) and (duration >= defaultDuration)):
   print("Please stop the experiment")
elif (sound < defaultSound):
   print("Please increase the sound intensity")
elif (duration > defaultDuration):
   print("Please reduce the time of the experiment")
elif (minDuration < duration < defaultDuration):
   print("Please restart the experiment")
else:
   print("Everything is ok")
```

Applications

Exercise: Basic loops operations

Set 2 integers : `i = 0` and `j = 15`
Write a first loop showing and increasing the value of `i` as long as it remains lower than `j`.
Write a second loop that, as long as `j` is not zero, decreases the value of `j` and displays its value if it is even.

Applications

Exercise: Basic loops operations

```
i = 0
j = 15
```

```
print("First loop")
while (i < j):
   print("i=", i)
   i += 1

print("Second loop")
while (j != 0):
   j -= 1
   if (j % 2 == 0):
      print("j=", j)
```

Applications

Exercise: Max and sum of a list

Write a program to ask the user to give 5 numbers (floats or integers) and display the maximum value and the sum of all the numbers given by the user.
You will write two possible versions for the maximum and the sum.

Applications

Exercise: Max and sum of a list (version 1)

```
l = []
for i in range(5):
    print("Please give a number")
    nb = float(input())
    l.append(nb)

# Find max (version 1)
print("The maximum value is", max(l))

# Sum all values (version 1)
print("The sum of all your values is", sum(l))
```

Applications

Exercise: Max and sum of a list (version 2)

```
l = []
for i in range(5):
    print("Please give a number")
    nb = float(input())
    l.append(nb)

# Find max (version 2)
tempMax = 0
for i in range(len(l)):
    if (l[i] > tempMax):
        tempMax = l[i]
print("The maximum value is", tempMax)

# Sum all values (version 2)
total = 0
for i in range(len(l)):
    total += l[i]
print("The sum of all your values is", total)
```

Applications

Exercise: Mean of a list

Write a program to ask the user to give 5 numbers and display the mean of these numbers.
You will write two possible versions of this program.

Applications

Exercise: Mean of a list

```
l = []
for i in range(5):
   print("Please give a number")
   nb = float(input())
   l.append(nb)

# Mean
result = sum(l) / len(l)
print("The mean value is", result)
```

Applications

Exercise: How many letters in a sentence?

Write a program that asks you to write a short sentence.
Use a for loop to display each letter one by one.

Then displays the number of letters in the sentence (the spaces are not taken into account).

Applications

Exercise: How many letters in a sentence?

```
print("Please write a sentence")
sentence = input()
cpt = 0

for letter in sentence:
   print(letter)
   if (letter != " "):
      cpt += 1

print("They are", cpt, "letters in this sentence")
```

Applications

Exercise: DNA to RNA

Transform DNA to RNA :

myDNA = "ATGCATGCAGCATGCAT"

Write a code that transform this DNA into RNA. You will need to transform first this string into a list and then apply some conditions for the "RNA conversion": A→U, C→G, G→C, T→A

Applications

Exercise: DNA to RNA

```
myDNA = "ATGCATGCAGCATGCAT"
dna = list(myDNA)
rna = []
    for i in range(len(dna)):
        if (dna[i] == "A"):
            rna.append("U")
        elif (dna[i] == "C"):
            rna.append("G")
        elif (dna[i] == "G"):
            rna.append("C")
        elif (dna[i] == "T"):
            rna.append("A")
        else:
            print("Wrong AA:", dna[i])
print("DNA:", dna)
print("RNA:", rna)
```

Applications

Exercise: Is Methionine in my DNA sample?

You have some DNA sample and you want to know if the codon Methionine (ATG) is inside.
Write a program that helps you find it and if yes, displays the position of the codon in your DNA sample.

dna = "ATGCATGCAGCATAGCAT"

Applications

Exercise: Is Methionine in my DNA sample?

```
dna = "ATGCATGCAGCATAGCAT"
methionine = "ATG"

if (methionine in dna):
    print("Methionine found")
```

```
# Version 1
for i in range(len(dna)):
    if (i+2 < len(dna)):
        if ((dna[i]=="A") and (dna[i+1]=="T") and (dna[i+2]=="G")):
            print("Methionine found at position", i)

# Version 2
for i in range(len(dna)):
    if (dna[i:i+3] == methionine):
        print("Methionine found at position", i)
```

Applications

Exercise: Lab schedule manager (version 1)

You will write a program that asks the user to enter the time he/she starts (hour and minutes), the duration of the experiment (in minutes) and then displays the time he/she will end the experiment.
(Note: "24 hours" based system and no "AM/PM" for this exercise)

Applications

Exercise: Lab schedule manager (version 1)

```
print("Please give the hour of the experiment beginning")
hour = float(input())
print("Please give the minutes of the experiment beginning")
minutes = float(input())
print("Please give the duration of your experiment (in
minutes)")
duration = float(input())

finalMinutes = minutes + duration
cptHours = 0
while (finalMinutes >= 60):
    finalMinutes = finalMinutes - 60
    cptHours += 1
finalHours = hour + cptHours
print("Your experiment will end at", int(finalHours), ":",
  int(finalMinutes))
```

Applications

Exercise: Lab schedule manager (version 2)

You will write a program that asks the user to enter the time he/she starts (hour and minutes), the duration of the experiment (in minutes) and then displays the time he/she will end the experiment.
(Note: "24 hours" based system and no "AM/PM" for this exercise)

You will pay attention that the numbers entered for hours are from 0 to 23 and from 0 to 59 for the minutes.

(faire idem mais en rentrant le numéro utilisateur)

Applications

Exercise: Lab schedule manager (version 2)

```
print("Please give the hour of the experiment beginning")
hour = float(input())
while not (0 <= hour <= 23):
    print("Please give a correct time hour (0 to 23)")
    hour = float(input())
print("Please give the minutes of the experiment beginning")
minutes = float(input())
while not (0 <= minutes <= 59):
    print("Please give a correct minutes value (0 to 59)")
    minutes = float(input())
print("Please give the duration of your experiment (in minutes)")
duration = float(input())

finalMinutes = minutes + duration
cptHours = 0
while (finalMinutes >= 60):
    finalMinutes = finalMinutes - 60
    cptHours += 1
finalHours = hour + cptHours
print("Your experiment will end at", int(finalHours), ":", int(finalMinutes))
```