

# Python & ML - Module 00

Basic stuff - Eleven Commandments

Summary: The goal of the module is to get started with the Python language.

## Chapter I

## Common Instructions

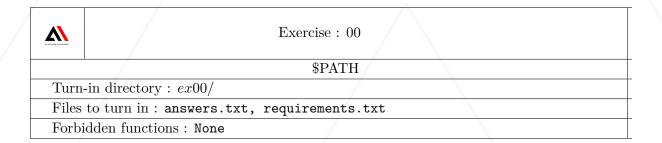
- The version of Python recommended to use is 3.7, you can check the version of Python with the following command: python -V
- The norm: during this piscine, it is recommended to follow the PEP 8 standards, though it is not mandatory. You can install pycodestyle which is a tool to check your Python code.
- The function eval is never allowed.
- The exercises are ordered from the easiest to the hardest.
- Your exercises are going to be evaluated by someone else, so make sure that your variable names and function names are appropriate and civil.
- Your manual is the internet.
- You can also ask questions in the #bootcamps channel in the 42AI or 42born2code.
- If you find any issue or mistake in the subject please create an issue on 42AI repository on Github.
- We encourage you to create test programs for your project even though this work won't have to be submitted and won't be graded. It will give you a chance to easily test your work and your peers' work. You will find those tests especially useful during your defence. Indeed, during defence, you are free to use your tests and/or the tests of the peer you are evaluating.
- Submit your work to your assigned git repository. Only the work in the git repository will be graded. If Deepthought is assigned to grade your work, it will be run after your peer-evaluations. If an error happens in any section of your work during Deepthought's grading, the evaluation will stop.

# Contents

_	Common mistractions	\ 1
II /	Exercise 00	3
ш	Exercise 01	8
IV	Exercise 02	9
$\mathbf{V}$	Exercise 03	10
VI	Exercise 04	12
VII	Exercise 05	14
VIII	Exercise 06	17
IX	Exercise 07	20
$\mathbf{X}$	Exercise 08	21
XI	Exercise 09	22
XII	Exercise 10	24

## Chapter II

## Exercise 00



The first thing you need to do is install Python.

Most modern Unix-based system have a python interpreter installed by default, but its version might be lower/higher than the one used for these modules. It is also possible that the default python command uses a version 2.x (for legacy reasons). This is obviously very confusing for new developper.



To deal with those version issues we will use conda. This program allow you to manage your Python packages and different working environments.

Note: the actual requirement is to use a Python 3.7.X version. You are free to use a different program/utilities to achieve this goal. At your own risk.

### Conda manual installation

Go the next section for an automated installation.

We recommend the following path for your conda folder.

\$> MYPATH="/goinfre/\$USER/miniconda3"

#### 1. Download & Install conda

```
# For MAC
$> curl -L0 "https://repo.anaconda.com/miniconda/Miniconda3-latest-MacOSX-x86_64.sh"
$> sh Miniconda3-latest-MacOSX-x86_64.sh -b -p $MYPATH

# For Linux
$> curl -L0 "https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.sh"
$> sh Miniconda3-latest-Linux-x86_64.sh -b -p $MYPATH
```

#### 2. Initial configuration of conda

```
# For zsh
$> $MYPATH/bin/conda init zsh
$> $MYPATH/bin/conda config --set auto_activate_base false
$> source ~/.zshrc

# For bash
$> $MYPATH/bin/conda init bash
$> $MYPATH/bin/conda config --set auto_activate_base false
$> source ~/.bash_profile
```

#### 3. Create an environment for 42AI!

```
$> conda create --name 42AI-$USER python=3.7 jupyter pandas pycodestyle numpy
```

### 4. Check your 42AI Python environment

```
$> conda info --envs
$> conda activate 42AI-$USER
$> which python
$> python -V
$> python -c "print('Hello World!')"
```

#### Help!

- I have lost my miniconda3 folder! Repeat step 1 and 3.
- I have lost my home directory! Repeat step 2.

#### Conda automated installation

Copy the following script into a file, launch it and follow the instruction. It downloads miniconda, installs it in a /goinfre subfolder and creates a python environment in conda.

```
#!/bin/bash
function which_dl {
   # If operating system name contains Darwnin: MacOS. Else Linux
   if uname -s | grep -iqF Darwin; then
       echo "Miniconda3-latest-MacOSX-x86_64.sh"
      echo "Miniconda3-latest-Linux-x86_64.sh"
function which_shell {
   # if $SHELL contains zsh, zsh. Else Bash
   if echo $SHELL | grep -iqF zsh; then
       echo "zsh"
   else
       echo "bash"
function when_conda_exist {
   # check and install 42AI environement
   printf "Checking 42AI-$USER environment: "
   if conda info --envs | grep -iqF 42AI-$USER; then
      printf "\e[33mDONE\e[0m\n"
       printf "e[31mKO]e[0m]n"
       printf "\e[33mCreating 42AI environnment:\e[0m\n"
       conda update -n base -c defaults conda -y conda create --name 42AI-$USER python=3.7 jupyter numpy pandas pycodestyle -y
   fi
function set_conda \{
   MINICONDA_PATH="/goinfre/$USER/miniconda3"
CONDA=$MINICONDA_PATH"/bin/conda"
   PYTHON_PATH=$(which python)
   REQUIREMENTS="jupyter numpy pandas pycodestyle"
   SCRIPT=$(which_dl)
   MY_SHELL=$(which_shell)
   DL_LINK="https://repo.anaconda.com/miniconda/"$SCRIPT
   DL_LOCATION="/tmp/"
   printf "Checking conda: "
   TEST=$(conda -h 2>/dev/null)
   if [ $? == 0 ] ; then
       printf "\e[32m0K\e[0m\n"
       when_conda_exist
       return
   printf "\e[31mKO\e[0m\n"
   if [ ! -f $DL_LOCATION$SCRIPT ]; then
       printf "\e[33mDonwloading installer:\e[0m\n"
       cd $DL_LOCATION
       curl -LO $DL_LINK
       cd -
   printf "\e[33mInstalling conda:\e[0m\n"
   sh $DL_LOCATION$SCRIPT -b -p $MINICONDA_PATH
   printf "\e[33mConda initial setup:\e[0m\n"
   $CONDA init $MY_SHELL
   $CONDA config --set auto_activate_base false
   printf "\e[33mCreating 42AI-$USER environnment:\e[0m\n"
   $CONDA update -n base -c defaults conda -y $CONDA create --name 42AI-$USER python=3.7 jupyter numpy pandas pycodestyle -y
   printf "\e[33mLaunch the following command or restart your shell:\e[0m\n'
```

```
if [ $MY_SHELL == "zsh" ]; then
    printf "\tsource ~/.zshrc\n"
else
    printf "\tsource ~/.bash_profile\n"
fi
}
set_conda
```

Don't forget to check your 42AI Python environment!

```
conda info --envs
conda activate 42AI-$USER
which python
python -V
python -c "print('Hello World!')"
```

## (Finally) getting started

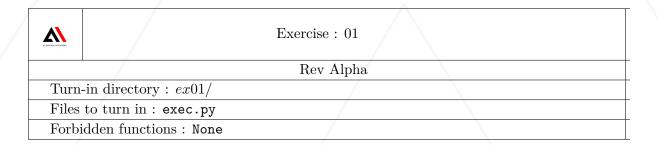
Now that your setup is ready to run, here's a few questions that need to be solved using python, pip or conda. Save your answers in a file answers.txt (one answer per line and per question), and check them with your peers.

Find the commands to:

- Output a list of installed packages and their versions.
- Show the package metadata of numpy.
- Remove the package numpy.
- (Re)install the package numpy.
- Freeze your python packages and their versions in a requirements.txt file you have to turn-in.

# Chapter III

## Exercise 01



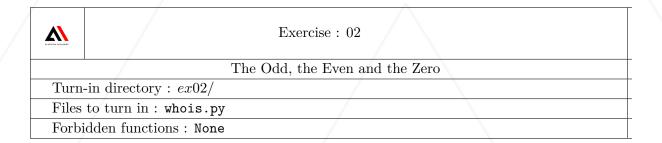
Make a program that takes a string as argument, reverses it, swaps its letters case and print the result.

- If more than one argument are provided, merge them into a single string with each argument separated by a space character.
- If no argument are provided, do nothing or print an usage.

```
$> python3 exec.py 'Hello World!' | cat -e
!DLROw OLLEh$
$>
$> python3 exec.py 'Hello' 'my Friend' | cat -e
DNEIRf YM OLLEh$
$>
$> python3 exec.py
```

# Chapter IV

## Exercise 02



Make a program that takes a number as argument, checks whether it is odd, even or zero, and print the result.

- If more than one argument are provided or if the argument is not an integer, print an error message.
- If no argument are provided, do nothing or print an usage.

### Examples

```
$> python3 whois.py 12
I'm Even.
$>
$> python3 whois.py 3
I'm Odd.
$>
$> python3 whois.py
$>
$> python3 whois.py
0
I'm Zero.
$>
$> python3 whois.py Hello
AssertionError: argument is not an integer
$>
$> python3 whois.py 12 3
AssertionError: more than one argument are provided
$>
```



No bonus point to be gained from a complex error management system. Keep it simple.

# Chapter V

## Exercise 03

as all fairs, will as offered		Exercise: 03
Functional file		
Turn-in directory : $ex03/$		
Files to turn in : count.py		
Forbidden functions : None		

### Part 1. text\_analyzer

Create a function called text\_analyzer that takes a single string argument and displays the sums of its upper-case characters, lower-case characters, punctuation characters and spaces.

- If None or nothing is provided, the user is prompted to provide a string.
- If the argument is not a string, print an error message.
- This function must have a docstring explaning its behavior.

Test your function with the python console

```
text contains 234 character(s):
 5 upper letter(s)
 187 lower letter(s)
 8 punctuation mark(s)
 30 space(s)
>> text_analyzer()
What is the text to analyze?
>> Hello World!
The text contains 8 character(s):
 2 upper letter(s)
 8 lower letter(s)
 1 punctuation mark(s)
 1 space(s)
>>> text_analyzer(42)
AssertionError: argument is not a string
>>> print(text_analyzer.__doc__)
   This function counts the number of upper characters, lower characters,
   punctuation and spaces in a given text.
```

### Part 2. \_\_\_\_ name\_\_ == \_\_\_ main\_\_\_

In the previous part, you wrote a function that can be used in the console or in another file when imported. Without changing this behavior, update your file so it can also be launched as a standalone program.

- If more than one argument is provided to the program, print an error message.
- Otherwise, use the text\_analyzer function.

```
$> python3 count.py 'Hello World!'
The text contains 8 character(s):
    2 upper letter(s)
    8 lower letter(s)
    1 punctuation mark(s)
    1 space(s)
    $> python3
>>> from count import text_analyzer
>>> text_analyzer("Hello World!")
The text contains 8 character(s):
    2 upper letter(s)
    8 lower letter(s)
    1 punctuation mark(s)
    1 space(s)
```

# Chapter VI

## Exercise 04

A SAFE COM, INTERSECTED	Exercise: 04		
	Elementary		
Turn-in directory : $ex04/$			
Files to turn in : operations.py			
Forbidden functions: None			

Write a program that takes two integers A and B as arguments and prints the result of the following operations:

```
Sum: A+B
Difference: A-B
Product: A*B
Quotient: A/B
Remainder: A%B
```

- If more or less than two argument are provided or if either of the argument is not an integer, print an error message.
- If no argument are provided, do nothing or print an usage.
- If an operation is impossible, print an error message instead of a numerical result.

```
$> python3 operations.py 10 3
Sum: 13
Difference: 7
Product: 30
Quotient: 3.3333...
Remainder: 1
$>
$> python3 operations.py 42 10
Sum: 52
Difference: 32
Product: 420
Quotient: 4.2
Remainder: 2
$>
$> python3 operations.py 1 0
```

```
Sum: 1
Difference: 1
Product: 0
Quotient: ERROR (division by zero)
Remainder: ERROR (modulo by zero)
$>
$> python3 operations.py <number1> <number2>
Example:
    python operations.py 10 3
$>
$> python3 operations.py 12 10 5
AssertionError: too many arguments
$>
$> python3 operations.py "one" "two"
AssertionError: only integers
$>
```



No bonus point to be gained from handling decimal point or scientific notation. Keep it simple.

# Chapter VII

## Exercise 05

AL ASSESSMENT TO SESSESSES	Exercise: 05	
The right format		
Turn-in directory : $ex05/$		
Files to turn in : kata00.py, kata01.py, kata02.py, kata03.py, kata04.py		
Forbidden functions: None		

Let's get familiar with the useful concept of **string formatting** through a kata series.

Each exercice will provide you with a kata variable. This variable can be modified to a certain extent: your program must react accordingly.

#### kata00

The kata variable is always a tuple and can only be filled with integer.

```
# Put this at the top of your kata00.py file
kata = (19,42,21)
```

Write a program that display this variable content according to the format shown below:

```
$> python3 kata00.py
The 3 numbers are: 19, 42, 21
$>
```

### kata01

The kata variable is always a dictionary and can only be filled with strings.

```
# Put this at the top of your kata01.py file
kata = {
   'Python': 'Guido van Rossum',
   'Ruby': 'Yukihiro Matsumoto',
   'PHP': 'Rasmus Lerdorf',
}
```

Write a program that display this variable content according to the format shown below:

```
$> python3 kata01.py
Python was created by Guido van Rossum
Ruby was created by Yukihiro Matsumoto
PHP was created by Rasmus Lerdorf
$>
```

#### kata02

The kata variable is always a tuple that contains 5 non-negative integers. The first integer contains up to 4 digits, the rest up to 2 digits.

```
# Put this at the top of your kata02.py file
kata = (2019, 9, 25, 3, 30)
```

Write a program that display this variable content according to the format shown below:

```
$> python3 kata02.py | cat -e
09/25/2019 03:30$
$> python3 kata02.py | wc -c
17
$>
```

#### kata03

The kata variable is always a string whose length is not higher than 42.

```
# Put this at the top of your kata03.py file
kata = "The right format"
```

Write a program that display this variable content according to the format shown below:

```
$> python3 kata03.py | cat -e
------The right format%
$> python3 kata03.py | wc -c
42
$>
```

#### kata04

The kata variable is always a tuple that contains, in the following order:

- 2 non-negative integer containing up to 2 digits
- 1 decimal
- 1 integer
- 1 decimal

```
# Put this at the top of your kata04.py file
kata = (0, 4, 132.42222, 10000, 12345.67)
```

Write a program that display this variable content according to the format shown below:

```
$> python3 kata04.py
module_00, ex_04 : 132.42, 1.00e+04, 1.23e+04
$> python3 kata04.py | cut -c 10,18
,:
```

# Chapter VIII

## Exercise 06

AL ANT ROM, INTERNATION		Exercise: 06	
	A recipe		
Turn-in directory : $ex06/$			
Files to turn in : recipe.py			
Forbi	Forbidden functions: None		

#### Part 1: Nested Dictionaries

Create a dictionary called cookbook. You will use this cookbook to store recipe.

A recipe is a **dictionary** that stores (at least) 3 couples key-value:

- "ingredients": a list of string representing the list of ingredients
- "meal": a **string** representing the type of meal
- "prep\_time": a **non-negative integer** representing a time in minutes

In the cookbook, the **key** to a recipe is the recipe name. Initialize your cookbook with 3 recipes:

- The Sandwich's ingredients are ham, bread, cheese and tomatoes. It is a lunch and it takes 10 minutes of preparation.
- The Cake's ingredients are *flour*, *sugar* and *eggs*. It is a *dessert* and it takes 60 minutes of preparation.
- The Salad's ingredients are avocado, arugula, tomatoes and spinach. It is a lunch and it takes 15 minutes of preparation.

### Part 2: A series of Helpful Functions

Create a series of useful functions to handle your cookbook:

- 1. A function that print all recipe names.
- 2. A function that takes a recipe name and print its details.
- 3. A function that takes a recipe name and delete it.
- 4. A function that add a recipe from user input. You will need a name, a list of ingredient, a meal type and a preparation time.

#### input example

```
>>> Enter a name:
chips
>>> Enter ingredients:
potatoes
oil
salt
>>> Enter a meal type:
lunch
>>> Enter a preparation time:
15
```

#### Part 3: A command line executable!

Create a program that use your cookbook and your functions.

The program will prompt the user to make a choice between printing the cookbook content, printing one recipe, adding a recipe, deleting a recipe or quitting the cookbook.

Your program will continue to ask for prompt until the user decide to quit it. The program cannot crash if a wrong value is entered: you must handle the error and ask for another prompt.

```
$> python3 recipe.py
Velcome to the Python Cookbook!
List of available option:
  1: Add a recipe
  2: Delete a recipe
  3: Print a recipe
  4: Print the cookbook
  5: Quit
Please select an option:
>> 3
Please enter a recipe name to get its details:
>> cake
Recipe for cake:
  Ingredients list: ['flour', 'sugar', 'eggs']
  To be eaten for dessert.
  Takes 60 minutes of cooking.
 lease select an option:
  Hello
```

```
Sorry, this option does not exist.

List of available option:

1: Add a recipe

2: Delete a recipe

3: Print a recipe

4: Print the cookbook

5: Quit

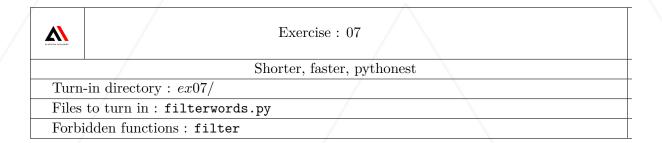
Please select an option:

>> 5

Cookbook closed. Goodbye!
```

## Chapter IX

## Exercise 07



Make a program that takes a string S and an integer N as argument and print the list of words in S that contains more than N non-punctuation characters.

- Words are separated from each other by space characters
- Punctuation symbols must be removed from the printed list: they are neither part of a word nor a separator
- The program must contains at least one **list comprehension** expression.

If the number of argument is different from 2, or if the type of any argument is wrong, the program prints an error message.

```
$> python3 filterwords.py 'Hello, my friend' 3
['Hello', 'friend']
$> python3 filterwords.py 'Hello, my friend' 10
[]
$> python3 filterwords.py 'A robot must protect its own existence as long as such protection does not conflict with the First or Second Law' 6
['protect', 'existence', 'protection', 'conflict']
$> python3 filterwords.py Hello World
ERROR
$> python3 filterwords.py 3 'Hello, my friend'
ERROR
$> python3 filterwords.py 3 'Hello, my friend'
ERROR
$> python3 filterwords.py
```

# Chapter X

## Exercise 08

A APPECIAL INTERSPECTATION		Exercise: 08		
	/	S.O.S		
Turn-in directory: $ex08/$				
Files to turn in : sos.py				
Forbi	Forbidden functions: None			

Make a program that takes a string as argument and encode it into Morse code.

- The program supports space and alphanumeric characters
- An alphanumeric character is represented by dots . and dashes -:
- A space character is represented by a slash /
- Complete morse characters are separated by a single space

If more than one argument are provided, merge them into a single string with each argument separated by a space character.

If no argument is provided, do nothing or print an usage.

## Examples



https://morsecode.world/international/morse2.html

# Chapter XI

## Exercise 09

AL ANT ROOM, OF TRANSPORTED		Exercise: 09
Secret number		
Turn-in directory : $ex09/$		
Files to turn in : guess.py		
Forbidden functions : None		

You have to make a program that will be an interactive guessing game. It will ask the user to guess a number between 1 and 99. The program will tell the user if their input is too high or too low. The game ends when the user finds out the secret number or types exit. You will import the random module with the randint function to get a random number. You have to count the number of trials and print that number when the user wins.

```
$> python guess.py
This is an interactive guessing game!
You have to enter a number between 1 and 99 to find out the secret number.
Type 'exit' to end the game.
Good luck!
What's your guess between 1 and 99?
>> 54
Too high!
What's your guess between 1 and 99?
Too low!
What's your guess between 1 and 99?
>> 45
Too high!
What's your guess between 1 and 99?
That's not a number.
What's your guess between 1 and 99?
Congratulations, you've got it!
You won in 5 attempts!
```

If the user discovers the secret number on the first try, tell them. If the secret number is 42, make a reference to Douglas Adams.

```
$> python guess.py
This is an interactive guessing game!
You have to enter a number between 1 and 99 to find out the secret number.
Type 'exit' to end the game.
Good luck!

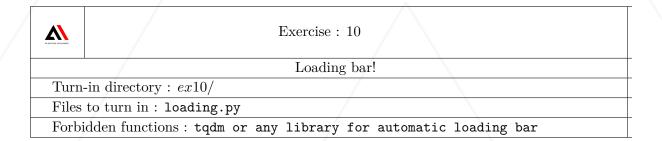
What's your guess between 1 and 99?
>> 42
The answer to the ultimate question of life, the universe and everything is 42.
Congratulations! You got it on your first try!
```

#### Other example:

```
$> python guess.py
This is an interactive guessing game!
You have to enter a number between 1 and 99 to find out the secret number.
Type 'exit' to end the game.
Good luck!
What's your guess between 1 and 99?
>> exit
Goodbye!
```

# Chapter XII

## Exercise 10



You are about to discover the yield operator! So let's create a function called ft\_progress(lst). The function will display the progress of a for loop.

```
listy = range(1000)
ret = 0
for elem in ft_progress(listy):
    ret += (elem + 3) % 5
    sleep(0.01)
print()
print(ret)
```

```
listy = range(3333)
ret = 0
for elem in ft_progress(listy):
    ret += elem
    sleep(0.005)
print()
print(ret)
```



We advise you to go take a look at the wonderful tqdm library, it will come in handy in many situations

#### Contact

You can contact 42AI association by email: contact@42ai.fr You can join the association on 42AI slack and/or apply to one of the association teams.

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who betatest the first version of the modules of Machine Learning.

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