

Having a comprehensive cheat sheet at hand when starting your programming adventure or even while coding as an experienced developer makes you more confident in your skills and saves time.

# python 3 beginner's cheat sheet

based on the [Python 3 Complete Masterclass](#) bestselling course

Mihai Cătălin Teodosiu @ pythontutorial.io

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# Python 3 Beginner's Cheat Sheet

Mihai Cătălin Teodosiu

Visit my website at [www.PythonTutorial.io](http://www.PythonTutorial.io)

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### *About this cheat sheet and its author*

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Mihai Cătălin Teodosiu is a Network Engineer (CCNP), QA Specialist (ISTQB) and Python Developer who decided to share his knowledge and skills with anyone looking to learn Python programming from scratch, in an easy-to-understand, learn-by-doing fashion, without the fancy wording and endless rambling and gibberish that most authors tend to include in their books and training courses.

Mihai's beginner-friendly teaching methods turned out to be very efficient for tens of thousands of students enrolled in his Python 2.x and 3.x video courses, published on various e-learning platforms. As a matter of fact, this book is based on Mihai's most comprehensive, **bestselling online course for beginners**, called [Python 3 Complete Masterclass](#).

From California to Fiji and from Norway to South Africa, Mihai helped programming rookies become proficient in Python, upgrade their skills and nail job interviews. Now, he's grateful for having the chance to help you, as well.

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## About the 'Python 3 Complete Masterclass' online course

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If you would like to get serious about coding and be part of the get-smart-quick scheme, then I'm inviting you to join my amazing learning community by enrolling in my Python 3 Complete Masterclass. But why would you take my course and not one of the many other Python tutorials on the Internet?

- 👍 Unlimited, 24/7, lifetime access to the course and instant access to updates.
- 👍 Over 18 hours of Python content - videos, notebooks, quizzes, coding exercises.
- 👍 I am uploading new content each month, completely free of charge.
- 👍 I'm teaching everything from scratch. No prior Python knowledge is required.
- 👍 No slides, no boring theory, no rambling, no chitchat. Just coding.
- 👍 Real-life skills: Excel / Database / Data Analysis / Network / Test Automation.
- 👍 You get my full support regarding any questions you might have.
- 👍 Python 3 Cheat Sheet and 200+ pages PDF e-book are also included.
- 👍 Private Discord community for instructor support and learning as a team.
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- 👍 You are covered by a 30-day money back guarantee, full refund, no questions asked.

By now you may be thinking "sounds great, but it also sounds expensive". Well, I'm no expert in finance or economics, but \$9.99 sure doesn't sound too much for a career change.

The truth is that the original price of this course is \$199.99, but my goal is to make Python learning accessible for everyone who is committed to taking the first step. And what better incentive than a 95% discount, right? 😊

Therefore, without further ado, if you would like to join my worldwide study group and get all the benefits that I mentioned above for only \$9.99, then use the link below and I'll see you on the other side.

🔒 95% OFF Secret Link: [CLICK HERE](#)

Let's get started!

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## Python 3 - Basics

#Defining a variable

```
my_var = 10 #type integer
```

```
my_var = "Hello" #type string
```

```
my_var = True #type boolean
```

#User input

```
input("Please enter the string you want to be printed out: ")
```

#Saving the input to a variable

```
user_says = input("Please enter the string you want to be printed out: ")
```

#The input of the user is saved as a string by the input() function!

## Python 3 - Strings

#Strings - indexing

```
a = "Cisco Switch"
```

```
a.index("i")
```

#Strings - character count

```
a = "Cisco Switch"
```

```
a.count("i")
```

#Strings - finding a character

```
a = "Cisco Switch"
```

```
a.find("sco")
```

#Strings - converting the case

```
a = "Cisco Switch"
```

```
a.lower() #lowercase
```

```
a.upper() #uppercase
```

#Strings - checking whether the string starts with a character

```
a = "Cisco Switch"
```

```
a.startswith("C")
```

#Strings - checking whether the string ends with a character

```
a = "Cisco Switch"
```

```
a.endswith("h")
```

#Strings - removing a character from the beginning and the end of a string

```
a = " Cisco Switch "
```

```
a.strip() #remove whitespaces
```

```
b = "$$$Cisco Switch$$$"
```

```
b.strip("$") #remove a certain character
```

#Strings - removing all occurrences of a character from a string

```
a = " Cisco Switch "
```

```
a.replace(" ", "") #replace each space character with the absence of any character
```

#Strings - splitting a string by specifying a delimiter; the result is a list

```
a = "Cisco,Juniper,HP,Avaya,Nortel" #the delimiter is a comma
```

```
a.split(",")
```

#Strings - inserting a character in between every two characters of the string / joining the characters by using a delimiter

```
a = "Cisco Switch"
```

```
"_".join(a)
```

#Additional methods

#source: [https://www.tutorialspoint.com/python3/python\\_strings.htm](https://www.tutorialspoint.com/python3/python_strings.htm)

```
capitalize()
```

#Capitalizes first letter of string.

```
lstrip()
```

#Removes all leading whitespace in string.

```
rstrip()
```

#Removes all trailing whitespace of string.

```
swapcase()
```

#Inverts case for all letters in string.

```
title()
```



#Returns "titlecased" version of string, that is, all words begin with uppercase and the rest are lowercase.

isalnum()

#Returns true if string has at least 1 character and all characters are alphanumeric and false otherwise.

isalpha()

#Returns true if string has at least 1 character and all characters are alphabetic and false otherwise.

isdigit()

#Returns true if string contains only digits and false otherwise.

islower()

#Returns true if string has at least 1 cased character and all cased characters are in lowercase and false otherwise.

isnumeric()

#Returns true if a unicode string contains only numeric characters and false otherwise.

isspace()

#Returns true if string contains only whitespace characters and false otherwise.

istitle()

#Returns true if string is properly "titlecased" and false otherwise.

isupper()

#Returns true if string has at least one cased character and all cased characters are in uppercase and false otherwise.

#source: [https://www.tutorialspoint.com/python3/python\\_strings.htm](https://www.tutorialspoint.com/python3/python_strings.htm)

## #Strings - concatenating two or more strings

a = "Cisco"

b = "2691"

a + b

## #Strings - repetition / multiplying a string

a = "Cisco"

a \* 3

## #Strings - checking if a character is or is not part of a string

a = "Cisco"

"o" in a

"b" not in a

## #Strings - formatting v1

"Cisco model: %s, %d WAN slots, IOS %f" % ("2600XM", 2, 12.4)

"Cisco model: %s, %d WAN slots, IOS %f" % ("2600XM", 2, 12.4)

"Cisco model: %s, %d WAN slots, IOS %.1f" % ("2600XM", 2, 12.4)

"Cisco model: %s, %d WAN slots, IOS %.2f" % ("2600XM", 2, 12.4)

## #Strings - formatting v2

"Cisco model: {}, {} WAN slots, IOS {}".format("2600XM", 2, 12.4)

"Cisco model: {0}, {1} WAN slots, IOS {2}".format("2600XM", 2, 12.4)

## #Strings - formatting v3 (f-strings)

model = "2950M"

wan = 4

ios = "12.2"

```
f"Cisco model: {model}, {wan} WAN slots, IOS {ios}"
```

### #Strings - slicing

```
string1 = "O E2 10.110.8.9 [160/5] via 10.119.254.6, 0:01:00, Ethernet2"
```

`string1[5:15]` #slice starting at index 5 up to, but NOT including, index 15; so index 14 represents the last element in the slice

`string1[5:]` #slice starting at index 5 up to the end of the string

`string1[:10]` #slice starting at the beginning of the string up to, but NOT including, index 10

`string1[:]` #returns the entire string

`string1[-1]` #returns the last character in the string

`string1[-2]` #returns the second to last character in the string

`string1[-9:-1]` #extracts a certain substring using negative indexes

`string1[-5:]` #returns the last 5 characters in the string

`string1[:-5]` #returns the string minus its last 5 characters

`string1[::2]` #adds a third element called step; skips every second character of the string

`string1[::-1]` #returns string1's elements in reverse order

## Python 3 - Numbers and Booleans

#Numbers

num1 = 10

num2 = 2.5

type(num1) #checking the type of this variable; integer

type(num2) #checking the type of this variable; float

#Numbers - math operations

1 + 2 #addition

2 - 1 #subtraction

4 / 2 #division

4 \* 2 #multiplication

4 \*\* 2 #raising to a power

5 % 2 #modulo (this means finding out the remainder after division of one number by another)

#Numbers - float division vs. integer division (special case)

3 / 2 #float division; result is 1 in Python 2 and 1.5 in Python 3

3 // 2 #integer division; result is 1 in Python 2 and Python 3

#Numbers - order of evaluation in math operations

#Highest priority: raising to a power; Medium priority: division, multiplication and modulo; Low priority: addition and subtraction

`100 - 5 ** 2 / 5 * 2` #1st: 5 \*\* 2, second: / then \*, third - ; result is 90.0

#Numbers - conversion between numeric types

`int(1.5)` #result is 1

`float(2)` #result is 2.0

#Numbers - useful functions

`abs(5)` #the distance between the number in between parantheses and 0

`abs(-5)` #returns the same result as `abs(5)`

`max(1, 2)` #returns the largest number

`min(1, 2)` #returns the smallest number

`pow(3, 2)` #another way of raising to a power

#Booleans - logical operations

`(1 == 1) and (2 == 2)` #result is True; AND means that both operands should be True in order to get the expression evaluated as True

`(1 == 1) or (2 == 2)` #result is True; when using OR, it is enough if only one expression is True, in order to have True as the final result

`not(1 == 1)` #result is False; using the NOT operator means denying an expression, in this case denying a True expression

`not(1 == 2)` #result is True; using the NOT operator means denying an expression, in this case denying a False expression

**None, 0, 0.0, 0L, 0j**, empty string, empty list, empty tuple, empty dictionary  
 #these values always evaluate to False

`bool(None)` #returns False; function that evaluates values and expressions

`bool(0)` #returns False; function that evaluates values and expressions

`bool(2)` #returns True; function that evaluates values and expressions

`bool("router")` #returns True; function that evaluates values and expressions

## Python 3 - Lists

### #Lists

`list1 = ["Cisco", "Juniper", "Avaya", 10, 10.5, -11]` #creating a list

`len(list)` #returns the number of elements in the list

`list1[0]` #returns "Cisco" which is the first element in the list (index 0)

`list1[0] = "HP"` #replacing the first element in the list with another value

### #Lists - methods

`list2 = [-11, 2, 12]`

`min(list2)` #returns the smallest element (value) in the list

`max(list2)` #returns the largest element (value) in the list

```
list1 = ["Cisco", "Juniper", "Avaya", 10, 10.5, -11]
```

```
list1.append(100) #appending a new element to the list
```

```
del list1[4] #removing an element from the list by index
```

```
list1.pop(0) #removing an element from the list by index
```

```
list1.remove("HP") #removing an element from the list by value
```

```
list1.insert(2, "Nortel") #inserting an element at a particular index
```

```
list1.extend(list2) #appending a list to another list
```

```
list1.index(-11) #returns the index of element -11
```

```
list1.count(10) #returns the number of times element 10 is in the list
```

```
list2 = [9, 99, 999, 1, 25, 500]
```

```
list2.sort() #sorts the list elements in ascending order; modifies the list in place
```

```
list2.reverse() #sorts the list elements in descending order; modifies the list in place
```

```
sorted(list2) #sorts the elements of a list in ascending order and creates a new list at the same time
```

```
sorted(list2, reverse = True) #sorts the elements of a list in descending order and creates a new list at the same time
```

`list1 + list2` #concatenating two lists

`list1 * 3` #repetition of a list

#Lists - slicing (works the same as string slicing, but with list elements instead of string characters)

`a_list[5:15]` #slice starting at index 5 up to, but NOT including, index 15; so index 14 represents the last element in the slice

`a_list[5:]` #slice starting at index 5 up to the end of the list

`a_list[:10]` #slice starting at the beginning of the list up to, but NOT including, index 10

`a_list[:]` #returns the entire list

`a_list[-1]` #returns the last element in the list

`a_list[-2]` #returns the second to last element in the list

`a_list[-9:-1]` #extracts a certain sublist using negative indexes

`a_list[-5:]` #returns the last 5 elements in the list

`a_list[:-5]` #returns the list minus its last 5 elements

`a_list[::2]` #adds a third element called step; skips every second element of the list

`a_list[::-1]` #returns a\_list's elements in reverse order



## Python 3 – Sets and Frozensets

#Sets – unordered collections of unique elements

```
set1 = {"1.1.1.1", "2.2.2.2", "3.3.3.3", "4.4.4.4"} #creating a set
```

```
list1 = [11, 12, 13, 14, 15, 15, 15, 11]
```

```
string1 = "aaabcdeefgg"
```

```
set1 = set(list1) #creating a set from a list; removing duplicate elements;
returns {11, 12, 13, 14, 15}
```

```
set2 = set(string1) #creating a set from a string; removing duplicate
characters; returns {'b', 'a', 'g', 'f', 'c', 'd', 'e'}; remember that sets are
UNORDERED collections of elements
```

```
len(set1) #returns the number of elements in the set
```

```
11 in set1 #returns True; checking if a value is an element of a set
```

```
10 not in set 1 #returns True; checking if a value is an element of a set
```

```
set1.add(16) #adding an element to a set
```

```
set1.remove(16) #removing an element from a set
```

#Frozensets – immutable sets.

#The elements of a frozenset remain the same after creation.

```
fs1 = frozenset(list1) #defining a frozenset
```

```
fs1
```

```
frozenset({11, 12, 13, 14, 15}) #the result
```

```
type(fs1)
```

```
<class 'frozenset'> #the result
```

```
#proving that frozensets are indeed immutable
```

```
fs1.add(10)
```

```
AttributeError: 'frozenset' object has no attribute 'add'
```

```
fs1.remove(1)
```

```
AttributeError: 'frozenset' object has no attribute 'remove'
```

```
fs1.pop()
```

```
AttributeError: 'frozenset' object has no attribute 'pop'
```

```
fs1.clear()
```

```
AttributeError: 'frozenset' object has no attribute 'clear'
```

```
#Sets - methods
```

```
set1.intersection(set2) #returns the common elements of the two sets
```

```
set1.difference(set2) #returns the elements that set1 has and set2 doesn't
```

```
set1.union(set2) #unifying two sets; the result is also a set, so there are no duplicate elements; not to be confused with concatenation
```

```
set1.pop() #removes a random element from the set; set elements cannot be removed by index because sets are UNORDERED collections of elements, so there are no indexes to use
```

```
set1.clear() #clearing a set; the result is an empty set
```

## Python 3 - Tuples

#Tuples - immutable lists (their contents cannot be changed by adding, removing or replacing elements)

my\_tuple = () #creating an empty tuple

my\_tuple = (9,) #creating a tuple with a single element; DO NOT forget the comma

my\_tuple = (1, 2, 3, 4)

#Tuples - the same indexing & slicing rules apply as for lists

len(my\_tuple) #returns the number of elements in the tuple

my\_tuple[0] #returns the first element in the tuple (index 0)

my\_tuple[-1] #returns the last element in the tuple (index -1)

my\_tuple[0:2] #returns (1, 2)

my\_tuple[:2] #returns (1, 2)

my\_tuple[1:] #returns (2, 3, 4)

my\_tuple[:] #returns (1, 2, 3, 4)

my\_tuple[:-2] #returns (1, 2)

my\_tuple[-2:] #returns (3, 4)

```
my_tuple[::-1] #returns (4, 3, 2, 1)
```

```
my_tuple[::-2] #returns (1, 3)
```

```
#Tuples - tuple assignment / packing and unpacking
```

```
tuple1 = ("Cisco", "2600", "12.4")
```

```
(vendor, model, ios) = tuple1 #vendor will be mapped to "Cisco" and so are  
the rest of the elements with their corresponding values; both tuples should  
have the same number of elements
```

```
(a, b, c) = (1, 2, 3) #assigning values in a tuple to variables in another tuple
```

```
min(tuple1) #returns "12.4"
```

```
max(tuple1) #returns "Cisco"
```

```
tuple1 + (5, 6, 7) #tuple concatenation
```

```
tuple1 * 20 #tuple multiplication
```

```
"2600" in tuple1 #returns True
```

```
784 not in tuple1 #returns True
```

```
del tuple1 #deleting a tuple
```

## Python 3 - Ranges

#Ranges - unlike in Python 2, where the range() function returned a list, in Python 3 it returns an iterator; cannot be sliced

```
r = range(10) #defining a range
```

```
r
```

```
range(0, 10) #the result
```

```
type(r)
```

```
<class 'range'> #the result
```

```
list(r) #converting a range to a list
```

```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9] #the result
```

```
list(r)[2:5] #slicing a range by using the list() function first
```

```
[2, 3, 4] #the result
```

## Python 3 - Dictionaries. Conversions between data types

#Dictionaries - a dictionary is an unordered set of key-value pairs

```
dict1 = {} #creating an empty dictionary
```

```
dict1 = {"Vendor": "Cisco", "Model": "2600", "IOS": "12.4", "Ports": "4"}
```

```
dict1["IOS"] #returns "12.4"; extracting a value for a specified key
```

```
dict1["IOS"] = "12.3" #modifies an existing key-value pair
```

```
dict1["RAM"] = "128" #adds a new key-value pair to the dictionary
```

```
del dict1["Ports"] #deleting a key-value pair from the dictionary
```

```
len(dict1) #returns the number of key-value pairs in the dictionary
```

```
"IOS" in dict1 #verifies if "IOS" is a key in the dictionary
```

```
"IOS2" not in dict1 #verifies if "IOS2" is not a key in the dictionary
```

```
#Dictionaries - methods
```

```
dict1.keys() #returns a list having the keys in the dictionary as elements
```

```
dict1.values() #returns a list having the values in the dictionary as elements
```

```
dict1.items() #returns a list of tuples, each tuple containing the key and value of each dictionary pair
```

```
#Conversions between data types
```

```
str() #converting to a string
```

```
int() #converting to an integer
```

```
float() #converting to a float
```

```
list() #converting to a list
```

```
tuple() #converting to a tuple
```

```
set() #converting to a set
```

```
bin() #converting to a binary representation
```

```
hex() #converting to a hexadecimal representation
```

```
int(variable, 2) #converting from binary back to decimal
```

```
int(variable, 16) #converting from hexadecimal back to decimal
```

## Python 3 - Conditionals

#If / Elif / Else conditionals - executing code based on one or more conditions being evaluated as True or False; the "elif" and "else" clauses are optional

```
x = 5
```

```
if x > 5: #if the "x > 5" expression is evaluated as True, the code indented under the "if" clause gets executed, otherwise the execution jumps to the "elif" clause...
```

```
    print("x is greater than 5")
```

```
elif x == 5: #...if the "x == 5" expression is evaluated as True, the code indented under the "elif" clause gets executed, otherwise the execution jumps to the "else" clause
```

```
    print("x IS 5")
```

```
else: #this covers all situations not covered by the "if" and "elif" clauses; the "else" clause, if present, is always the last clause in the code block
```

```
    print("x is NOT greater than 5" )
```

```
#result of the above "if" block
```

```
x IS 5
```

## Python 3 - For and While Loops

#For / For Else loops - executes a block of code a number of times, depending on the sequence it iterates on; the "else" clause is optional

```
vendors = ["Cisco", "HP", "Nortel", "Avaya", "Juniper"]
```

**for** element **in** vendors: #iterating over a sequence and executing the code indented under the "for" clause for each element in the sequence

```
    print(element)
```

**else:** #the indented code below "else" will be executed when "for" has finished looping over the entire list

```
    print("The end of the list has been reached")
```

#result of the above "for" block

Cisco

HP

Nortel

Avaya

Juniper

The end of the list has been reached

#While / While Else loops - a while loop executes as long as an user-specified condition is evaluated as True; the "else" clause is optional

```
x = 1
```

**while** x <= 10:

```
    print(x)
```

```
    x += 1
```

**else:**

```
    print("Out of the while loop. x is now greater than 10")
```



```
#result of the above "while" block
```

```
1 2 3 4 5 6 7 8 9 10
```

```
Out of the while loop. x is now greater than 10
```

## Python 3 - If / For / While Nesting

```
#If / For / While Nesting
```

```
x = "Cisco"
```

```
if "i" in x:
```

```
    if len(x) > 3: #if nesting
```

```
        print(x, len(x))
```

```
Cisco 5 #result of the above block
```

```
list1 = [4, 5, 6]
```

```
list2 = [10, 20, 30]
```

```
for i in list1:
```

```
    for j in list2: #for nesting
```

```
        print(i*j)
```

```
40 80 120 50 100 150 60 120 180 #result of the above block
```

```
x = 1
```

```
while x <= 10:
```

```
    z = 5
```

```
    x += 1
```

```
    while z <= 10: #while nesting
```

```
        print(z)
```

```
        z += 1
```

```
5 6 7 8 9 10 5 6 7 8 9 10 5 6 7 8 9 10 5 6 7 8 9 10 5 6 7 8 9 10 5 6
7 8 9 10 5 6 7 8 9 10 5 6 7 8 9 10 #result of the above block
```

```
for number in range(10):
```

```
    if 5 <= number <= 9: #mixed nesting
```

```
        print(number)
```

```
5 6 7 8 9 #result of the above block
```

## Python 3 - Break / Continue / Pass

```
#Break, Continue, Pass
```

```
list1 = [4, 5, 6]
```

```
list2 = [10, 20, 30]
```

```
for i in list1:
```

```
    for j in list2:
```

```
        if j == 20:
```

```
            break #stops the execution here, ignores the print statement below
and completely quits THIS "for" loop; however, it doesn't quit the outer
"for" loop, too!
```

```
            print(i * j)
```

```
        print("Outside the nested loop")
```

```
#result of the above block
```

```
40
```

```
Outside the nested loop
```

```
50
```

```
Outside the nested loop
```

**60**

Outside the nested loop

list1 = [4, 5, 6]

list2 = [10, 20, 30]

**for** i **in** list1:    **for** j **in** list2:        **if** j == 20:

**continue** #ignores the rest of the code below for the current iteration, then goes up to the top of the loop (inner "for") and starts the next iteration

**print**(i \* j)    **print**("Outside the nested loop")

#result of the above block

**40****120**

Outside the nested loop

**50****150**

Outside the nested loop

**60****180**

Outside the nested loop

**for** i **in** range(10):

**pass** #pass is the equivalent of "do nothing"; it is actually a placeholder for when you just want to write a piece of code that you will treat later

## Python 3 - Try / Except / Else / Finally

#Try / Except / Else / Finally - handling an exception when it occurs and telling Python to keep executing the rest of the lines of code in the program

**try:**

**print(4/0)** #in the "try" clause you insert the code that you think might generate an exception at some point

**except ZeroDivisionError:**

**print("Division Error!")** #specifying what exception types Python should expect as a consequence of running the code inside the "try" block and how to handle them

**else:**

**print("No exceptions raised by the try block!")** #executed if the code inside the "try" block raises NO exceptions

**finally:**

**print("I don't care if an exception was raised or not!")** #executed whether the code inside the "try" block raises an exception or not

#result of the above block

Division Error!

I don't care if an exception was raised or not!

## Python 3 - Functions

### #Functions - Basics

**def** my\_first\_function(x, y): #defining a function that takes two parameters

sum = x + y

**return** sum #this statement is used to exit a function and return something when the function is called

my\_first\_function(1, 2) #calling a function and passing two POSITIONAL arguments, the values of 1 and 2; result is 3

my\_first\_function(x = 1, y = 2) #calling a function and passing two KEYWORD arguments, the values of 1 and 2; result is 3

my\_first\_function(1, y = 2) #calling a function and passing mixed types of arguments, the values of 1 and 2; result is 3; rule: positional arguments always before keyword arguments!

**def** my\_first\_function(x, y, z = 3): #specifying a default parameter value in a function definition

**def** my\_first\_function(x, \*args) #specifying a variable number of positional parameters in a function definition; args is a tuple

**def** my\_first\_function(x, \*\*kwargs) #specifying a variable number of keyword parameters in a function definition; args is a tuple

**global** my\_var #"importing" a variable in the global namespace to the local namespace of a function

## Python 3 - Modules

#Modules and importing - Basics

**import** sys #importing the sys module; the import statements should be placed before any other code in your application

**from** math **import** pi #importing only a variable (pi) from the math module

**from** math **import** sin #importing only a function (sin()) from the math module; there's no need to add the parantheses of the function when importing it

**from** math **import** \* #importing all the names (variables and functions) from the math module

#Installing a non-default Python 3 module in Windows is done from the command line (e.g. the openpyxl module)

```
C:\WINDOWS\system32> pip install openpyx
```

#Installing a non-default Python 3 module in macOS is done from the terminal (e.g. the openpyxl module)

```
mihais-MacBook-Pro:~ mihai$ pip3 install openpyx
```

## Python 3 - File Operations

#Files - opening and reading a file

`myfile = open("routers.txt", "r")` # "r" is the file access mode for reading and it is the default mode when opening a file

`myfile.mode` #checking the mode in which a file has been opened

`myfile.read()` #method that returns the entire content of a file in the form of a string

`myfile.read(5)` #returning only the first 5 characters (bytes) in the file

`myfile.seek(0)` #moving the cursor at the beginning of the file

`myfile.tell()` #checking the current position of the cursor inside the file

`myfile.readline()` #returns the file content one line at a time, each time you use the method

`myfile.readlines()` #returns a list where each element is a line in the file

#Files - writing and appending to a file

`newfile = open("newfile.txt", "w")` #opens/creates a new file for writing; the "w" method also creates the file for writing if the file doesn't exist and overrides the file if the file already exists; remember to close the file after writing to it to save the changes!

`newfile.writelines(["Cisco", "Juniper", "HP", "\n"])` #this method takes a sequence of strings as an argument and writes those strings to the file

`newfile = open("newfile.txt", "a")` #opening a file for appending

```
newfile = open("newfile.txt", "w+") #opens a file for both writing and
reading at the same time
```

```
newfile = open("newfile.txt", "x") #opens for exclusive creation, failing if
the file already exists
```

```
#Files - closing a file
```

```
newfile.closed #checking if a file is closed
```

```
newfile.close() #closing a file
```

```
with open("python.txt", "w") as f: #using the with-as solution, the files
gets closed automatically, without needing the close() method
```

```
f.write("Hello Python!\n")
```

```
#Truncating files - the file should be open for reading AND writing, not
just reading!
```

```
f = open("D:\\test.txt", "r+")
```

```
f.truncate() #this deletes all the content inside the file
```

```
#Truncating files - the file should be open for reading AND writing, not
just reading!
```

```
f = open("D:\\test.txt", "r+")
```

```
f.truncate(10) #this will keep the first 10 characters in the file and delete
the rest
```



## Python 3 - Regular Expressions

#Regular Expressions - the "re.match" and "re.search" methods

`a = re.match(pattern, string, optional flags)` #general match syntax; "a" is called a match object if the pattern is found in the string, otherwise "a" will be None

`mystr = "You can learn any programming language, whether it is Python2, Python3, Perl, Java, javascript or PHP."`

`import re` #importing the regular expressions module

`a = re.match("You", mystr)` #checking if the characters "You" are indeed at the beginning of the string

`a.group()` #result is 'You'; Python returns the match it found in the string according to the pattern we provided

`a = re.match("you", mystr, re.I)` #re.I is a flag that ignores the case of the matched characters

`a = re.search(pattern, string, optional flags)` #general search syntax; searching for a pattern throughout the entire string; will return a match object if the pattern is found and None if it's not found

`arp = "22.22.22.1 0 b4:a9:5a:ff:c8:45 VLAN#222 L"`

`a = re.search(r"(.+?) +(\d) +(.+?)s{2,}(\w)*", arp)` #result is '22.22.22.1'; 'r' means the pattern should be treated like a raw string; any pair of parentheses indicates the start and the end of a group; if a match is found for the pattern inside the parentheses, then the contents of that group can be extracted with the group() method applied to the match object; in regex syntax, a dot represents any character, except a new line character; the plus sign means that the previous expression, which in our case is just a dot,

may repeat one or more times; the question mark matching as few characters as possible

`a.groups()` #returns all matches found in a given string, in the form of a tuple, where each match is an element of that tuple

`('22.22.22.1', '0', 'b4:a9:5a:ff:c8:45 VLAN#222', 'L')`

#Regular Expressions - the "re.findall" and "re.sub" methods

`a = re.findall(r"\d\d\.\d{2}\.[0-9][0-9]\.[0-9]{1,3}", arp)` #returns a list where each element is a pattern that was matched inside the target string

`['22.22.22.1']` #result of the above operation - a list with only one element, the IP address matched by the regex

`b = re.sub(r"\d", "7", arp)` #replaces all occurrences of the specified pattern in the target string with a string you enter as an argument

`'77.77.77.7 7 b7:a7:7a:ff:c7:77 VLAN#777 L 77.77.77.77'`  
#result of the above operation

## Python 3 - Basics of OOP. Classes and Objects

#Classes and objects

**class MyRouter(object):** #creating a class which inherits from the default "object" class

**def \_\_init\_\_(self, routename, model, serialno, ios):** #class constructor; initializing some variables and the method is called whenever you create a new instance of the class

`self.routename = routename` #"self" is a reference to the current instance of the class

`self.model = model`

`self.serialno = serialno`

`self.ios = ios`

```
def print_router(self, manuf_date):
```

```
    print("The router name is: ", self.routername)
```

```
    print("The router model is: ", self.model)
```

```
    print("The serial number of: ", self.serialno)
```

```
    print("The IOS version is: ", self.ios)
```

```
    print("The model and date combined: ", self.model + manuf_date)
```

```
router1 = MyRouter('R1', '2600', '123456', '12.4') #creating an object by
simply calling the class name and entering the arguments required by the
__init__ method in between parentheses
```

```
router1.model #accessing the object's attributes; result is '2600'
```

```
router1.print_router("20150101") #accessing a function (actually called
method) from within the class
```

```
The router name is: R1
```

```
The router model is: 2600
```

```
The serial number of: 123456
```

```
The IOS version is: 12.4
```

```
The model and date combined: 260020150101
```

```
getattr(router1, "ios") #getting the value of an attribute
```

```
setattr(router1, "ios", "12.1") #setting the value of an attribute
```

```
hasattr(router1, "ios") #checking if an object attribute exists
```

```
delattr(router1, "ios") #deleting an attribute
```

```
isinstance(router1, MyRouter) #verifying if an object is an instance of a
particular class
```

```
class MyNewRouter(MyRouter): #creating a new class (child) inheriting
from the MyRouter parent class
```

```
...
```

```
issubclass(MyNewRouter, MyRouter) #returns True or False; checking if a
class is the child of another class
```

## Python 3 - List comprehensions

```
#List / Set / Dictionary comprehensions
```

```
#Instead of...
```

```
list1 = []
```

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

```
    j = i ** 2
```

```
    list1.append(j)
```

```
#...we can use a list comprehension
```

```
list2 = [x ** 2 for x in range(10)]
```

```
list3 = [x ** 2 for x in range(10) if x > 5] #with a conditional statament
```

```
set1 = {x ** 2 for x in range(10)} #set comprehension
```

```
dict1 = {x: x * 2 for x in range(10)} #dictionary comprehension
```

## Python 3 - Lambda functions

#Lambda functions - anonymous functions

**lambda** arg1, arg2, ..., arg n: an expression using the arguments #general syntax

a = **lambda** x, y: x \* y #defining a lambda function

a(20, 10) #result is 200; calling the lambda function

#Instead of...

**def** myfunc(list):

    prod\_list = []

**for** x **in** range(10):

**for** y **in** range(5):

            product = x \* y

            prod\_list.append(product)

**return** prod\_list + list

#...we can use a lambda function, a list comprehension and concatenation on a single line of code

b = **lambda** list: [x \* y **for** x **in** range(10) **for** y **in** range(5)] + list

## Python 3 - map() and filter()

### #Map and Filter

#map() - takes a function and a sequence as arguments and applies the function to all the elements of the sequence, returning a list as the result

```
def product10(a):
```

```
    return a * 10
```

```
list1 = range(10)
```

map(product10, list1) #result is [0, 10, 20, 30, 40, 50, 60, 70, 80, 90]; applying the product10() function to each element of list1

#or...

map((lambda a: a \* 10), list1) #result is [0, 10, 20, 30, 40, 50, 60, 70, 80, 90] as well

#filter() - takes a function and a sequence as arguments and extracts all the elements in the list for which the function returns True

```
filter(lambda a: a > 5, list1) #result is [6, 7, 8, 9]
```

## Python 3 - Basics of Iterators and Generators

#Iterators - an object which allows a programmer to traverse through all the elements of a collection

```
my_list = [1, 2, 3, 4, 5, 6, 7]
```

```
my_iter = iter(my_list) #iter() returns an iterator object
```

`next(my_iter)` #in Python 2 and 3, it returns the elements of a sequence one by one; raises `StopIteration` when the sequence is exhausted

#Generators - special routines that can be used to control the iteration behavior of a loop; defined using the "def" keyword;

`def my_gen(x, y):` #creating a generator function

`for i in range(x):`

`print("i is %d" % i)`

`print("y is %d" % y)`

`yield i * y` #yields the values one at a time; traversing a sequence up to a certain point, getting the result and suspending the execution

`my_object = my_gen(10, 5)` #creating a generator object

`next(my_object)` #manually yield the next element returned by the `my_gen()` function; raises `StopIteration` when the sequence is exhausted

`gen_exp = (x for x in range(5))` #creating a generator expression; similar to list comprehensions, but using parentheses instead of square brackets

`next(gen_exp)` #extracting each value in the list generated by `range(5)`, one value at a time; raises `StopIteration` when the sequence is exhausted

## Python 3 - itertools

#Itertools - built-in Python module for working with iterable data sets

`import itertools`

`list1 = [1, 2, 3, 'a', 'b', 'c']`

`list2 = [101, 102, 103, 'X', 'Y']`

**#chain()** - takes several sequences and chains them together

**chain(list1, list2)**

**list(chain(list1, list2))** #result is [1, 2, 3, 'a', 'b', 'c', 101, 102, 103, 'X', 'Y']

**#count()** - returns an iterator that generates consecutive integers until you stop it, otherwise it will go on forever

**for i in count(10, 2.5):**

**if i <= 50:**

**print(i)**

**else:**

**break** #result is printing the numbers between 10 and 50 inclusively, with a step of 2.5

**#cycle()** - returns an iterator that simply repeats the value given as argument infinitely; you have to find a way to break out of the infinite loop

**a = range(11, 16)**

**for i in cycle(a):**

**print(i)** #use Ctrl+C to break out of the infinite loop

**#filterfalse()** - returns the elements for which the function you give as argument returns False

**list(filterfalse(lambda x: x < 5, [1, 2, 3, 4, 5, 6, 7]))** #in Python 2 the result is [5, 6, 7]; in Python 3 there is no ifilter() like in Python 2, just filter() and filterfalse()

**#islice()** - performs slicing; we can specify a starting point of the slice, an end point and a step

**list(islice(range(10), 2, 9, 2))** #result is [2, 4, 6, 8]



## Python 3 - Basics of Decorators

#Decorators - functions that take another function as a parameter and extend its functionality and behavior without modifying it

```
def my_decorator(target_function):
```

```
    def function_wrapper():
```

```
        return "Python is the " + target_function() + " programming language!"
```

```
    return function_wrapper
```

```
@my_decorator
```

```
def target_function():
```

```
    return "coolest"
```

```
target_function() #returns 'Python is the coolest programming language!'
```

**Note:** The official documentation of Python 3 is available [here](#)