Python:
Basics (in Python)

AAA-Python Edition

Plan

- 1- Basic Operations and variables
- 2- Basic Types
- 3- Functions and white space formatting
- 4- Modules and Libraries
- 5- Examples of some Libraries
- 6- Installing Libraries in Google Colab

1- Basic Operations And variables

- To perform simple operations, you just have to type them:

```
[6]   1 11 + 8
      19

[8]   1 25 / 2
      12.5

[4]   1 25 // 2
      12

[3]   1 10 % 4
      2

[13]  1 2 ** 3
      8
```

Integer division/floored quotient

Modulus (remainder)

Exponent

1- Basic Operations And variables

The only case this expression is evaluated to True, it's when the two operands are evaluated to True

- Other type of operations:

```
[24]  1 5 > 3
```

True

If 5 wasn't greater than 3, it would returned False

```
[25]  1 5 != 3
```

True

Is 5 different from 3

```
[29]  1 5 == 3
```

False

Is 5 equal to 3

```
[30]  1 not (5==3)
```

True

```
[31]  1 (5>3) and (2 >3)
```

False

```
[32]  1 (5>3) or (2 >3)
```

True

The only case this expression is evaluated to False, it's when the two operands are evaluated to False

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1- Basic Operations And variables

To evaluate an expression with multiple operators,the "**precedence**" rule apply

Expression between parentheses is evaluated first:**(-1+1)=0**
Then the exponentiation is evaluated: **6**0=1**
Then the multiplication is evaluated: **3*1=3**
Then the addition is evaluated: **5+3=8**

```
1 5 +3 *6 ** (-1+1)
```

8

Table of precedence of some operators (increasing order)

Operators in the same box have same precedence

Operators in the same box group from left to right (except for exponentiation **).For example, to evaluate **5 / 4 * 2** :
We start by: **5 / 4 = 1.25** (the most left operator)
Then: **1.25 * 2 = 2.5** (we continue with the following one)

Highest precedence

or
and
not
< , <= , > , >= , != , ==
+, -
* , / , // , %
**
( )

The full table can be seen at:
https://docs.python.org/3.6/reference/expressions.html#operator-precedence

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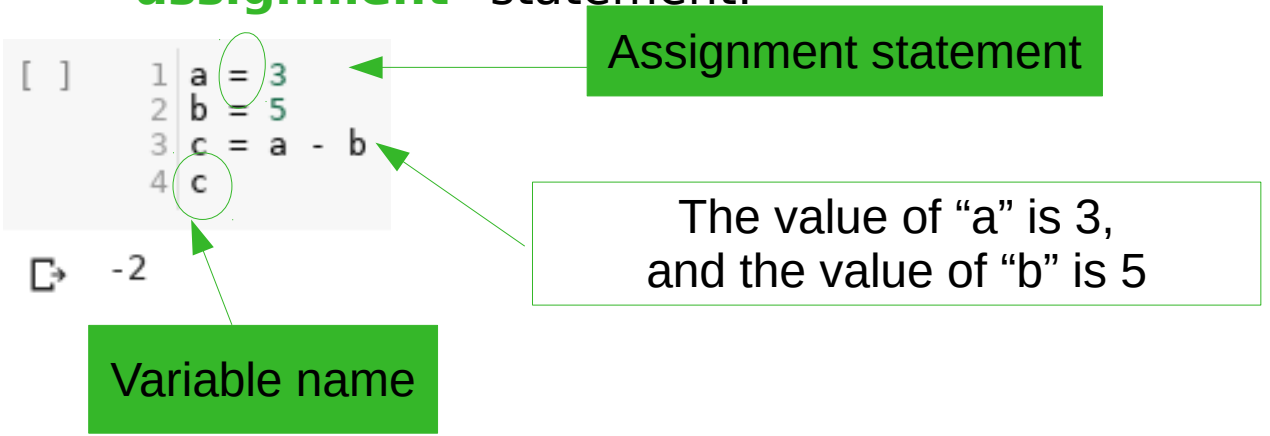
1- Basic Operations And variables

- We can store values of expressions in “**variables**” with the “**assignment**” statement:



- Variable names have some mandatory characteristics
  - Composed of **1 word**
  - Composed **only** by: **letters**, **number** or the underscore character (_)
  - **Can not start** with a **number**

1- Basic Operations And variables

- We can assign **one value** to **multiple variables**

```
[34]  1 g = h = j = 5.31
      2
      3 h
```

```
5.31
```

- We can assign **multiple values** to **multiples variables**:

```
[35]  1 str1 , str2 , num1 = "Hello" , "World!" , -3
      2 str2
```

```
'World!'
```

- **Numbers**
  - A number can be:
    - **Integer** **5**, **-3**, **0**, **1000**
    - **Float** **7.8**, **-3.156**, **0.0**
    - **Complex** **5.3+2j**, **10+1J**

```
[37]  1 a = 4.3 + 5j
      2 a
```

```
(4.3+5j)
```

```
[38]  1 a.real
```

```
4.3
```

```
[39]  1 a.imag
```

```
5.0
```

Real part

Imaginary part

Strings

- String are text values written between **quotes:**

```
1 S1='Simple Quoted String'
2 S2="Double Quoted String"
3 S3='''Triple Quoted String with a simple quote.
4 Can be written with double quotes.
5 Contatins multiple lines'''
6 S1
```

```
'Simple Quoted String'
```

```
[54] 1 S2
```

```
'Double Quoted String'
```

```
[58] 1 S3
```

```
'Triple Quoted String with a simple quote.\nCan be written with double quotes.\nContatins multiple lines'
```

```
[59] 1 print(S3)
```

```
Triple Quoted String with a simple quote.
Can be written with double quotes.
Contatins multiple lines
```

Strings

- With Strings, we can perform **Concatenation** and **Replication** operations:

```
[62]  1 S1 +" and a  " + S2
```

```
'Simple Quoted String and a  Double Quoted String'
```

```
[63]  1 S2 * 2
```

```
'Double Quoted StringDouble Quoted String'
```

Boolean

- They have only two values: **True** and **False**
- In a numeric context: **True** behaves like **1** and **False** like **0**

```
[66]  1 True + 3
```

```
4
```

```
[65]  1 False + 3
```

```
3
```

- The Boolean operators are : **and, or, not**

Functions

- Functions are a “**reusable**” block of code.
- They can be “**built-in**” functions: already defined
- They can be also “**user-defined**”: you can define your own functions.
- Example of **built-in** functions:

```
[68]  1 print(S1,"A simple string")

      Simple Quoted String A simple string
```

Number of character of string S1

```
[74]  1 len(S1)

      20
```

Functions

```
[82]  1 j= input("Give je value of j:\n")
      2 print ("j=",j)
      3
```

```
Give je value of j:
12
j= 12
```

New line character

```
[80]  1 float(j)
```

```
12.0
```

Convert j into a float

3- Functions and white space formatting

White space formatting

- Python uses **indentation** to define blocks of code
- Blocks begin when the indentation **increases**
- Blocks end when the indentation **decreases**
- Whitespace is **ignored** inside parentheses and brackets

User defined functions

The block of code
is marked by a colon(:)
and its indentation
(the space before print)

```
[88]  1 def function_name(param):
      2   print("This is the parameter of the function: "+ param)
      3 function_name("here")
```

```
This is the parameter of the function: here
```

Calling the function
(decreasing the indentation to terminate
The function definition block)

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3- Functions and white space formatting

Return statement

- A function can **return** a value using the keyword "**return**"

```
[95]  1 def add(a, b):
      2   c= a+b
      3   return c
      4
      5 print(add(5,3))
```

```
8
```

The function arguments

The function returns the value of a+b

Keyword and default arguments

- In a function **call**, we can **identify** the arguments by their **name**.
- In a function **definition**, the arguments can have a **default value**
  → they will be **optional**

```
[97]  1 def printAnyway(a,b,toprint="No Given third argument"):
      2   d=a/b
      3   print("The result=",d)
      4   print(toprint)
      5   return d
      6 printAnyway(b=2,a=4)
      7
```

```
The result= 2.0
No Given third argument
2.0
```

The default value of a third argument
So the argument is optional

The order of the arguments a and b doesn't matter, since they are identified by their names

Module and Library

- A module is a program that contains a related **group of functions** that can be **embedded** in your programs

- To use the functions module you have to use the "**import**" statement.
- Other statement with **import** like "**from**" and "**as**" can be used

- A set of modules define a **Library**
- Python comes with a **library** called the **standard library**
- To use an other library modules, you have to **install** the corresponding library : a **third-party library**


```
[100]  1 import random
       2 print(random.randint(1,100))
```

```
93
```

```
[101]  1 from random import randint
       2 print(randint(1,100))
```

```
22
```

```
[102]  1 from random import randint as ri
       2 print(ri(1,100))
```

```
14
```

Function “randint “from module random

Only “randint” was imported

The name of “randint” was replaced by “ri”

5- Examples of some Libraries

Third-party libraries

- **Numpy:** is the fundamental package for scientific computing with Python

- **Pandas:** is an open source, BSD-licensed library providing high-performance, easy-to-use data structures and data analysis tools for the Python programming language.

- **Matpolotlib:** is a Python 2D plotting library

- **Tensorflow:** An open source machine learning framework for everyone. It is a software library for high performance numerical computation.

Third-party libraries

- **Numpy:**

```
[5]  import numpy as np
     # create an array wih a range of integers from 0 to 5
     a = np.arange(6)
     print(a)

     # transoform the array into a (2,3) dimension array
     a=a.reshape(2,3)
     print(a)
```

```
[0 1 2 3 4 5]
[[0 1 2]
 [3 4 5]]
```

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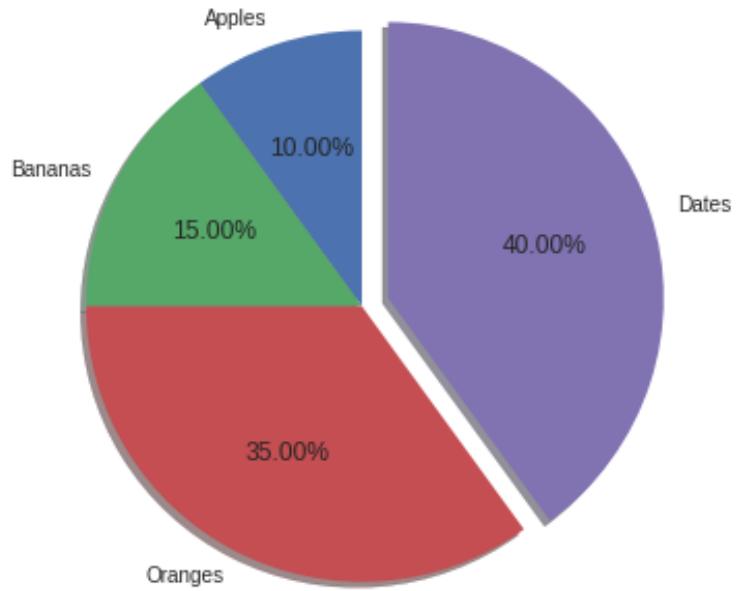
5- Examples of some Libraries

Third-party libraries

- **Matplotlib:**

```
import matplotlib.pyplot as plt
# Pie chart
labels = 'Apples', 'Bananas','Oranges', 'Dates' #names of the pie slices
sizes = [10, 15, 35, 40] # size of each slice
explode = (0,0,0,0.1 )   # explode the bigest slice (with 0.1 value)
fig, ax = plt.subplots()
ax.pie(sizes, explode=explode, labels=labels, autopct='%1.2f%%',shadow=True, startangle=90)
ax.axis('equal')  # The pie has a circle form
plt.show()
```



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6- Installing Libraries in Google Colab

! pip install

```
[ ]
# To determine which version you're using:
!pip show tensorflow

# For the current version:
!pip install --upgrade tensorflow

# For a specific version:
!pip install tensorflow==1.2

# For the latest nightly build:
!pip install tf-nightly
```

From:(https://colab.research.google.com/notebooks/snippets/importing_libraries.ipynb)

apt-get

```
[ ]
!apt-get install r-base
```

After !apt-get update

References

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Thank you!

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