Python Tutorial Series 2019
Basics 1: Python Overview

Ph.D. Bruno C. Quint
bquint@gemini.edu
Data Process Developer
SUSD - GEMINI South, La Serena, Chile

Table of Contents

What is Python?

High level interpreted programming language developed for fast development

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

10110001010010010010

What is Python?

High level interpreted **programming language** developed for fast development

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

10110001010010010010

What is Python?

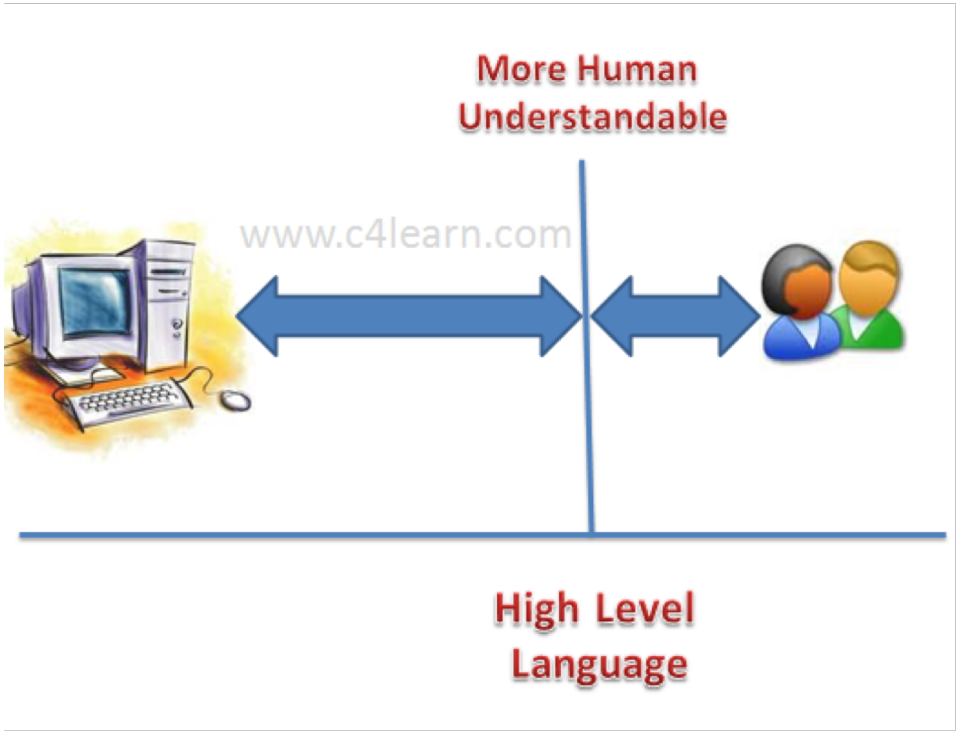
High level **interpreted** programming language developed for fast development

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

10110001010010010010

What is Python?

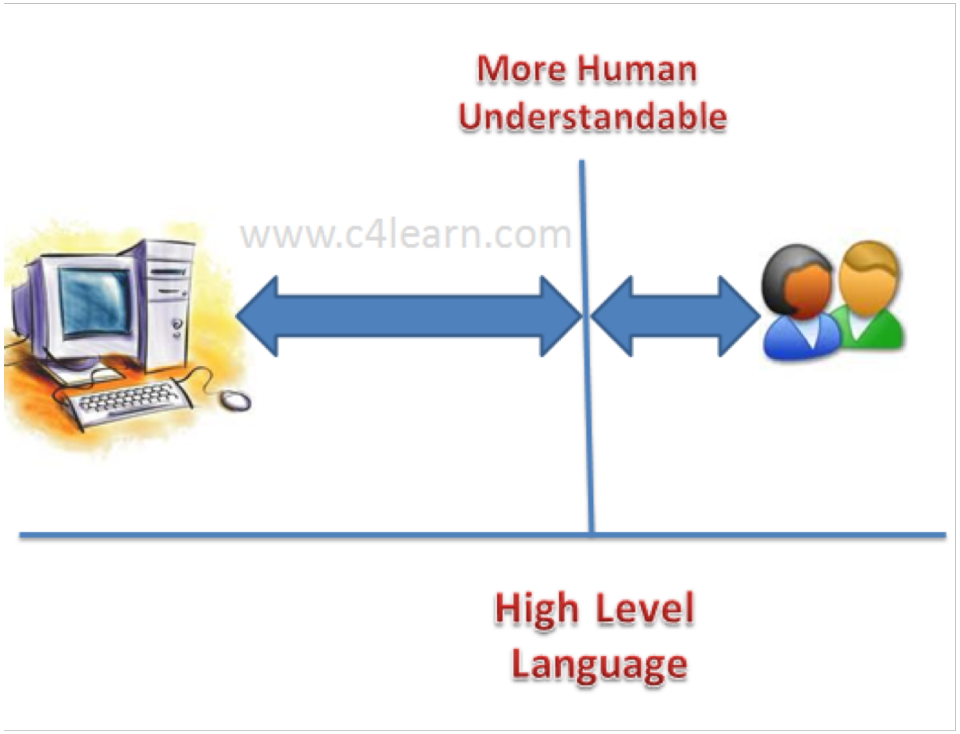
High level interpreted programming language developed for fast development




```
if x is not 5:
    print("Blah")
```

What is Python?

High level interpreted programming language **developed for fast development**




```
if x is not 5:
....print("Blah")
```

What will you need?

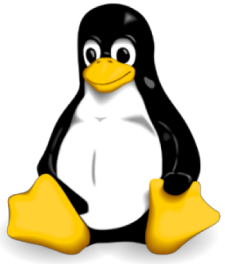
- **Computer**
- Operational System
- Python
- Python Libs
- Text Editors
- Integrated Development Environment (IDE)

What will you need?

- Computer
- **Operational System**
- Python
- Python Libs
- Text Editors
- Integrated Development Environment (IDE)

Windows

MacOs



Linux ™ Distributions

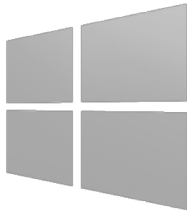
Linux Mint ™

Ubuntu ™

CentOS ™

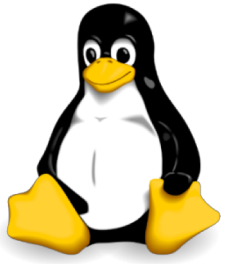
What will you need?

- Computer
- **Operational System**
- Python
- Python Libs
- Text Editors
- Integrated Development Environment (IDE)



Windows

MacOs



Linux ™ Distributions

Linux Mint ™

Ubuntu ™

CentOS ™

What will you need?

- Computer
- Operational System
- **Python**
- Python Libs
- Text Editors
- Integrated Development Environment (IDE)

https://www.python.org/

2.x 3.x

What will you need?

- Computer
- Operational System
- **Python**
- Python Libs
- Text Editors
- Integrated Development Environment (IDE)

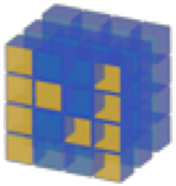
https://www.python.org/

2.x 3.x

Python 2.x is legacy,
Python 3.x is the present and future of the language.
https://wiki.python.org/moin/Python2orPython3

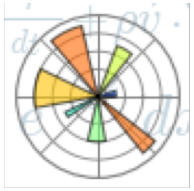
What will you need?

- Computer
- Operational System
- Python
- **Python Libs**
- Text Editors
- Integrated Development Environment (IDE)



NumPy
Numerical Python

SciPy
Scientifical Python



MatPlotLib
Python Plotting

AstroPy
Astronomical Python

Jupyter
Python Notebooks

Conda
Python Package Manager

What will you need?

- Computer
- Operational System
- Python
- Python Libs
- **Text Editors**
- Integrated Development Environment (IDE)

GEdit

Vim

Notepad

EMACS

What will you need?

- Computer
- Operational System
- Python
- Python Libs
- Text Editors
- **Integrated Development Environment (IDE)**

PyCharm

ATOM

What will you need?

- Computer
- Operational System
- Python
- Python Libs
- Text Editors
- **Integrated Development Environment (IDE)**

PyCharm

ATOM

Python as a terminal Getting Started

Start typing

```
$ python
```

Python as a terminal

Getting Started

Start typing

```
$ python
```

Say “Hello World!”

```
>>> print(“Hello World”)
Hello World
```

Python as a terminal

Getting Started

Start typing

```
$ python
```

Say “Hello World!”

```
>>> print(“Hello World”)
Hello World
```

Assign a variable

```
>>> x = 2
>>> print(x)
2
```

Python as a terminal

Getting Started

Start typing

```
$ python
```

Say “Hello World!”

```
>>> print(“Hello World”)
Hello World
```

Assign a variable

```
>>> mag_V = 28.1970
>>> print(mag_V)
28.1970
```

Python as a terminal Getting Started

Start typing

```
$ python
```

Say “Hello World!”

```
>>> print(“Hello World”)
Hello World
```

Assign a variable

```
>>> mag_V = 28.1970
>>> print(mag_V)
28.1970
```

Which version am I using?

```
$ python --version
Python 3.6.7 :: Anaconda, Inc.
```

Python as a script

File “**say_hello_world.py**”

```
01 print(“Hello World”)
```

To run this file:

```
$ cd path_to_my_python_file
$ python say_hello_world.py
Hello World
```

Python as a script

File “**say_hello_world.py**”

```
01 #!/path/to/python
02 print(“Hello World”)
```

To run this file:

```
$ cd path_to_my_python_file
$ chmod a+x say_hello_world.py
$ ./say_hello_world.py
Hello Python
```

Python as a script

File “**say_hello_world.py**”

```
01 #!/path/to/python
02 print(“Hello W
```

```
#!/usr/bin/env python
#!/usr/bin/python
#!/usr/local/bin/python
#! python
```

To run this file:

```
$ cd path_to_my_python_file
$ chmod a+x say_hello_world.py
$ ./say_hello_world.py
Hello Python
```

Python as a script

File “**say_hello_world.py**”

```
01 #!/path/to/python
02 print(“Hello W
```

```
#!/usr/bin/env python
#!/usr/bin/python
#!/usr/local/bin/python
#! python
```

To run this file:

```
$ cd path_to_my_python_file
$ chmod a+x say_hello_world.py
$ ./say_hello_world.py
Hello Python
```

Python as a script

File “**say_hello_world.py**”

```
01 #!/path/to/python
02 print(“Hello W
```

```
#!/usr/bin/env python
#!/usr/bin/python
#!/usr/local/bin/python
#! python
```

To run this file:

```
$ cd path_to_my_python_file
$ chmod a+x say_hello_world.py
$ ./say_hello_world.py
Hello Python
```

Python as a script

File “**use_coding.py**”

```
01 #!/path/to/python
02 # -*- coding: utf8 -*-
03 print(“aá eé cç”)
```

To run this file:

```
path_to_file $ python use_coding.py
Aá eé cç
```

Python as a script

File "**say_hello_world.py**"

```
01 #!/path/to/python
02 # -*- coding: utf8 -*-
03 """
04 This is a docstring where information
05 about what you are doing and be written.
06 """
07 print("Hello World!")
```

To run this file:

```
path_to_file $ python say_hello_world.py
Hello World!
```

Types of variables

Integers

```
>>> 5 + 4
9

>>> 5 - 4
1

>>> 5 * 4
20

>>> 5 // 4
1
```

More on operators
(like +, -, /, *, **, >, <)
HERE

Types of variables

Integers

```
>>> 5 + 4
9

>>> 5 - 4
1

>>> 5 * 4
20

>>> 5 // 4
1
```

Float/Double

```
>>> 2.0 + 3.0
5.0

>>> 2.0 - 3
-1.0

>>> 2. * 3
6.0

>>> 2 / 3
0.666666...
```

More on operators
(like +, -, /, *, **, >, <)
HERE

Types of variables

Integers

```
>>> 5 + 4
9

>>> 5 - 4
1

>>> 5 * 4
20

>>> 5 // 4
1
```

Float/Double

```
>>> 2.0 + 3.0
5.0

>>> 2.0 - 3
-1.0

>>> 2. * 3
6.0

>>> 2 / 3
0.666666...
```

More on operators
(like +, -, /, *, **, >, <)
HERE

Types of variables

Integers

```
>>> 5 + 4
9

>>> 5 - 4
1

>>> 5 * 4
20

>>> 5 // 4
1
```

Float/Double

```
>>> 2.0 + 3.0
5.0

>>> 2.0 - 3
-1.0

>>> 2. * 3
6.0

>>> 2 / 3
0.666666...
```

More on operators
(like +, -, /, *, **, >, <)
HERE

Types of variables

Integers

```
>>> x = 2
>>> type(x)
<type 'int'>
```

Float/Double

```
>>> y = 1.
>>> x = x + y
>>> type(x)
<type 'float'>
```

Types of variables

Complex

```
>>> (2 + 3j) + (5 - 4j)
(7 - 1j)

>>> (2 + 3j) - (5 - 4j)
(-3 + 7j)

>>> (2 + 3j) * (5 - 4j)
(22 + 7j)

>>> (2 + 3j) / (5 - 4j)
(-0.049 + 0.561j)
```

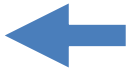
```
>>> c = (1 + 3.j)
>>> type(c)
<type 'complex'>
```

More on operators
(like +, -, /, *, **, >, <)
HERE

Types of variables

Booleans

```
>>> fruit = ‘banana’
>>> fruit == ‘apple’
False
>>> fruit != ‘apple’
True
```



Variable assignment

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Booleans

```
>>> fruit = ‘banana’
>>> fruit == ‘apple’
False
>>> fruit != ‘apple’
True
```

Assign variable

Compare variables

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Booleans

```
>>> fruit = ‘banana’
>>> fruit == ‘apple’
False
>>> fruit != ‘apple’
True
```

Assign variable

Compare variables

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Booleans

```
>>> fruit = 'banana'
>>> fruit == 'apple'
False
>>> fruit != 'apple'
True
```

```
>>> mag_V = 15.5
>>> mag_V < 10.0
False
>>> mag_V >= 10.0
True
```

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Booleans

```
>>> fruit = ‘banana’
>>> fruit == ‘apple’
False
>>> fruit != ‘apple’
True
```

```
>>> mag_V = 15.5
>>> mag_V < 10.0
False
>>> mag_V >= 10.0
True
```

```
>>> mag_V = 15.5
>>> test = mag_V < 10.0
>>> print(test)
False
```

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Booleans

```
>>> True + False
True
>>> True or False
True
```

```
>>> True * False
False
>>> True and False
False
```

```
>>> not False
True
>>> not True
False
```

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Booleans

```
>>> x = 1
>>> y = 1.
>>> x == y
True
>>> x is y
False
```

```
>>> x = 1
>>> y = 1
>>> x == y
True
>>> x is y
True
```

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Booleans

```
>>> x = 1
>>> y = 1.
>>> x == y
True
>>> x is y
False
```

```
>>> x = 1
>>> y = 1
>>> x == y
True
>>> x is y
True
```

More on boolean operators
(like +, *, ==, !=, <, >, <=, >=, is, not)
HERE

Types of variables

Lists

```
>>> x = [2, 4, 6, 8]
```

Sum of lists (appending)

```
>>> x + x
[2, 4, 6, 8, 2, 4, 6, 8]
```

Multiplication by integer

```
>>> 3 * x
[2, 4, 6, 8, 2, 4, 6, 8, 2,
4, 6, 8]
```

Types of variables

Lists

```
>>> x = [2, 4, 6, 8]
```

Sum of lists (appending)

```
>>> x + x
[2, 4, 6, 8, 2, 4, 6, 8]
```

Multiplication by integer

```
>>> 3 * x
[2, 4, 6, 8, 2, 4, 6, 8, 2,
4, 6, 8]
```

C-Like Indexing (from 0 to n-1)

```
>>> x[0] # First element
2
```

```
>>> x[3] # 4th element
8
```

```
>>> x[-1] # Last element
8
```

Types of variables

Lists

```
>>> x = [2, 4, 6, 8]
```

Slicing

```
>>> x[0:2]
[2, 4]
```

```
>>> x[i:j]
i – start index
j – last index (exclusive)
```

Types of variables

Lists

```
>>> x = [2, 4, 6, 8]
```

Slicing

```
>>> x[0:2]
[2, 4]
```

0-index can be omitted

```
>>> x[:2]
[2, 4]
```

```
>>> x[i:j]
i – start index
j – last index (exclusive)
```

Types of variables

Lists

```
>>> x = [2, 4, 6, 8]
```

```
>>> x[i:j]
i – start index
j – last index (exclusive)
```

Slicing

```
>>> x[0:2]
[2, 4]
```

0-index can be omitted

```
>>> x[:2]
[2, 4]
```

-1 can be used as limit too!

```
>>> x[1:-1]
[4, 6]
```

Types of variables

Lists

```
>>> x = [2, 4, 6, 8]
```

```
>>> x[i:j]
i – start index
j – last index (exclusive)
```

Slicing

```
>>> x[0:2]
[2, 4]
```

0-index can be omitted

```
>>> x[:2]
[2, 4]
```

-1 can be used as limit too!

```
>>> x[1:-1]
[4, 6]
```

Go until the end of the list!

```
>>> x[2:]
[6, 8]
```

Types of variables

Lists

```
>>> y = [1, 4, 9, 16, 25, 36, 49]
```

Slicing with steps

```
>>> y[0:6:2]
[1, 9, 25]
```

```
>>> x[i:j:k]
i – start index
j – last index (exclusive)
k – step
```

Types of variables

Lists

```
>>> y = [1, 4, 9, 16, 25, 36, 49]
```

Slicing with steps

```
>>> y[0:6:2]
[1, 9, 25]
```

Last index 6 can be omitted

```
>>> y[1:6:2]
[4, 16, 36]
```

```
>>> x[i:j:k]
i – start index
j – last index (exclusive)
k – step
```

Types of variables

Lists

```
>>> y = [1, 4, 9, 16, 25, 36, 49]
```

Slicing with steps

```
>>> y[0:6:2]
[1, 9, 25]
```

Last index 6 can be omitted

```
>>> y[1:6:2]
[4, 16, 36]
```

Easily revert lists!

```
>>> y[::-1]
[6, 5, 4, 3, 2, 1, 0]
```

```
>>> x[i:j:k]
i - start index
j - last index (exclusive)
k - step
```

Types of variables

Lists

```
>>> y = [1, 4, 9, 16, 25, 36, 49]
```

One list can hold variables of diferente types!

```
>>> z = [5, 2.0, “abc”]
>>> z[1]
2.0
>>> z[2]
“abc”
```

Types of variables

Strings

```
>>> s = 'I am a string'
>>> r = “I'm another string”
```

Strings behaves like lists

```
>>> s[3]
'm'
```

Types of variables

Strings

```
>>> s = 'I am a string'
>>> r = “I'm another string”
```

Strings behaves like lists

```
>>> s[3]
'm'
```

```
>>> 5 * “xy”
'xyxyxyxyxy'
```

```
>>> s + r
“I am a stringI'm another
string”
```

Types of variables

Strings

```
>>> s = 'I am a string'
>>> r = “I'm another string”
```

Strings behaves like lists

```
>>> s[3]
'm'
```

```
>>> 5 * “xy”
'xyxyxyxyxy'
```

```
>>> s + r
“I am a stringI'm another
string”
```

Format using **.format()**

```
>>> x = 7
>>> print(“Number: {:03d}”.format(x))
Number 003
```

Python – Format mini language specs

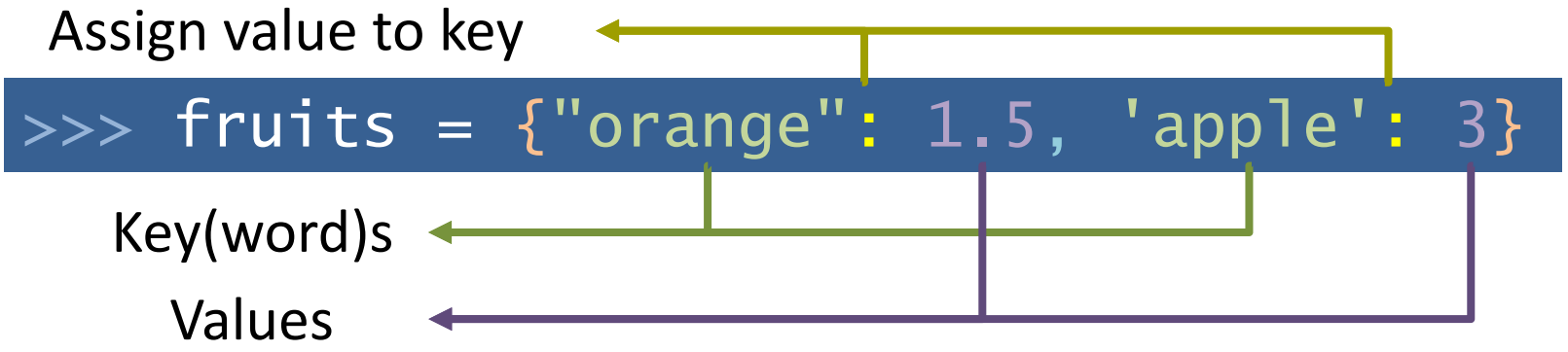
Types of variables

Dictionaries

```
>>> fruits = {"orange": 1.5, 'apple': 3}
```

Types of variables

Dictionaries



Types of variables

Dictionaries

Creating a dictionary and accessing its elements

```
>>> fruits = {"orange": 1.5, 'apple': 3}
>>> fruits['apple']
3
```

Types of variables

Dictionaries

Creating a dictionary and accessing its elements

```
>>> fruits = {"orange": 1.5, 'apple': 3}
>>> fruits['apple']
3
```

```
>>> fruits = dict(orange=1.5, apple=3)
>>> fruits['apple']
3
```

Types of variables

Dictionaries

Creating a dictionary and accessing its elements

```
>>> fruits = {"orange": 1.5, 'apple': 3}
>>> fruits['apple']
3
```

Adding elements to a dictionary

```
>>> fruits['banana'] = None
>>> print(fruits)
{'apple': 3, 'orange': 1.5, 'banana': None}
```

Types of variables

Dictionaries

Creating a dictionary and accessing its elements

```
>>> fruits = {"orange": 1.5, 'apple': 3}
>>> fruits['apple']
3
```

Check if a dictionary has an element

```
>>> 'apple' in fruits
True
>>> 'kiwi' in fruits
False
```

Types of variables

Exercises

Click here to access the GitHub Page.

- Review code syntax and make sure you can run it.
- Give a meaningful name for x, y, and z.
- Group code parts only using blank lines.
- Let your code breath by adding spaces before and after =.
- Check if it prints the expected output:

```
I bought 5 oranges
and I will give you 1.
Then I will divide between
8 people.
Each one will receive 0.5 oranges.
```

Questions?