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# Introduction to Python



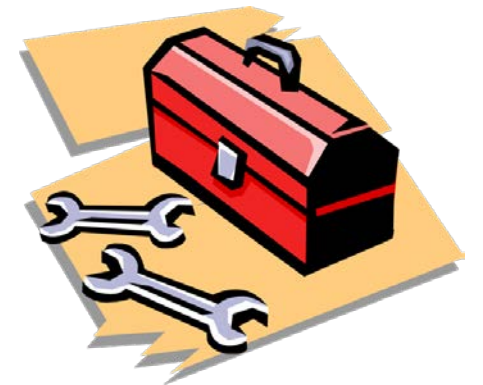
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## WHAT IS PYTHON?

- Invented by a Dutch programmer Guido van Rossum as a “hobby” during Christmas week, 1989
- Name comes from “Monty Python”
- Open source
- Companies: Instagram, Amazon, Facebook, SurveyMonkey...
- Design philosophy: “Readability counts”





# Why PYTHON?

## Python Programming Language



Easy

Useful

Powerful

Popular

General Purpose

Large Libraries

#Python

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

#Java

```
public class Main {  
    public static void main(String[ ] args) {  
        System.out.println( "Hello, World!" );  
    }  
}
```



- One of the most popular programming languages

Interest over time

Google Trends

● Python ● C++



United States. Past 12 months. Web Search.

- Top Ten Languages of 2018

Language Rank	Types	Spectrum Ranking
1. Python	🌐 🖥️ 📱	100.0
2. C++	📱 🖥️ 📱	99.7
3. Java	🌐 📱 🖥️	97.5
4. C	📱 🖥️ 📱	96.7
5. C#	🌐 📱 🖥️	89.4
6. PHP	🌐	84.9
7. R	🖥️	82.9
8. JavaScript	🌐 📱	82.6
9. Go	🌐 🖥️	76.4
10. Assembly	📱	74.1

Source: IEEE(Institute of Electrical and Electronics Engineers)

[Spectrum's fifth annual interactive ranking of the top programming languages](#)



## PYTHON IS USED FOR

- Web Development
- Data Analysis/visualization
- Machine Learning
- Web Scraping



- Over 6 million users
  - Works on Linux, Windows, and Mac
  - 1400+ packages pre-installed
  - IDEs including: Jupyter, JupyterLab, Spyder, and RStudio
- [Anaconda](#)



## DATA TYPES

Python knows various types of data. Common ones are:

- Strings – “a”, “hi”
- Integer numbers – 2, 4, 6,
- Floating point numbers – 3.14, 2.0, 2.12
- Boolean – True/False



## CHECK AND CHANGE TYPES BUILT-IN FUNCTION type

In [50]:

```
1 print(type(int("3")))
2 print(str(3))
3 print(float(3))
```

```
<class 'int'>
3
3.0
```





## PRINT TEXT

```
In [18]: 1 print ("Hello World!")
          2 print ('Hello World!')
          3
          4 print ("I'm a girl")
          5 print('I\'m a girl') "escape" character.
          6
          7 "Hello World!"
          8
```

```
Hello World!
Hello World!
I'm a girl
I'm a girl
```

```
Out[18]: 'Hello World!'
```



# Arithmetic Operators

Operator	Meaning	Example
<b>+</b>	Addition	$4 + 7 \longrightarrow 11$
<b>-</b>	Subtraction	$12 - 5 \longrightarrow 7$
<b>*</b>	Multiplication	$6 * 6 \longrightarrow 36$
<b>/</b>	Division	$30 / 5 \longrightarrow 6$
<b>%</b>	Modulus	$10 \% 4 \longrightarrow 2$
<b>//</b>	Quotient	$18 // 5 \longrightarrow 3$
<b>**</b>	Exponent	$3 ** 5 \longrightarrow 243$



# USE AS A CALCULATOR MATHEMATIC OPERATORS

+, -, /, \*, %

```
In [1]: 1 3+4  
        2
```

Out[1]: 7

```
In [2]: 1 ((5+6-1)*2/5)**2  
        2
```

Out[2]: 16.0

# Exercise 1:

# Radius=5,  $\pi=3.14$ , calculate the area of the circle



## OPERATORS WORK DIFFERENTLY BASE ON DATA TYPE

```
In [ ]: 1 print("Hello"+"World")
```

```
In [ ]: 1 print("Hello"*3)
```

```
In [46]: 1 print("Hello"+"World")
```

```
HelloWorld
```

```
In [2]: 1 print("Hello"*3)
```

```
HelloHelloHello
```



# LOGIC OPERATORS <, >, ==, !=, <=, >= AND STATEMENTS and, or, not RETURN BOOLEAN DATA TYPE

```
In [10]: 1 3>7
```

```
Out[10]: False
```

```
In [11]: 1 True and False
```

```
Out[11]: False
```

```
In [12]: 1 True or False
```

```
Out[12]: True
```

```
In [13]: 1 not True
```

```
Out[13]: False
```



# INPUT

How old are you?

How old are you?

```
How old are you?6  
Your age is 6
```

```
In [20]: 1 Age = input("How old are you?")  
        2 print ("Your age is ",Age)
```

## #Exercise 2:

Create a variable affiliation, prompt a question, "Are you a student or a staff member?"

```
print "You are a " + input
```



# ASSIGNING VARIABLES

In [28]:

```
1 a = 3
2 b = 4
3
4 c = a + b
5 d = a*b + c
6 e = a**b/c
7
8 print (c)
9 print (d)
10 print (e)
11
```

7

19

11.571428571428571



## USER-DEFINED FUNCTION

In [26]:

```
1 def C_F(C):
2     F = 1.8*C+32
3     return F
4
5 temp = C_F(20)
6 print(temp)
7
```

68.0

Exercise 3: Create a BMI function and calculate BMI for person1 and person2. BMI = weight/height<sup>2</sup>

# person1: height:1.65m, weight:60kg

# person2: height:1.75m, weight:75kg

```
5 def BMI(H,W):
6     bmi=
7
8 person1 =
9 person2 =
10 print(person1)
11 print(person2)
```

```
5 def BMI(H,W):
6     bmi=W/H**2
7     return bmi
8 person1 = BMI(1.65,60)
9 person2 = BMI(1.75,75)
10 print(person1)
11 print(person2)
```

22.03856749311295

24.489795918367346





# BASIC DATA STRUCTURES IN PYTHON

- Lists `[1,2,3]` ordered and changeable
- Tuples `(1,2,3)` ordered and unchangeable
- Dictionary `{'a': 1, 'b':2, 'c':3}` unordered, changeable and indexed

# LIST

## Create a list:

```
1 mylist = ['apple', 'orange', 'banana']
2 print (mylist)
```

```
['apple', 'orange', 'banana']
```

## Access item:

```
1 mylist = ['apple', 'orange', 'banana']
2 print (mylist[1])
```

```
orange
```

## Change Item Value:

```
1 mylist = ['apple', 'orange', 'banana']
2 mylist[1] = 'cherry'
3 print (mylist)
```

```
['apple', 'cherry', 'banana']
```

## Add Items:

```
1 mylist = ['apple', 'orange', 'banana']
2 mylist.append('pear')
3 print (mylist)
```

```
['apple', 'orange', 'banana', 'pear']
```

## Remove Items:

```
1 mylist = ['apple', 'orange', 'banana']
2 mylist.remove('apple')
3 print (mylist)
```

```
['orange', 'banana']
```

## Exercise 4:

- 1) Create a list of your favorite songs, print the list
- 2) Print the 3<sup>rd</sup> item in the list
- 3) Change the 3<sup>rd</sup> item into another song
- 4) Add one more song
- 5) Remove one song



## CONTROL FLOW – IF/ELSE

In [31]:

```
1 GPA = 4.0
2 if GPA >3.8 and GPA <= 4.0:
3     print ("Welcome to Rice!")
4 elif GPA <= 3.8:
5     print ("Sorry")
6 else:
7     print ("Oops, type a GPA in range")
```

Welcome to Rice!

Exercise 5: Create a variable called "behavior", assign a value "good" to it

```
# if "good" print "candy"
# elif "bad" print "no candy"
# else print "ask your mom"
```



## CONTROL FLOW – FOR LOOP

```
1 for x in range(1,6):  
2     print (x)
```

```
1  
2  
3  
4  
5
```

### Exercise 6

Create a list called "animals" and put "cat","dog","pig"...in it  
Use for loop to print each one out

```
5 animals=['cat','dog','pig']  
6 for x in animals:  
7     print (x)|
```

```
cat  
dog  
pig
```



## Useful Libraries

- Beautiful Soup – web scraping
- NumPy – advance math functionalities
- Matplotlib – [graphs](#)
- Pandas – data structures and data analysis tools



## Tell us your thoughts

- <https://library.rice.edu/requests/course-evaluation-form>

# What Does Research Data Services Provide?

<https://library.rice.edu/research-data-services>

- Offers Data @ Rice Workshops on Python, R, Excel, etc.
- Consults on managing data, acquiring data, using applications such as Python, R, SPSS & Excel, etc.
- Reviews draft data management plans
- Teaches custom workshops on request

## Data Office Hours

Prefer a one-on-one consultation? Drop by our office hours **3:00 p.m.-4:00 p.m. on Tuesdays** or **12:30-1:30 p.m. on Thursdays** in the GIS-Data Center classroom (basement of Fondren Library), or schedule an appointment at <https://library.rice.edu/data-assistance>.

The screenshot shows the Rice University Research Data Services website. At the top, there is a navigation bar with links for Services, Places, Equipment, Floor Maps, Contact Us, Visitor Information, FAQ, My Account, and Log out. Below the navigation bar is a header for "Research Data Services" with buttons for View, Edit, and Revisions. A large image of laboratory glassware is displayed. To the right of the image is a contact information box with an email address (researchdata@rice.edu) and phone number ((713) 348-2480). Below this are buttons for "Short Course List", "Register for a Class", and "Request Data Assistance". Further down are buttons for "Address & Location", "Guides", "Links", and "People". At the bottom, there are sections for "Our Services, Requests and More", "Services: Training and Research", "Requests: Training and Research", and "Expertise: Data Management, Data Wrangling, Digital Preservation, Humanities Data, Metadata, Microsoft Access, Microsoft Excel, MySQL, Python, R". A "Classes & Events" section lists "Introduction to R" and "Introduction to IBM SPSS Statistics".