WELCOME TO PYTHON PROGRAMMING!

A PYTHON BOOTCAMP

Center for Continuing Education AND ViSER LLC

April 27 - 30, 2020

BOOTCAMP AGENDA

	BACKGROUND AND INSTALLATION
APRIL 27	INTRO TO PYTHON BASICS Data types, operators, type conversion etc STRING PARSING AND FORMATTING
APRIL 28	DEFINING FUNCTIONS USING LOOPS AND CONDITIONS: • If-then-else (CONDITIONS) • for AND while (LOOPS)
APRIL 29	DATA STRUCTURES Lists and its functions, Dictionary, Numpy array
APRIL 30	DRAWING GRAPHS • Using Matplotlib package: Scatter plot, Line chart, Bar chart, Histogram • Intro to other plotting packages

INTRODUCTION

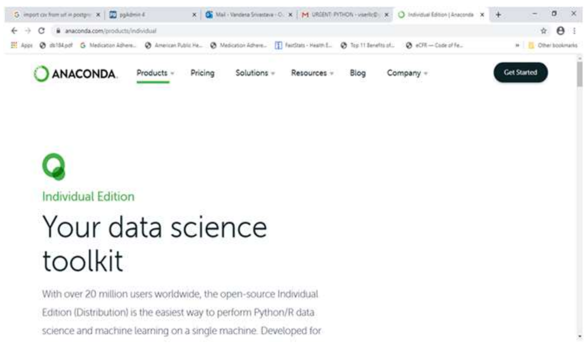
- Created by *Guido van Rossum* and first released in 1991
- Meant to be an easily readable
  - often uses English keywords
- Top programming language (IEEE – 2018 and 2019)
  - simple to use
  - vast application in Data Analysis and other fields (Machine Learning)
  - salary and job openings in 2019 (codeplatoon.org)
- Interpreted language
  - easy to debug
- Extensive support libraries
  - many programs are already embedded in libraries and reduce the length of the code
- Open source language
  - freely available for the programmers to download and distribute for commercial use
- Cross-platform
  - supports all the major platforms such as windows, Linux, Macintosh

INSTALLATION (ANY ONE OF THE TWO)

- Integrated development environment (IDE):
  - environment for writing, editing, debugging and running Python programs
  - IDLE, PyCharm, Eclipse with Pydev, Sublime Text 3 etc

Anaconda Distribution

(**https://www.anaconda.com/products/individual**

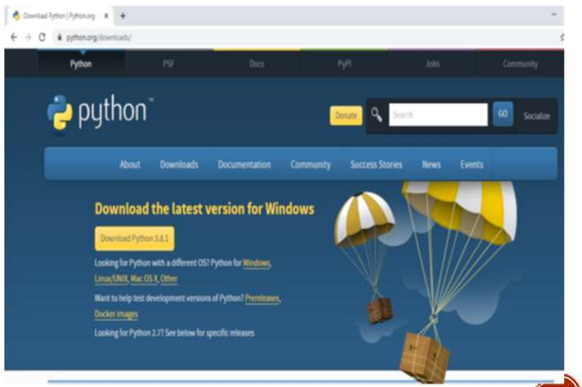


Individual Edition

Your data science toolkit

With over 20 million users worldwide, the open-source Individual Edition (Distribution) is the easiest way to perform Python/R data science and machine learning on a single machine. Developed for

(https://www.python.org/downloads/) for windows , Linux/UNIX, Mac OS X,



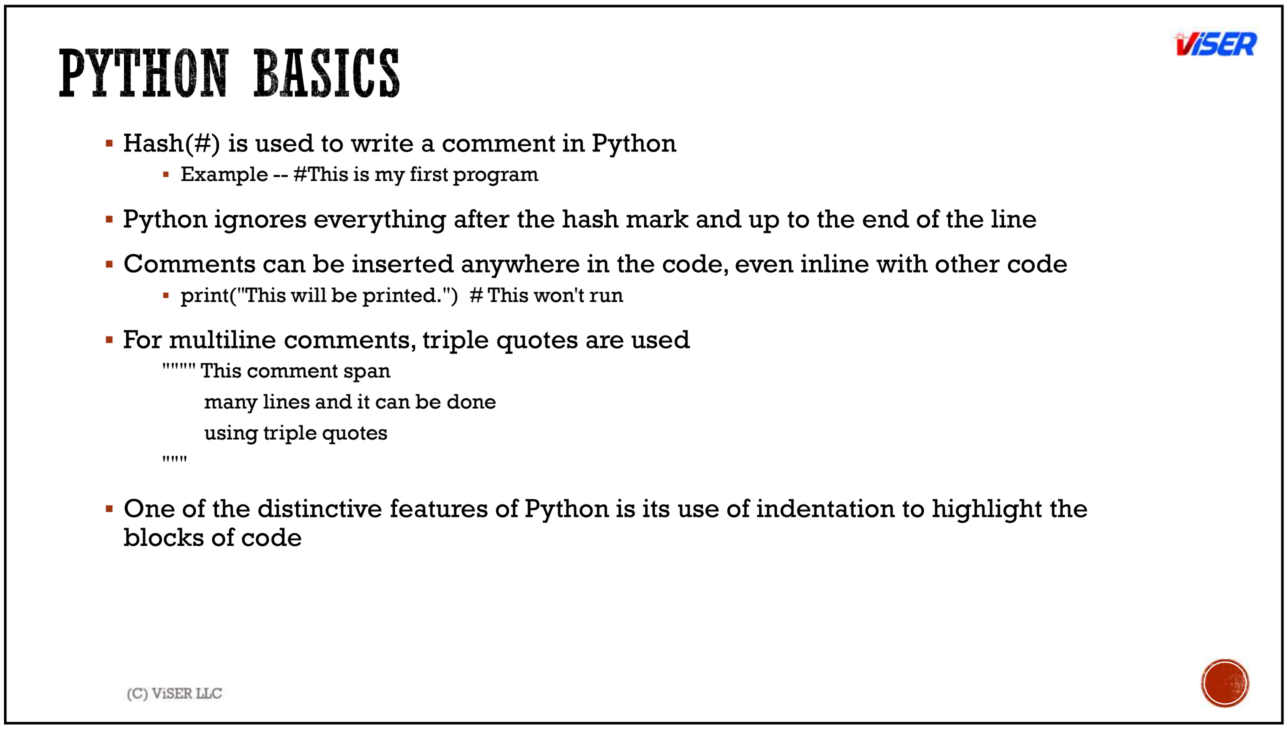
Download the latest version for Windows

Looking for Python with a different OS? Python for Windows, Linux/UNIX, Mac OS X, Other

Want to help test development versions of Python? Prereleases, Docker images

Looking for Python 2.7? See below for specific releases

- Type "jupyter notebook" in the windows search bar at the bottom of the screen to launch Jupyter



PYTHON BASICS

- Hash(#) is used to write a comment in Python
  - Example -- #This is my first program
- Python ignores everything after the hash mark and up to the end of the line
- Comments can be inserted anywhere in the code, even inline with other code
  - print("This will be printed.") # This won't run
- For multiline comments, triple quotes are used

```
""""" This comment span
      many lines and it can be done
      using triple quotes
"""
```

- One of the distinctive features of Python is its use of indentation to highlight the blocks of code

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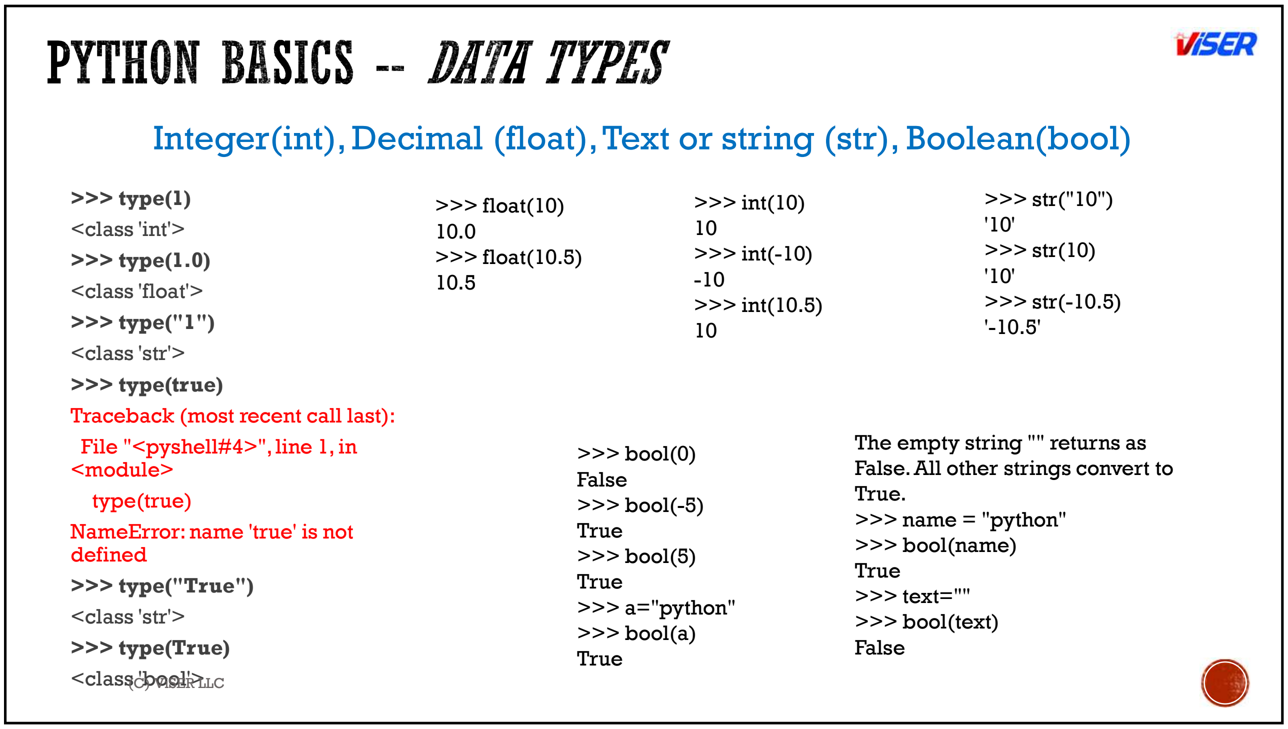

PYTHON BASICS -- *DATA TYPES*

Integer(int), Decimal (float), Text or string (str), Boolean(bool)

```
>>> type(1)
<class 'int'>
>>> type(1.0)
<class 'float'>
>>> type("1")
<class 'str'>
>>> type(true)
Traceback (most recent call last):
 File "<pyshell#4>", line 1, in <module>
   type(true)
NameError: name 'true' is not defined
>>> type("True")
<class 'str'>
>>> type(True)
<class 'bool'>
```

```
>>> float(10)
10.0
>>> float(10.5)
10.5
```

```
>>> int(10)
10
>>> int(-10)
-10
>>> int(10.5)
10
```

```
>>> str("10")
'10'
>>> str(10)
'10'
>>> str(-10.5)
'-10.5'
```

```
>>> bool(0)
False
>>> bool(-5)
True
>>> bool(5)
True
>>> a="python"
>>> bool(a)
True
```

The empty string "" returns as False. All other strings convert to True.

```
>>> name = "python"
>>> bool(name)
True
>>> text=""
>>> bool(text)
False
```

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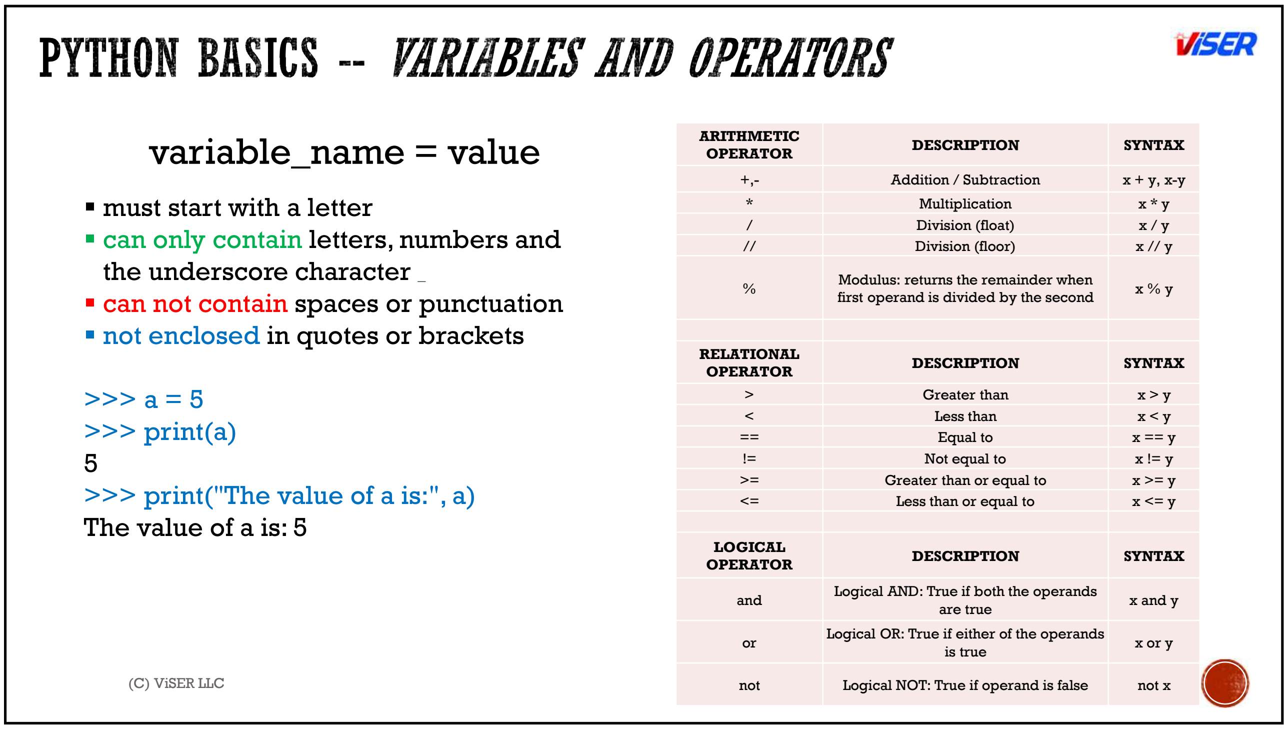


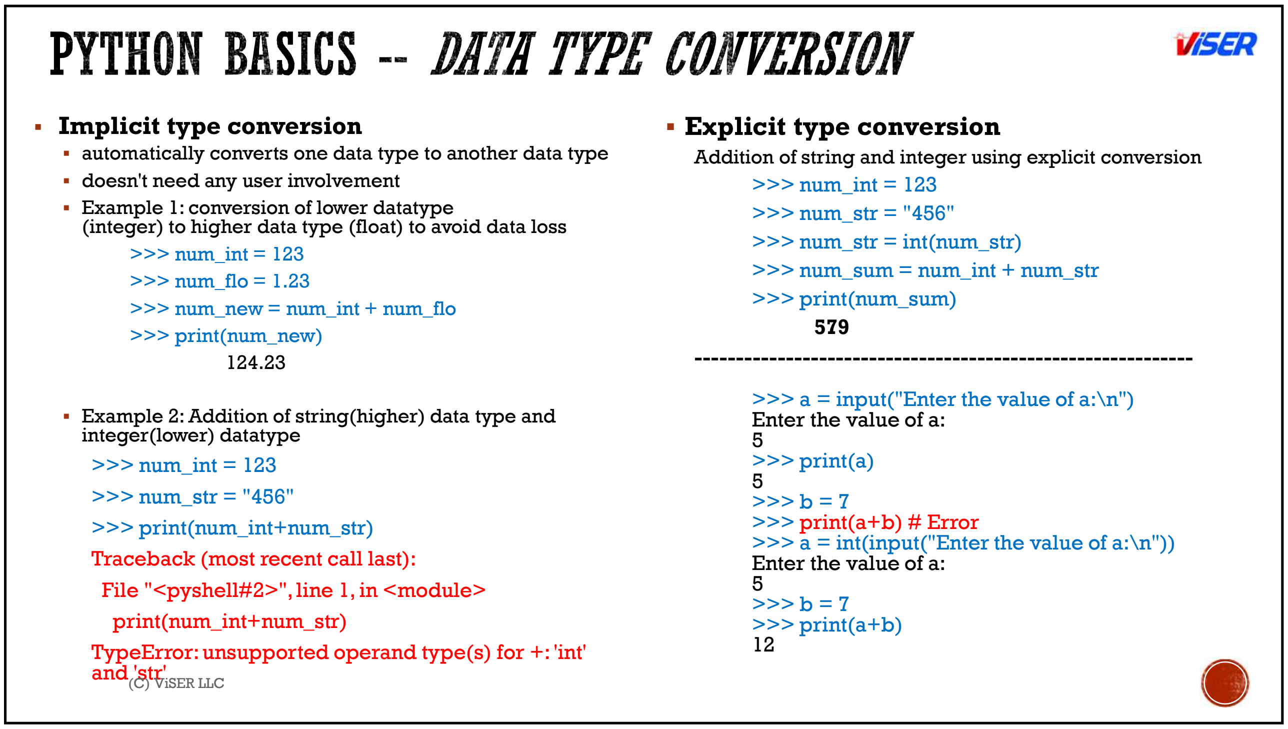
PYTHON BASICS -- *VARIABLES AND OPERATORS*

variable_name = value

- must start with a letter
- can only contain letters, numbers and the underscore character _
- can not contain spaces or punctuation
- not enclosed in quotes or brackets

```
>>> a = 5
>>> print(a)
5
>>> print("The value of a is:", a)
The value of a is: 5
```

ARITHMETIC OPERATOR	DESCRIPTION	SYNTAX
+,-	Addition / Subtraction	x + y, x-y
*	Multiplication	x * y
/	Division (float)	x / y
//	Division (floor)	x // y
%	Modulus: returns the remainder when first operand is divided by the second	x % y
RELATIONAL OPERATOR	**DESCRIPTION**	**SYNTAX**
>	Greater than	x > y
<	Less than	x < y
==	Equal to	x == y
!=	Not equal to	x != y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y
LOGICAL OPERATOR	**DESCRIPTION**	**SYNTAX**
and	Logical AND: True if both the operands are true	x and y
or	Logical OR: True if either of the operands is true	x or y
not	Logical NOT: True if operand is false	not x



PYTHON BASICS -- *DATA TYPE CONVERSION*

- **Implicit type conversion**
  - automatically converts one data type to another data type
  - doesn't need any user involvement
  - Example 1: conversion of lower datatype (integer) to higher data type (float) to avoid data loss

```
>>> num_int = 123
>>> num_flo = 1.23
>>> num_new = num_int + num_flo
>>> print(num_new)
    124.23
```

  - Example 2: Addition of string(higher) data type and integer(lower) datatype

```
>>> num_int = 123
>>> num_str = "456"
>>> print(num_int+num_str)
Traceback (most recent call last):
  File "<pyshell#2>", line 1, in <module>
    print(num_int+num_str)
TypeError: unsupported operand type(s) for +: 'int' and 'str'
```

- **Explicit type conversion**

Addition of string and integer using explicit conversion

```
>>> num_int = 123
>>> num_str = "456"
>>> num_str = int(num_str)
>>> num_sum = num_int + num_str
>>> print(num_sum)
    579
```

```
>>> a = input("Enter the value of a:\n")
Enter the value of a:
5
>>> print(a)
5
>>> b = 7
>>> print(a+b) # Error
>>> a = int(input("Enter the value of a:\n"))
Enter the value of a:
5
>>> b = 7
>>> print(a+b)
12
```

PYTHON LOOPS -- "WHILE"

while expression:
statement(s)

when the condition becomes false, the line immediately after the loop in program is executed

```
>>> count = 0
>>> while (count < 3):
        count = count + 1
        print("Hello World")
    Hello World
    Hello World
    Hello World
```

```
while condition:
    # execute these statements
else:
    # execute these statements

count = 0
while (count < 3):
   count = count + 1
   print("Hello World")
else:
   print("This block will execute")

Hello World
Hello World
Hello World
This block will execute
```

Single statement while block:

```
count = 0
while (count == 0): print("Hello World")
```

Infinite loop

suggested **not to use** this type of loops

PYTHON LOOPS -- "FOR"

for index_var in sequence:
statements(s)

```
count = 0
for i in range (1, 4):
    count = count + i
    print(count)
    1
    3
    6
```

```
# nested for loops in Python
for i in range(1, 5):
   for j in range(i):
       print(i, end=' ')
   print()

    1
    2 2
    3 3 3
    4 4 4 4
```

```
for index_var in sequence:
    # execute these statements
else:
    # execute these statements

for index in range(0,3):
   print (index)
else:
   print ("Inside Else Block")
0
1
2
Inside Else Block
```

break is used to exit a for loop
continue is used to skip the current block, and return to the "for" statement.

The **for** statement *iterates* through a collection or iterable object or generator function
The **while** statement simply loops *until a condition is False*.

PYTHON - CONDITIONAL STATEMENTS

IF conditions (single)
- Equals: a == b
- Not Equals: a != b
- Less than: a < b
- Less than or equal to: a <= b
- Greater than: a > b
- Greater than or equal to: a >= b

```
if condition 1 is true:
    # execute these statements
elif condition 2 is true:
    # execute these statements
elif condition 3 is true:
    # execute these statements
.
.
.
.
else:
    # execute these statements
```

IF conditions (multiple)

AND (example- if a > b and c > a:)
OR (example- if a > b or a > c:)

Nested If

if statements inside if statements is called *nested* if statements.

PYTHON FUNCTIONS

Creating a Function

In Python a function is defined using the def keyword

```
def my_function():
  print("Hello from a function")
```

```
def sum(x,y):
  add = x+y
  print(add)
```

Calling a Function

To call a function, use the function name- ***my_function():***

Parameters

-Information can be passed to functions as parameter

-can add as many parameters as needed, separating them with a comma

PRACTICE EXERCISES -- LOOPS/CONDITIONS/FUNCTIONS

- Write a Python program that:
  - prints all the letters of a given text
  - prints all the numbers from 0 to 6 except 3 and 6
  - accepts a word from the user and reverse it
  - will return TRUE if the two given integer values are equal and FALSE if their sum or difference is 5
  - counts the number of even and odd numbers from a series of numbers
- Write a function that:
  - To add the numbers from 0 to n where n is a given number
  - returns the sum of multiples of 3 and 5 between 0 and limit (parameter).

IMPORTANT ANNOUNCEMENTS

- All slides and jupyter notebooks are available at:

https://github.com/viserllc/CCE_Bootcamp

- Registration is open for the next bootcamp in the series:

PYTHON FOR DATA ANALYSIS

Starting Monday. May 4, 2020

- Complete the feedback form by tomorrow evening. Link will be in the chatbox
- Last class of Bootcamp is Tomorrow, May 1, 2020 at 6:00 pm

STRING PARSING

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Parsing is the process of analyzing the string of characters

capitalize()	
count()	Returns the number of times a specified value occurs in a string
endswith()	Returns true if the string ends with the specified value, else false is returned
find()	Searches the string for a specified value and returns the position of where it was found
index()	Searches the string for a specified value and returns the position of where it was found

islower() /isupper()	**Returns True if all characters in the string are lower case / upper case**
isnumeric()	Returns True if all characters in the string are numeric
isupper()	Returns True if all characters in the string are upper case
split()	Splits the string at the specified separator, and returns a list
rstrip()	Returns a right trim version of the string
splitlines()	Splits the string at line breaks and returns a list
startswith()	Returns true if the string starts with the specified value

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PYTHON DATA STRUCTURES

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List	• Can be used for any type of object, from numbers and strings to more lists • Simple to use and they're variable length, i.e. they grow and shrink • Can store heterogeneous data type
Dictionary	• It consists of key value pairs. The value can be accessed by unique key in the dictionary. • Keys are unique & mutable (can make changes) • Syntax: dictionary = {"key name": value}
Tuple	• Usually written inside parentheses to distinguish them from lists (which use square brackets), but parentheses aren't always necessary • Tuples are immutable, their length is fixed. To grow or shrink a tuple, a new tuple must be created.
Others	• Sets, Arrays etc

PYTHON DATA STRUCTURES

```
# Iterating over a list
print("List Iteration")
l = ["I", "love", "python"]
for i in l:
   print(i)
```

```
# Iterating over dictionary
print("\nDictionary
Iteration")
d = dict()
d['xyz'] = 123
d['abc'] = 345
for i in d :
   print("%s  %d" %(i, d[i]))
```

```
# Iterating over a tuple
(immutable)
print("\nTuple Iteration")
t = ("I", "love", "python")
for i in t:
   print(i)
```

SOME "LIST" FUNCTIONS

append() *list.append (element)*	Used for appending and adding elements to List.It is used to add elements to the last position of List.

insert()
list.insert(<position, element)
	Inserts an elements at specified position. Position mentioned should be within the range of List, as in this case between 0 and 4, elsewise would throw IndexError.

sum()
sum(list_name)
	Calculates sum of all the elements of List. Only for Numeric values, elsewise throws TypeError.

count()
list.count(element)
	Calculates total occurrence of given element of List

Length *len(list_name)*	Calculates total length of List.

index()
list_name.index(element[,start[,end]])
	Returns the index of first occurrence. Start and End index are not necessary parameters.

min() , *min(list_name)*	Calculates minimum of all the elements of List.
max() , *max(list_name)*	Calculates maximum of all the elements of List.
pop(), *list.pop([index])*	To Delete one or more elements, i.e. remove an element Pop: Index is not a necessary parameter, if not mentioned takes the last index.
del(), *del list.[index]*	remove: Element to be deleted is mentioned using list name and element.

remove()
list.remove(element)
	Note: Index must be in range of the List, elsewise IndexErrors occurs.

sorted(list_name)	Sorts the given list in ascending order
OR	

list_name.sort()
list_name.sort(reverse=True)
	Sorts the list in descending order

REFERENCES/RESOURCES

- https://yourstory.com/mystory/interesting-facts-about-python-language
- https://www.geeksforgeeks.org/loops-in-python/
- https://www.programiz.com/python-programming/regex
- https://www.w3resource.com/python-exercises/
- https://www.w3schools.com/python/default.asp
- Online community
  - Stack overflow