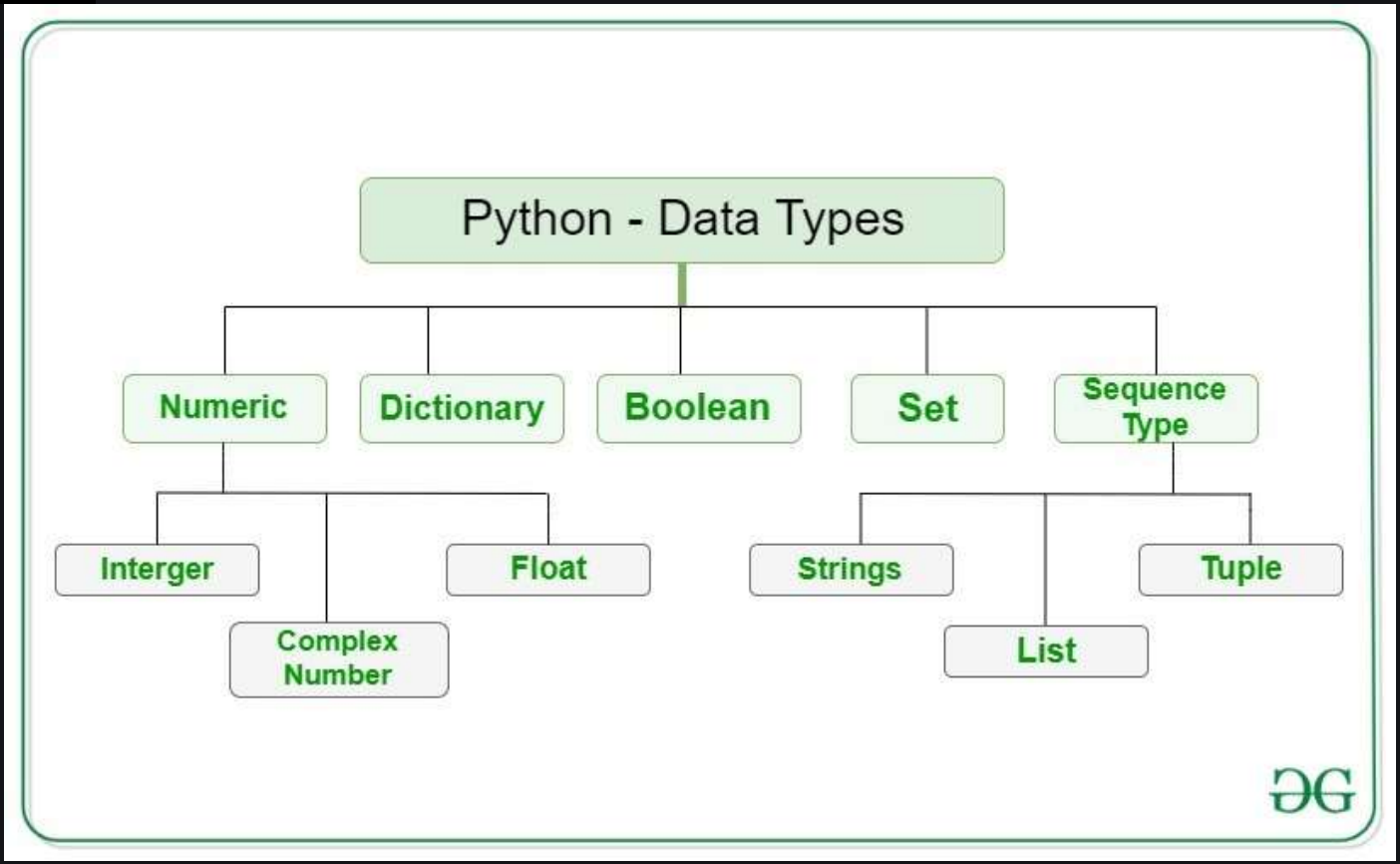
Python Data Types

Data types are the classification or categorization of data items. It represents the kind of value that tells what operations can be performed on a particular data. Since everything is an object in Python programming, data types are actually classes and variables are instances (object) of these classes. The following are the standard or built-in data types in Python:

- **Numeric**
- **Sequence Type**
- **Boolean**
- **Set**
- **Dictionary**
- **Binary Types(memoryview, bytearray, bytes)**



What is Python type() Function?

To define the values of various data types and check their data types we **use the type() function**. Consider the following examples.

- Python3

```
# DataType Output: str
x = "Hello World"
```

```python
# DataType Output: int
x = 50

# DataType Output: float
x = 60.5

# DataType Output: complex
x = 3j

# DataType Output: list
x = ["geeks", "for", "geeks"]

# DataType Output: tuple
x = ("geeks", "for", "geeks")

# DataType Output: range
x = range(10)

# DataType Output: dict
x = {"name": "Suraj", "age": 24}

# DataType Output: set
x = {"geeks", "for", "geeks"}

# DataType Output: frozenset
x = frozenset({"geeks", "for", "geeks"})

# DataType Output: bool
x = True

# DataType Output: bytes
x = b"Geeks"
```

```
# DataType Output: bytearray
x = bytearray(4)

# DataType Output: memoryview
x = memoryview(bytes(6))

# DataType Output: NoneType
x = None
```

Numeric Data Type in Python

The numeric data type in Python represents the data that has a numeric value. A numeric value can be an integer, a floating number, or even a complex number. These values are defined as Python int, Python float, and Python complex classes in Python.

- **Integers** – This value is represented by int class. It contains positive or negative whole numbers (without fractions or decimals). In Python, there is no limit to how long an integer value can be.
- **Float** – This value is represented by the float class. It is a real number with a floating-point representation. It is specified by a decimal point. Optionally, the character e or E followed by a positive or negative integer may be appended to specify scientific notation.
- **Complex Numbers** – Complex number is represented by a complex class. It is specified as *(real part) + (imaginary part)j*. For example – 2+3j

Note – type() function is used to determine the type of data type.

- Python3

```
# Python program to
# demonstrate numeric value

a = 5
print("Type of a: ", type(a))

b = 5.0
print("\nType of b: ", type(b))

c = 2 + 4j
```

```
print("\nType of c: ", type(c))
```

Output:

```
Type of a:  <class 'int'>

Type of b:  <class 'float'>

Type of c:  <class 'complex'>
```

Sequence Data Type in Python

The sequence Data Type in Python is the ordered collection of similar or different data types. Sequences allow storing of multiple values in an organized and efficient fashion. There are several sequence types in Python –

- Python String
- Python List
- Python Tuple

String Data Type

Strings in Python are arrays of bytes representing Unicode characters. A string is a collection of one or more characters put in a single quote, double-quote, or triple-quote. In python there is no character data type, a character is a string of length one. It is represented by str class.

Creating String

Strings in Python can be created using single quotes or double quotes or even triple quotes.

- Python3

```
# Python Program for
# Creation of String


# Creating a String
# with single Quotes
String1 = 'Welcome to the Geeks World'
print("String with the use of Single Quotes: ")
print(String1)


# Creating a String
```

```
# with double Quotes
String1 = "I'm a Geek"
print("\nString with the use of Double Quotes: ")
print(String1)
print(type(String1))

# Creating a String
# with triple Quotes
String1 = '''I'm a Geek and I live in a world of "Geeks"'''
print("\nString with the use of Triple Quotes: ")
print(String1)
print(type(String1))

# Creating String with triple
# Quotes allows multiple lines
String1 = '''Geeks
            For
            Life'''
print("\nCreating a multiline String: ")
print(String1)
```

Output:

```
String with the use of Single Quotes:
Welcome to the Geeks World

String with the use of Double Quotes:
I'm a Geek
<class 'str'>

String with the use of Triple Quotes:
I'm a Geek and I live in a world of "Geeks"
<class 'str'>

Creating a multiline String:
Geeks
```

```
For
Life
```

Accessing elements of String

In Python, individual characters of a String can be accessed by using the method of Indexing. Negative Indexing allows negative address references to access characters from the back of the String, e.g. -1 refers to the last character, -2 refers to the second last character, and so on.

- Python3

```
# Python Program to Access
# characters of String

String1 = "GeeksForGeeks"
print("Initial String: ")
print(String1)

# Printing First character
print("\nFirst character of String is: ")
print(String1[0])

# Printing Last character
print("\nLast character of String is: ")
print(String1[-1])
```

Output:

```
Initial String:
GeeksForGeeks

First character of String is:
G

Last character of String is:
s
```

Note – To know more about strings, refer to Python String.

List Data Type

Lists are just like arrays, declared in other languages which is an ordered collection of data. It is very flexible as the items in a list do not need to be of the same type.

Creating List

Lists in Python can be created by just placing the sequence inside the square brackets[].

- Python3

```
# Creating a List
List = []
print("Initial blank List: ")
print(List)

# Creating a List with
# the use of a String
List = ['GeeksForGeeks']
print("\nList with the use of String: ")
print(List)

# Creating a List with
# the use of multiple values
List = ["Geeks", "For", "Geeks"]
print("\nList containing multiple values: ")
print(List[0])
print(List[2])

# Creating a Multi-Dimensional List
# (By Nesting a list inside a List)
List = [['Geeks', 'For'], ['Geeks']]
print("\nMulti-Dimensional List: ")
print(List)
```

Output:

```
Initial blank List:

[]
```

```
List with the use of String:
['GeeksForGeeks']

List containing multiple values:
Geeks
Geeks

Multi-Dimensional List:
[['Geeks', 'For'], ['Geeks']]
```

Python Access List Items

In order to access the list items refer to the index number. Use the index operator [ ] to access an item in a list. In Python, negative sequence indexes represent positions from the end of the array. Instead of having to compute the offset as in List[len(List)-3], it is enough to just write List[-3]. Negative indexing means beginning from the end, -1 refers to the last item, -2 refers to the second-last item, etc.

- Python3

```python
# Python program to demonstrate
# accessing of element from list


# Creating a List with
# the use of multiple values
List = ["Geeks", "For", "Geeks"]


# accessing a element from the
# list using index number
print("Accessing element from the list")
print(List[0])
print(List[2])


# accessing a element using
# negative indexing
print("Accessing element using negative indexing")


# print the last element of list
```

```
print(List[-1])


# print the third last element of list
print(List[-3])
```

Output:

```
Accessing element from the list
Geeks
Geeks
Accessing element using negative indexing
Geeks
Geeks
```

Note – To know more about Lists, refer to Python List.

Tuple Data Type

Just like a list, a tuple is also an ordered collection of Python objects. The only difference between a tuple and a list is that tuples are immutable i.e. tuples cannot be modified after it is created. It is represented by a tuple class.

Creating a Tuple

In Python, tuples are created by placing a sequence of values separated by a 'comma' with or without the use of parentheses for grouping the data sequence. Tuples can contain any number of elements and of any datatype (like strings, integers, lists, etc.). **Note:** Tuples can also be created with a single element, but it is a bit tricky. Having one element in the parentheses is not sufficient, there must be a trailing 'comma' to make it a tuple.

- Python3

```
# Creating an empty tuple
Tuple1 = ()
print("Initial empty Tuple: ")
print(Tuple1)


# Creating a Tuple with
# the use of Strings
Tuple1 = ('Geeks', 'For')
print("\nTuple with the use of String: ")
```

```
print(Tuple1)


# Creating a Tuple with
# the use of list
list1 = [1, 2, 4, 5, 6]
print("\nTuple using List: ")
print(tuple(list1))


# Creating a Tuple with the
# use of built-in function
Tuple1 = tuple('Geeks')
print("\nTuple with the use of function: ")
print(Tuple1)


# Creating a Tuple
# with nested tuples
Tuple1 = (0, 1, 2, 3)
Tuple2 = ('python', 'geek')
Tuple3 = (Tuple1, Tuple2)
print("\nTuple with nested tuples: ")
print(Tuple3)
```

Output:

```
Initial empty Tuple:
()

Tuple with the use of String:
('Geeks', 'For')

Tuple using List:
(1, 2, 4, 5, 6)

Tuple with the use of function:
('G', 'e', 'e', 'k', 's')
```

```
Tuple with nested tuples:
((0, 1, 2, 3), ('python', 'geek'))
```

Note – The creation of a Python tuple without the use of parentheses is known as Tuple Packing.

Access Tuple Items

In order to access the tuple items refer to the index number. Use the index operator [ ] to access an item in a tuple. The index must be an integer. Nested tuples are accessed using nested indexing.

- Python3

```python
# Python program to
# demonstrate accessing tuple

tuple1 = tuple([1, 2, 3, 4, 5])

# Accessing element using indexing
print("First element of tuple")
print(tuple1[0])

# Accessing element from last
# negative indexing
print("\nLast element of tuple")
print(tuple1[-1])

print("\nThird last element of tuple")
print(tuple1[-3])
```

Output:

```
First element of tuple
1

Last element of tuple
5

Third last element of tuple
3
```

Note – To know more about tuples, refer to Python Tuples.

Boolean Data Type in Python

Data type with one of the two built-in values, True or False. Boolean objects that are equal to True are truthy (true), and those equal to False are falsy (false). But non-Boolean objects can be evaluated in a Boolean context as well and determined to be true or false. It is denoted by the class bool.

Note – True and False with capital 'T' and 'F' are valid booleans otherwise python will throw an error.

- Python3

```
# Python program to
# demonstrate boolean type


print(type(True))
print(type(False))


print(type(true))
```

Output:

```
<class 'bool'>
<class 'bool'>
Traceback (most recent call last):
  File "/home/7e8862763fb66153d70824099d4f5fb7.py", line 8, in
    print(type(true))
NameError: name 'true' is not defined
```

Set Data Type in Python

In Python, a Set is an unordered collection of data types that is iterable, mutable and has no duplicate elements. The order of elements in a set is undefined though it may consist of various elements.

Create a Set in Python

Sets can be created by using the built-in set() function with an iterable object or a sequence by placing the sequence inside curly braces, separated by a 'comma'. The type of elements in a set need not be the same, various mixed-up data type values can also be passed to the set.

- Python3

```
# Python program to demonstrate
```

```python
# Creation of Set in Python


# Creating a Set
set1 = set()
print("Initial blank Set: ")
print(set1)


# Creating a Set with
# the use of a String
set1 = set("GeeksForGeeks")
print("\nSet with the use of String: ")
print(set1)


# Creating a Set with
# the use of a List
set1 = set(["Geeks", "For", "Geeks"])
print("\nSet with the use of List: ")
print(set1)


# Creating a Set with
# a mixed type of values
# (Having numbers and strings)
set1 = set([1, 2, 'Geeks', 4, 'For', 6, 'Geeks'])
print("\nSet with the use of Mixed Values")
print(set1)
```

Output:

```
Initial blank Set:
set()

Set with the use of String:
{'F', 'o', 'G', 's', 'r', 'k', 'e'}

Set with the use of List:
{'Geeks', 'For'}
```

```
Set with the use of Mixed Values
{1, 2, 4, 6, 'Geeks', 'For'}
```

Access Set Items

Set items cannot be accessed by referring to an index, since sets are unordered the items has no index. But you can loop through the set items using a for loop, or ask if a specified value is present in a set, by using the in the keyword.

- Python3

```
# Python program to demonstrate
# Accessing of elements in a set

# Creating a set
set1 = set(["Geeks", "For", "Geeks"])
print("\nInitial set")
print(set1)

# Accessing element using
# for loop
print("\nElements of set: ")
for i in set1:
    print(i, end=" ")

# Checking the element
# using in keyword
print("Geeks" in set1)
```

Output:

```
Initial set:
{'Geeks', 'For'}

Elements of set:
Geeks For

True
```

Note – To know more about sets, refer to Python Sets.

Dictionary Data Type in Python

A dictionary in Python is an unordered collection of data values, used to store data values like a map, unlike other Data Types that hold only a single value as an element, a Dictionary holds a key: value pair. Key-value is provided in the dictionary to make it more optimized. Each key-value pair in a Dictionary is separated by a colon : , whereas each key is separated by a ‘comma’.

Create a Dictionary

In Python, a Dictionary can be created by placing a sequence of elements within curly {} braces, separated by ‘comma’. Values in a dictionary can be of any datatype and can be duplicated, whereas keys can’t be repeated and must be immutable. The dictionary can also be created by the built-in function dict(). An empty dictionary can be created by just placing it in curly braces{}. **Note** – Dictionary keys are case sensitive, the same name but different cases of Key will be treated distinctly.

- Python3

```
# Creating an empty Dictionary
Dict = {}
print("Empty Dictionary: ")
print(Dict)


# Creating a Dictionary
# with Integer Keys
Dict = {1: 'Geeks', 2: 'For', 3: 'Geeks'}
print("\nDictionary with the use of Integer Keys: ")
print(Dict)


# Creating a Dictionary
# with Mixed keys
Dict = {'Name': 'Geeks', 1: [1, 2, 3, 4]}
print("\nDictionary with the use of Mixed Keys: ")
print(Dict)


# Creating a Dictionary
# with dict() method
Dict = dict({1: 'Geeks', 2: 'For', 3: 'Geeks'})
print("\nDictionary with the use of dict(): ")
```

```
print(Dict)


# Creating a Dictionary
# with each item as a Pair
Dict = dict([(1, 'Geeks'), (2, 'For')])
print("\nDictionary with each item as a pair: ")
print(Dict)
```

Output:

```
Empty Dictionary:
{}

Dictionary with the use of Integer Keys:
{1: 'Geeks', 2: 'For', 3: 'Geeks'}

Dictionary with the use of Mixed Keys:
{1: [1, 2, 3, 4], 'Name': 'Geeks'}

Dictionary with the use of dict():
{1: 'Geeks', 2: 'For', 3: 'Geeks'}

Dictionary with each item as a pair:
{1: 'Geeks', 2: 'For'}
```

Accessing Key-value in Dictionary

In order to access the items of a dictionary refer to its key name. Key can be used inside square brackets. There is also a method called get() that will also help in accessing the element from a dictionary.

- Python3

```
# Python program to demonstrate
# accessing a element from a Dictionary


# Creating a Dictionary
Dict = {1: 'Geeks', 'name': 'For', 3: 'Geeks'}
```

```
# accessing a element using key
print("Accessing a element using key:")
print(Dict['name'])


# accessing a element using get()
# method
print("Accessing a element using get:")
print(Dict.get(3))
```

Output:

```
Accessing a element using key:
For
Accessing a element using get:
Geeks
```

Python | Set 3 (Strings, Lists, Tuples, Iterations)

Strings in Python:

A string is a sequence of characters that can be a combination of letters, numbers, and special characters. It can be declared in python by using single quotes, double quotes, or even triple quotes. These quotes are not a part of a string, they define only starting and ending of the string. Strings are immutable, i.e., they cannot be changed. Each element of the string can be accessed using indexing or slicing operations.

- Python

```
# Assigning string to a variable
a = 'This is a string'
print (a)
b = "This is a string"
print (b)
c= '''This is a string'''
print (c)
```

Output:

```
This is a string
This is a string
This is a string
```

Lists in Python:

Lists are one of the most powerful data structures in python. Lists are sequenced data types. In Python, an empty list is created using list() function. They are just like the arrays declared in other languages. But the most powerful thing is that list need not be always homogeneous. A single list can contain strings, integers, as well as other objects. Lists can also be used for implementing stacks and queues. Lists are mutable, i.e., they can be altered once declared. The elements of list can be accessed using indexing and slicing operations.

- Python

```
# Declaring a list
L = [1, "a" , "string" , 1+2]
print L
#Adding an element in the list
L.append(6)
print L
```

```
#Deleting last element from a list
L.pop()
print (L)
#Displaying Second element of the list
print (L[1])
```

The output is:

```
[1, 'a', 'string', 3]
[1, 'a', 'string', 3, 6]
[1, 'a', 'string', 3]
a
```

Tuples in Python: A tuple is a sequence of immutable Python objects. Tuples are just like lists with the exception that tuples cannot be changed once declared. Tuples are usually faster than lists.

- Python

```
tup = (1, "a", "string", 1+2)
print(tup)
print(tup[1])
```

The output is :

```
(1, 'a', 'string', 3)
a
```

Iterations in Python: Iterations or looping can be performed in python by 'for' and 'while' loops. Apart from iterating upon a particular condition, we can also iterate on strings, lists, and tuples.
Example 1: Iteration by while loop for a condition

- Python

```
i = 1
while (i < 10):
    print(i)
    i += 1
```

The output is:

```
1
2
```

3

4

5

6

7

8

9

Example 2: Iteration by for loop on the string

- Python

```
s = "Hello World"

for i in s:

    print(i)
```

The output is:

H

e

l

l

o

W

o

r

l

d

Example 3: Iteration by for loop on list

- Python

```
L = [1, 4, 5, 7, 8, 9]

for i in L:

    print(i)
```

The output is:

1

4

5

7

8

9

Example 4: Iteration by for loop for range

- Python

```
for i in range(0, 10):

    print(i)
```

The output is:

0

1

2

3

4

5

6

7

8

9