Python Data Types

In this tutorial, you will learn about different data types you can use in Python.

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Data types in Python

Every value in Python has a datatype. Since everything is an object in Python programming, data types are actually classes and variables are instance (object) of these classes.

There are various data types in Python. Some of the important types are listed below.

Python Numbers

Integers, floating point numbers and complex numbers falls under Python numbers category. They are defined as `int`, `float` and `complex` class in Python.

TUTORIAL EXAMPLES BUILT-IN FUNCTIONS

script.py IPython Shell

```
1  a = 5
2  print(a, "is of type", type(a))
3
4  a = 2.0
5  print(a, "is of type", type(a))
6
7  a = 1+2j
8  print(a, "is complex number?", isinstance(1+2j,complex))
```

Run

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Integers can be of any length, it is only limited by the memory available.

A floating point number is accurate up to 15 decimal places. Integer and floating points are separated by decimal points. `1` is integer, `1.0` is floating point number.

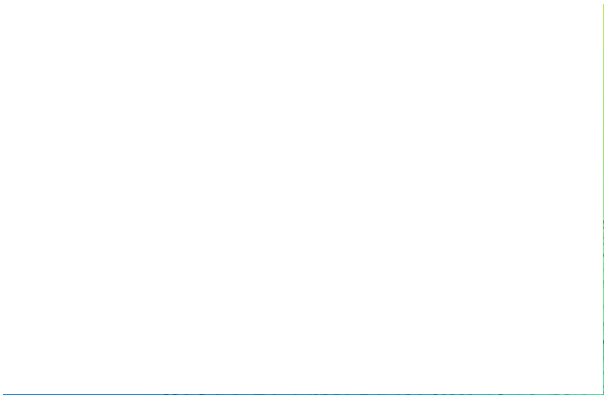
Complex numbers are written in the form, `x + yj`, where `x` is the real part and `y` is the imaginary part. Here are some examples.

```
>>> a = 1234567890123456789
>>> a
1234567890123456789
>>> b = 0.1234567890123456789
>>> b
0.12345678901234568
>>> c = 1+2j
>>> c
(1+2j)
```

Notice that the `float` variable `b` got truncated.

Python List

List is an ordered sequence of items. It is one of the most used datatype in Python and is very flexible. All the items in a list do not need to be of the same type.



Declaring a list is pretty straight forward. Items separated by commas are enclosed within brackets [ ].

```
>>> a = [1, 2.2, 'python']
```

We can use the slicing operator [ ] to extract an item or a range of items from a list. Index starts form 0 in Python.

script.py IPython Shell

```
1   a = [5,10,15,20,25,30,35,40]
2
3   # a[2] = 15
4   print("a[2] = ", a[2])
5
6   # a[0:3] = [5, 10, 15]
7   print("a[0:3] = ", a[0:3])
8
9   # a[5:] = [30, 35, 40]
10  print("a[5:] = ", a[5:])
```

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Lists are mutable, meaning, value of elements of a list can be altered.

```
>>> a = [1,2,3]
>>> a[2]=4
>>> a
[1, 2, 4]
```

Tuple is an ordered sequence of items same as list.The only difference is that tuples are immutable. Tuples once created cannot be modified.

Tuples are used to write-protect data and are usually faster than list as it cannot change dynamically.

It is defined within parentheses () where items are separated by commas.

```
>>> t = (5,'program', 1+3j)
```

We can use the slicing operator [] to extract items but we cannot change its value.

script.py IPython Shell

```
1   t = (5,'program', 1+3j)
2
3   # t[1] = 'program'
4   print("t[1] = ", t[1])
5
6   # t[0:3] = (5, 'program', (1+3j))
7   print("t[0:3] = ", t[0:3])
8
9   # Generates error
10  # Tuples are immutable
11  t[0] = 10
```

Run

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Python Strings

String is sequence of Unicode characters. We can use single quotes or double quotes to represent strings. Multi-line strings can be denoted using triple quotes, ''' or """.

```
>>> s = "This is a string"
>>> s = '''a multiline
```

Like list and tuple, slicing operator [ ] can be used with string. Strings are immutable.

```
# s[4] = 'o'
print("s[4] = ", s[4])

# s[6:11] = 'world'
print("s[6:11] = ", s[6:11])

# Generates error
# Strings are immutable in Python
s[5] ='d'
```

Run

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Python Set

Set is an unordered collection of unique items. Set is defined by values separated by comma inside braces { }. Items in a set are not ordered.

script.py IPython Shell

```
a = {5,2,3,1,4}

# printing set variable
print("a = ", a)

# data type of variable a
print(type(a))
```

Run

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We can perform set operations like union, intersection on two sets. Set have unique values. They eliminate duplicates.

```
>>> a = {1,2,2,3,3,3}
>>> a
{1, 2, 3}
```

does not work.

```
>>> a = {1,2,3}
>>> a[1]
Traceback (most recent call last):
  File "<string>", line 301, in runcode
  File "<interactive input>", line 1, in <module>
TypeError: 'set' object does not support indexing
```

Python Dictionary

Dictionary is an unordered collection of key-value pairs.

It is generally used when we have a huge amount of data. Dictionaries are optimized for retrieving data. We must know the key to retrieve the value.

In Python, dictionaries are defined within braces {} with each item being a pair in the form `key:value` . Key and value can be of any type.

```
>>> d = {1:'value','key':2}
>>> type(d)
<class 'dict'>
```

We use key to retrieve the respective value. But not the other way around.

script.py IPython Shell

```
1  d = {1:'value','key':2}
2  print(type(d))
3
4  print("d[1] = ", d[1]);
5
6  print("d['key'] = ", d['key']);
7
8  # Generates error
9  print("d[2] = ", d[2]);
```

Run

Conversion between data types

We can convert between different data types by using different type conversion functions like int(), float(), str() etc.

```
>>> float(5)
5.0
```

Conversion from float to int will truncate the value (make it closer to zero).

```
>>> int(10.6)
10
>>> int(-10.6)
-10
```

Conversion to and from string must contain compatible values.

```
>>> float('2.5')
2.5
>>> str(25)
'25'
>>> int('1p')
Traceback (most recent call last):
  File "<string>", line 301, in runcode
  File "<interactive input>", line 1, in <module>
ValueError: invalid literal for int() with base 10: '1p'
```

We can even convert one sequence to another.

```
>>> set([1,2,3])
{1, 2, 3}
>>> tuple({5,6,7})
(5, 6, 7)
>>> list('hello')
['h', 'e', 'l', 'l', 'o']
```

To convert to dictionary, each element must be a pair

```
>>> dict([[1,2],[3,4]])
{1: 2, 3: 4}
```

Check out these examples to learn more:

- Add Two Numbers
- Find the Square Root
- Calculate the Area of a Triangle

PREVIOUS
PYTHON VARIABLES

NEXT
PYTHON TYPE CONVERSION

Python Tutorial