



Python Object and Data Structure Basics



Basic Data Types



Complete Python 3 Bootcamp

- In this section of the course we will cover the key data types in Python.
- These are your basic building blocks when constructing larger pieces of code.
- Let's quickly discuss all of the possible data types, then we'll have lectures that go into more detail about each one!



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Complete Python 3 Bootcamp

Name	Type	Description
Integers	int	Whole numbers, such as: 3 300 200
Floating point	float	Numbers with a decimal point: 2.3 4.6 100.0
Strings	str	Ordered sequence of characters: "hello" 'Sammy' "2000" "楽しい"
Lists	list	Ordered sequence of objects: [10,"hello",200.3]
Dictionaries	dict	Unordered Key:Value pairs: {"mykey" : "value" , "name" : "Frankie"}
Tuples	tup	Ordered immutable sequence of objects: (10,"hello",200.3)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical value indicating True or False



Let's get started!



Numbers



Complete Python 3 Bootcamp

- There are two main number types we will work with:
 - Integers which are whole numbers.
 - Floating Point numbers which are numbers with a decimal.
- Let's explore basic math with Python!
- We will also discuss how to create variables and assign them values.



Variable Assignments



Complete Python 3 Bootcamp

- We just saw how to work with numbers, but what do these numbers represent?
- It would be nice to assign these data types a variable name to easily reference them later on in our code!
- For example:
 - **my_dogs = 2**



Complete Python 3 Bootcamp

- **Rules for variable names**

- Names can not start with a number.
- There can be no spaces in the name, use _ instead.
- Can't use any of these symbols
:!"',<>/?|\()!@#\$\$%^&*~ - +



Complete Python 3 Bootcamp

- Rules for variable names
 - It's considered best practice (PEP8) that names are lowercase.
 - Avoid using words that have special meaning in Python like "list" and "str"



Complete Python 3 Bootcamp

- Python uses **Dynamic Typing**
- This means you can reassign variables to different data types.
- This makes Python very flexible in assigning data types, this is different than other languages that are **“Statically-Typed”**



Complete Python 3 Bootcamp

```
my_dogs = 2
```

```
my_dogs = [ "Sammy" , "Frankie" ]
```

**This is okay in
Python!**



Complete Python 3 Bootcamp

```
my_dogs = 2
```

```
my_dogs = [ "Sammy" , "Frankie" ]
```

ERROR
in other
Languages!



Complete Python 3 Bootcamp

```
int my_dog = 1;
```

```
my_dog = "Sammy" ; //RESULTS IN ERROR
```

**Example of Static Typing
(C++)**



Complete Python 3 Bootcamp

- Pros of Dynamic Typing:
 - Very easy to work with
 - Faster development time
- Cons of Dynamic Typing:
 - May result in bugs for unexpected data types!
 - You need to be aware of **type()**



Let's explore these concepts!



Strings



Complete Python 3 Bootcamp

- Strings are sequences of characters, using the syntax of either single quotes or double quotes:
 - **'hello'**
 - **"Hello"**
 - **" I don't do that "**



Complete Python 3 Bootcamp

- Because strings are **ordered sequences** it means we can using **indexing** and **slicing** to grab sub-sections of the string.
- Indexing notation uses [] notation after the string (or variable assigned the string).
- Indexing allows you to grab a single character from the string...



Complete Python 3 Bootcamp

- These actions use `[]` square brackets and a number index to indicate positions of what you wish to grab.

Character : **h** **e** **l** **l** **o**

Index : **0** **1** **2**

3 **4**



Complete Python 3 Bootcamp

- These actions use `[]` square brackets and a number index to indicate positions of what you wish to grab.

Character : **h** **e** **l** **l** **o**

Index : **0** **1** **2**

3 **4**

Reverse Index: **0** **-4** **-3** **-2** **-1**



Complete Python 3 Bootcamp

- Slicing allows you to grab a subsection of multiple characters, a “slice” of the string.
- This has the following syntax:
 - **[start:stop:step]**
- **start** is a numerical index for the slice start



Complete Python 3 Bootcamp

- Slicing allows you to grab a subsection of multiple characters, a “slice” of the string.
- This has the following syntax:
 - **[start:stop:step]**
- **start** is a numerical index for the slice start
- **stop** is the index you will go up to (but not include)
- **step** is the size of the “jump” you take.



Let's explore these concepts!



String Indexing and Slicing



String Properties and Methods



String Formatting for Printing



Complete Python 3 Bootcamp

- Often you will want to “inject” a variable into your string for printing. For example:
 - **`my_name = “Jose”`**
 - **`print(“Hello ” + my_name)`**
- There are multiple ways to format strings for printing variables in them.
- This is known as string interpolation.



Complete Python 3 Bootcamp

- Let's explore two methods for this:
 - **.format()** method
 - **f-strings** (formatted string literals)



Lists



Complete Python 3 Bootcamp

- Lists are ordered sequences that can hold a variety of object types.
- They use [] brackets and commas to separate objects in the list.
 - **[1,2,3,4,5]**
- Lists support indexing and slicing. Lists can be nested and also have a variety of useful methods that can be called off of them.



Dictionaries



Complete Python 3 Bootcamp

- Dictionaries are unordered mappings for storing objects. Previously we saw how lists store objects in an ordered sequence, dictionaries use a key-value pairing instead.
- This key-value pair allows users to quickly grab objects without needing to know an index location.



Complete Python 3 Bootcamp

- Dictionaries use curly braces and colons to signify the keys and their associated values.

`{'key1':'value1','key2':'value2'}`

- So when to choose a list and when to choose a dictionary?



Complete Python 3 Bootcamp

- **Dictionaries:** Objects retrieved by key name.

Unordered and can not be sorted.

- **Lists:** Objects retrieved by location.

Ordered Sequence can be indexed or sliced.



Tuples



Complete Python 3 Bootcamp

Tuples are very similar to lists. However they have one key difference - **immutability**.

Once an element is inside a tuple, it can not be reassigned.

Tuples use parenthesis: **(1,2,3)**



Sets



Complete Python 3 Bootcamp

Sets are unordered collections of **unique** elements.

Meaning there can only be one representative of the same object.

Let's see some examples!



Booleans



Complete Python 3 Bootcamp

Booleans are operators that allow you to convey **True** or **False** statements.

These are very important later on when we deal with control flow and logic!



Files



Complete Python 3 Bootcamp

Before we finish this section, let's quickly go over how to perform simple I/O with basic .txt files.

We'll also discuss file paths on your computer.

Let's get started!



Objects and Data Structures Assessment Test



Complete Python 3 Bootcamp

Let's have a quick overview of your first test.

You can download the notebooks from GitHub or as a zip file from the Course Overview Lecture.



Objects and Data Structures Assessment Test SOLUTIONS



Complete Python 3 Bootcamp

- Numbers: Store numerical information and come in two forms:
 - Integers - Whole Numbers
 - Floating Point - Numbers with a decimal



Complete Python 3 Bootcamp

- Strings: Ordered sequence of characters
- Lists: Ordered sequence of objects (mutable)
- Tuples: Ordered sequence of objects (immutable)
- Dictionary: Key-Value pairing that is unordered.



Python Documentation