

Python Object and Data Structure Basics



Basic Data Types





- 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!





Name	Туре	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



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Let's get started!





Numbers





- There are two main number types we will work with:
 - o 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





- 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





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:"',<>/?|\()!@#\$%^&*~-+



- 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"



- 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"



 $my_dogs = 2$

my_dogs = ["Sammy", "Frankie"]

This is okay in Python!



 $my_dogs = 2$

my_dogs = ["Sammy", "Frankie"]

ERROR in other Languages!



int my_dog = 1;

my_dog = "Sammy"; //RESULTS IN ERROR

Example of Static Typing (C++)





- 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





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



- 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...





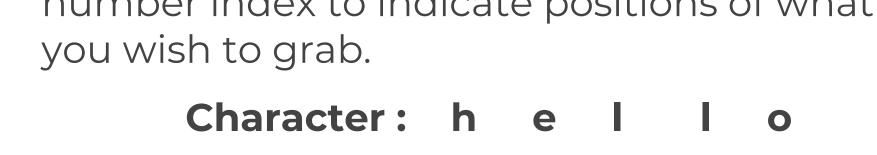
• These actions use [] square brackets and a number index to indicate positions of what you wish to grab.

Character: h e l l o Index: 0 1 2

3 4



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



Reverse Index: 0 -4 -3 -2 -1 PIERIAN 🥔 DATA

Index: 0 1 2



- 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





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- 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





- Often you will want to "inject" a variable into your string for printing. For example:
 - o 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.





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



Lists





- Lists are ordered sequences that can hold a variety of object types.
- They use [] brackets and commas to separate objects in the list.
 - o [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





- 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.





• 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?





• **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





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





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

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

Let's see some examples!





Booleans





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





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





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





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



- 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

