Python Coding Schools

4th lesson

Seed Academy

Agenda

- wk1. Installing Python, HelloWorld
- wk2. Arithmetic Operators
- wk3. Data Types : Integer, Floating point, Boolean, String
- wk4. Data Structures: List
- wk5. Data Structures: Set, Tuples
- wk6. Data Structures: Dictionary

Agenda

- wk7. Control flows
- wk8. Conditional
- wk9. Loops
- wk10. Function
- wk11. Class
- wk12. Data Visualization

Class materials

https://github.com/TaeheeJeong/seedacademy

https://github.com/TaeheeJeong/SummerCoding2023

Today’s topic: List

Data structure

- List
- Tuples
- Set
- Dictionary

What is Not a “Collection”?

Most of our variables have one value in them - when we put a new value in the variable, the old value is overwritten.

```
$ python
>>> x = 2
>>> x = 4
>>> print(x)
4
```

A List is a Kind of Collection

A collection allows us to put many values in a single “variable”.

A collection is nice because we can carry all many values around in one convenient package.

```
friends = [ 'Joseph', 'Glenn', 'Sally' ]

carryon = [ 'socks', 'shirt', 'perfume' ]
```

List Constants

List constants are surrounded by square brackets and the elements in the list are separated by commas

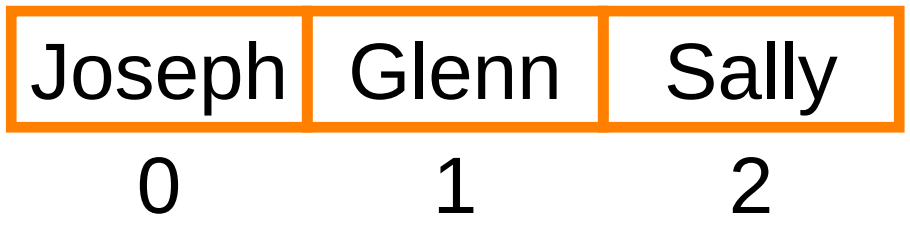
A list element can be any Python object - even another list

A list can be empty

```
>>> print([1, 24, 76])
[1, 24, 76]
>>> print(['red', 'yellow', 'blue'])
['red', 'yellow', 'blue']
>>> print(['red', 24, 98.6])
['red', 24, 98.6]
>>> print([ 1, [5, 6], 7])
[1, [5, 6], 7]
>>> print([])
[]
```

Looking Inside Lists

Just like strings, we can get at any single element in a list using an index specified in square brackets




```
>>> friends = [ 'Joseph', 'Glenn', 'Sally' ]
>>> print(friends[1])
Glenn
```

Lists are Mutable

Strings are “immutable” - we cannot change the contents of a string - we must make a new string to make any change

Lists are “mutable” - we can change an element of a list using the index operator

```
>>> fruit = 'Banana'
>>> fruit[0] = 'b'
Traceback
TypeError: 'str' object does not
support item assignment
>>> x = fruit.lower()
>>> print(x)
banana
>>> lotto = [2, 14, 26, 41, 63]
>>> print(lotto)
[2, 14, 26, 41, 63]
>>> lotto[2] = 28
>>> print(lotto)
[2, 14, 28, 41, 63]
```

How Long is a List?

The len() function takes a list as a parameter and returns the number of elements in the list

Actually len() tells us the number of elements of any set or sequence (such as a string...)

```
>>> greet = 'Hello Bob'
>>> print(len(greet))
9
>>> x = [ 1, 2, 'joe', 99]
>>> print(len(x))
4
```

Using the range Function

The range function returns a list of numbers that range from zero to one less than the parameter

We can construct an index loop using for and an integer iterator

```
>>> list(range(4))
[0, 1, 2, 3]
>>> friends = ['Joseph', 'Glenn', 'Sally']
>>> print(len(friends))
3
>>> list(range(len(friends)))
[0, 1, 2]
```

Concatenating Lists Using +

We can create a new list by adding two existing lists together

```
>>> a = [1, 2, 3]
>>> b = [4, 5, 6]
>>> c = a + b
>>> print(c)
[1, 2, 3, 4, 5, 6]
>>> print(a)
[1, 2, 3]
```

Lists Can Be Sliced Using :

```
>>> t = [9, 41, 12, 3, 74, 15]
>>> t[1:3]
[41,12]
>>> t[:4]
[9, 41, 12, 3]
>>> t[3:]
[3, 74, 15]
>>> t[:]
[9, 41, 12, 3, 74, 15]
```

Source: Python for Everybody, Charles Severance, University of Michigan School of Information

Building a List from Scratch

We can create an empty list and then add elements using the append method

The list stays in order and new elements are added at the end of the list

```
>>> stuff = list()
>>> stuff.append('book')
>>> stuff.append(99)
>>> print(stuff)
['book', 99]
>>> stuff.append('cookie')
>>> print(stuff)
['book', 99, 'cookie']
```

Is Something in a List?

Python provides two operators that let you check if an item is in a list

These are logical operators that return True or False

They do not modify the list

```
>>> some = [1, 9, 21, 10, 16]
>>> 9 in some
True
>>> 15 in some
False
>>> 20 not in some
True
```

Source: Python for Everybody, Charles Severance, University of Michigan School of Information

Lists are in Order

A list can hold many items and keeps those items in the order until we do something to change the order

A list can be sorted (i.e., change its order)

The sort method (unlike in strings) means “sort yourself”

```
>>> friends = [ 'Joseph', 'Glenn', 'Sally' ]
>>> friends.sort()
>>> print(friends)
['Glenn', 'Joseph', 'Sally']
>>> print(friends[1])
Joseph
```

Built-in Functions and Lists

There are a number of functions built into Python that take lists as parameters

```
>>> nums = [3, 41, 12, 9, 74, 15]
>>> print(len(nums))
6
>>> print(max(nums))
74
>>> print(min(nums))
3
>>> print(sum(nums))
154
>>> print(sum(nums)/len(nums))
25.6
```

Strings and Lists

```
>>> abc = 'With three words'
>>> stuff = abc.split()
>>> print(stuff)
['With', 'three', 'words']
>>> print(len(stuff))
3
>>> print(stuff[0])
With
>>> print(stuff)
['With', 'three', 'words']
```

Split breaks a string into parts and produces a list of strings. We think of these as words. We can access a particular word or loop through all the words.

```
>>> line = 'A lot                  of spaces'
>>> etc = line.split()
>>> print(etc)
['A', 'lot', 'of', 'spaces’]

>>> line = 'first;second;third'
>>> thing = line.split()
>>> print(thing)
['first;second;third']
>>> print(len(thing))
1
>>> thing = line.split(';')
>>> print(thing)
['first', 'second', 'third']
>>> print(len(thing))
3
```

When you do not specify a delimiter, multiple spaces are treated like one delimiter.

You can specify what delimiter character to use in the splitting.

Source: Python for Everybody, Charles Severance, University of Michigan School of Information

Acknowledgements / Contributions

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