Python Coding Schools

4th lesson: List

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: IF statement
- wk8. Loops
- wk9. Function
- wk10. Class
- wk11. 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

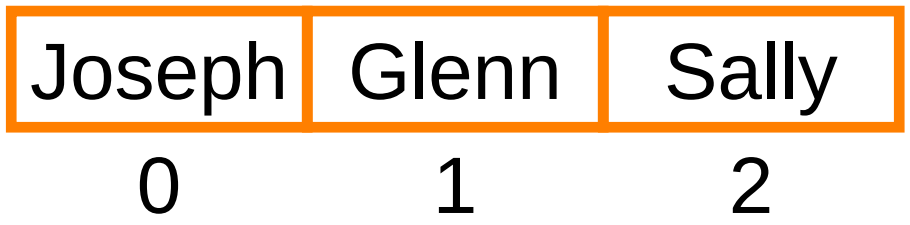
A list can be empty([ ])

```
>>> 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([])
[]
```

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

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]
```

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

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
```

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

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']
```

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

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
```

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Strings and Lists

- 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.

```
>>> 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']
```

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Strings and Lists

- 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.

```
>>> 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
```

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

Acknowledgements / Contributions

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