Python Tutorial – Part I: Introduction

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Overview

1. What is Python?
   - Origins, Features, Framework for Scientific Computing
2. Program Development with Python
   - Working with the Terminal
   - Integrated Development Environments
3. Elements of Python Programming
   - Data Types, Variables, Arithmetic Expressions, Strings, Program Control, and Functions
4. First Program (Evaluate and Plot Sigmoid Function)
5. Builtin Collections (Lists, Dictionaries, and Sets)
6. Numerical Python (NumPy)

Builtin Containers and Collections

(Working with Lists, Dictionaries, Sets)

Builtin Containers and Collection

Containers and Collections

A container is an object that stores objects, and provides a way to access and iterate over them. Collections are container data types, namely lists, sets, tuples, dictionary.

Builtin Collection Data Types:

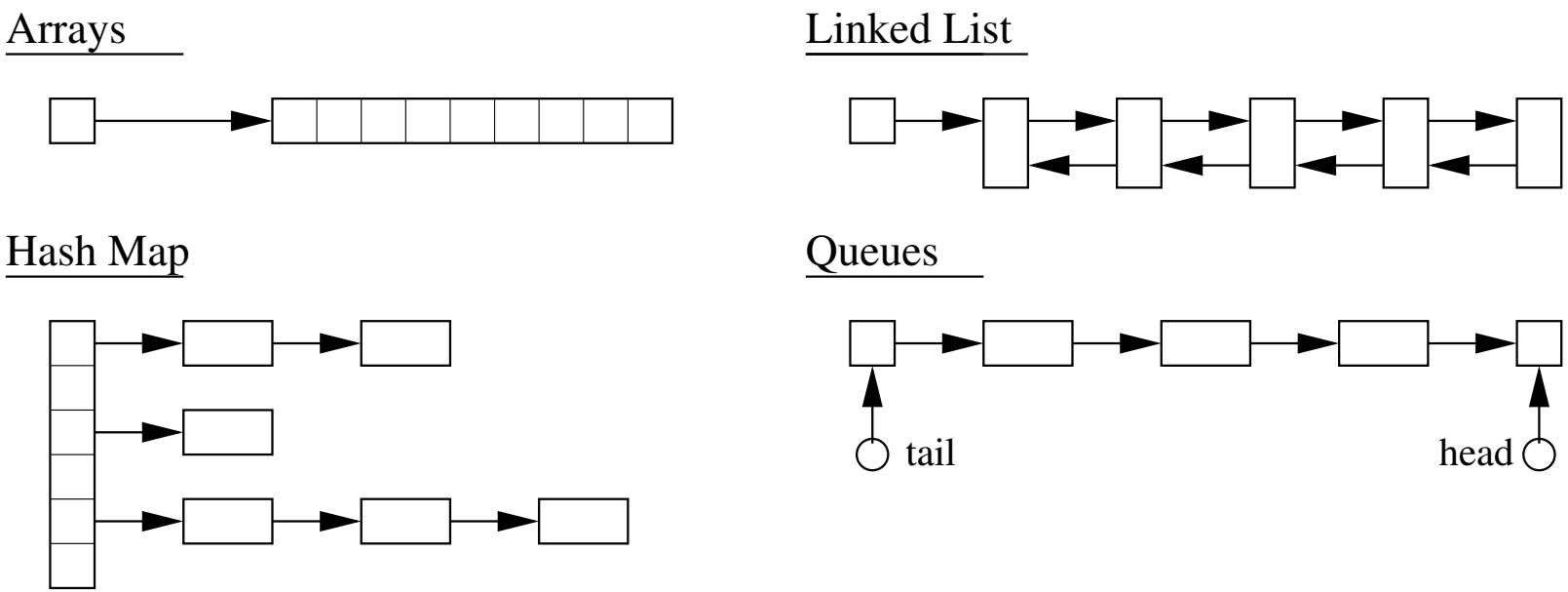
- **List:** A list is a collection which is ordered and changeable.
- **Dictionary:** A dictionary is a collection which is ordered and changeable. No duplicate members.
- **Set:** A set is a collection which is unordered, unchangeable and unindexed. No duplicate members.
- **Tuple:** A tuple is a collection which is ordered and unchangeable.

Working with Lists

List

Lists are used to store multiple items in a single variable. A list may store multiple types (heterogeneous) of elements.

Array, List, HashMap, and Queue Structures



Working with Lists

Basic List Methods

Method	Description
append()	Adds an element at the end of the list
clear()	Removes all the elements from the list
copy()	Returns a copy of the list
count()	Returns the number of elements with the specified value
extend()	Add the elements of a list (or any iterable), to the end of the current list.
index()	Returns the index of the first element with the specified value.
insert()	Adds an element at the specified position.
remove()	Removes the item with the specified value.
reverse()	Reverses the order of the list.
sort()	Sorts the list.

Working with Lists

Example 1: Create working lists ...

```
  list01 = [ "apple", "orange", "avocado", "banana", "grape", "watermelon"]
  list02 = [ "apple", "avocado", "banana", "banana", "grape", "watermelon"]

  print ("--- List01: {:s} ...".format( str( list01) ))
  print ("--- List02: {:s} ...".format( str( list02) ))

# Create list with mix of data types ...

  list03 = [ "apple", 40, True, 2.5 ]

  print ("--- List03 (with multiple data types): {:s} ...".format( str(list03))
```

Output:

```
--- List01: ['apple', 'orange', 'avocado', 'banana', 'grape', 'watermelon'] ...
--- List02: ['apple', 'avocado', 'banana', 'banana', 'grape', 'watermelon'] ...

--- List03 (with multiple data types): ['apple', 40, True, 2.5] ...
```

Working with Lists

Example 2: Access list items ...

```
list04 = list(( "apple", 40, True, 2.5, False ))

print ("---   list04[0]: {:s} ...".format( str( list04[0]) ))
print ("---   list04[1]: {:s} ...".format( str( list04[1]) ))
print ("---   list04[2]: {:s} ...".format( str( list04[2]) ))
print ("---   list04[3]: {:s} ...".format( str( list04[3]) ))
print ("---   list04[4]: {:s} ...".format( str( list04[4]) ))
```

Output:

```
---   list04[0]: apple ...
---   list04[1]: 40 ...
---   list04[2]: True ...
---   list04[3]: 2.5 ...
---   list04[4]: False ...
```

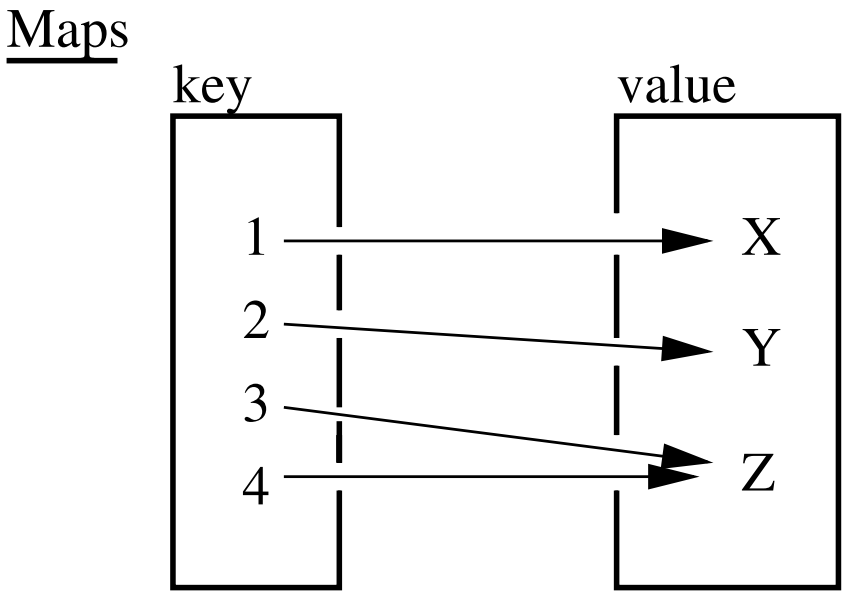
Source Code: See: python-code.d/collections/

Working with Dictionaries

Dictionary

Dictionaries store data values as key:value pairs. As of Python 3.7, a dictionary is a collection which is ordered, changeable and do not allow duplicates.

Key:Value Map Operations



Working with Dictionaries

Basic Dictionary Methods

Method	Description
clear()	Removes all the elements from the dictionary.
copy()	Returns a copy of the dictionary.
fromkeys()	Returns a dictionary with the specified keys and value.
get()	Returns the value of the specified key.
items()	Returns a list containing a tuple for each key value pair.
keys()	Returns a list containing the dictionary's keys.
pop()	Removes the element with the specified key.
popitem()	Removes the last inserted key-value pair.
update()	Updates the dictionary with the specified key-value pairs.
values()	Returns a list of all the values in the dictionary.

Working with Dictionaries

Example 1: Create dictionary of car attributes.

```
car01 = {  "brand": "Honda",  # <-- Create simple dictionary ....
           "model": "Acura",
           "miles": 25000,
             "new": False,
            "year": 2016
        }

# Print dictionary ...

print ("--- Car01: {:s} ...".format( str( car01 ) ))
```

Output: Print simple dictionary.

```
--- Car01: {'brand': 'Honda', 'model': 'Acura',
            'miles': 25000, 'new': False, 'year': 2016} ...
```

Working with Dictionaries

Example 2: Systematically access items in Car01 ...

```
print ("--- Car01: brand --> {:s} ...".format( str( car01.get("brand")) ))
print ("---      : model --> {:s} ...".format( str( car01.get("model")) ))
print ("---      : miles --> {:d} ...".format( car01.get("miles") ))
print ("---      : new   --> {:s} ...".format( str ( car01.get("new")) ))
print ("---      : year  --> {:d} ...".format( car01.get("year") ))
```

Output:

```
--- Access items in Car01 ...
--- Car01: brand --> Honda ...
---      : model --> Acura ...
---      : miles --> 25000 ...
---      : new   --> False ...
---      : year  --> 2016 ...
```

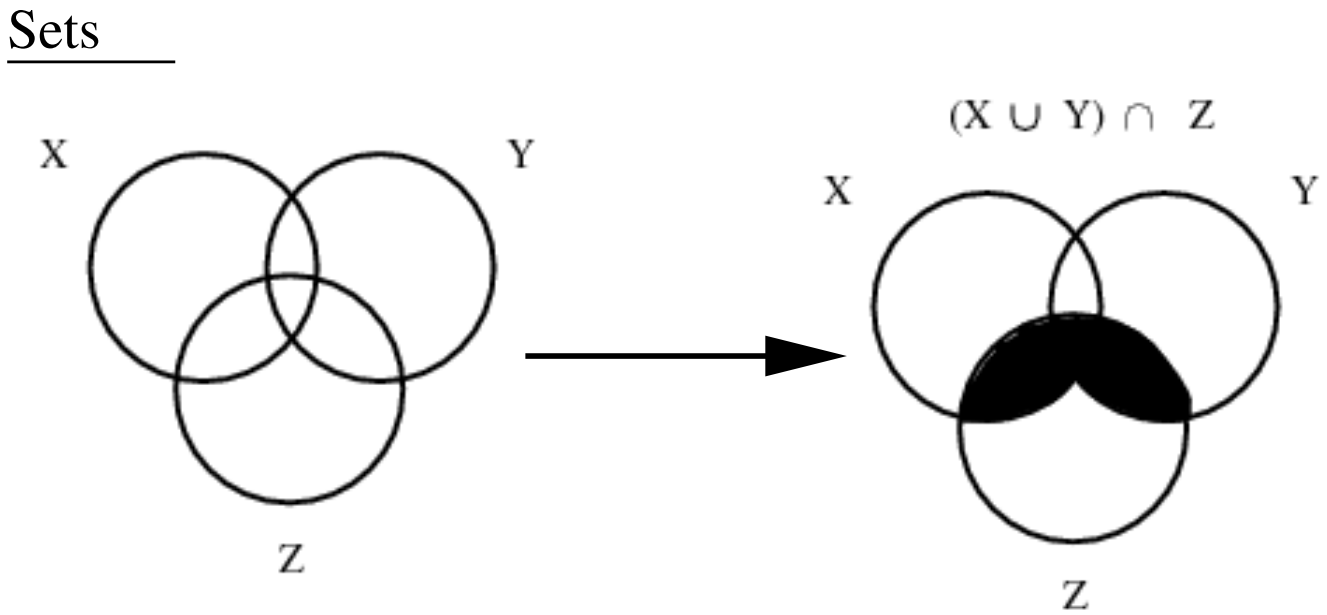
Source Code: See: python-code.d/collections/

Working with Sets

Sets

Sets store multiple items in a single variable. A set is a collection which is unordered, unchangeable (but you can remove items and add new items) and unindexed.

Set Operations



Working with Sets

Basic Set Methods

Method	Description
add()	Adds an element to the set.
clear()	Removes all the elements from the set.
copy()	Returns a copy of the set.
discard()	Remove the specified item.
intersection()	Returns a set, that is the intersection of two other sets.
remove()	Removes the specified element.
union()	Return a set containing the union of sets
update()	Update the set with the union of this set and others.

Working with Sets

Example 1: Create working sets; set operations ...

```
set01 = { 1, 2, 3, 4, 5, 6, 7 }
set02 = { 6, 7, 8, 9, 10 }
set03 = {"apple", "banana", "cherry"}
set04 = {True, False, False}

print ("--- Set01.union(Set02) : %s ..." %( set01.union(set02) ))
print ("--- Set01.intersection(Set02) : %s ..."
                                    %( set01.intersection(set02) ))
```

Output:

```
--- Create working sets ...
--- Set01: {1, 2, 3, 4, 5, 6, 7} ...
--- Set02: {6, 7, 8, 9, 10} ...
--- Set03: {'cherry', 'banana', 'apple'} ...
--- Set04: {False, True} ...

--- Set01.union(Set02) : {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} ...
--- Set01.intersection(Set02) : {6, 7} ...
```

Working with Sets

Example 2: Add items to set03, then print ...

```
set03.add("strawberry")
set03.add("kiwi")
print ("--- Set03 (appended): ...")
for x in set03:
    print ("---   %s ..." %(x))
```

Output: Set03 appended ...

```
---   cherry ...
---   strawberry ...
---   banana ...
---   kiwi ...
---   apple ...
```

Source Code: See: python-code.d/collections/