# Python Tutorial – Part I: Introduction

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# Overview



Part 4

# 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:**

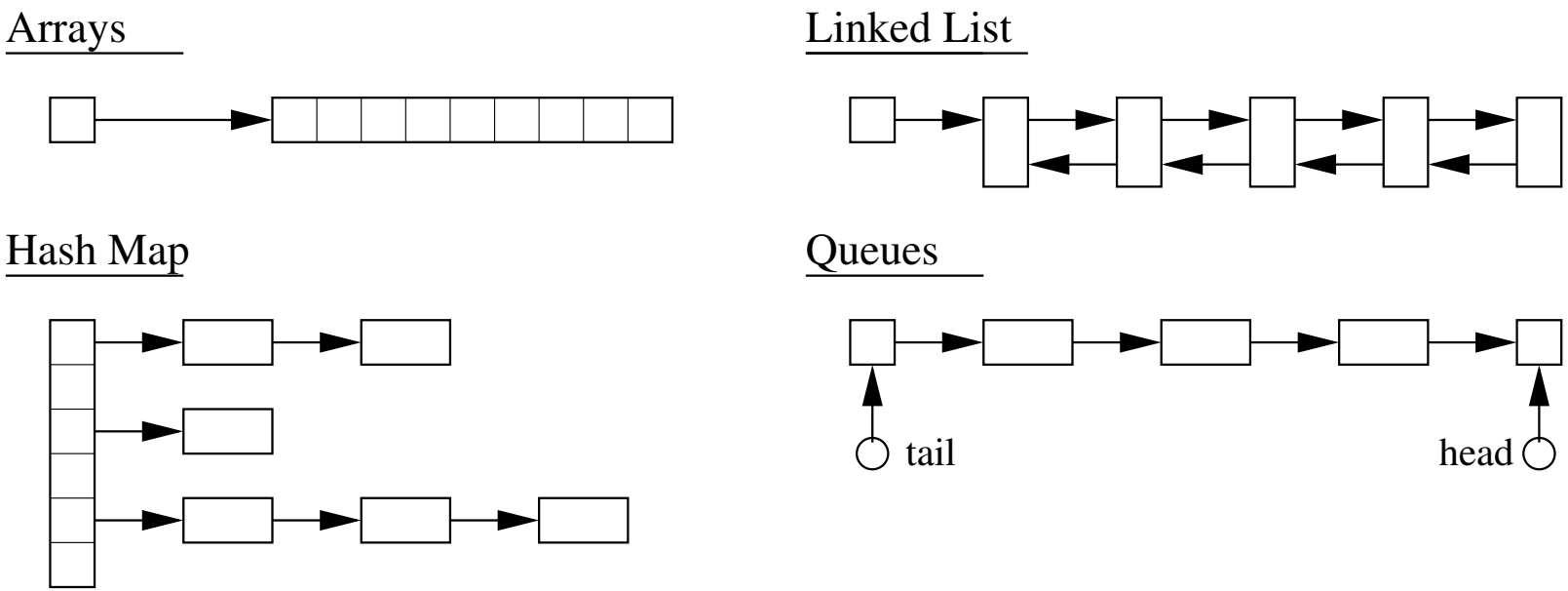
- **List:** A list is a collection which is ordered and changeable.
- **Dictionary:** A dictionary is a collection which is ordered and changeable. No duplicate members.
- **Set:** A set is a collection which is unordered, unchangeable and unindexed. No duplicate members.
- **Tuple:** A tuple is a collection 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 ..." %( list01 ))
  print ("--- List02: %s ..." %( list02 ))

# Create list with mix of data types ...

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

  print ("--- List03 (with multiple data types): %s ..." %( 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 ..." %( list04[0] ))
print ("---   list04[1]: %s ..." %( list04[1] ))
print ("---   list04[2]: %s ..." %( list04[2] ))
print ("---   list04[3]: %s ..." %( list04[3] ))
print ("---   list04[4]: %s ..." %( list04[4] ))
```

**Output:**

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

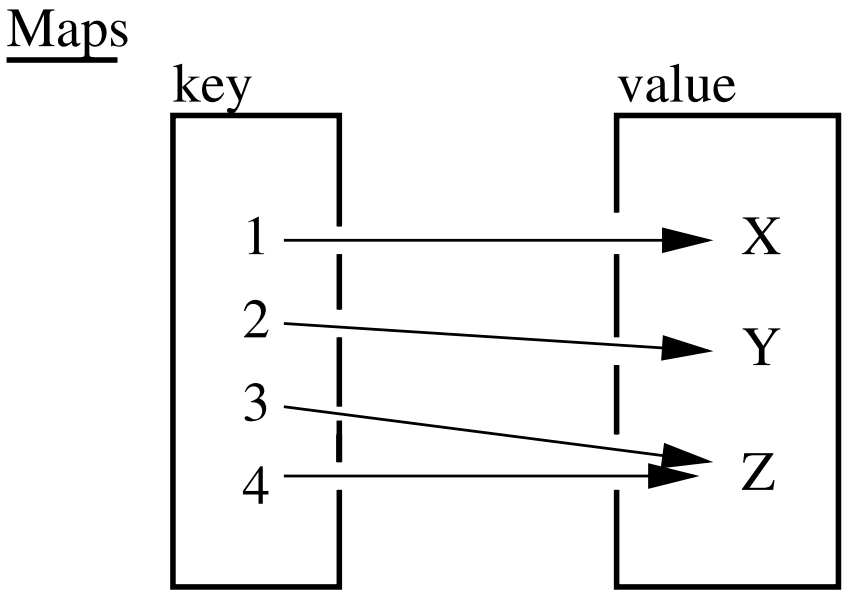
**Source Code:** See: python-code.d/collections/

# 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 ("--- Car01: %s ..." %( car01 ))  # <-- print dictionary ...
```

**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 ..." %( car01.get("brand") ))
print ("---      : model --> %s ..." %( car01.get("model") ))
print ("---      : miles --> %d ..." %( car01.get("miles") ))
print ("---      : new   --> %s ..." %( car01.get("new") ))
print ("---      : year  --> %d ..." %( car01.get("year") ))
```

**Output:**

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

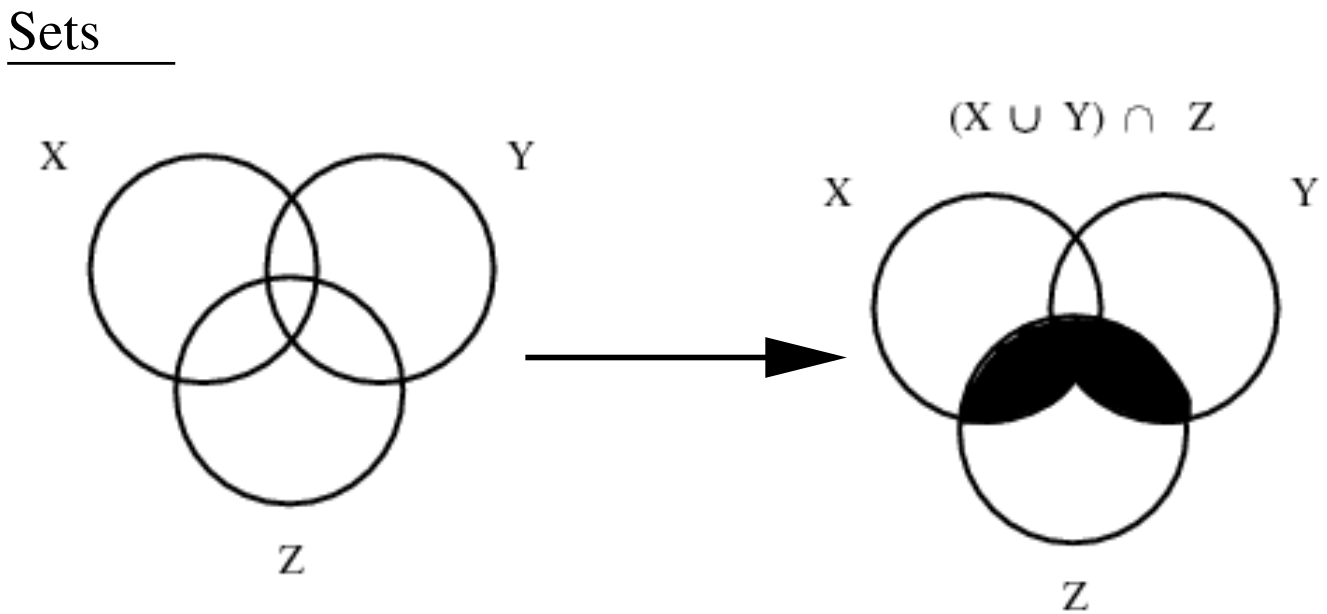
**Source Code:** See: python-code.d/collections/

# 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/