



**TASK**

# **Data Structures — Lists and Dictionaries**

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# Introduction

## WELCOME TO THE DATA STRUCTURES - LISTS AND DICTIONARIES TASK!

This task is aimed to ensure that you have a concrete understanding of strings and list manipulation and also to give you a little introduction to dictionaries.

In **example.py**, you will see examples that deal with operations that can be applied to elements in lists as well as dictionaries.

This task also touches on functions and how they can be used to compute certain values on list elements as well as dictionaries (otherwise known as hash maps).



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## COPYING LISTS

There are several ways to make a copy of a list. The simplest, and often best, way to do this is using the slice operator. The slice operator always makes a new list by making a copy of a portion of another list. Slice a whole list to make a copy of that list. See an example of this :

```
>>> a = [1, 2, 3]
>>> b = a[:]
>>> b[1] = 10
>>> print a
[1, 2, 3]
>>> print b
[1, 10, 3]
```

Taking the slice `[:]` creates a new copy of the list. However, it only copies the outer list. Any sublist inside is still a reference to the sublist in the original list. Therefore, when the list contains inner lists, these inner lists have to be copied as well. You could do that manually but Python already contains a module that does it for you. You simply use the `deepcopy` function of the `copy` module:

```
>>> import copy
>>> a = [[1, 2, 3], [4, 5, 6]]
>>> b = a[:]
>>> c = copy.deepcopy(a)
>>> b[0][1] = 10
>>> c[1][1] = 12
>>> print a
[[1, 10, 3], [4, 5, 6]]
>>> print b
[[1, 10, 3], [4, 5, 6]]
>>> print c
[[1, 2, 3], [4, 12, 6]]
```

For more information about `deepcopy`, see [here](#).

## PYTHON LIST METHODS

There are many useful built-in list methods available for you to use. We have already looked at the `append()` method.

Some other List methods can be found below:

- **extend()** - Adds all elements of a list to the another list
- **insert()** - Inserts an item at the defined index
- **remove()** - Removes an item from the list
- **pop()** - Removes and returns an element at the given index
- **index()** - Returns the index of the first matched item
- **count()** - Returns the count of number of items passed as an argument
- **sort()** - Sorts items in a list in ascending order
- **reverse()** - Reverses the order of items in the list

## LIST COMPREHENSION

List comprehension can be used to construct lists in an elegant and concise way. It is a powerful tool that will apply some operation to every element in a list and then put the element into a new list. List comprehension consists of an expression followed by a *for* statement inside square brackets.

For Example:

```
num_list = ['1', '5', '8', '14', '25', '31']
new_num_list_ints = [int(element) for element in num_list]
```

For each element in **num\_list**, we are casting it to an Integer and putting it into a new list called **new\_num\_list\_ints**.

## DICTIONARIES

Dictionaries are used to store data and are very similar to lists. However, lists are ordered sets of elements, whereas dictionaries are unordered sets. Also, elements in dictionaries are accessed via keys and not via their positions the way lists are. When the key is known, you can use it to retrieve the value associated with it.

## CREATING A DICTIONARY

To create a dictionary, simply place the items inside curly braces and separate them by commas. An item has a key and a value, which is expressed as a pair (key: value). Items in a dictionary can have a value of any data type, however, the key must be either a string or number and must be unique.

For Example:

```
int_key_dict = {1: 'apple',
                2: 'banana',
                3: 'orange'
                }
```

## ACCESSING ELEMENTS FROM A DICTIONARY

While you might use indexing to access elements in a list, dictionaries use keys. Keys can be used to access values either by placing them inside square brackets [], such as with indices in lists, or with the **get()** method. However, if you use the **get()** method, it will return 'None' instead of 'KeyError', if the key is not found.

For Example:

```
profile_dict = {'name': 'Chris',
                'surname': 'Smith',
                'age': 28,
                'cell': '083 233 3242'
                }

print (profile_dict['surname'])    # prints out 'Smith'
print (profile_dict.get('cell'))  # prints out '083 233 3242'
```

## CHANGING ELEMENTS IN A DICTIONARY

We can add new items or change items using the assignment operator (=). If there is already a key present, the value gets updated, or else, if there is no key, a new key: value pair is added.

## DICTIONARY MEMBERSHIP TEST

You can test if a key is in a dictionary by using the keyword **in**. You simply enter the key you want to test for membership, followed by the **in** keyword and lastly the name of the dictionary. This will return either True or False, depending on whether the dictionary contains the key or not. The membership test is for keys only, not for values.

# Instructions

First, read **example.py**, open it using Notepad++ (Right-click the file and select 'Edit with Notepad++') or IDLE. Run example.py to see the output. Feel free to write and run your own example code before doing the Task to become more comfortable with the topic.

## Compulsory Task 1

Follow these steps:

- Create a new Python file in this folder called **cafe.py**.
- Create a list called menu, which should contain at least 4 items in the cafe.
- Next, create a dictionary called stock, which should contain the stock value for each item on your menu.
- Create another dictionary called price, which should contain the prices for each item on your menu.
- Next, create a function which will calculate the total stock worth in the cafe. You will need to remember to loop through the appropriate dictionaries and lists to do this.
- Finally, print out the result of your function.

## Compulsory Task 2

Follow these steps:

- Create a new Python file in this folder called **hash.py**
- Create a dictionary called countryMap, where the KEYS are the name of a country (i.e. a String), and the VALUE for each key is the name of that country's capital city.

- For Example:

```
countryMap = {  
    'UnitedKingdom': 'London',  
    'Sweden': 'Stockholm',  
}
```

```
'Canada': 'Ottawa',  
}
```

- What does `print(countryMap['Sweden'])` return?

## Optional Tasks

Follow these steps:

- See **example.py** for instructions for optional tasks.

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