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## Dictionaries

We've been learning about *sequences* in Python but now we're going to switch gears and learn about *mappings* in Python. If you're familiar with other languages you can think of these Dictionaries as hash tables.

This section will serve as a brief introduction to dictionaries and consist of:

- 1.) Constructing a Dictionary
- 2.) Accessing objects from a dictionary
- 3.) Nesting Dictionaries
- 4.) Basic Dictionary Methods

So what are mappings? Mappings are a collection of objects that are stored by a *key*, unlike a sequence that stored objects by their relative position. This is an important distinction, since mappings won't retain order since they have objects defined by a key.

A Python dictionary consists of a key and then an associated value. That value can be almost any Python object.

## Constructing a Dictionary

Let's see how we can construct dictionaries to get a better understanding of how they work!

```
In [1]: # Make a dictionary with {} and : to signify a key and a value
my_dict = {'key1': 'value1', 'key2': 'value2'}
```

```
In [2]: # Call values by their key
my_dict['key2']
```

```
Out[2]: 'value2'
```

Its important to note that dictionaries are very flexible in the data types they can hold. For example:

```
In [3]: my_dict = {'key1':123,'key2':[12,23,33],'key3':['item0','item1','item2']}
```

```
In [4]: # Let's call items from the dictionary  
my_dict['key3']
```

```
Out[4]: ['item0', 'item1', 'item2']
```

```
In [5]: # Can call an index on that value  
my_dict['key3'][0]
```

```
Out[5]: 'item0'
```

```
In [6]: # Can then even call methods on that value  
my_dict['key3'][0].upper()
```

```
Out[6]: 'ITEM0'
```

We can affect the values of a key as well. For instance:

```
In [7]: my_dict['key1']
```

```
Out[7]: 123
```

```
In [8]: # Subtract 123 from the value  
my_dict['key1'] = my_dict['key1'] - 123
```

```
In [9]: #Check  
my_dict['key1']
```

```
Out[9]: 0
```

A quick note, Python has a built-in method of doing a self subtraction or addition (or multiplication or division). We could have also used += or -= for the above statement. For example:

```
In [10]: # Set the object equal to itself minus 123  
my_dict['key1'] -= 123  
my_dict['key1']
```

```
Out[10]: -123
```

We can also create keys by assignment. For instance if we started off with an empty dictionary, we could continually add to it:

```
In [11]: # Create a new dictionary  
d = {}
```

```
In [12]: # Create a new key through assignment  
d['animal'] = 'Dog'
```

```
In [13]: # Can do this with any object  
d['answer'] = 42
```

```
In [14]: #Show  
d
```

```
Out[14]: {'animal': 'Dog', 'answer': 42}
```

## Nesting with Dictionaries

Hopefully you're starting to see how powerful Python is with its flexibility of nesting objects and calling methods on them. Let's see a dictionary nested inside a dictionary:

```
In [15]: # Dictionary nested inside a dictionary nested inside a dictionary  
d = {'key1':{'nestkey':{'subnestkey':'value'}}}
```

Wow! That's a quite the inception of dictionaries! Let's see how we can grab that value:

```
In [16]: # Keep calling the keys  
d['key1']['nestkey']['subnestkey']
```

```
Out[16]: 'value'
```

## A few Dictionary Methods

There are a few methods we can call on a dictionary. Let's get a quick introduction to a few of them:

```
In [17]: # Create a typical dictionary  
d = {'key1':1, 'key2':2, 'key3':3}
```

```
In [18]: # Method to return a list of all keys  
d.keys()
```

```
Out[18]: dict_keys(['key1', 'key2', 'key3'])
```

```
In [19]: # Method to grab all values  
d.values()
```

```
Out[19]: dict_values([1, 2, 3])
```

```
In [20]: # Method to return tuples of all items (we'll learn about tuples soon)  
d.items()
```

```
Out[20]: dict_items([('key1', 1), ('key2', 2), ('key3', 3)])
```

Hopefully you now have a good basic understanding how to construct dictionaries. There's a lot more to go into here, but we will revisit dictionaries at later time. After this section all you need to know is how to create a dictionary and how to retrieve values from it.

