

# Dictionaries

In Python, a *dictionary* stores “key: value” pairs. In the following assignment, the key:value pairs are separated by commas and wrapped in curly braces. For example:

```
elements = {'C': 'carbon', 'H': 'hydrogen', 'O': 'oxygen', 'N': 'nitrogen'}
```

Key	Value
'C'	'carbon'
'H'	'hydrogen'
'O'	'oxygen'
'N'	'nitrogen'

In contrast to sequence types, a dictionary is a *mapping* type. Values are referenced by *keys*, rather than by consecutive integer indexes.

Evaluate the following code statements in the order they are listed:

Python code	Output
<code>type(elements)</code>	
<code>elements.keys()</code>	
<code>elements.values()</code>	
<code>elements['C']</code>	
<code>atom = 'N'</code>	
<code>elements[atom]</code>	
<code>elements[N]</code>	
<code>elements['nitrogen']</code>	
<code>elements[1]</code>	
<code>len(elements)</code>	
<code>elements['B'] = 'boron'</code>	

1. List all the keys stored in the `elements` dictionary after completing the table.
2. What is the data type of the keys in the `elements` dictionary?

3. Explain the reason for the error after entering each of the following lines:

a) `elements[N]`

b) `elements['nitrogen']`

c) `elements[1]`

4. Write a Python expression that creates a dictionary for the seven days of the week, i.e., Sun=1, Mon=2, Tue=3, etc. Assign the dictionary to the variable `dow`.

5. If you assign two different values to the same key (i.e., two assignment statements with one value each), which value is stored in the dictionary? Justify your answer with an example.

6. Another way to store the data is to use two lists:

```
keys = ['C', 'H', 'O', 'N']  
vals = ['carbon', 'hydrogen', 'oxygen', 'nitrogen']
```

What is a disadvantage of this approach? Explain your reasoning.

7. Write down code that check that the value stored by variable `target` is a key in the dictionary `my_dict`:

8. Write down code that check that the value stored by variable target is a value in the dictionary my\_dict:

9. Below is a portion of the pirate dictionary. Write a function called translate that takes in the pirate dictionary and a phrase in English and returns its translation in pirate. For example, translate(pirate\_dict, 'hello there students') must return 'avast there swabbies'.

English Word	Pirate Translation	English Word	Pirate Translation
'sir'	'matey'	'excuse'	'arr'
'hotel'	'fleabag inn'	'are'	'be'
'student'	'swabbie'	'lawyer'	'foul blaggart'
'students'	'swabbies'	'the'	'th''
'boy'	'matey'	'restroom'	'head'
'madam'	'proud beauty'	'my'	'me'
'professor'	'foul blaggart'	'hello'	'avast'
'restaurant'	'galley'	'is'	'be'
'your'	'yer'	'man'	'matey'

10. Write a function called `freq_counts` that takes in a string and then prints a table of the letters of the alphabet in alphabetical order which occur in the string together with the number of times each letter occurs. Case should be ignored. A sample run of the program might look like this:

```
freq_counts('This is String with Upper and lower case Letters.')
```

```
a 2  
c 1  
d 1  
e 5  
...
```

11. Rewrite the previous problem assuming that the order of the letters did not matter (try to think of a different more optimal implementation that does not keep track of every letter, only letters that have been seen):