Dictionaries

Introduction to Programming

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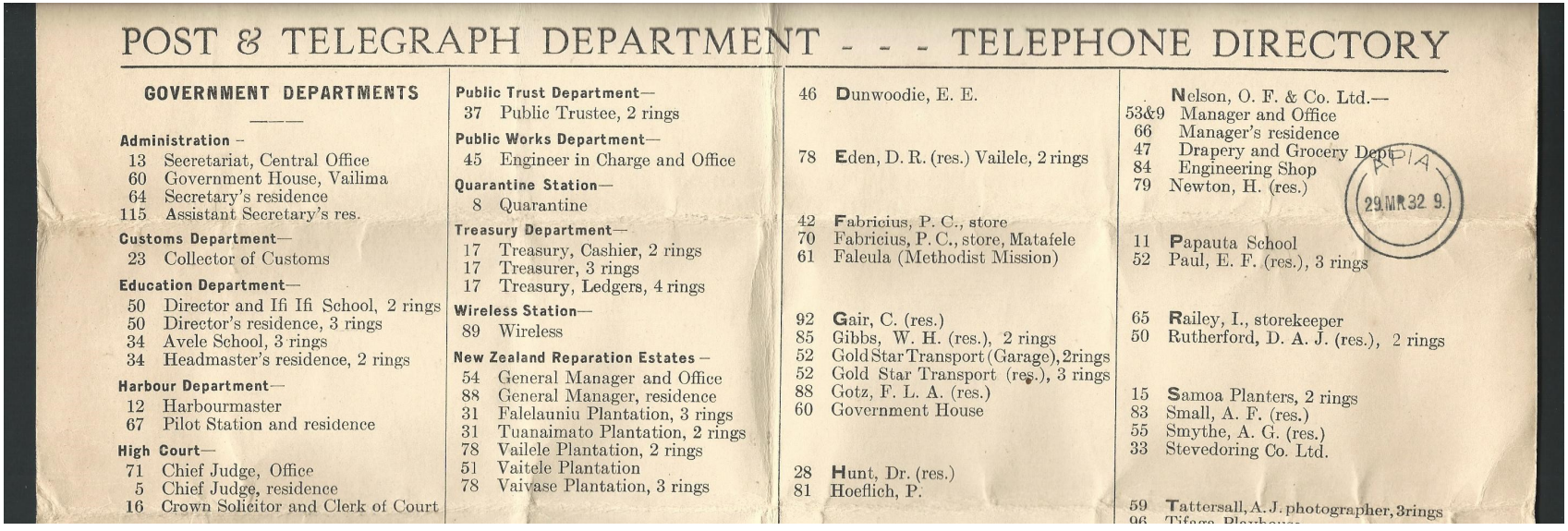
Dictionaries - a definition

A dictionary keeps an association between a set of **keys** and their **values**. For example: lets take a phonebook, names could be the keys and the numbers could be the values:



POST & TELEGRAPH DEPARTMENT - - - TELEPHONE DIRECTORY

GOVERNMENT DEPARTMENTS

Administration –
13 Secretariat, Central Office
60 Government House, Vailima
64 Secretary's residence
115 Assistant Secretary's res.

Customs Department—
23 Collector of Customs

Education Department—
50 Director and Ifi Ifi School, 2 rings
50 Director's residence, 3 rings
34 Avele School, 3 rings
34 Headmaster's residence, 2 rings

Harbour Department—
12 Harbourmaster
67 Pilot Station and residence

High Court—
71 Chief Judge, Office
5 Chief Judge, residence
16 Crown Solicitor and Clerk of Court

Public Trust Department—
37 Public Trustee, 2 rings

Public Works Department—
45 Engineer in Charge and Office

Quarantine Station—
8 Quarantine

Treasury Department—
17 Treasury, Cashier, 2 rings
17 Treasurer, 3 rings
17 Treasury, Ledgers, 4 rings

Wireless Station—
89 Wireless

New Zealand Reparation Estates –
54 General Manager and Office
88 General Manager, residence
31 Falelauniu Plantation, 3 rings
31 Tuanaimato Plantation, 2 rings
78 Vailele Plantation, 2 rings
51 Vaitele Plantation
78 Vaivase Plantation, 3 rings

46 Dunwoodie, E. E.

78 Eden, D. R. (res.) Vailele, 2 rings

42 Fabricius, P. C., store
70 Fabricius, P. C., store, Matafele
61 Faleula (Methodist Mission)

92 Gair, C. (res.)
85 Gibbs, W. H. (res.), 2 rings
52 Gold Star Transport (Garage), 2rings
52 Gold Star Transport (res.), 3 rings
88 Gotz, F. L. A. (res.)
60 Government House

28 Hunt, Dr. (res.)
81 Hoeflich, P.

Nelson, O. F. & Co. Ltd.—
53&9 Manager and Office
66 Manager's residence
47 Drapery and Grocery Dept.
84 Engineering Shop
79 Newton, H. (res.)

APIA 29 MR 32 9.

11 Papauta School
52 Paul, E. F. (res.), 3 rings

65 Railey, I., storekeeper
50 Rutherford, D. A. J. (res.), 2 rings

15 Samoa Planters, 2 rings
83 Small, A. F. (res.)
55 Smythe, A. G. (res.)
33 Stevedoring Co. Ltd.

59 Tattersall, A. J. photographer, 3rings

Figure 1: Telephone directory

By Samoa Post & Telegraph Department, via Wikimedia Commons

Creating and accessing a dictionary

- There are several ways to create a dictionary. You can start off with an empty dictionary and then add key/value pairs to it:

```
name = {}              # syntax 1 (preferred)
name = dict()          # syntax 2
```

- You can create a dictionary with initial key/value pairs using the syntax:

```
name = {key: value, key: value, ..., key: value}
```

Note: the colon in between the key and the value.

```
# dictionary with initial data
phonebook = {"Allison": "(520)555-6789", "Marty": "(650)555-1234"}
```

Lookup elements in a dictionary

```
>>> phonebook["Allison"]
'(520)555-6789'
>>>
>>> phonebook["Marty"]
'(650)555-1234'
```

Modify elements in a dictionary

```
>>> phonebook["Allison"] = '(01279) 36993'
```

Gotcha - Dictionary keys are unique

- The keys in a dictionary are unique and if you add a key, value pair where the key already exists, the original key, value pair will be overwritten.
- You will not receive an error or a warning. Here is an example using the Python shell, you can assume that the dictionary has been set up.

```
>>> # replacing a value in a dictionary
>>> phonebook["Allison"]
'(520)555-6789'
>>> phonebook["Allison"] = "(444)555-8800"
>>> phonebook["Allison"]
'(444)555-8800'
```

Gotcha - More than one key can be associated with the same value

- It is perfectly legal to have two or more keys that refer to the same value. Using the previous example:

```
>>> # dictionary where two keys pair with the same value
>>> phonebook
{'Allison': '(520)555-6789', 'Marty': '(650)555-1234'}
>>> phonebook["Yana"] = "(650)555-1234"   # duplicate value
>>> phonebook["Marty"]
'(650)555-1234'
>>> phonebook["Yana"]
'(650)555-1234'
>>> phonebook
{'Allison': '(520)555-6789', 'Marty': '(650)555-1234',
  'Yana': '(650)555-1234'}
```

Gotcha - Removing dictionary items

- To remove an item from a dictionary, call the `pop()` method with the key as the argument. Here is an example using the Python shell.

```
>>> phonebook = {}                                  # create empty dict
>>> phonebook["Allison"] = "(520)555-6789"  # store a pair
>>> phonebook["Marty"]   = "(650)555-1234"  # store another pair
>>> phonebook.pop("Allison")                 # delete entry with key "All
'(520)555-6789'
>>> phonebook["Allison"]
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
KeyError: 'Allison'
>>>
```

- You can see that if a key doesn't exist, you will get a KeyError exception. We will look at exceptions in a future lecture.

Traversing a dictionary

- Just like sets, you cannot access the elements in a dictionary by position.
- This means that traversing a dictionary is done in much the same way as a set.

```
for name in phonebook:
  print(name, phonebook[name])
```

Dictionary operations

Operation	Description
`dict[key]`	returns the value associated with the given key; raises `KeyError` if not found
`dict[key] = value`	sets the value associated with the given key; replaces if already found
`del dict[key]`	removes the given key and its paired value; raises `KeyError` if not found
`key in dict`	returns `True` if the given key is found
`key not in dict`	returns `True` if the given key is *not* found
`len(dict)`	number of key/value pairs
`str(dict)`	returns string representation such as `"{'a':1, 'b':2}"`
`dict.clear()`	removes all key/value pairs
`dict.get(key,default)`	returns the value associated with the given key; returns `default` if not found
`dict.items()`	returns the contents of the dictionary as a sequence of (key, value) tuples
`dict.keys()`	returns the keys in the dictionary as a sequence
`dict.pop(key)`	returns the value associated with the given key, and removes that key/value pair
`dict.update(dict2)`	adds all key/value pairs from another dictionary, replacing if keys are already present
`dict.values()`	returns the values in the dictionary as a sequence

Question 1

- Given the following dictionary definition

```
favoriteFoods = {"Peg": "burgers", "Cy": "hotdogs",\
   "Bob": "apple pie"}
```

Which code segment correctly prints the dictionary, both the key and value, in alphabetical order by the person's name?

(i)
```
print(favoriteFoods)
```

(ii)
```
for name in sorted(favoriteFoods) :
    print(name, favoriteFoods[name])
```

(iii)
```
for name in (favoriteFoods) :
        print(name, favoriteFoods[name])
```

(iv)
```
for name in sorted(favoriteFoods) :
        print(favoriteFoods[name])
```

Question 2

- Given the dictionary `periodicTable` that contains the periodic table of the elements, which of the following correctly prints the values stored in the table, one per line?

(i)
```
print(periodicTable)
```

(ii)
```
print(values(periodTable))
```

(iii)
```
for value in periodicTable :
    print(value)
```

(iv)
```
for value in periodicTable.values() :
    print(value)
```

p 486, Horstmann, Cay S., Rance Necaise. Python for Everyone, Interactive Edition, 2nd Edition. Wiley, 2016-05-09. VitalBook file.

Answer 1

(ii)
```
for name in sorted(favoriteFoods) :
    print(name, favoriteFoods[name])
```

Answer 2

(iv)
```
for value in periodicTable.values() :
    print(value)
```