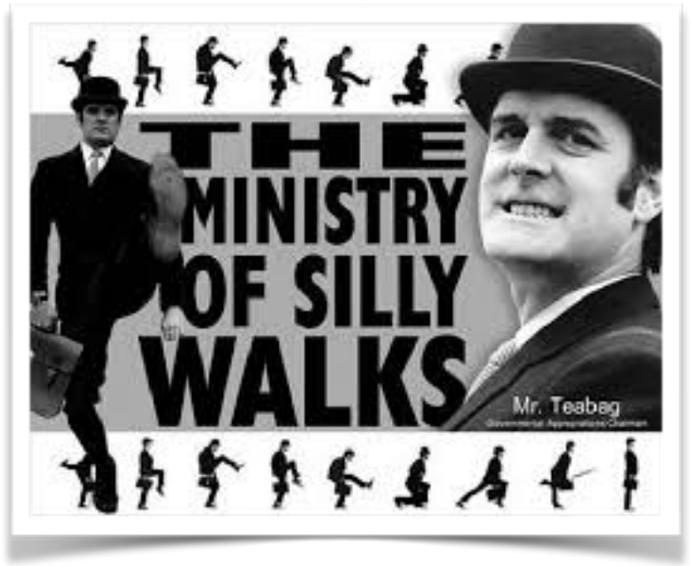
Dictionaries

Python



Dictionaries

- Python has a efficient association data structure — the dictionary
  - Dictionary pairs keys with values
  - Useful for: indices
  - Useful for: translations
  - Useful for: quick lookups
    - E.g.: first letters —> full email address
    - E.g.: human-readable URL —> IP address
    - …

Dictionaries

- Dictionaries are key-value stores
  - Keys — anything, but needs to be immutable
    - Remember: Lists are mutable, strings are immutable
  - Value — anything

Dictionaries

- Dictionaries are created by using curly brackets
  - Can use lists

```
dicc = {1: ‘uno’, 2: ‘dos’, 3: ‘tres’}
```

  - Or can use assignment

```
dicc = {}

dicc[1] = “uno”

dicc[2] = “dos”

dicc[3] = “tres”
```

- Values are assigned / retrieved using the bracket notation

Dictionary

- Dictionary `dicc={}`
- Accessing values:

  `dicc['key']`

  - With default value

    `dicc.get(key, default_value)`

  - Or with if - else

    `if key in dicc:`

- Creating / changing values

  `dicc['key'] = value`

```
>>> dicc = {1: "uno", 2: "dos", 3: "tres"}
>>> dicc[1]
'uno'
>>> dicc[1] = "one"
>>> dicc[1]
'one'
```

Dictionary

- Deleting from a dictionary

```
dicc = {}
```

  - Use the `del` keyword

    - Raises a key error if the key is not in the dictionary

```
if key in dicc:
    del dicc[key]
```

  - Use the pop method, which returns the value

```
value = dicc.pop(key)
value = dicc.pop(key, default)
```

Dictionary

- Checking for existence
  - Use the “in” keyword

```
>>> dicc = {1: "uno", 2: "dos", 3: "tres"}
>>> 1 in dicc
True
>>> 4 not in dicc
True
```

Dictionaries

- A simple program that “learns” Spanish words

```
def test():
    dicc = {}
    while True:
        astr = input("Enter an English word: ")
        if astr == "Stop it":
            return
        elif astr in dicc:
            print(dicc[astr])
        else:
            print("I have not yet learned this word")
            val = input("Please enter the Spanish word: ")
            dicc[astr] = val
```

Dictionaries

- Dictionaries have an internal structure
  - You will learn in Data Structures how to build dictionaries yourselves
  - For the moment, enjoy their power
- You can print dictionaries
  - You will notice that they change structure after inserts and not reflect the order in which you inserted elements
  - This is because they optimize access

Dictionaries

- Deleting all entries in a dictionary
  - use the `clear()` method
- Deleting an entry without fear of creating a key error
- Use an if statement
- Use pop with a second argument None
  - `dicc.pop(1, None)`

Dictionaries

- Looping over keys
  - Simplest:
    - `for number in dicc:`
  - iterkeys( ) or iter works the same way
    - `for number in dicc.iterkeys():`
    - `for number in iter(dicc):`

Some Uses of Dictionaries

- Dictionaries can be used to count things.
  - Example: Count the number of letters in a file.
    - We open the file with encoding latin-1 so that there are no encoding errors

```
alphabet = "abcdefghijklmnopqrstuvwxyz"

with open("alice.txt", encoding = "latin-1") as infile:
    dicc = {}
    for letter in alphabet:
        dicc[letter]=0
```

Some Uses of Dictionaries

- Create and initialize a dictionary
  - We are only interested in letters

```
alphabet = "abcdefghijklmnopqrstuvwxyz"

with open("alice.txt", encoding = "latin-1") as infile:
    dicc = {}
    for letter in alphabet:
        dicc[letter]=0
```

Some Uses of Dictionaries

- Read the file line by line.
  - Read each letter in the line
    - After changing to lower case, update dictionary

```
alphabet = "abcdefghijklmnopqrstuvwxyz"

with open("alice.txt", encoding = "latin-1") as infile:
    dicc = {}
    for letter in alphabet:
        dicc[letter]=0
    for line in infile:
        for letter in line:
            letter=letter.lower()
            if letter in alphabet:
                dicc[letter]+=1
```

Some Uses of Dictionaries

- Now process the dictionary
  - Calculate the sum of values (i.e. the counts)
  - Pretty-print the results

```
for letter in alphabet:
    cum += dicc[letter]
for letter in alphabet:
    print("{:1s} {:5d} {:5.2f}%”.format(
            letter, dicc[letter], dicc[letter]/cum*100))
```

Some Uses of Dictionaries

- Using lists as dictionary values
  - in order to create an index of words in a file

Some Uses of Dictionaries

- Open file with encoding “latin-1”
  - Read file line by line
    - Break line into words
    - Normalize words by stripping and lowering

```
with open("alice.txt", encoding = "latin-1") as infile:
    index = {}
    word_count = 0
    for line in infile:
        for word in line.split():
            word_count += 1
            word = word.lower().strip(",.;:?![]-'\"")
```

Some Uses of Dictionaries

- Add word to dictionary if long enough

```
with open("alice.txt", encoding = "latin-1") as infile:
    index = {}
    word_count = 0
    for line in infile:
        for word in line.split():
            word_count += 1
            word = word.lower().strip(",.;:?![]-'\"")
            if len(word)>7:
                if word in index:
                    index[word].append(word_count)
                else:
                    index[word] = [word_count]
```

Some Uses of Dictionaries

- Print out results if word is frequent enough

```
for word in index:
    if len(index[word])>2:
        print(word, index[word])
```