

# A Short and Incomplete Introduction to Python

## Part 5: File I/O and string processing

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# Strings

In Python, Strings are sequences of characters:

- ▶ They can be indexed and sliced like **list**'s and other sequences:

```
In [1]: s = 'python'
```

```
In [2]: s[:2]
```

```
Out[2]: 'py'
```

- ▶ They are **homogeneous**: items of a string are always characters.
- ▶ They are **immutable**: you can only alter a string through functions that make a (modified) copy:

```
In [3]: s[0] = 'c'
```

```
...
```

```
TypeError: 'str' object does not support  
item assignment
```

## Operations on strings, I

`s.capitalize()`, `s.lower()`, `s.upper()`

Return a *copy* of the string capitalized / turned all lowercase / turned all uppercase.

`s.split(t)`

Split `s` at every occurrence of `t` and return a list of parts. If `t` is omitted, split on whitespace.

`s.startswith(t)`, `s.endswith(t)`

Return `True` if `t` is the initial/final substring of `s`.

*Reference:* <http://docs.python.org/library/stdtypes.html#string-methods>

## Operations on strings, II

`s.replace(old, new)`

Return a *copy* of string `s` with all occurrences of substring `old` replaced by `new`.

`s.lstrip()`, `s.rstrip()`, `s.strip()`

Return a *copy* of the string with the leading (resp. trailing, resp. leading *and* trailing) whitespace removed.

*Reference:* <http://docs.python.org/library/stdtypes.html#string-methods>

**Exercise 5.A:** Write a function `split_comma(s)` which, given a string `s` (containing comma-separated items) returns a *list* of the items. For example:

```
In [4]: split_comma("a,b,c")
```

```
Out [4]: ['a', 'b', 'c']
```

**Exercise 5.B:** Modify `split_comma` to remove whitespace around the returned items, so that

```
split_comma("a, b, c") and split_comma("a,b,c")
```

return the same result `['a', 'b', 'c']`.

**Exercise 5.C:** Write a function `unquote(s)` which, given a string `s` returns a copy of `s` with: 1. All leading and trailing whitespace removed, 2. Initial and final double quote “” characters removed (if any). For example:

```
In [5]: unquote(' "abc"')
```

```
Out [5]: 'abc'
```

## File I/O

File I/O is the process of reading and writing data to and from a file. It is a fundamental operation in many applications, and it is often used to store and retrieve data from a persistent storage device.

File I/O is typically performed using a set of functions or methods that are provided by a programming language or a library. These functions or methods allow you to open a file, read data from it, write data to it, and close it.

File I/O is often used to store and retrieve data from a persistent storage device, such as a hard drive or a solid-state drive. It is also used to read and write data to and from a network, such as a web server or a database.

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## File I/O

Code for processing a text file usually looks like this:

```
with open(filename, 'r') as stream:  
    # prepare for processing  
    for line in stream:  
        # process each line
```



## File I/O

```
with open(filename, 'r') as stream:  
    # prepare for processing  
    for line in stream:  
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```

The `open(path, mode)` function opens the file located at `path` and returns a “file object” that can be used for reading and/or writing.

Mode is one of `'r'`, `'w'` or `'a'` for reading, writing (truncates on open), appending. You can add a `'+'` character to enable read+write (other effects being the same).

## File I/O

```
with open(filename, 'r') as stream:  
    # prepare for processing  
    for line in stream:  
        # process each line
```

This is equivalent to `stream = open(...)` but in addition *closes* the file when the code in the `with`-block is done.

There are many more uses of the `with` statement besides automatically closing files, check out <https://jeffknupp.com/blog/2016/03/07/python-with-context-managers/>

# File I/O

```
with open(filename, 'r') as stream:  
    # prepare for processing  
    for line in stream:  
        # process each line
```

A for-loop can be used to process all lines in a file, as if the file were a list.

## File open modes

*First char.*    *Open file for ...*

- r    reading
- w    writing, position at beginning of file
- a    writing, position at end of file (append)
- x    writing, create new file (error if exists)

*More char.'s*    *Open file for ...*

- +    reading *and* writing
- b    use bytes for I/O operations
- t    use str for I/O operations (default)

Run `help(open)` to get all details.

## More on File I/O

The `.read()` method can be used to read the *whole* contents of a file in one go as a single string:

```
>>> s = stream.read()
```

Method `.readlines()` returns a list of all lines in the file:

```
>>> L = stream.readlines()
```

*Reference:* <http://docs.python.org/library/stdtypes.html#file-objects>

## Type conversions

`str(x)` Converts the argument `x` to a string; for numbers, the base 10 representation is used.

`int(x)` Converts its argument `x` (a number or a string) to an integer; if `x` is a floating-point literal, decimal digits are truncated.

`float(x)` Converts its argument `x` (a number or a string) to a floating-point number.

## The 'in' operator (1)

Use the `in` operator to test for presence of an item in a collection.

**`x in S`**

Evaluates to `True` if `x` is equal to a *value* contained in the `S` sequence (list, tuple, set).

**`S in T`**

Evaluates to `True` if `S` is a substring of string `T`.

**Exercise 5.D:** Write a function `load_data(filename)` that reads a file containing one integer number per line, and return a list of the integer values.

Test it with the `values.txt` file:

```
>>> load_data('values.dat')  
[299850, 299740, 299900, 300070, 299930]
```

**Exercise 5.E:** Write a function `fgrep(s, p)` which returns a list of all lines in file `p` which contain string `s`.



# Filesystem operations, I

These functions are available from the `os` module.

**`os.getcwd()`, `os.chdir(path)`**

Return the path to the current working directory / Change the current working directory to `path`.

**`os.listdir(dir)`**

Return list of entries in directory `dir` (omitting `'.'` and `'..'`)

**`os.makedirs(path)`**

Create a directory; no-op if the directory already exists. Creates all the intermediate-level directories needed to contain the leaf.

**`os.rename(old, new)`**

Rename a file or directory from `old` to `new`.

*Reference:* <http://docs.python.org/library/os.html>

## Filesystem operations, II

These functions are available from the `os.path` module.

`os.path.exists(path)`, `os.path.isdir(path)`,  
`os.path.isfile(path)`

Return `True` if `path` exists / is a directory / is a regular file.

`os.path.basename(path)`, `os.path.dirname(path)`

Return the base name (the part after the last `'/'` character) or the directory name (the part before the last `/` character).

`os.path.abspath(path)`

Make `path` absolute (i.e., start with a `/`).

*Reference:* <http://docs.python.org/library/os.path.html>