

Python for advanced level:

Python File Open

File handling is an important part of any web application.

Python has several functions for creating, reading, updating, and deleting files.

File Handling

The key function for working with files in Python is the `open()` function.

The `open()` function takes two parameters; *filename*, and *mode*.

There are four different methods (modes) for opening a file:

`"r"` - Read - Default value. Opens a file for reading, error if the file does not exist

`"a"` - Append - Opens a file for appending, creates the file if it does not exist

`"w"` - Write - Opens a file for writing, creates the file if it does not exist

`"x"` - Create - Creates the specified file, returns an error if the file exists

In addition you can specify if the file should be handled as binary or text mode

`"t"` - Text - Default value. Text mode

`"b"` - Binary - Binary mode (e.g. images)

Syntax

To open a file for reading it is enough to specify the name of the file:

```
f = open("demofile.txt")
```

The code above is the same as:

```
f = open("demofile.txt", "rt")
```

Because "r" for read, and "t" for text are the default values, you do not need to specify them.

Python File Open

Open a File on the Server

Assume we have the following file, located in the same folder as Python:

demofile.txt

Hello! Welcome to demofile.txt
This file is for testing purposes.
Good Luck!

To open the file, use the built-in `open()` function.

The `open()` function returns a file object, which has a `read()` method for reading the content of the file:

Example

```
f = open("demofile.txt", "r")  
print(f.read())
```

If the file is located in a different location, you will have to specify the file path, like this:

Example

Open a file on a different location:

```
f = open("D:\\myfiles\\welcome.txt", "r")  
print(f.read())
```

Read Only Parts of the File

By default the `read()` method returns the whole text, but you can also specify how many characters you want to return:

Example

Return the 5 first characters of the file:

```
f = open("demofile.txt", "r")
print(f.read(5))
```

Python File Write

Write to an Existing File

To write to an existing file, you must add a parameter to the `open()` function:

"a" - Append - will append to the end of the file

"w" - Write - will overwrite any existing content

Example

Open the file "demofile2.txt" and append content to the file:

```
f = open("demofile2.txt", "a")
f.write("Now the file has more content!")
f.close()

#open and read the file after the appending:
f = open("demofile2.txt", "r")
print(f.read())
```

Example

Open the file "demofile3.txt" and overwrite the content:

```
f = open("demofile3.txt", "w")
f.write("Woops! I have deleted the content!")
```

```
f.close()
```

#open and read the file after the overwriting:

```
f = open("demofile3.txt", "r")  
print(f.read())
```

Create a New File

To create a new file in Python, use the `open()` method, with one of the following parameters:

"x" - Create - will create a file, returns an error if the file exist

"a" - Append - will create a file if the specified file does not exist

"w" - Write - will create a file if the specified file does not exist

Example

Create a file called "myfile.txt":

```
f = open("myfile.txt", "x")
```

Result: a new empty file is created!

Example

Create a new file if it does not exist:

```
f = open("myfile.txt", "w")
```

Python Delete File

Delete a File

To delete a file, you must import the OS module, and run its `os.remove()` function:

Example

Remove the file "demofile.txt":

```
import os
os.remove("demofile.txt")
```

Check if File exist:

To avoid getting an error, you might want to check if the file exists before you try to delete it:

Example

Check if file exists, *then* delete it:

```
import os
if os.path.exists("demofile.txt"):
    os.remove("demofile.txt")
else:
    print("The file does not exist")
```

Delete Folder

To delete an entire folder, use the `os.rmdir()` method:

Example

Remove the folder "myfolder":

```
import os
os.rmdir("myfolder")
```

Python Math:

Python has a set of built-in math functions, including an extensive math module, that allows you to perform mathematical tasks on numbers.

Built-in Math Functions

The `min()` and `max()` functions can be used to find the lowest or highest value in an iterable:

Example

```
x = min(5, 10, 25)
y = max(5, 10, 25)

print(x)
print(y)
```

The `abs()` function returns the absolute (positive) value of the specified number:

Example

```
x = abs(-7.25)

print(x)
```

The `pow(x, y)` function returns the value of x to the power of y (x^y).

Example

Return the value of 4 to the power of 3 (same as $4 * 4 * 4$):

```
x = pow(4, 3)

print(x)
```

Python JSON

JSON is a syntax for storing and exchanging data.

JSON is text, written with JavaScript object notation.

JSON in Python

Python has a built-in package called `json`, which can be used to work with JSON data.

Example

Import the json module:

```
import json
```

Parse JSON - Convert from JSON to Python

If you have a JSON string, you can parse it by using the `json.loads()` method.

Example

Convert from JSON to Python:

```
import json

# some JSON:
x = '{ "name":"John", "age":30, "city":"New York"}'

# parse x:
y = json.loads(x)

# the result is a Python dictionary:
print(y["age"])
```

Convert from Python to JSON

If you have a Python object, you can convert it into a JSON string by using the `json.dumps()` method.

Example

Convert from Python to JSON:

```
import json

# a Python object (dict):
x = {
    "name": "John",
    "age": 30,
    "city": "New York"
}

# convert into JSON:
y = json.dumps(x)

# the result is a JSON string:
print(y)
```

Python RegEx

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A RegEx, or Regular Expression, is a sequence of characters that forms a search pattern.

RegEx can be used to check if a string contains the specified search pattern.

RegEx Module

Python has a built-in package called `re`, which can be used to work with Regular Expressions.

Import the `re` module:

```
import re
```

RegEx in Python

When you have imported the `re` module, you can start using regular expressions:

Example

Search the string to see if it starts with "The" and ends with "Spain":

```
import re

txt = "The rain in Spain"
x = re.search("^The.*Spain$", txt)
```

RegEx Functions

The `re` module offers a set of functions that allows us to search a string for a match:

Function	Description
findall	Returns a list containing all matches
search	Returns a Match object if there is a match anywhere in the string
split	Returns a list where the string has been split at each match
sub	Replaces one or many matches with a string

Python Try Except

The **try** block lets you test a block of code for errors.

The **except** block lets you handle the error.

The **else** block lets you execute code when there is no error.

The **finally** block lets you execute code, regardless of the result of the try- and except blocks.

Exception Handling

When an error occurs, or exception as we call it, Python will normally stop and generate an error message.

These exceptions can be handled using the **try** statement:

Example

The **try** block will generate an exception, because **x** is not defined:

```
try:  
    print(x)  
except:  
    print("An exception occurred")
```

Since the try block raises an error, the except block will be executed.

Without the try block, the program will crash and raise an error:

Example

This statement will raise an error, because **x** is not defined:

```
print(x)
```

Many Exceptions

You can define as many exception blocks as you want, e.g. if you want to execute a special block of code for a special kind of error:

Example

Print one message if the try block raises a `NameError` and another for other errors:

```
try:
    print(x)
except NameError:
    print("Variable x is not defined")
except:
    print("Something else went wrong")
```

Else

You can use the `else` keyword to define a block of code to be executed if no errors were raised:

Example

In this example, the `try` block does not generate any error:

```
try:
    print("Hello")
except:
    print("Something went wrong")
else:
    print("Nothing went wrong")
```

Finally

The `finally` block, if specified, will be executed regardless if the try block raises an error or not.

Example

```
try:
    print(x)
except:
```

```
    print("Something went wrong")
finally:
    print("The 'try except' is finished")
```

This can be useful to close objects and clean up resources:

Example

Try to open and write to a file that is not writable:

```
try:
    f = open("demofile.txt")
    try:
        f.write("Lorum Ipsum")
    except:
        print("Something went wrong when writing to the file")
finally:
    f.close()
except:
    print("Something went wrong when opening the file")
```

The program can continue, without leaving the file object open.

Raise an exception

As a Python developer you can choose to throw an exception if a condition occurs.

To throw (or raise) an exception, use the **raise** keyword.

Example

Raise an error and stop the program if x is lower than 0:

```
x = -1

if x < 0:
    raise Exception("Sorry, no numbers below zero")
```

The **raise** keyword is used to raise an exception.

You can define what kind of error to raise, and the text to print to the user.

Example

Raise a `TypeError` if `x` is not an integer:

```
x = "hello"
```

```
if not type(x) is int:  
    raise TypeError("Only integers are allowed")
```