Reading Files

Table of Contents

1 `open()` Function

How was your pre-class content. Did you understand the “Reading Files with Python”?

Students, drag the icon!

open( ) Function (review)

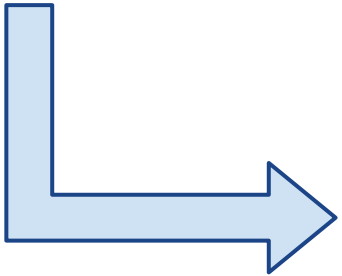
- To start working with files, we need to open it first by using a built-in function `open()`. According to the official related Python documents, it has the following parameters :

```
open (file, mode='r', buffering=-1, encoding=None,
errors=None, newline=None, closefd=True, opener=None)
```

open( ) Function (review)

- We will mostly examine and work with some of the following parameters of the `open()` function :

```
open (file, mode='r', buffering=-1, encoding=None,
errors=None, newline=None, closefd=True, opener=None)
```



- file
- encoding
- mode

open( ) Function (review)

`file`

- **`file`** is the only required parameter of the `open()` function. This parameter is a path-like object which is a `str` or `bytes` that represents a path in the file directory.
- This parameter takes the name of the file that you want to open which is stored in the directory where the Python installed. In other words, the file should be stored in the **current working directory**.

⚠ Attention ! :

- Since the interpreter of the Playground is installed on the server, you cannot open, read or write a file on it.

`open()` Function (review)

- You can see the current path of your Jupyter using **`pwd`** command.

```
In [4]:  1 pwd

Out[4]: 'C:\\Users\\YD'
```

open( ) Function (review)

file

- In the following example, you see that we open a **.txt** file object. We passed the required parameter (**file**) into the **open( )** function.

```
1  my_file = open("first_file.txt")  # this syntax opens a 'txt' file
2
3  print(type(my_file))
```

open( ) Function (review)

file

```
1  my_file = open("first_file.txt")  # this syntax opens a 'txt' file
2
3  print(type(my_file))
```

```
1  <class '_io.TextIOWrapper'>
2
```

- It opens the file and returns a corresponding **file-like object**. If the file cannot be opened, an **OSError** is raised. Pay attention to the type of **my_file**. We have created a file-like object. So we can apply different kinds of **methods** to **my_file**.

open( ) Function (review)

encoding

- The `encoding` parameter indicates the encoding that needs to be used to *decode* or *encode* a file. The default value depends on the platform you use and its language.
- **UTF-8** is one of the most preferred used encodings, and **Python generally defaults to using it.** UTF stands for "**Unicode Transformation Format**", and the '**8**' means that **8-bit** values are used in the encoding.
- We can open a file in the same way by using the following syntax :

```
1  my_file = open("first_file.txt", encoding="utf-8")
2  # we've used 'utf8' encoding format just the same as the previous one
```

I have learned enough about the `encoding` parameter so far.

2

mode Parameter

`mode` Parameter (review)

- `mode` parameter has several options that regulate how or for what purpose we open the file. These options are as follows :

Character	What it's used for?
`'r'`	Open for reading (default). If the file doesn't exist, FileNotFoundError will raise.
`'a'`	Open for writing. It will append to the end of the file if it already exists. If there is no file, it will create it.
`'w'`	Open for writing. It will be overwritten if the file already exists. If there is no file, it will create it.
`'x'`	Open for exclusive creation, it will fail if the file already exists.
`'b'`	Open in binary mode.
`'t'`	Open as a text file (default).
`'+'`	Open for updating (reading and writing).

`mode` Parameter (review)

- By default, `open()` function executes opening the file for reading (`'r'`) as a text (`'t'`). In other words, it defaults to `'r'` or `'rt'` which means open for reading in text mode.

Tips:

- Note that, as you can see above, depending on what you are going to do with the file, you can combine the modes according to your needs.
- If you want to *open* and be able to *read*, modify, and *update* the existing file you should set the mode as `'r+'`.

`mode` Parameter (review)

- Another **important point** we should cover about **`mode`** is that you can choose the format in which you want to open the file as text (`'t'`) or binary (`'b'`).

`'b'`

Returns contents as `bytes objects` without any decoding.

`'t'`

most common use

The contents of the file are returned as `str`.

It's **default** for **`mode`** parameter.

3

Reading the Files with `.read()` Method

Reading Methods

- You can use the following methods for reading a file :

```
.read(size)
```

```
.readline(size)
```

```
.readlines()
```

```
using loops
```

Reading Methods

```
.read(size)
```

Reading Methods

- First of all, we need to create a text file and save it in the folder where Anaconda3 / Python is installed. Suppose we have a file named **"fishes.txt"** with the following content.

fishes.txt

```
Orca is a kind of Dolphin.
Blue Whale is the largest animal known on earth.
Sharks are the sister group to the Rays (batoids).
The Tuna Fish can weigh up to 260 kg.
Squid and Octopus are in the same class.
```

Reading Methods

Keep in your mind!

You can pass **full path** of the file into `open()` function. So that, when the file path is entered, the location where the file is saved does not matter.

```
file = open("C:/users/desktop/fishes.txt", "r")
```

`.read()` Method (review)

- This method reads the size bytes (characters) of the file. If this parameter is not specified, the entire file is read at once.

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.read())  # displays the entire text content
4
5  sea.close()  # be sure to close the file
```

What is the output? Try to figure out in your mind...

Students, write your response!

`.read()` Method (review)

- This method reads the size bytes (characters) of the file. If this parameter is not specified, the entire file is read at once.

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.read())  # displays the entire text content
4
5  sea.close()  # be sure to close the file
```

```
1  Orca is a kind of Dolphin.
2  Blue Whale is the largest animal known on earth.
3  Sharks are the sister group to the Rays (batoids).
4  The Tuna Fish can weigh up to 260 kg.
5  Squid and Octopus are in the same class.
6
```

`.read()` Method (review)

- Now let's do some readings using the `size` parameter. It specifies the sequence number of the characters starting at number 1.

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.read(33))  # displays the first 33 chars of the text
4
5  sea.close()
6
```

What is the output? Try to figure out in your mind...

`.read()` Method (review)

- The output :

```
sea = open("fishes.txt", 'r')

print(sea.read(33))  # displays the first 33 chars of the text

sea.close()

```

```
Orca is a kind of Dolphin.
Blue W
```

`.read()` Method (review)

- Now let's continue to read using the `size` parameter.

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.read(25))  # displays the next 25 chars of the text
4
5  sea.close()
6
```

What is the output? Try to figure out in your mind...

`.read()` Method (review)

- The output :

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.read(25))  # displays the next 25 chars of the text
4
5  sea.close()
6
```

```
3
4  hale is the largest anima
5
```

`.read()` Method (review)

- Now let's continue to read using the `size` parameter.

```
1  sea = open("fishes.txt", 'r')
2
3  sea.seek(0)  # changes the stream (cursor) position to zero
4  print(sea.read(33))  # displays the first 33 chars again
5
6  sea.close()
7
```

What is the output? Try to figure out in your mind...

`.read()` Method (review)

- The output :

```
1  sea = open("fishes.txt", 'r')
2
3  sea.seek(0)  # changes the stream (cursor) position to zero
4  print(sea.read(33))  # displays the first 33 chars again
5
6  sea.close()
7
```

```
5
6  Orca is a kind of Dolphin.
7  Blue W
8
```

`.read()` Method (review)

- Now let's continue to read using the `size` parameter.

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.tell())  # returns the current stream (cursor) position
4
5  sea.close()
6
```

What is the output? Try to figure out in your mind...

`.read()` Method (review)

- The output :

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.tell())  # returns the current stream (cursor) position
4
5  sea.close()
6
```

```
8
9   34
10
```

`.read()` Method

- **Task :**
  - Create a **txt** file named **rumi.txt** in your current directory consisting of the following quotes of Rumi.

rumi.txt

```
I want to sing
Like the birds sing,
Not worrying about
Who hears or
What they think.
```

`.read()` Method

- **Task (continued):**
  - Create a **txt** file named **rumi.txt** in your current directory consisting of the following quotes of Rumi.
  - Read and display the entire contents of this file at once.
  - Display the *first two lines* using `read()` method.

`.read()` Method (review)

- **Task (continued):**
  - Display the next 13 chars of the content,
  - Display the current location of the cursor,
  - Bring the cursor onto beginning of the second line and display the second line again.
  - Close the file.

`.read()` Method (review)

- **The entire code block can be as follows** (suppose you've created the **rumi.txt** manually into your current directory:

```
1  f = open("rumi.txt", "r", encoding="utf-8")
2
3  print(f.read(35))
4  print(f.read(13))
5  print(f.tell())
6  f.seek(15)
7  print(f.read(20))
8
9  f.close()
10
```

`.read()` Method (review)

- The output :

Output

```
I want to sing
Like the birds sing,

Not worrying
48
Like the birds sing,
```

First 35 chars (first two lines)

The next 13 chars

The current location of the cursor

4

Reading the Files with `.readline()` Method

`.readline()` Method (review)

- This method reads only `size` bytes from a single line of the text. Now let's start to examine this method through an example :

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readline())  # displays the first line of the text
4  print(sea.readline())  # displays the second line
5  print(sea.readline())  # each time it goes to the new line
6
7  sea.close()
```

What is the output? Try to figure out in your mind...

`.readline()` Method (review)

- The output :

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readline())  # displays the first line of the text
4  print(sea.readline())  # displays the second line
5  print(sea.readline())  # each time it goes to the new line
6
7  sea.close()
```

```
1  Orca is a kind of Dolphin.
2
3  Blue Whale is the largest animal known on earth.
4
5  Sharks are the sister group to the Rays (batoids).
6
```

`.readline()` Method (review)

💡**Tips:**

- Note that; `.readline()` reads the entire line.
- Pay attention to the output that there are empty lines between each line.

- Now, let's take a look at an example using the `size` parameter. The first line of the text contains **26** bytes (characters) except the newline char (`\n`). But, note that the **newline** character (`\n`) is ***considered as a part of each line***.

`.readline()` Method (review)

- So that, first line of text consists of *27 characters*. Let's choose 13 as the `size` parameter and see what happens :

fishes.txt

```
Orca is a kind of Dolphin.
Blue Whale is the largest animal known on earth.
Sharks are the sister group to the Rays (batoids).
The Tuna Fish can weigh up to 260 kg.
Squid and Octopus are in the same class.
```

`.readline()` Method (review)

fishes.txt

```
Orca is a kind of Dolphin.\n
|||||||||||||||||||||||||||=27
Squid and octopus are in the same class.
```

`.readline()` Method (review)

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readline(13))
4  print(sea.readline(13))
5  print(sea.readline(13))
6  print(sea.readline(13))
7
8  sea.close()
```

What is the output? Try to figure out in your mind...

Students, write your response!

.readline() Method (review)

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readline(13))
4  print(sea.readline(13))
5  print(sea.readline(13))
6  print(sea.readline(13))
7
8  sea.close()
```

```
1  Orca is a kin
2  d of Dolphin.
3
4
5  Blue Whale is
6
```

`\n` is the last char of the first line

when a line ends, whatever the `size` parameter is, it goes ahead to the next line

default empty line

`.readline()` Method

- **Task :**
  - Consider the **rumi.txt** file you created before.

rumi.txt

```
I want to sing
Like the birds sing,
Not worrying about
Who hears or
What they think.
```

`.readline()` Method

- **Task (continued) :**
  - Read and display the first line of this file,
  - Read and display the second line of this file,
  - Read and display the third line of this file using `size` parameter in the method,
  - Close the file.

`.readline()` Method

- **The entire code block can be as follows** (suppose you've created the **rumi.txt** manually into your current directory:

```
1  f = open("rumi.txt", "r", encoding="utf-8")
2
3  print(f.readline())
4  print(f.readline())
5  print(f.readline(18))
6
7  f.close()
8
```

`.readline()` Method

- The output :

Output

```
I want to sing

Like the birds sing,

Not worrying about
```

reading of 18 chars
displays the third line

5

Reading the Files with `.readlines()` Method

`.readlines()` Method (review)

- And the third method in reading the files in Python is `.readlines()`. It reads the entire file line by line in the `list` form.
- Using our same text file, let's look at the following example on how the output looks like :

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readlines())
4
5  sea.close()
```

What is the output? Try to figure out in your mind...

`.readlines()` Method (review)

- The output :

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readlines())
4
5  sea.close()
```

```
1  ['Orca is a kind of Dolphin.\n', 'Blue Whale is the largest animal known on
2  earth.\n', 'Sharks are the sister group to the Rays (batoids).\n', 'The Tuna
3  Fish can weigh up to 260 kg.\n', 'Squid and Octopus are in the same class.']
4
```

`.readlines()` Method (review)

- Let's take a look at the following example where `.readline()` and `.readlines()` are used together.

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readline())  # first line
4  print(sea.readlines())  # the rest of the lines
5
6  sea.close()
```

What is the output? Try to figure out in your mind...

`.readlines()` Method (review)

- The output :

```
1  sea = open("fishes.txt", 'r')
2
3  print(sea.readline())  # first line
4  print(sea.readlines())  # the rest of the lines
5
6  sea.close()
```

```
1  Orca is a kind of Dolphin.
2
3  ['Blue Whale is the largest animal known on earth.\n', 'Sharks are the sister
4  group to the Rays (batoids).\n', 'The Tuna Fish can weigh up to 260 kg.\n',
5  'Squid and Octopus are in the same class.']
6
```

`.readlines()` Method (review)

- You may have noticed that the type of the `sea.readlines()` object is the `list`. Let's see it :

```
1  sea = open("fishes.txt", 'r')
2
3  print(type(sea.readlines()))
4
5  sea.close()
```

```
1  <class 'list'>
2
```

⚠ Attention ! :

- Although it is very good to read relatively small files with this method, but when large files are involved, this method can be inefficient.

`.readlines()` Method

- **Task :**
  - Consider the **rumi.txt** file you created before.

rumi.txt

```
I want to sing
Like the birds sing,
Not worrying about
Who hears or
What they think.
```

`.readlines()` Method

- **Task (continued) :**
  - Read and display the entire file in a `list` form,
  - Close the file.

`.readlines()` Method

- **The entire code block can be as follows** (suppose you've created the **rumi.txt** manually into your current directory:

```
1  f = open("rumi.txt", "r", encoding="utf-8")
2
3  print(f.readlines())
4
5  f.close()
6
```

`.readlines()` Method

- The output :

Output

```
['I want to sing\n', 'Like the birds sing,\n', 'Not worrying about\n', 'Who hears or\n', 'What they think']
```

6

Reading the Files with loops

Reading the Files with Loops(review)

- The most efficient way to read the contents of a file is using the for loop. Let's take a look at an example of how we do this.

```
1  sea = open("fishes.txt", 'r')
2
3  for line in sea:
4      print(line)
5
6  sea.close()
```

What is the output? Try to figure out in your mind...

Reading the Files with Loops(review)

- The output :

```
1  sea = open("fishes.txt", 'r')
2
3  for line in sea:
4      print(line)
5
6  sea.close()
```

```
1  Orca is a kind of Dolphin.
2
3  Blue Whale is the largest animal known on earth.
4
5  Sharks are the sister group to the Rays (batoids).
6
7  The Tuna Fish can weigh up to 260 kg.
8
9  Squid and Octopus are in the same class.
10
```

Reading the Files with Loops(review)

- Since the type of `sea.readlines()` object is a `list`, we can use it as an iterator and read the whole file in the same way.

```
1  sea = open("fishes.txt", 'r')
2
3  for line in sea.readlines():
4      print(line)
5
6  sea.close()
```

```
1  Orca is a kind of Dolphin.
2
3  Blue Whale is the largest animal known on earth.
4
5  Sharks are the sister group to the Rays (batoids).
6
7  The Tuna Fish can weigh up to 260 kg.
8
9  Squid and Octopus are in the same class.
10
```

Reading the Files with Loops

- **Task :**
  - Consider the **rumi.txt** file you created before.

rumi.txt

```
I want to sing
Like the birds sing,
Not worrying about
Who hears or
What they think.
```

Reading the Files with Loops

- **Task (continued) :**
  - Read and display the entire file with loops using file-like object as an iterator,
  - Read and display the entire file with loops using .`readlines()`-produced `list` as an iterator,
  - Close the file.

Reading the Files with Loops

- **The entire code block can be as follows** (suppose you've created the **rumi.txt** manually into your current directory:

f is ***file-like object*** and it's used as an iterator

```
1  f = open("rumi.txt"
2
3  for line in f:
4      print(line)
5
6  f.close()
7
```

Reading the Files with Loops

- The output :

Output

```
I want to sing

Like the birds sing,

Not worrying about

Who hears or

What they think
```

Reading the Files with Loops

- **The entire code block can be as follows** (suppose you've created the **rumi.txt** manually into your current directory:

```
1  f = open("rumi.txt", "r", encoding="utf-8")
2
3  for line in f.readlines():
4      print(line)
5
6  f.close()
7
```

`f.readlines()` is ***a*** **`list`** type and it's used as an iterator

Reading the Files with Loops

- It gives the same output :

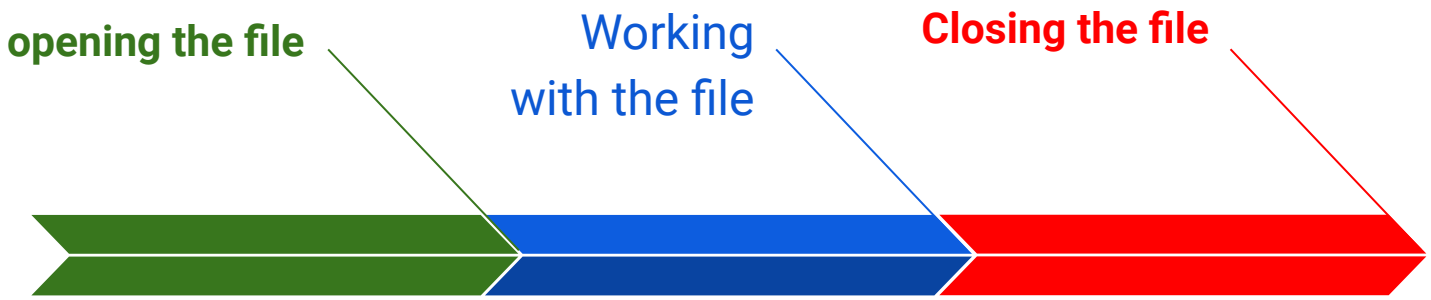
Output

```
I want to sing

Like the birds sing,

Not worrying about

Who hears or

What they think
```

7 The Matter of Closing Files

The Matter of Closing the Files(review)

Workflow of working with files to be followed



The Matter of Closing the Files(review)

- Normally, when the program finishes running, that file is closed. But this does not happen at times and people forget to close these files that have been opened while working with them.
- If we do not want to lose the data we are working with, we should **keep in mind** that the file **should be closed as soon as our work is finished**.

The Matter of Closing the Files(review)

- As we mentioned, we can do the closing process with the `close()` method, but there is a slightly easier way to do this.
- Using the `with .... as ...` block.
- In fact, the actual use of the `with ... as ...` block is to make sure that all the necessary functions are called.

```
with open("my_file.txt", "r", encoding="utf-8") as f:
    code block
```

The Matter of Closing the Files(review)

- Take a look at the way we use it :

```
1 with open("fishes.txt", "r") as sea:
2     print(sea.read())  # needs indented code block
```

```
1 Orca is a kind of Dolphin.
2 Blue Whale is the largest animal known on earth.
3 Sharks are the sister group to the Rays (batoids).
4 The Tuna Fish can weigh up to 260 kg.
5 Squid and Octopus are in the same class.
6
```

Using the `with ... as ...` block

- Create another `txt` file,
- Implement the same steps (reading methods) in the tasks shown in this presentation.

You can complete this assignment by yourself or in a group session later.

Students, follow the instructions on the slide

How well did you like this lesson?

Students, drag the icon!

THANKS!

Any questions?

You can find me at:

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