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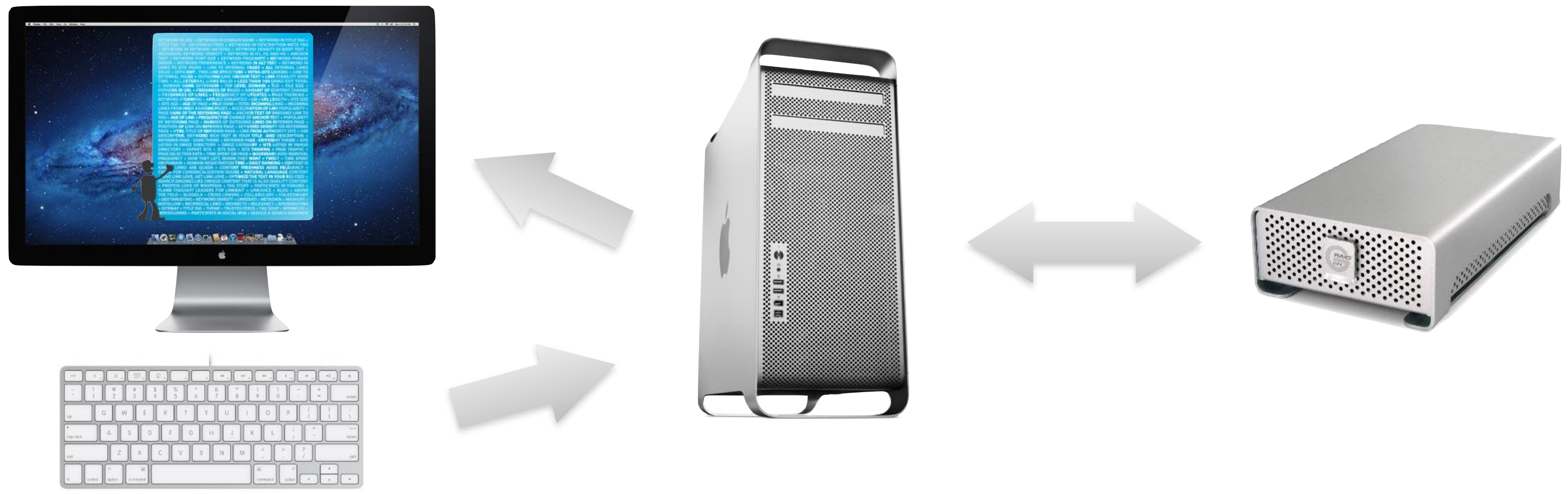
Introduction

- Up to now, our programs store their data in memory
  - We need non-volatile storage to permanently keep the information and retrieve it later

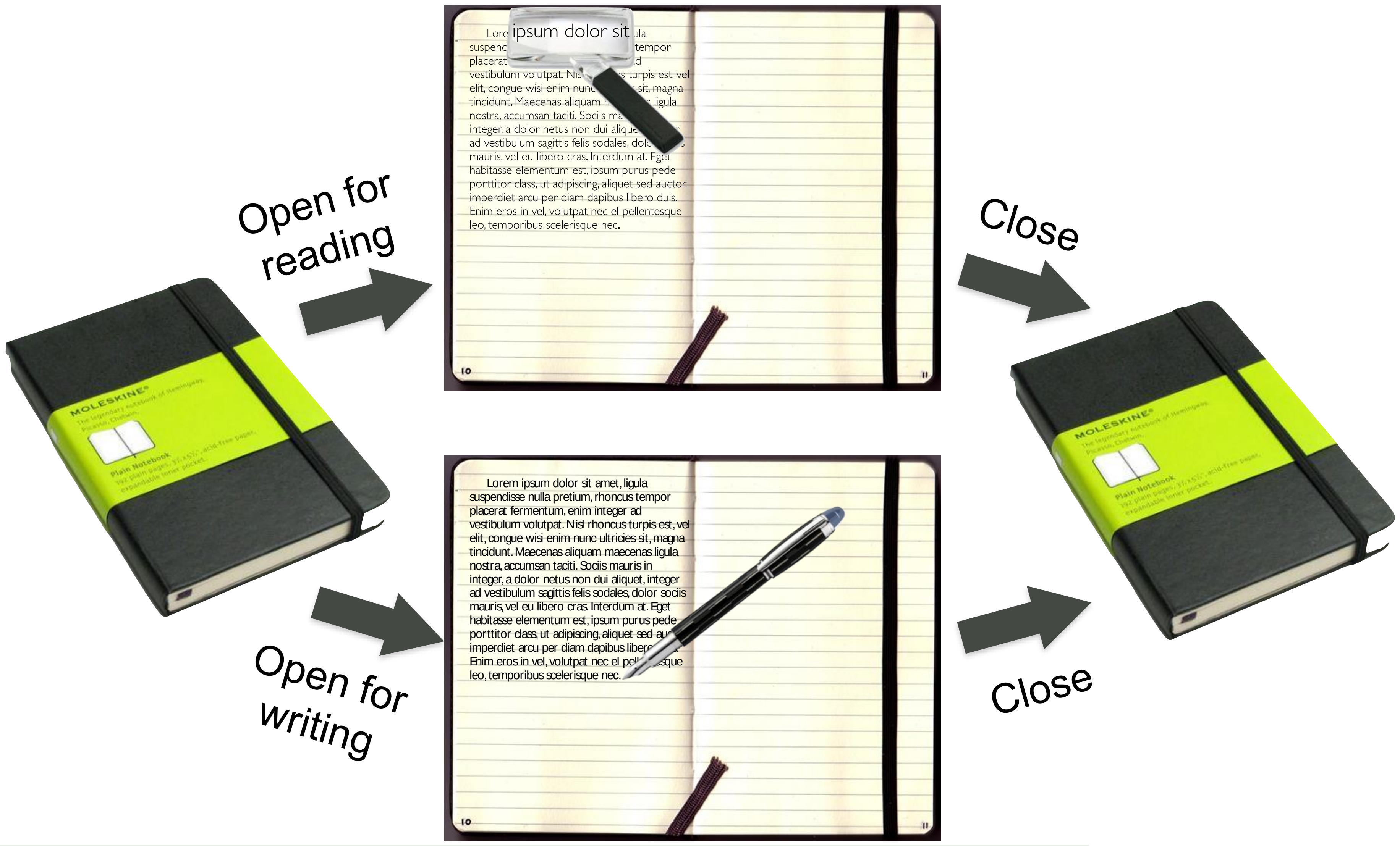


- **A file is a byte sequence that is kept in a permanent storage device**

Using files

- In Python, a file is categorized as either a text or binary, and the difference between the wo file types is important.
  - **Text files** are structured as a sequence of lines, where each line includes a sequence of characters.
  - Each line is determined with a special character, called the EOL or End of Line character. There are several types, but the most common is the new line character (`\n`).

Using files



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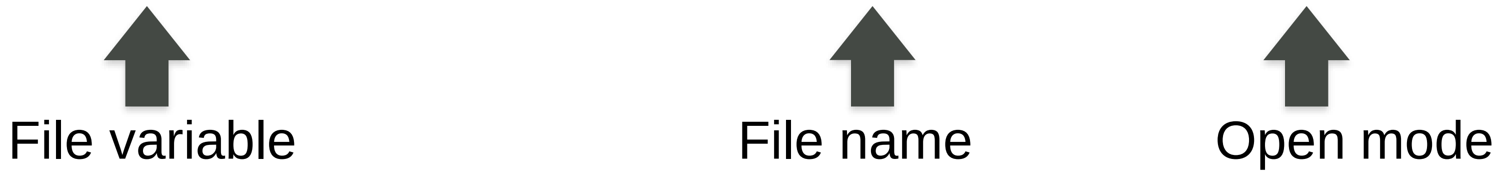
Opening a file

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



- **Open modes:** read, write, append.
  - **"r" → Open for reading (default value)**. If the file does not exist, an error is launched.
  - **"w" → Open for writing**. If the file does not exist, a new one is created. In any other case, its content is overwritten.
  - **"a" → Open for appending**. If the file does not exist, a new one is created. In any other case, it is opened with write permissions and new information is appended at the end.

Reading a file

- Most programming languages offer several ways to get information from a file.
- If you need to extract a string that contains all (or a number of) characters in the file, you can use the following method:

Characters read

```
c = f.read()
```

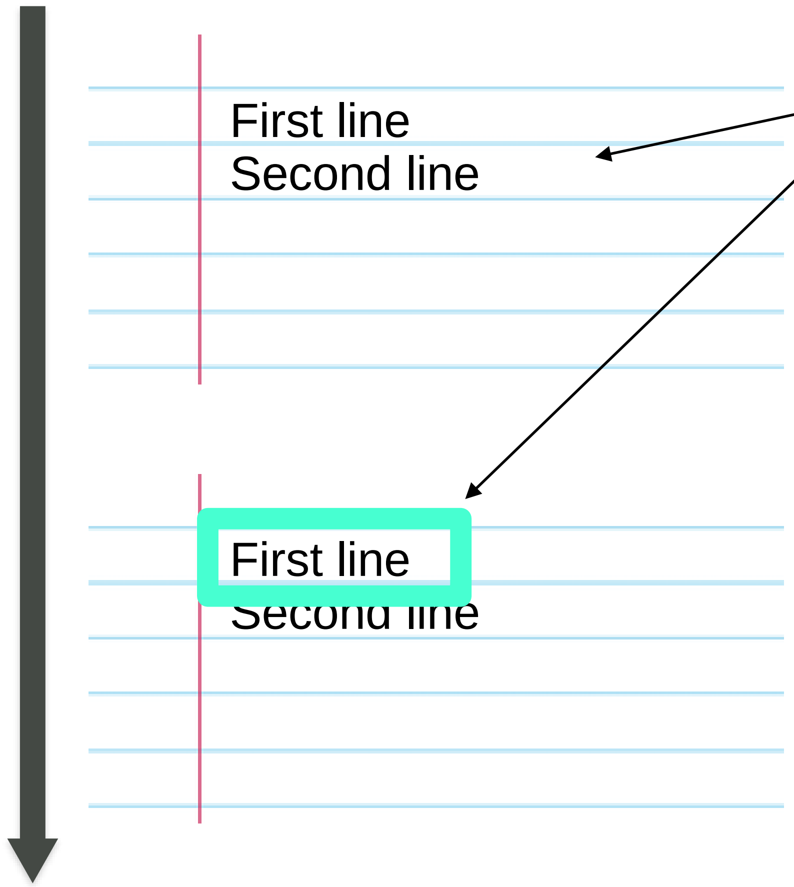
File variable

- The file is read in a sequential way
- It returns the whole file (or the number of characters specified as parameter)
- Next call will return next characters

Reading a file

- `f.readline()` will read from a file line by line (rather than pulling the entire file in at once). Basically, it will read a single line from the file and return a string containing characters up to `\n`. Subsequent calls to `readline()` will return successive lines.
- `f.readlines()` returns the complete the complete file as a list of strings each separated by `\n`.

Reading a file: example



```
>>> f = open("myfile.txt", "r")
>>> line = f.readline()
>>> print(line)
First line

>>> f.close()
```

IMPORTANT: The carriage return is also read and it is stored in the `line` variable, which is also displayed by `print`.

Writing a file

- Most programming languages offer one (or more) functions to add information from a file.

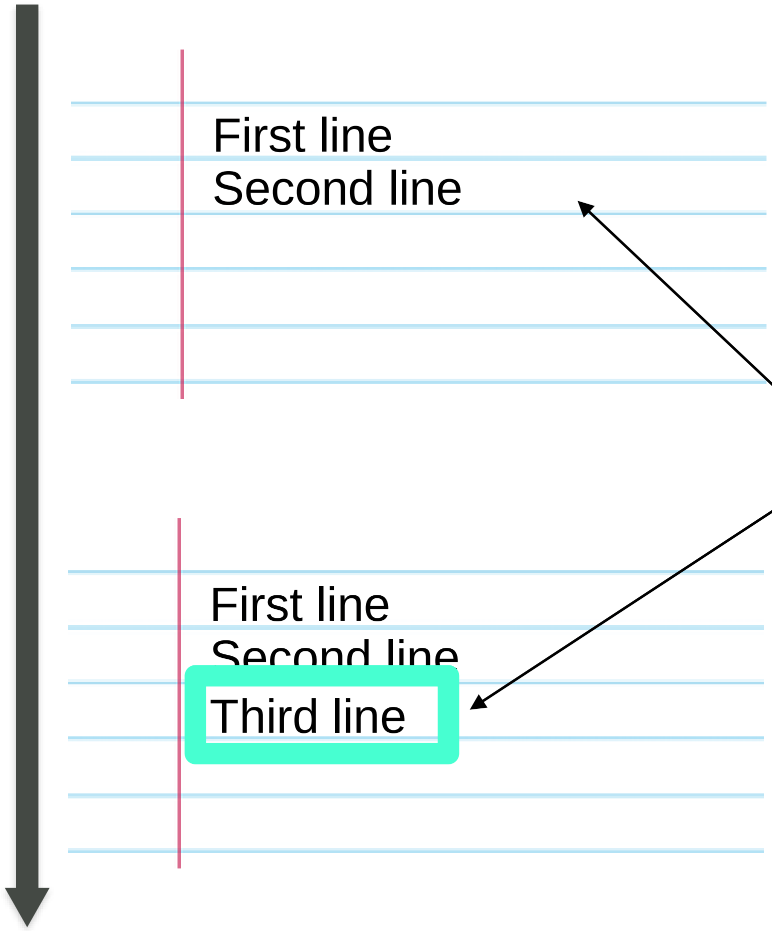
Characters to be added to the file

```
f.write(characters)
```

File variable

- Open mode **w**: Writes a string (character-oriented file) in the actual position of a file.
- Open mode **a**: Points to the EOF and add the characters there.

Writing a file (appending): example



```
>>> f = open("myfile.txt", "a")
>>> f.write("Third line\n")
>>> f.close()
```

We have to explicitly provide the EOL character in order to start a new line.

Closing a file

- The file cannot be accessed anymore unless it is opened again.

```
f.close()
```

↑

File variable

Example

- Python can read a whole file with just one instruction:

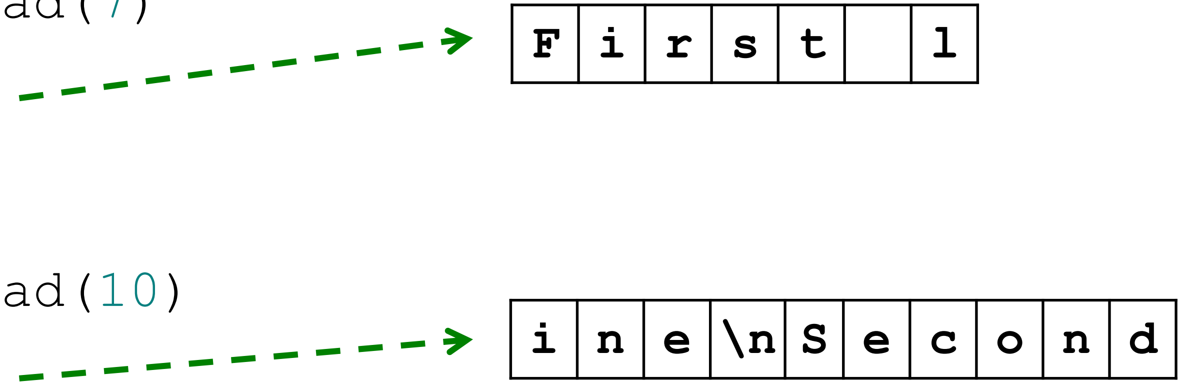
```
>>> f = open("myfile.txt", "r")
>>> all = f.read()
>>> print(all)
First line
Second line

>>> f.close()
```

F	i	r	s	t		l	i	n	e	\n	S	e	c	o	n	d		l	i	n	e	\n

Example

- Instead of reading full lines, we can also indicate the number of bytes we want to read.

```
>>> f = open("myfile.txt", "r")
>>> letters = f.read(7)
>>> print(letters)
First l
>>> letters = f.read(10)
>>> print(letters)
ine
Second
>>> f.close()
```



Examples

- A for loop to read a file line by line:

```
f = open("myfile.txt","r")
lines = f.readlines()
f.close()
for l in lines:
    print(l)
```

```
f = open("myfile.txt","r")
for l in f:
    print(l)
f.close()
```

- We can also read the file until we find the EOF:

```
f = open("myfile.txt","r")
line = f.readline()
while line != "":
    print(line)
    line = f.readline()
f.close()
```

```
[Output]
First line

Second line
```