Week 4: Reading and Writing Data

Unit 1: Motivation and Definition

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How can data be permanently stored?

- Right now, all the data processed in our programs is lost when the program is stopped.
- How can data be permanently stored, even when the computer is switched off?
- Read data from and write data into **files**
- Definition of a file:
  - Logically related
  - Usually sequentially ordered
  - Permanently stored (e.g. on a hard drive)
  - Identified by a name

Hard disk

Showtime

Now it’s time to get hands on and start programming!

If you like, you can open the Jupyter Notebook instructions in parallel to the demo.

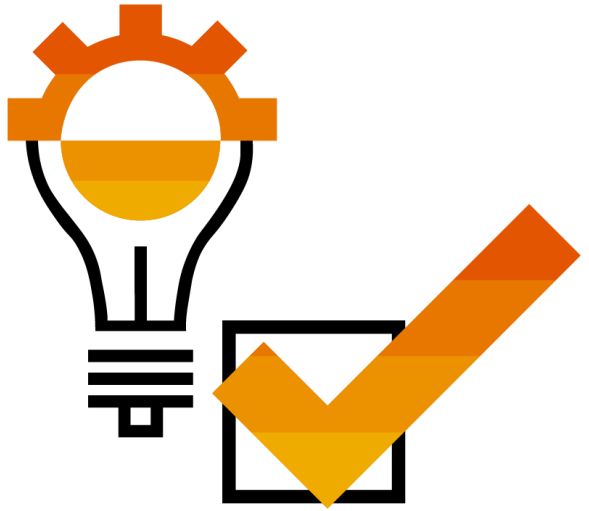
If you haven’t done so yet:

- Download the Notebook
- Start the Jupyter Server
- Open the Notebook

Summary / key takeaways

In this unit you learned ...

- … that files are the classical means to store data



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Week 4: Reading and Writing Data

Unit 2: Opening and Closing Files

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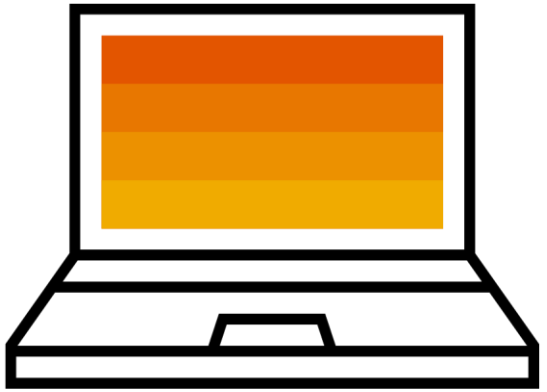
Opening and closing files

Working with files always uses the same steps

- There are three steps to handle files:
  - Open file
  - Access file (read from / write into file)
  - Close file
- When opening the file, a **mode** has to be given to state ...
  … if the file should be read
  … if data should be written into the file
  … if both should be done



Opening and closing files
Showtime

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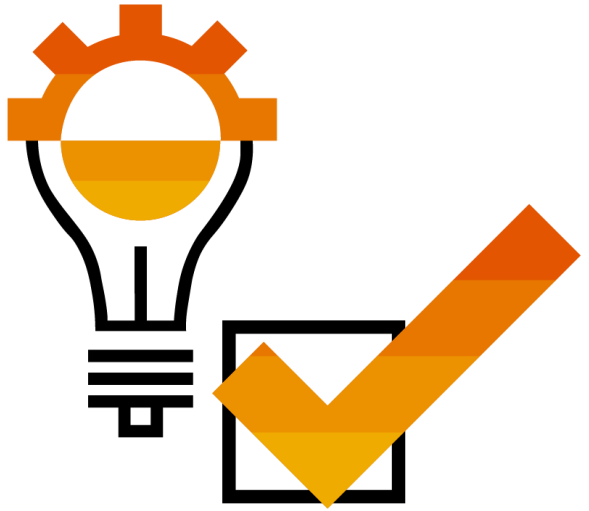
Summary / key takeaways

In this unit you learned ...

- … how to access files
- … the different modes to open a file
- … the `with` statement
- … that you should know **where** the files are stored



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Unit 3: Reading Data from Files

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Reading data from files

Getting input data for your program from files

- Recap: files are sequentially organized
  - That means, the for loop is well suited to make use of the sequential structure, one can loop over the lines of the file.
- At the end of each line, there is a line break
  - This can be deleted with the string-method `.strip()`

```
# Open file
with open("lorem_ipsum.txt", "r") as file:

    # read file line by line, strip from  and output the lines
    for line in file:
        line = line.strip()
        print(line)
```

```
Lorem ipsum dolor sit amet, consectetur adipiscing elit,
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```

Showtime

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If you like, you can open the Jupyter Notebook instructions in parallel to the demo.

If you haven’t done so yet:

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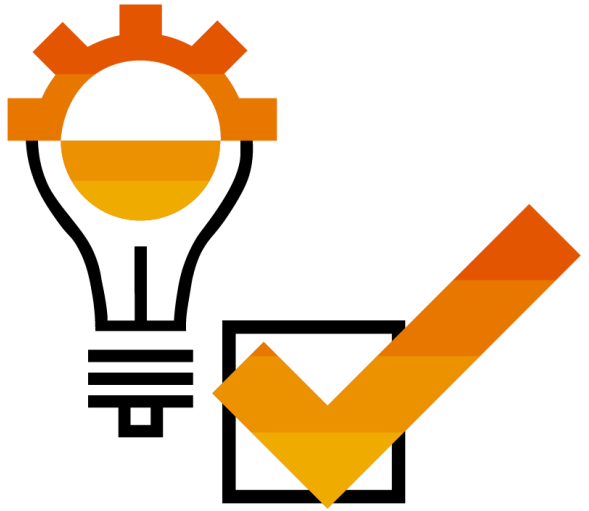
Summary / key takeaways

In this unit you learned ...

- … how to read data from files



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Week 4: Reading and Writing Data

Unit 4: Writing Data to Files

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Writing data to files

How to write data into files

- Similar to `.read()`, there is the method `.write()`
- Caution:
  - Only strings can be written into a file
  - Each line should end with a line break `\n`

```
with open("numbers.txt", "w") as file:
    for i in range(100):
        file.write(str(i) + "\n")
```

Showtime

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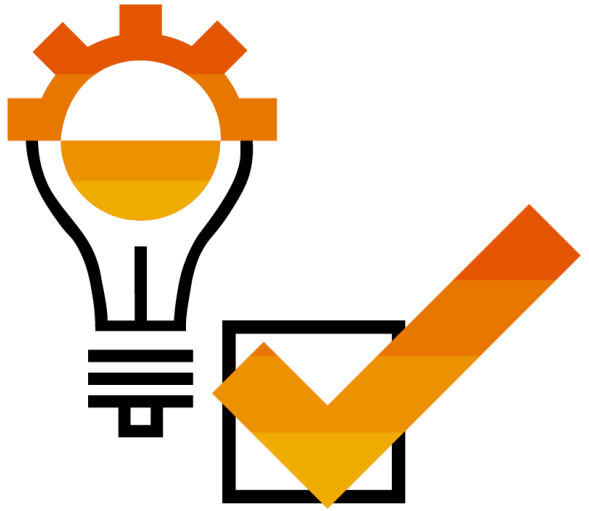
Summary / key takeaways

In this unit you learned ...

- … how to write data to a file
- … that everything needs to be transformed into a string before writing to a file



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Week 4: Reading and Writing Data

Unit 5: Formatting Output

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Formatting output
Basics

- Unformatted output using `print()` until now
- More options in `print()` function available
  - Multiple variables can be printed at once
  - Separator and end character can be chosen

```
print(192, 168, 1, 1, sep=".")
print("abc", "def", "ghi", sep="")
```

```
192.168.1.1
abcdefghi
```

- F-Strings
  - Simple way to replace values of variables
  - Possibility to specify additional format details

```
1  products = [("Dining Table", 3, 199.90), ("Chair", 12, 39.59), ("Shelf", 5, 9.90)]
2
3  for product in products:
4      print(
5          f"{product[0]:15s} Count: {product[1]:3d} Price: {product[2]:6.2f} Total: {pr
6      )
```

Formatting output
Showtime

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If you haven’t done so yet:

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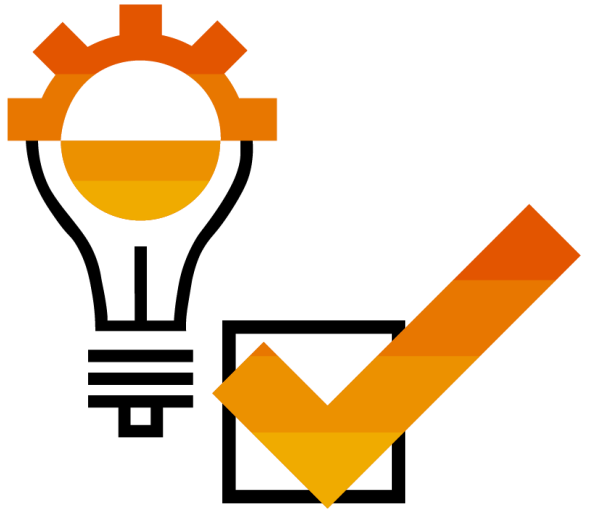
Summary / key takeaways

In this unit you learned ...

- … about the different options for formatting an output string
- … how to use formatted string literals in Python



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Unit 6: String Methods

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String methods

Reading data from and writing data into files requires the manipulation of strings

- Some methods to manipulate strings have already been introduced
  - e.g. `.strip()` to remove line breaks, whitespaces.
- There are many more methods to manipulate strings:
  - Split strings into parts
  - Replace parts of strings
  - Change strings into upper or lowercase
  - ...

```
1 case_string = "tHIS Is a TeSTString in different caSES"
2
3 print(case_string.upper())
4 print(case_string.lower())
5 print(case_string.title())
6 print(case_string.capitalize())
```

```
THIS IS A TESTSTRING IN DIFFERENT CASES
this is a teststring in different cases
This Is A Teststring In Different Cases
This is a teststring in different cases
```

String methods
Showtime

Now it’s time to get hands on and start programming!

If you like, you can open the Jupyter Notebook instructions in parallel to the demo.

If you haven’t done so yet:

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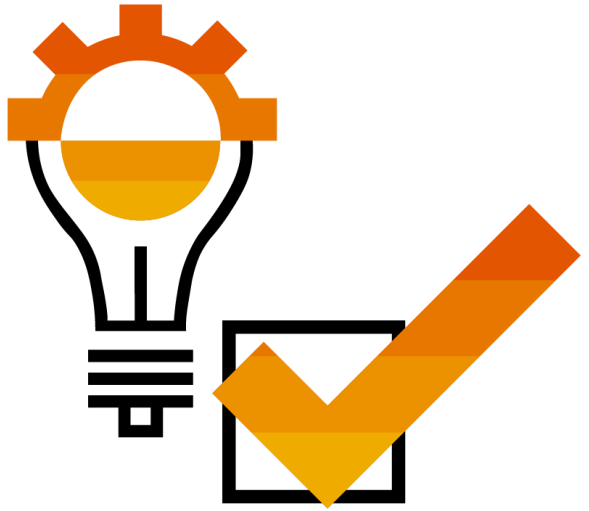
- Open the Notebook

String methods
Summary / key takeaways

In this unit you learned ...

- … some commonly used methods to manipulate strings



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