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Welcome to this session:
Task Walkthrough - Tasks 6 - 9

The session will start shortly...

Questions? Drop them in the chat.
We'll have dedicated moderators answering questions.

Safeguarding & Welfare

We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

If you are feeling upset or unsafe, are worried about a friend, student or family member, or you feel like something isn't right, speak to our safeguarding team:

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or email the Designated Safeguarding Lead:
Ian Wyles
safeguarding@hyperiondev.com

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- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly. **(Fundamental British Values: Mutual Respect and Tolerance)**
- No question is daft or silly - **ask them!**
- There are **Q&A sessions** midway and at the end of the session, should you wish to ask any follow-up questions. Moderators are going to be answering questions as the session progresses as well.
- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Academic Sessions. You can submit these questions here: **Questions**

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- For all **non-academic questions**, please submit a query: ***www.hyperiondev.com/support***
- **Report a safeguarding incident: *www.hyperiondev.com/safeguardreporting***
- We would love your feedback on lectures: ***Feedback on Lectures***
- If you are hearing impaired, please kindly use your computer's function through Google chrome to enable captions.

Learning Outcomes

- **Define and use user-defined functions** to perform modular and reusable operations.
- **Manipulate strings** for formatting, parsing, and extracting information.
- **Work with lists and dictionaries** to store, access, and manipulate data dynamically.
- **Perform file I/O operations** to read data from files and save results.
- **Model real-world entities using OOP principles** with Python classes.

Lecture Overview

- ➔ Presentation of the Task
- ➔ Recap of Functions
- ➔ Recap of Sequences
- ➔ Recap of IO Operations
- ➔ Recap of OOP
- ➔ Task Walkthrough

Task Walkthrough

Welcome to your role as the ultimate Survey Data Scientist! 🎉 Imagine working for a nonprofit organization conducting a nationwide survey to understand the needs of communities better. Your job is to create a Survey Data Manager, a Python-powered application that organizes participant data, analyzes responses, and helps make data-driven decisions for impactful change.

- **Add in a validate_email and __str__ method in the Participant class**
- **Add in functionality that allows you save and retrieve the responses for each participant in the text file as well.**
- **Add in a function that calculates the average age and number of participants**

What is the main benefit of using a dictionary in Python?

A. Storing data in a sequential order
B. Storing key-value pairs for fast lookups
C. Repeating a block of code multiple times
D. Creating reusable functions

Which of the following is a correct way to write a user-defined function?

A. function myFunction():
B. def myFunction():
C. def myFunction[]:
D. myFunction():

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Functions

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Functions

- To declare a function in Python, we use the **def** keyword.
- We have to provide a **name** for our function (using variable naming conventions), a list of **parameters** (placeholders for function inputs) in brackets, a colon and **body** of the function indented.
- We also need to add a **return statement** for functions that return a value. This is not necessary for all functions e.g. functions that modify a state.

```
# Syntax of a user-defined function
def functionName(parameter1, parameter2):
    # function block containing statements
    # which accomplishes a specific task
    result = "Output"
    return result
```

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Functions

- After defining a function, we **call or invoke** it to use it in our code.
- We call a function with its name followed by a list of **arguments** enclosed in brackets, if required by the functions.
- **Arguments** are the input values provided to the function and take the place of the **parameters** defined in the function in the **same position**.

```
# Function which calculates the sum of two numbers
def calculateSum(a, b):
    return a + b


sum1 = calculateSum(800982390, 247332) # 801229722
sum2 = calculateSum(sum1, 3)   # 801229725
```

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Sequences

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Lists

Ordered, mutable collections of data.

- Items in a list are known as **elements**.
- Elements do not have to be unique nor of the same type.
- Lists are **mutable**, meaning that elements in the list can be changed.
- Use **square brackets** to create lists and separate values with **commas**:

```
my_list = [1, "two", "buckle", True]
```

- We can access elements in a list using indexing, which is based on the element's position in the list:

```
print(my_list[0])  # 1
print(my_list[3])  # True
```

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Lists

- The most commonly used list functions are:
  - Adding an element

```
my_list.append("three")
my_list.insert(0, "zero")
```

  - Deleting an element

```
my_list.remove("zero")
my_list.pop(3)
```

  - Manipulating the list: sorting, reversing etc.

```
my_list.sort()
my_list.reverse()
```

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Strings

- Strings are considered to be **immutable** collections of sequences in Python.
- We can access characters in our strings the same way we can access elements in a list:

```
string = "hello"
print(string[0]) # h
```

- We can also manipulate strings using the same methods that we use on lists:

```
string.find("h")
```

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Dictionaries

Collections of key-value pairs, where each key is unique.

- Unlike lists, dictionaries distinguish each element in the collection using a **key** instead of an **index**.
- When we use dictionaries to study languages, we look up definitions of a given word by looking up the word in the dictionary.
- In the data structure, we can access the **value associated with a key** value by looking up the key in the dictionary.
- Each element in a dictionary is a **key-value pair**.
- To create a dictionary, keys and values are **separated by colons (:)** and pairs are **separated by commas** and **enclosed in curly brackets {}**.

Dictionaries

- We can also use the **dict** function to create dictionaries:

```
my_dict = {"name": "Zahra", "age": 24}
my_dict = dict(name = "Zahra", age = 24)
```

- To access values in a dictionary:

```
my_name = my_dict["name"]
```

- To add elements to a dictionary:

```
my_dict["bday"] = "13 November"
```

- To delete elements in a dictionary:

```
my_dict.pop("bday")
```

IO Operations

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File Modes

- **Read** text from a file with the **mode 'r'**

```
file = open('file.txt', 'r')
file.read()
```

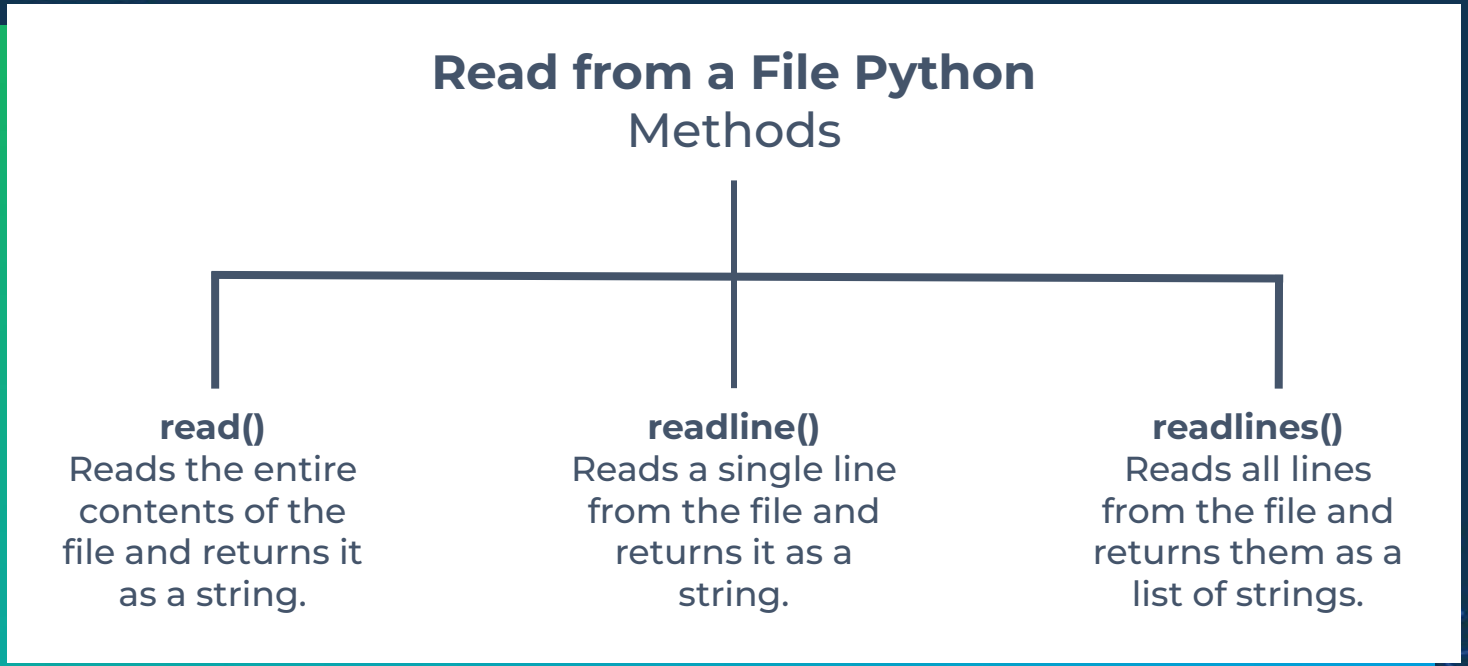
- **Write** text to a file with the **mode 'w'**

```
file = open('file.txt', 'w')
file.write("Hello World!")
```

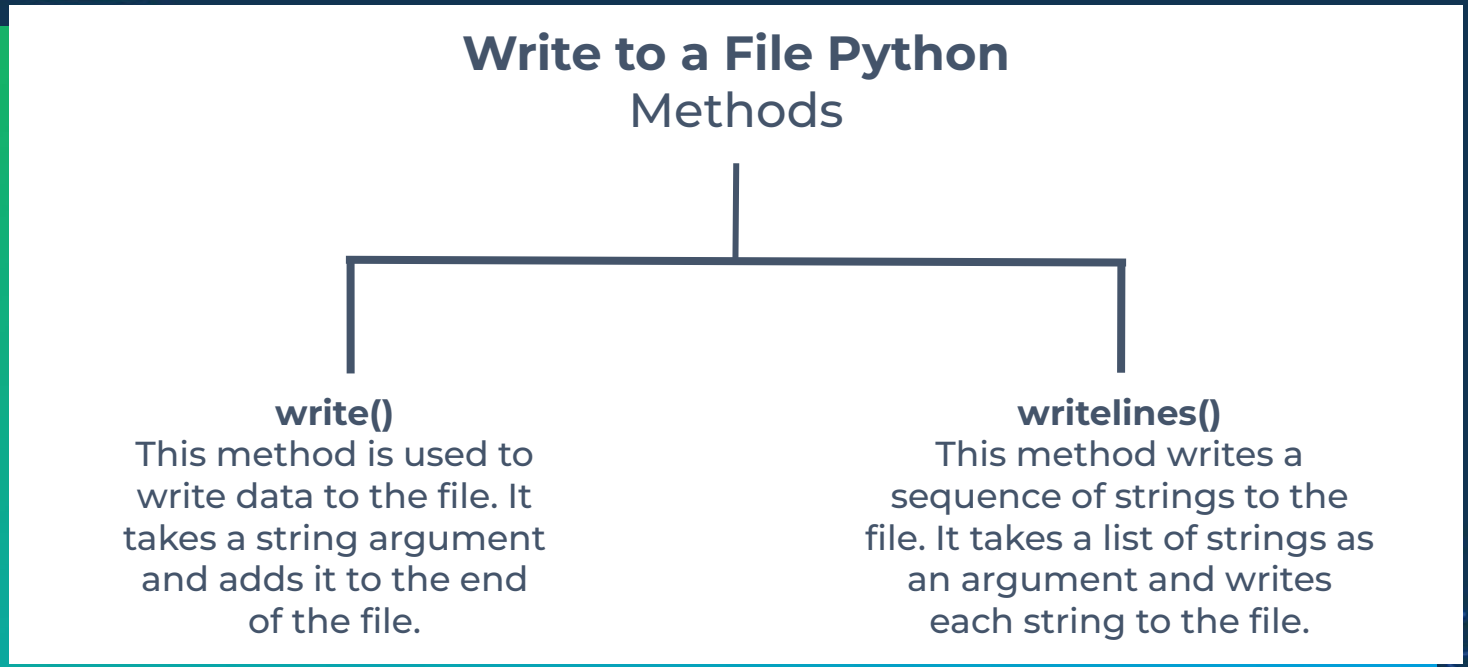
- **Append** text to an existing file with the **mode 'a'**

```
file = open('file.txt', 'a')
file.write("\nThis is a new line.")
```

File Handling (Reading)



File Handling (Writing)



Resource Management

```
# Creating and destroying a file object
# Implicitly using with statement
with open('filename.txt', 'r') as file:
    content = file.read()

# Explicitly using open and close
file = open('filename.txt', 'r')
content = file.read()
file.close()
```

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OOP - Classes

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Class Properties

- **Attributes** are **variables** that belong to a class. They represent the **properties or characteristics** of the class that objects can have.
- **Methods** are **functions** that belong to a class. They define the **behaviors or actions** that an object of the class can perform.

```python
class Student:
    def __init__(self, name, age, mark):
        self.name = name
        self.age = age
        self.mark = mark
```

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Class Properties

- We define methods in our classes the same way that we would define functions.
- To reference any of the class' attributes we use **self**.

```
def sayMyName (self):
    print("Hi, my name is " + self.name)
```

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Methods

- In Python, **self** has to be passed into every **instance method** as the first parameter but does not have to be included when the function is actually called. You have to reference **self** when accessing attributes.
- **Instance methods** are actions or behaviors that specific objects can perform.
- They have access to the object's data and are defined within the class.

```
def study(self):
    self.studying = True
    print("{} is studying. Please do not disturb.".format(self.name))
```

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Class Instantiation

- We use the **class** keyword to create a new class, followed by the name of the class.
- We use a **constructor function** to define anything that needs to take place when the object is first instantiated.
  - This includes any **attributes** that need to be defined, which we store using the **self** parameter, which is a reference to the object.
  - This function is called the **__init__ function** and it is called when a class is instantiated (created).

Class Instantiation

- To instantiate a class we call its constructor using the **name of the class**, followed by the **required attributes in brackets**.
- We usually store the instantiated class in a variable.
- We can access the instance methods and attributes by referencing the variable which stores the instantiated class followed by a ".".
- We can access class methods and static methods by referencing the class directly using the class' name.

Class Instantiation

```
class Student:
    def __init__(self, name, age, mark):
        self.name = name
        self.age = age
        self.mark = mark
        self.studying = False

    def study(self):
        self.studying = True
        print("{} is studying. Please do not disturb."
              .format(self.name))

student1 = Student("Zahra", 24, 89)
student1.study()
```

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Which method can be used to check if a string contains a specific substring?

A. in
B. find()
C. Both A and B
D. index()

What is the best way to update the value of a key in a Python dictionary?

A. dict.key = value
B. dict['key'] = value
C. dict.set(key, value)
D. update(dict.key=value)

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Summary

- ★ **User-Defined Functions:**
  Modularizing operations like data validation and analysis.
- ★ **Strings:**
  Validating email formats and formatting output.
- ★ **Lists and Dictionaries:**
  Storing participant objects and managing survey questions and responses.
- ★ **File I/O:**
  Reading and saving data to/from files for persistence.
- ★ **OOP Classes:**
  Modeling real-world entities and encapsulating behavior with methods.

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Q & A SECTION

Please use this time to ask any questions relating to the topic, should you have any.

Thank you for attending

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