Welcome to this CoGrammar Tutorial: Text File IO and Exception-Handling

The session will start shortly...

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

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SKILLS FOR LIFE
SKILLS BOOTCAMPS

Department for Education

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Text File IO

September 2024

Software Engineering Session Housekeeping

- 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**

Software Engineering Session Housekeeping cont.

- 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**

Skills Bootcamp Progression Overview

To be eligible for a certificate of completion, students must fulfil three specific criteria. These criteria ensure a high standard of achievement and alignment with the requirements for the successful completion of a Skills Bootcamp.

✅ Criterion 1 - Meeting Initial Requirements

Criterion 1 involves specific achievements within the first two weeks of the program. To meet this criterion, students need to:

- Attend a minimum of 7-8 hours per week of guided learning (lectures, workshops, or mentor calls) within the initial two-week period, for a total minimum of 15 guided learning hours (GLH), by no later than 15 September 2024.
- Successfully complete the Initial Assessment by the end of the first 14 days, by no later than 15 September 2024.

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Skills Bootcamp Progression Overview

✅ Criterion 2 - Demonstrating Mid-Course Progress

Criterion 2 involves demonstrating meaningful progress through the successful completion of tasks within the first half of the bootcamp.
To meet this criterion, students should:

- Complete 42 guided learning hours and the first half of the assigned tasks by the end of week 7, no later than 20 October 2024.

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Skills Bootcamp Progression Overview

✅ Criterion 3 - Demonstrating Post-Course Progress

Criterion 3 involves showcasing students' progress after completing the course. To meet this criterion, students should:

- Complete all mandatory tasks before the bootcamp's end date. This includes any necessary resubmissions, no later than 22 December 2024.
- Achieve at least 84 guided learning hours by the end of the bootcamp, 22 December 2024.

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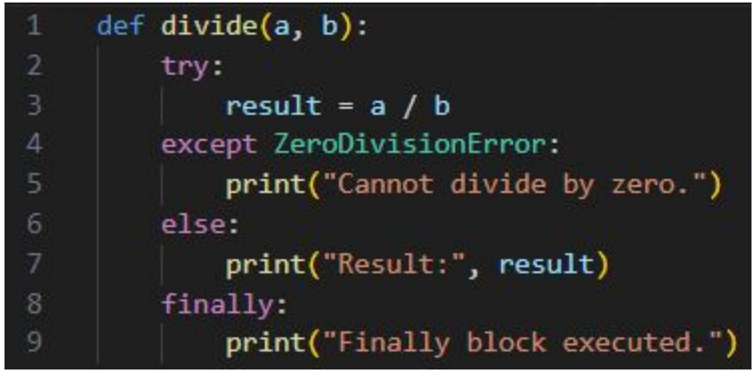
Poll

Consider the following code. What will be the output if you call divide(10, 0)?



```python
def divide(a, b):
    try:
        result = a / b
    except ZeroDivisionError:
        print("Cannot divide by zero.")
    else:
        print("Result:", result)
    finally:
        print("Finally block executed.")
```

1. Cannot divide by zero.
2. Result: 10
3. Finally block executed.
4. Cannot divide by zero. Finally block executed.

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Poll

What is the purpose of the with statement in Python when working with files?

a. It provides a way to read and write to files simultaneously.
b. It is used for creating temporary files.
c. It ensures that files are always closed properly, even if an exception occurs.

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Learning Objectives & Outcomes

- Perform common file operations such as reading from and writing to text files.
- Use the 'with' statement to manage file resources efficiently, ensuring files are properly closed after operations.
- Apply best practices for managing resources to prevent memory leaks and other resource-related issues.
- Write try and except blocks to catch and handle exceptions.
- Differentiate between various built-in exceptions and handle them appropriately.
- Implement finally blocks to manage cleanup tasks such as closing files or releasing resources.
- Use custom exceptions to provide more informative error messages and improve error handling in their code

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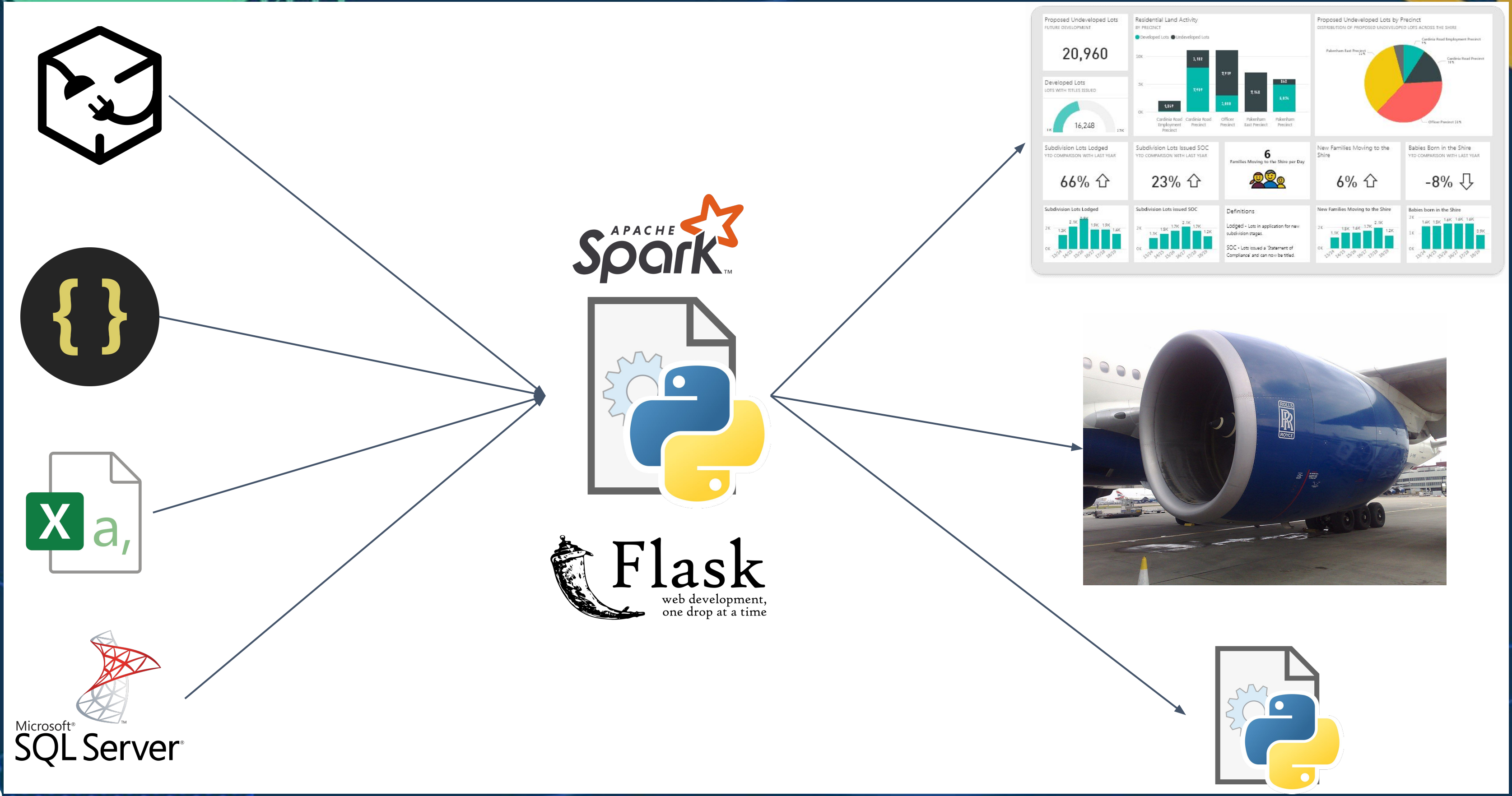
Text File IO

Introduction



File Access Modes

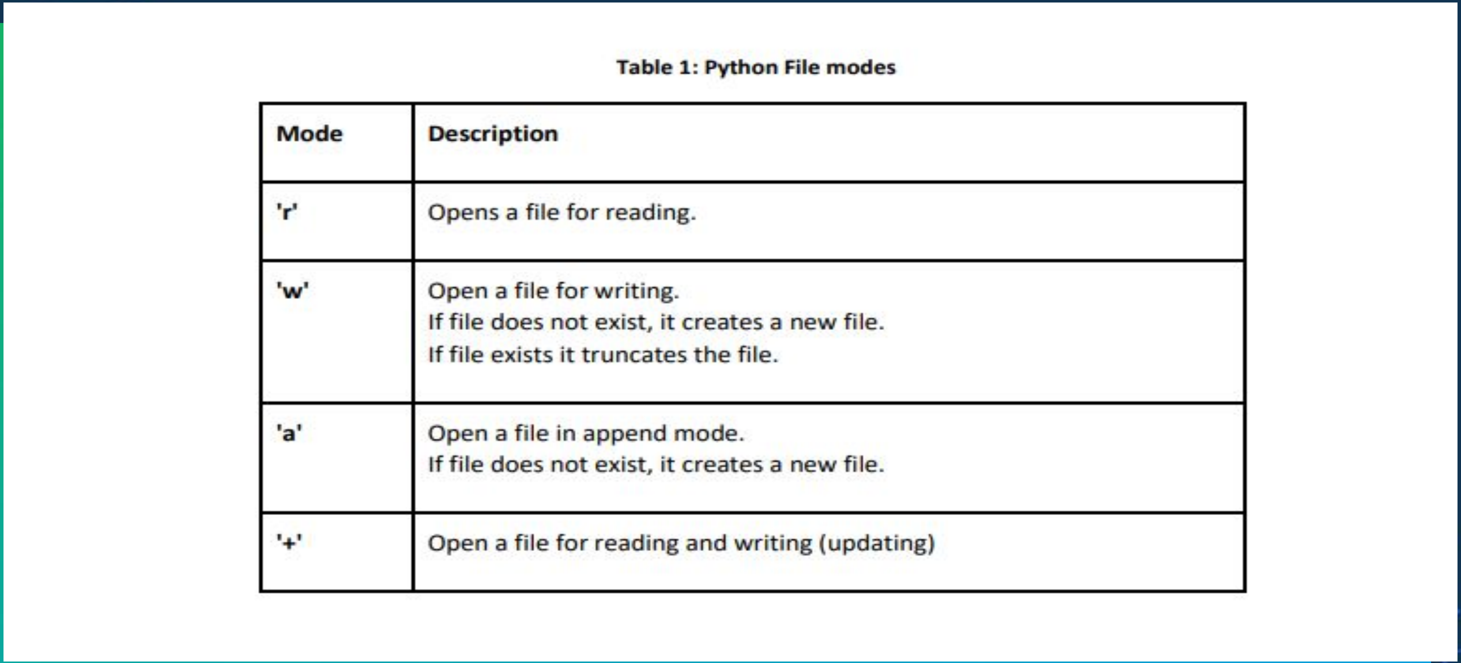


Table 1: Python File modes

Mode	Description
'r'	Opens a file for reading.
'w'	Open a file for writing. If file does not exist, it creates a new file. If file exists it truncates the file.
'a'	Open a file in append mode. If file does not exist, it creates a new file.
'+'	Open a file for reading and writing (updating)

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Resource Management: Explicit Method

```
file = open("filename.txt", "access_mode")
content = file.read()
file.close()
```

Text file (.txt)

opening

Read Only	r
Read and Write	r+
Write Only	w
Write and Read	w+
Append Only	a
Append and Read	a+

File Access Modes

closing

Must be closed to avoid issues like memory leaks

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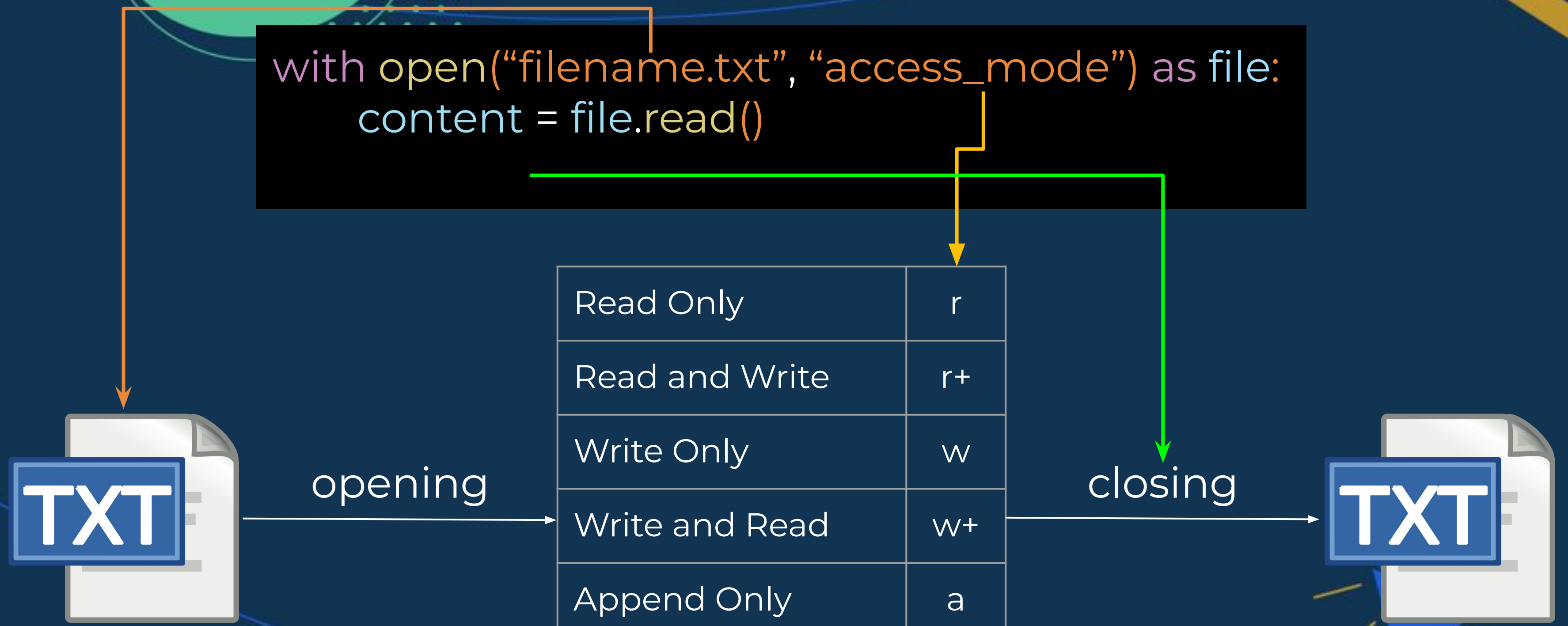
Resource Management: Implicit Method

```
with open("filename.txt", "access_mode") as file:
    content = file.read()
```



Read Only	r
Read and Write	r+
Write Only	w
Write and Read	w+
Append Only	a
Append and Read	a+

Text file (.txt)

File Access Modes

Must be closed to avoid issues like memory leaks

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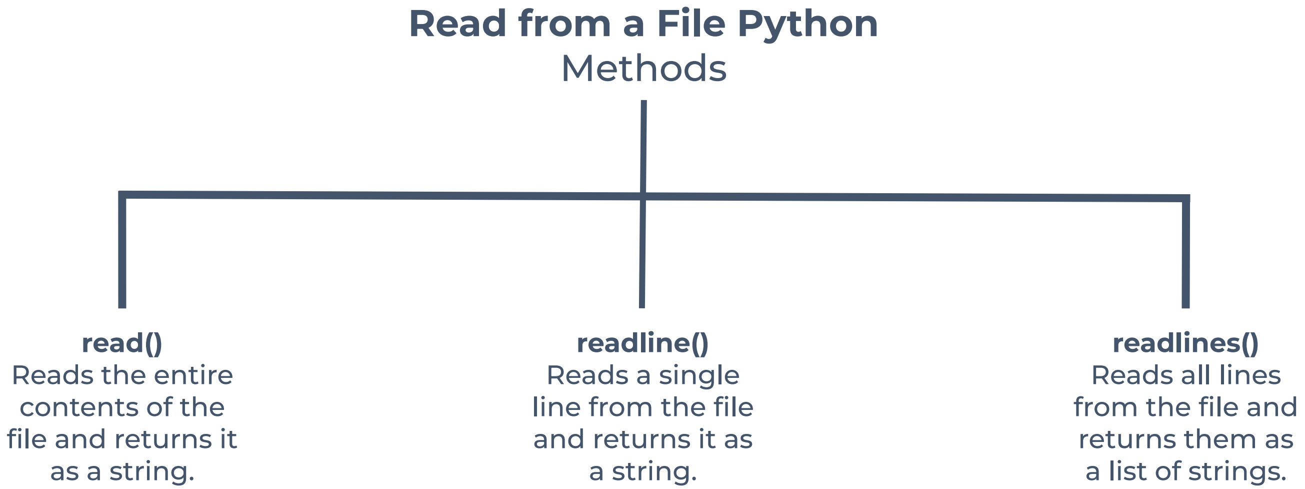
File Handling (Reading)



Read from a File Python
Methods

read()
Reads the entire contents of the file and returns it as a string.

readline()
Reads a single line from the file and returns it as a string.

readlines()
Reads all lines from the file and returns them as a list of strings.

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File Handling (Writing)

Write to a File Python
Methods

write()
This method is used to write data to the file. It takes a string argument and adds it to the end of the file.

writelines()
This method writes a sequence of strings to the file. It takes a list of strings as an argument and writes each string to the file.

Let’s take a short Break

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Custom Exceptions

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Exception Handling

- An **Error/Exception** is an unexpected event that interrupts the normal execution of a computer program, preventing it from achieving its intended outcome.
- **Exception handling** in Python allows you to gracefully manage errors that may occur during program execution, including when working with files.

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File Exception Handling

IsADirectoryError

```
with open("directory_name.txt", 'r') as file:
    content = file.read()
```

FileNotFoundError

```
with open("filename.txt", 'r') as file:
    content = file.read()
```

PermissionError

```
with open("filename.txt", 'w') as file:
    content = file.read()
```

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Custom Exceptions in Python Using “raise”

- The `raise` keyword allows you to trigger exceptions in Python.
- You can raise any built-in exception class to handle errors as needed.

```
raise ExceptionType("Custom error message")
```

- `ExceptionType`: Any valid built-in exception (e.g., `ValueError`, `TypeError`, `ValueError`, `FileNotFoundError`).
- `"Custom error message"`: Descriptive message for the raised exception.

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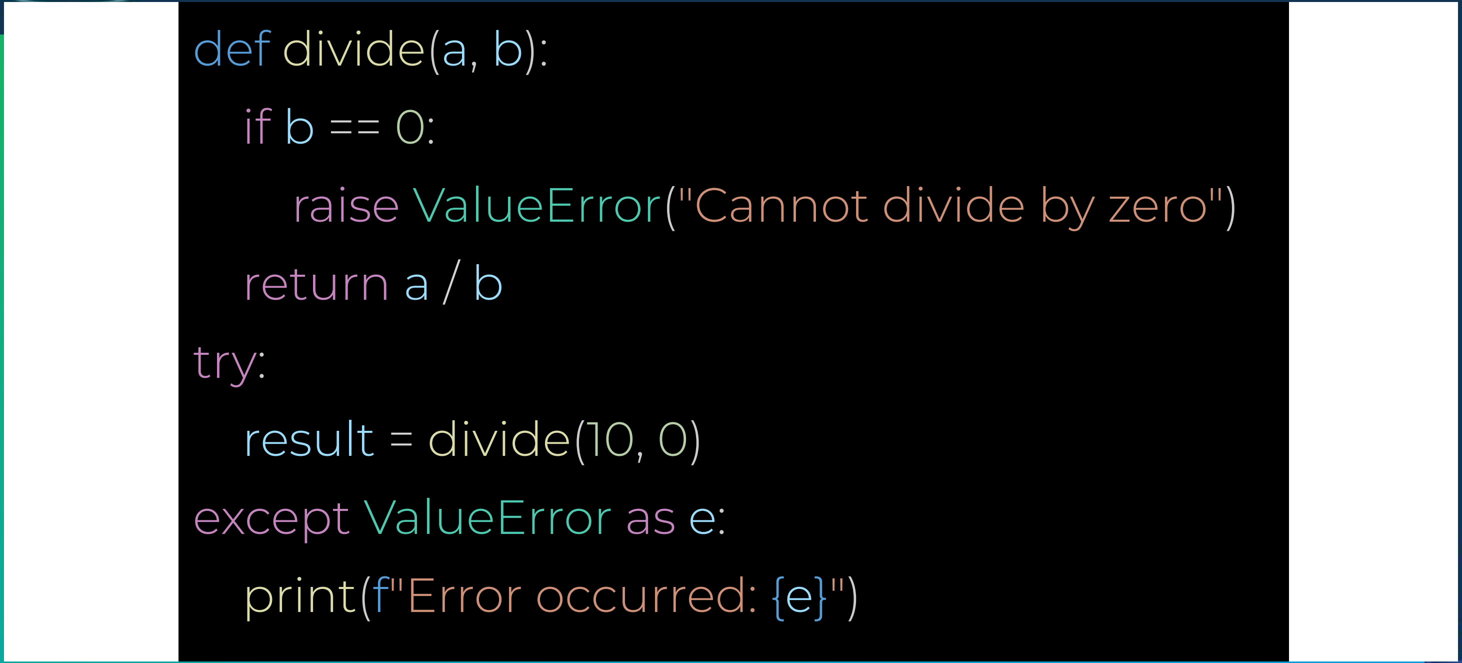
Custom Exceptions in Python Using “raise”



```
def divide(a, b):
    if b == 0:
        raise ValueError("Cannot divide by zero")
    return a / b
try:
    result = divide(10, 0)
except ValueError as e:
    print(f"Error occurred: {e}")
```

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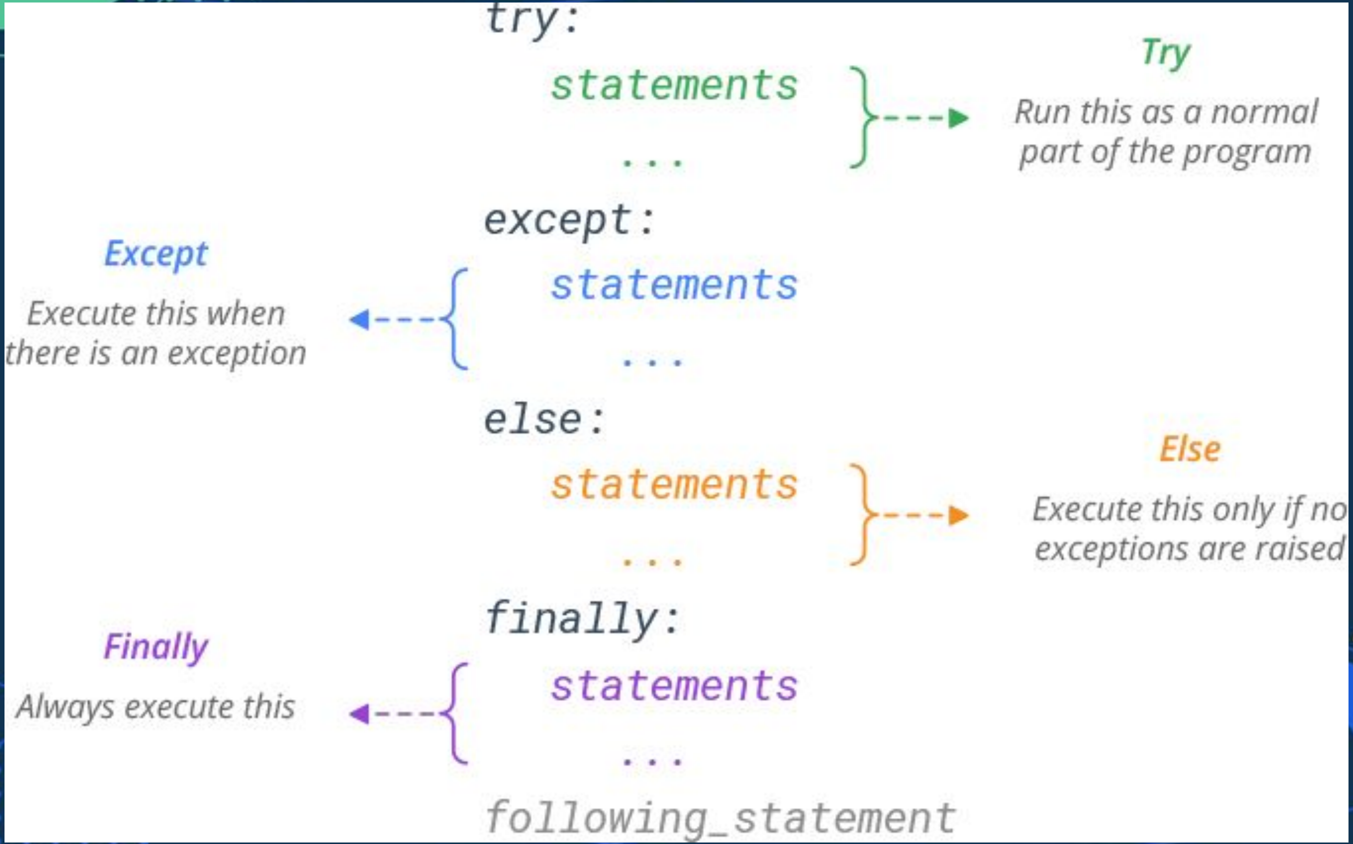
Try / Except / Finally Structure



```
try:
    statements
      ...
except:
    statements
      ...
else:
    statements
      ...
finally:
    statements
      ...
following_statement
```

Try
Run this as a normal part of the program
Except
Execute this when there is an exception
Else
Execute this only if no exceptions are raised
Finally
Always execute this

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Lesson Conclusion and Recap

- **File Operations in Python**:
  - Opening and closing files using open() and close(), and the advantages of using the with statement for automatic file management.
- **Reading and Writing to Files**:
  - Techniques for reading from (read(), readline(), readlines()) and writing to files (write(), writelines()), and the different file modes (read, write, append).
- **Exception Handling Basics**:
  - The structure of try, except, and finally blocks to catch and manage errors, ensuring programs handle unexpected situations gracefully.
- **Specific Exception Management**:
  - How to catch and handle specific exceptions like FileNotFoundError, and how to raise exceptions using the raise keyword for custom error handling.
- **Best Practices for File I/O and Error Handling**:
  - Importance of resource management (e.g., always closing files), avoiding silent failures, and writing readable, maintainable code when dealing with exceptions.

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Tutorial: E-commerce Product Review Analyzer

- **Objective**: Create a Python script that reads product reviews from a text file, analyses them, and handles various custom and built-in exceptions. The analysis includes counting reviews, calculating the average review length, detecting missing reviews, and handling different error scenarios effectively.
- **Steps to Implement**:
  - Get the file path from the user:
    - Prompt the user to input the file name containing product reviews.
  - Check if the file exists, is readable, and validate its type:
    - Handle errors like the file not being a .txt file or missing permissions.
  - Read and Analyse the Reviews:
    - Count the number of reviews (non-empty lines).
    - Calculate the average length of reviews.
    - Check for empty files.
  - Write the analysis to an output file:
    - Write the analysis summary (number of reviews, average length, missing reviews) to a new text file.
  - Handle exceptions:
    - Use raise for custom exceptions and handle various edge cases, including empty files.

Questions and Answers

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Thank you for attending

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