Welcome to the CoGrammar

Tutorial: Data Types & Control Structures

The session will start shortly...

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

Cyber Security 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**

Cyber Security Session Housekeeping cont.

- For all **non-academic questions**, please submit a query: **www.hyperiondev.com/support**
- We would love your **feedback** on lectures: **Feedback on Lectures**
- Find all the lecture **content** in you **Lecture Backpack** on GitHub.

Safeguarding & Welfare

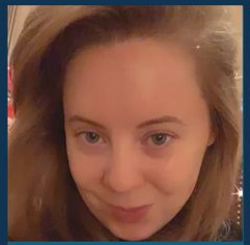
We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

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:

Ian Wyles
Designated Safeguarding Lead

Simone Botes

Rafiq Manan



Charlotte Witcher

Nurhaan Snyman

Ronald Munodawafa

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Scan to report a safeguarding concern

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

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Learning Objectives & Outcomes

- Use strings for storing and manipulating text.
- Explain and apply string operations.
- Perform operations on numerical data types in Python.
- Implement basic control structures (if-else statements).
- Use Boolean logic for decision-making.
- Build simple decision-making algorithms.


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Task 4 Update

- The deadline for task 4 has been extended to 5 Oct

Additional Note

- Mastery of these basics opens doors to more complex and exciting problems in programming

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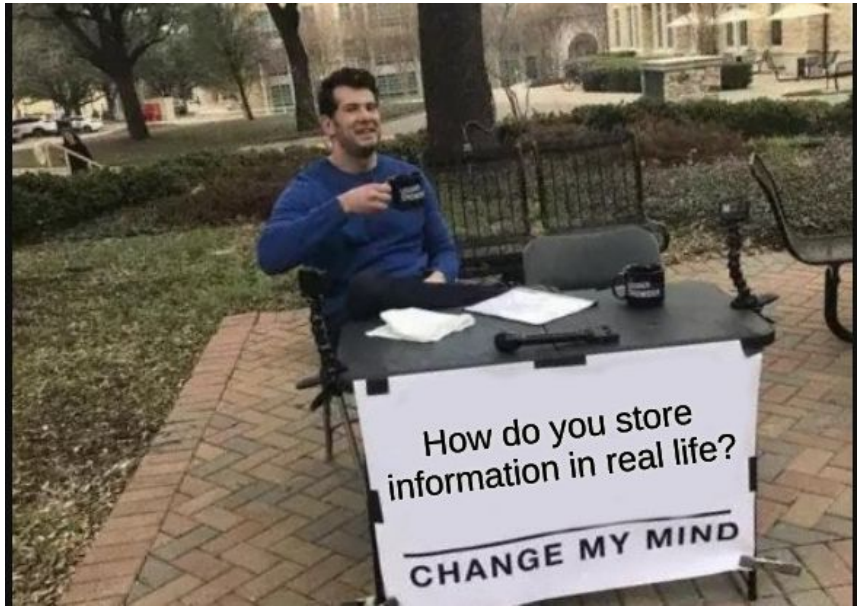

Polls

Please have a look at the poll notification and select an option.

- **Have you ever worked with variables, data types, and control structures before?**
  A. Yes
  B. Unsure
  C. No

Polls

Please have a look at the poll notification and select an option.

- **What is a variable?**
  A. A storage location for data
  B. A mathematical concept
  C. A type of function
  D. A constant value that cannot change

Introduction to Data Types and Control Structures

- Data types are the foundation of every program.
- **Analogy**:
  - Variables are like containers; the data types are the "content" in these containers.
- Storing a name (string), age (integer), or voting eligibility (Boolean).

Working with Strings

Example 1: Storing and Formatting a UK Address

```
1    address = "221B Baker Street, London"
2    postcode = "NW1 6XE"
3    full_address = address + ", " + postcode
4    print(full_address)  # Output: 221B Baker Street, London, NW1 6XE
5
6
7    # Extracting Postcode District
8    print(postcode[:3])  # Output: NW1
```

Example 2: Cleaning Postcodes

```
8
9     clean_postcode = postcode.replace(" ", "").upper()
10    print(clean_postcode)  # Output: NW16XE
11
12
```

Activity: Clean and standardize postcodes like "E1 6AN" and "SE1 9GF".

Numerical Data Types

```python
# Example 1: Calculating VAT (Value Added Tax)

price = 100  # in GBP
vat_rate = 0.20  # 20% VAT
total_price = price + (price * vat_rate)
print(f"Total price including VAT: £{total_price}")

```

Example 2

```python
# Example 2: Converting Celsius to Fahrenheit

celsius = 15
fahrenheit = (celsius * 9/5) + 32
print(f"Temperature: {fahrenheit}°F")

```

Control Structures and Decision Making

- Write a program for checking voting eligibility

```
1    age = 16
2    if age >= 18:
3        print("Eligible to vote")
4    else:
5        print("Not eligible to vote")
6
```

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Control Structures and Decision Making

- Write a program that calculates train fare based on age

```
age = 70
base_fare = 20.0
if age < 16 or age ⩾ 65:
    fare = base_fare * 0.5  # 50% discount
else:
    fare = base_fare
print(f"Train fare: £{fare}")
```

Let’s take a break
To stretch and relax

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Decision Making Algorithms

- A decision-making algorithm is a step-by-step process that uses conditions to make choices between different actions based on the input data.

Example: A Simple Grade Calculator Algorithm

```
score = 85
if score ⩾ 90:
    grade = "A"
elif score ⩾ 80:
    grade = "B"
elif score ⩾ 70:
    grade = "C"
elif score ⩾ 60:
    grade = "D"
else:
    grade = "F"
print(f"Grade: {grade}")
```

- This algorithm checks the score, starting with the highest condition.
- It will assign the correct grade based on the range the score falls into.

Example: Loan Approval Algorithm

Imagine an algorithm for a loan approval system based on income and credit score

```python
income = 50000  # in GBP
credit_score = 700  # out of 850

if income >= 40000 and credit_score >= 650:
    loan_approval = "Approved"
elif income < 40000 and credit_score >= 700:
    loan_approval = "Approved with lower limit"
else:
    loan_approval = "Not Approved"

print(f"Loan Status: {loan_approval}")
```

Optimizing Decision Making Algorithms

- When designing decision-making algorithms, efficiency matters.
- **Tip**: Always check the most common condition first to minimize unnecessary checks.

Example: Even or Odd Number Algorithm

```
1    number = 24
2    if number % 2 == 0:
3        print("Even")
4    else:
5        print("Odd")
6
```

Creating Decision-Making Algorithms

Recap

- Start with simple conditions, then expand based on additional data.
- **Key Steps:**
  - Identify the conditions (input criteria).
  - Use if-elif-else to define the decision process.
  - Test the algorithm with various input scenarios

Final Assessment

- **Which of the following is NOT a valid numerical data type in Python?**
  - A) int
  - B) float
  - C) double
  - D) complex

Final Assessment

- **How do you write an if-else statement in Python that checks if a number is even?**
  - A) if number % 2 == 0:
  - B) if number / 2 == 0:
  - C) if number % 2 != 1:
  - D) if number // 2 == 0:

Final Assessment

- **Which of the following string operations is NOT valid in Python?**
  - A) Concatenating two strings using +.
  - B) Multiplying a string by an integer.
  - C) Accessing individual characters using indexing.
  - D) Modifying individual characters of a string using indexing.

Key Takeaways

- Data types like strings and numbers are essential for storing information.
- Control structures allow programs to make decisions and automate tasks.
- Practical examples: VAT calculation, temperature conversion, voting eligibility, etc.

Questions and Answers

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Thank you for attending

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