Welcome to the

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Skills Bootcamp:
Variables, String and Numerical Data Types

The session will start shortly...

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

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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.

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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:

Scan to report a safeguarding concern

Simone Botes

Rafiq Manan

Charlotte Witcher

Ian Wyles
Designated Safeguarding Lead

Nurhaan Snyman

Ronald Munodawafa

Tevin Pitts

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

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Learning Objectives & Outcomes

- Define variables, strings, and numerical data types
- Explain the differences between variables, strings, and numerical data types.

- Write basic code that declares and initialises variables, strings, and numerical data types.

- Compare the use of strings and numerical data types in different programming contexts.

- Perform operations on numerical data.

- Assess the correct use of data types for specific programming problems.

- Design a basic program that uses variables, strings, and numerical data types effectively.

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How do we organise and store different types of information in real life? For example, how do you write down someone's name versus their phone number?

Polls

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

Have you ever worked with variables before?

A. Yes
B. Unsure
C. Never

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

What do you think a variable is?

A. A storage location for data
B. A mathematical concept
C. A type of function
D. A constant value that cannot change

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INTRODUCTION TO PROGRAMMING WITH PYTHON

- Python is an interpreted, object oriented, high level programming language with dynamic semantics.

- Its design philosophy emphasizes code readability with the use of significant indentation

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Python Use Cases

- Web Development
- Data Science and Analytics
- Machine Learning and Artificial Intelligence
- Cybersecurity and penetration testing
- Automation and Scripting

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Python Basics: Variables

- **Definition**: named location in memory that stores data which can be modified during program execution. It acts as a container for data values.

```
variable_name = value_you_want_to_store
```
Example:
```
num = 2
```

- In the above example, num is the variable declaration while 2 is the value assigned to the variable.

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Variable Naming Rules

- Must start with a letter or an underscore, but cannot start with a number.
- Can only contain letters, numbers and underscores.
- Variables are case-sensitive.
- Cannot use reserved keywords (e.g for, while, if).

Python Basics: Data Types

- **Definition**: The type of data a variable can hold. It specifies the kind of operations that can be performed on the data.
- Categories:
  - Primitive Data Types: (Basic Data types): Built into the language
  - Non-Primitive Data Types: Created from primitive types.

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Primitive Data Types

- **String:** A string is a sequence of characters enclosed in either single (') or double (") quotes
- **Integer:** An integer is a whole number without any fractions
- **Floating-Point (float/double):** A floating-point (or float) number is a number that has a decimal point.
- **Boolean:** A boolean is a data type that can hold one of two values: True or False

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Let's take a break
To stretch and relax

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Strings

Strings

- A string is a list of letters, numerals, symbols, and special characters that are put together.

- Strings must be written within quotation marks (" ").

- Strings can comprise of surname, name, address of a person e.t.c…

- Multi-line strings (long strings) are written within triple single quotes (''' ''').

Strings

- **Examples:**

  name = "Linda"

  song = "The Bird Song",

  licence_plate = "''' This is a long string

   using triple quotes preserves everything inside it as a string

   even on different lines and with different spacing. '''

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String Manipulation

- Common actions that can be performed on strings:
  - **Indexing:** Access individual characters in a string
  - **Slicing:** Extract a substring from a string
  - **Extended slicing:** Extract a substring with a specific step
  - **Using string methods:** Utilise built-in methods to manipulate and analyse strings.
  - **Concatenation:** Combining two or more strings using the + operator.

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String Manipulation

```python
1    #String indexing
2    name = 'Walobwa'
3    print(name[0]) #-> Outputs: W
4
5    #String Slicing
6    name = 'Walobwa'
7    print(name[0:3]) #-> Outputs: Wal
8
9    #String Concatenation
10   first_name = 'Dan'
11   last_name = 'Walobwa'
12   full_name = first_name + ' ' + last_name
13   print(full_name) #-> Outputs: Dan Walobwa
14
15   #String Extended Slicing
16   name = 'Walobwa'
17   print(name[0:6:2]) #-> Outputs: Wl
18
19
```

index.py

Snipped

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String Methods

- Python provides built-in functions to manipulate strings.
- Common methods used:
  - **.upper():** Convert a string to all uppercase letters
  - **.lower():** Convert a string to all lowercase letters
  - **.format():** Insert values using placeholders ({})
  - **.strip():** Remove all white spaces from a string.

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String Methods

```python
#String Methods
#.upper() - Converts all characters in a string to uppercase
name = "Walobwa"
print(name.upper()) #Output: WALOBWA

#.lower() - Converts all characters in a string to lowercase
name = "WALOBWA"
print(name.lower()) #Output: walobwa

#.format() - Formats specified values in a string
first_name = "Dan"
last_name = "Walobwa"
full_name = "My name is {} {}".format(first_name, last_name)

name = "   Walobwa   "
print(name.strip()) #Output: Walobwa
```

index.py

Snipped

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Numbers

Numbers

- **Types:**
  - **Integers:** Represents whole numbers, both positive and negative, without a fractional part.
  - **Floating-Point(float):** Represents numbers with decimal (floating-point) part.
  - **Complex Numbers:** Represents complex numbers, which have both a real part and an imaginary part.

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Numbers

```python
# index.py

1    #NUMBERS
2    #Integers
3    num1 = 1
4    num2 = 2001
5
6    #Floats
7    num3 = 3.14
8    num4 = 2001.0
9
10   #Complex
11   num5 = 1 + 2j
12   num6 = 2001 + 2001j


     Snipped
```

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Basic Arithmetic Operations

- Python provides the following basic arithmetic operations that can be performed on numbers.
    - \+ : Addition
    - \- : Subtraction
    - * : Multiplication
    - / : Division (floating point)
    - // : Floor division (integer)
    - % : Modulus (remainnder)
    - ** : Exponentiation (power)
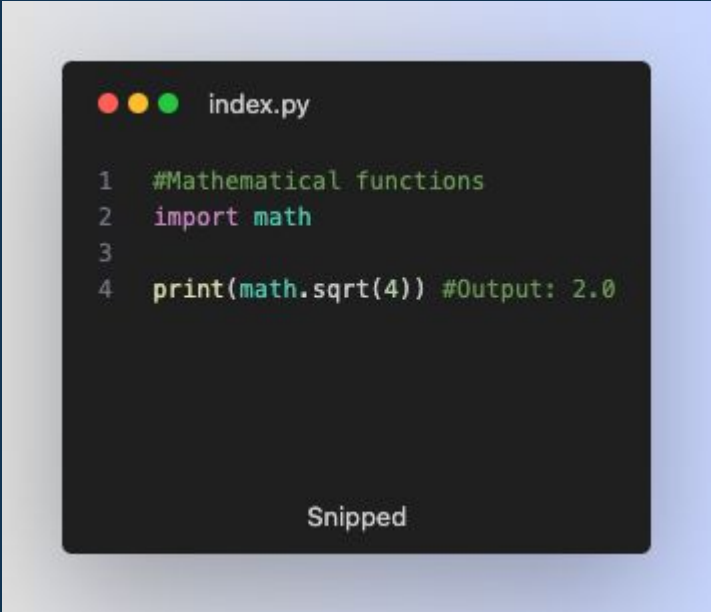
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Basic Arithmetic Operations

```python
#Arithmetic Operations

#Addition
print(2+3)

#Subtraction
print(2-3)

#Multiplication
print(2*3)

#Division
print(2/3)

#Modulus
print(2%3)

#Exponentiation
print(2**3)

#Floor Division
print(2//3)

```

Snipped

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Mathematical Functions

- Python's built-in math module provides various mathematical functions to perform more complex calculations.
- Common functions:
  - math.sqrt(x)
  - math.pow(x, y)
  - math.log(x, base)

Mathematical Functions

```python
# Mathematical functions
import math

print(math.sqrt(4)) #Output: 2.0
```

index.py

Snipped

Type checking and casting

- The type() method is a built-in python function that returns the data type of an object.
- You can convert between different numeric types using built-in functions: int(), float() and complex()
- You can convert other data types into a string using the str() function.

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

Which of the following methods is used to find the length of a string in most programming languages.

A. string.length()
B. len(string)
C. string.len()
D. length(string)

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Polls

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

Which of the following is NOT valid numerical data type in python

A. int
B. float
C. double
D. complex

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Polls

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

Which of the following string operations is NOT valid in Python

A.   Concatenating two string using (+)
B.   Multiplying a string by an integer
C.   Accessing individual characters using indexing
D.   Modifying individual characters of a string using indexing.

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Summary

- Variables are named location in memory that stores data which can be modified during program execution. It acts as a container for data values.

- Strings are immutable sequences of characters that support operations like concatenation, slicing, and various methods (upper(), replace(), etc.).

- Numerical Data Types include integers (int), floating-point numbers (float), and complex numbers (complex), supporting basic arithmetic operations.

- Type Conversion allows converting between data types using functions like int(), float(), and str().

- Common Operations for variables, strings, and numbers include indexing, arithmetic, and string manipulation with methods like split() and join().

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Stay Safe Series:

Mastering Online Safety One week at a Time

_____

While the digital world can be a wonderful place to make education and learning accessible to all, it is unfortunately also a space where harmful threats like online radicalization, extremist propaganda, phishing scams, online blackmail and hackers can flourish.

As a component of this BootCamp the *Stay Safe Series* will guide you through essential measures in order to protect yourself & your community from online dangers, whether they target your privacy, personal information or even attempt to manipulate your beliefs.

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Trustworthy Websites:
How to Spot Secure Sites

- When browsing the web, it's crucial to ensure you're visiting trustworthy websites to protect your personal information. A secure site can be identified by a few key factors.
- First, look for "https://" in the URL—the "s" stands for secure, meaning the site encrypts your data. A padlock symbol near the URL is another sign of security.
- Reputable sites also provide clear contact information, privacy policies, and avoid requesting excessive personal details. Be wary of websites with numerous pop-ups, poor design, or misspelled content, as these can signal fraud or malware.
- Additionally, checking online reviews or using tools like security software can help you verify the site's legitimacy, keeping you safe while browsing online.

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Stay Safe Series

Questions and Answers

Thank you for attending

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