Welcome to the CoGrammar

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.

Safeguarding & Welfare

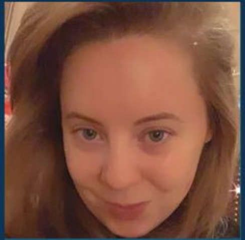
We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

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

Tevin Pitts

Scan to report a safeguarding concern

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

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.
- 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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CyberSecurity

September 2024

CyberSecurity

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

Polls

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

Python Use Cases

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

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.

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

Let’s take a break
To stretch and relax

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Strings

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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

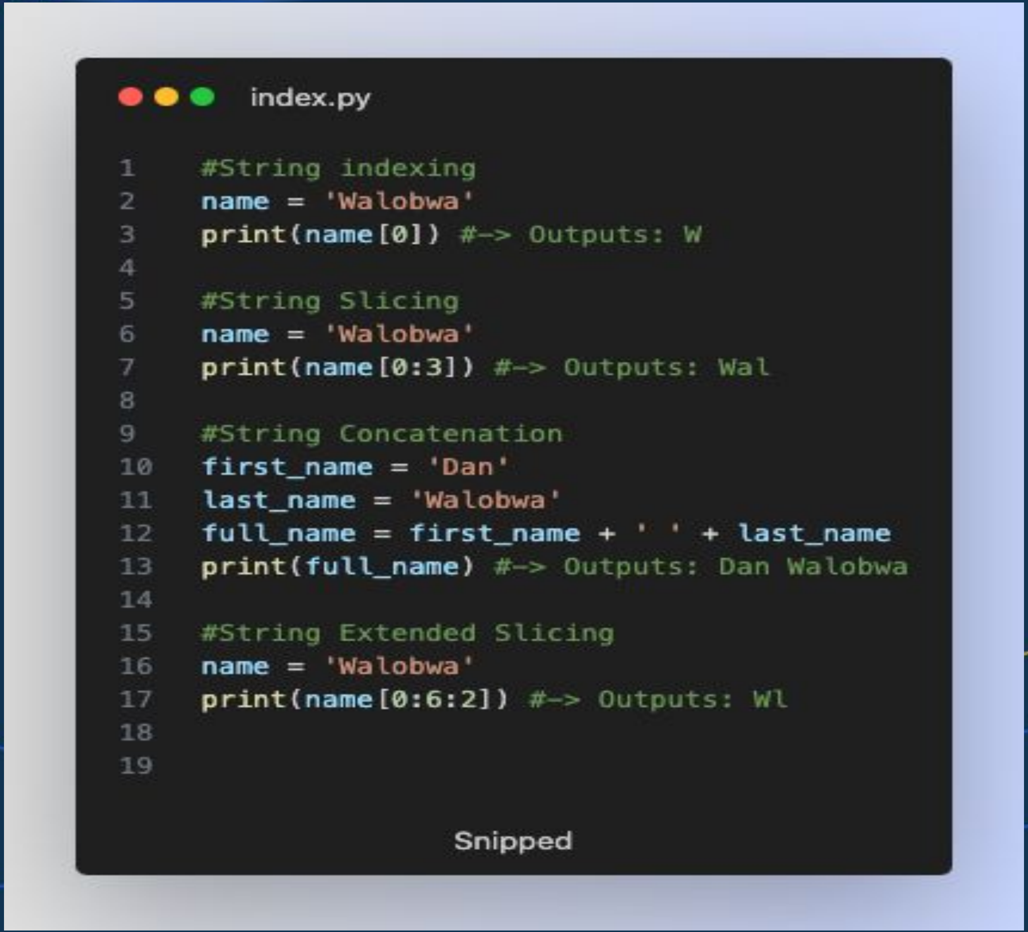
- **Examples:**

```
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. '''
```

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.

String Manipulation

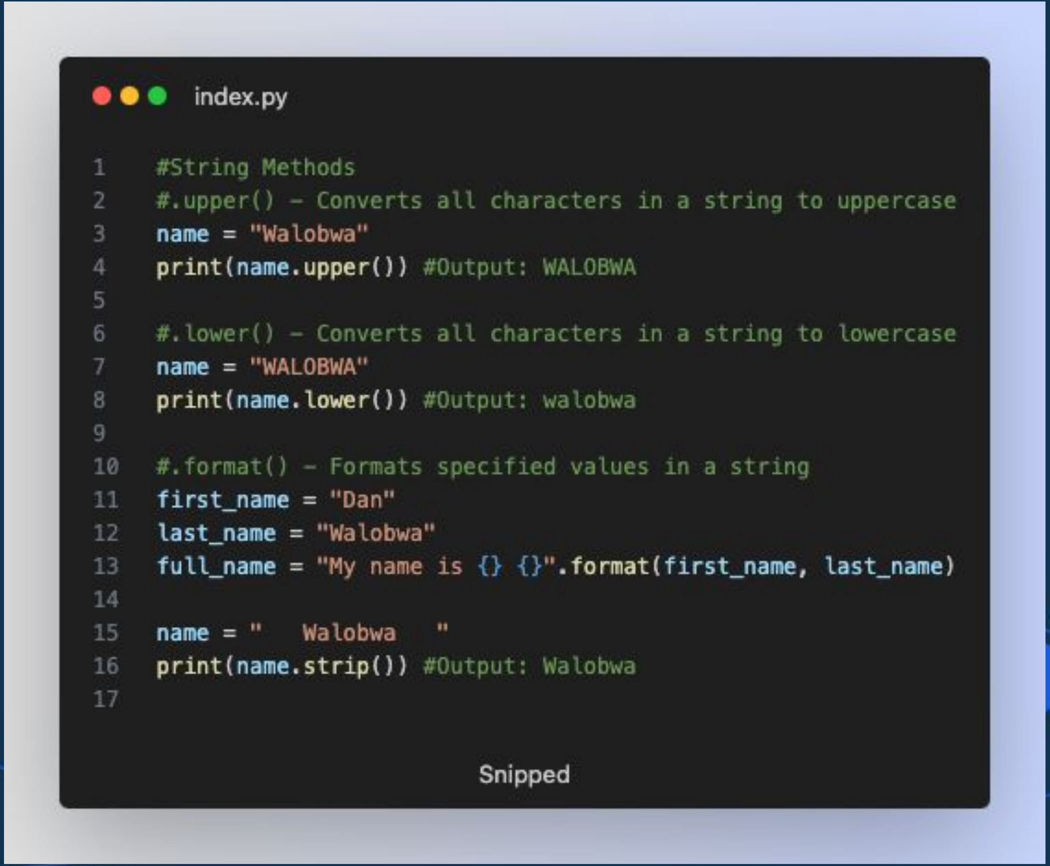


```python
#String indexing
name = 'Walobwa'
print(name[0]) #-> Outputs: W

#String Slicing
name = 'Walobwa'
print(name[0:3]) #-> Outputs: Wal

#String Concatenation
first_name = 'Dan'
last_name = 'Walobwa'
full_name = first_name + ' ' + last_name
print(full_name) #-> Outputs: Dan Walobwa

#String Extended Slicing
name = 'Walobwa'
print(name[0:6:2]) #-> Outputs: Wl
```

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.

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

```

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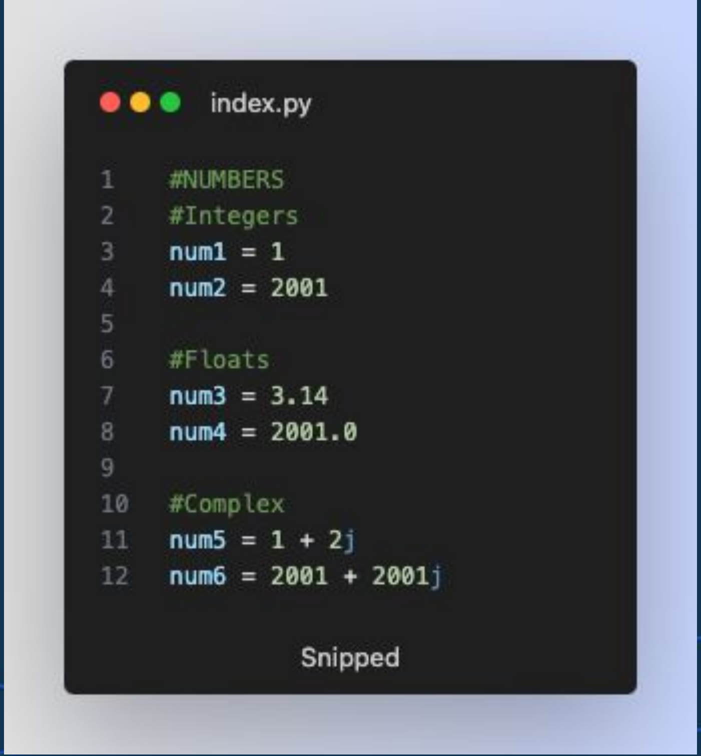
Numbers

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.

Numbers

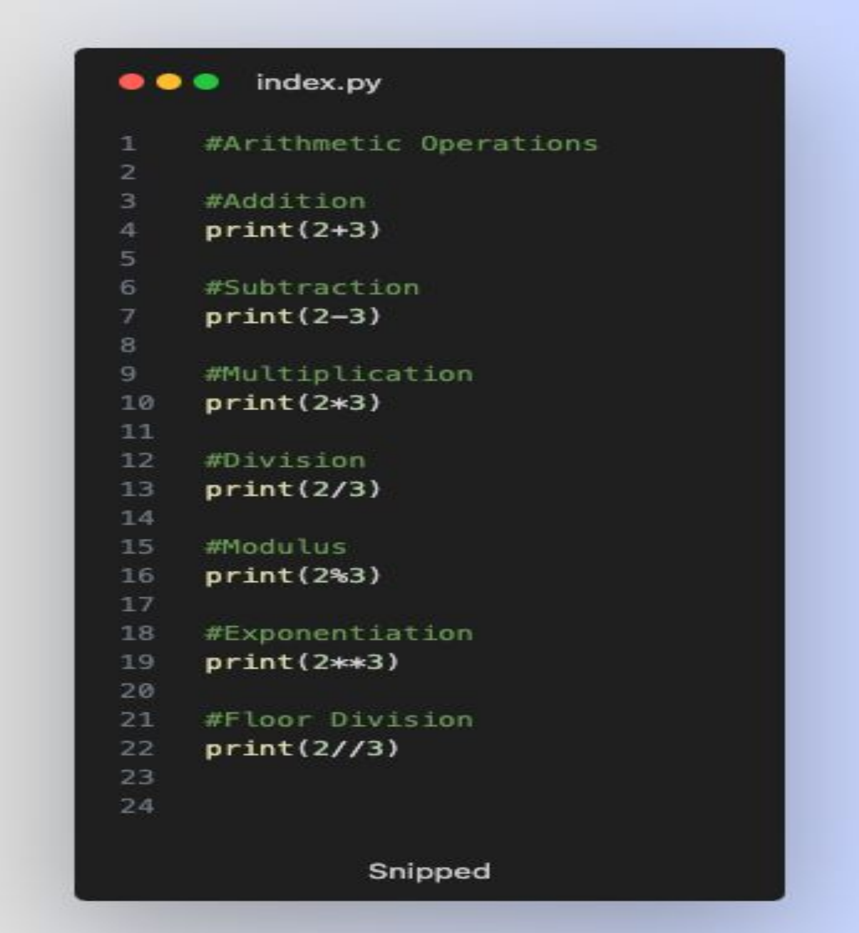


```python
#NUMBERS
#Integers
num1 = 1
num2 = 2001

#Floats
num3 = 3.14
num4 = 2001.0

#Complex
num5 = 1 + 2j
num6 = 2001 + 2001j
```

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)

Basic Arithmetic Operations

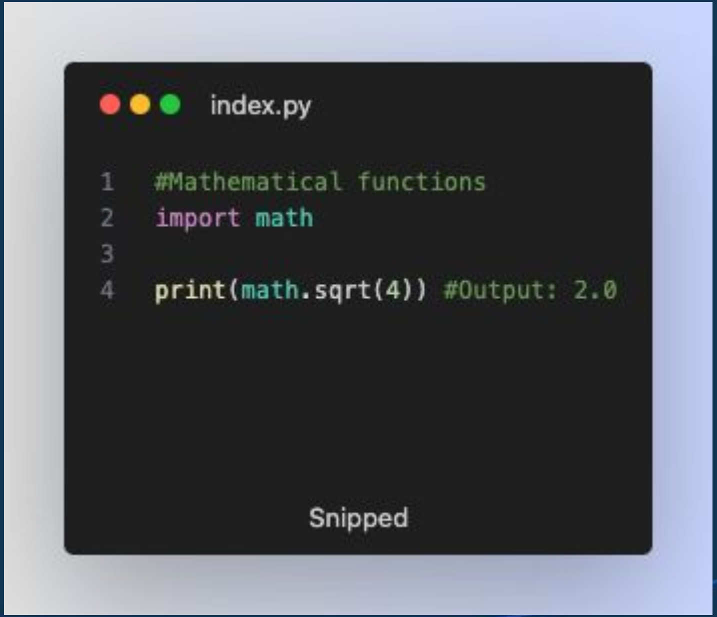


```python
#Arithmetic Operations

#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)


```

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
```

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.

Polls

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

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.

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().

Questions and Answers

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Thank you for attending

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