

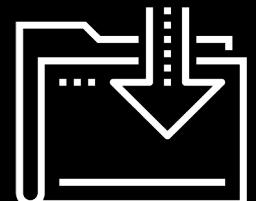


Python: Data Structures and Functions

Day 2

Wed Aug 17th, 2022

FinTech
Lesson 2.2



Class Objectives

By the end of today's class, you will do the following:

01

Identify homogeneous and heterogeneous data.

02

Access and manipulate data within list and dict objects.

03

Iterate over lists and dicts.

04

Visualize and iterate over nested lists and dicts.

05

Define and call custom functions.

Class Refresher

Class Refresher

In the previous class, we learned how to...



Define Python and how it's used.



Install JupyterLab.



Use the terminal.



Create and run Python files in JupyterLab (IDE).



Use variables.



Use conditionals.



Use for loops.



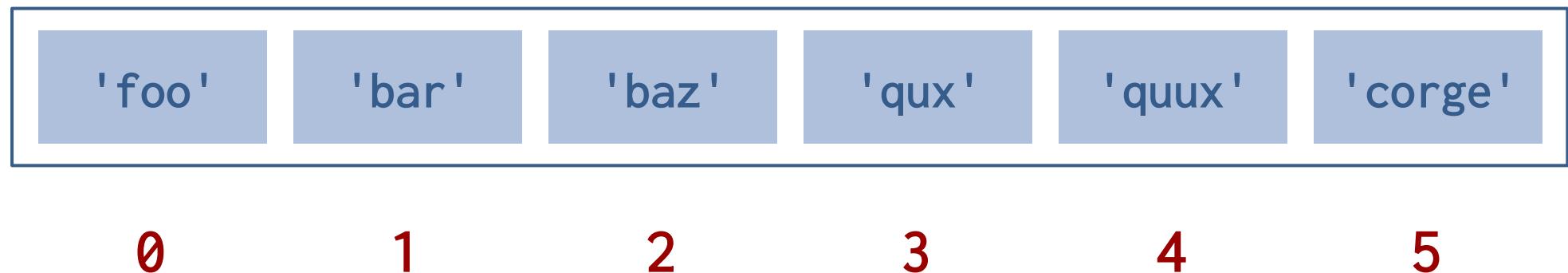
Pseudocode solutions.

Lists

Lists

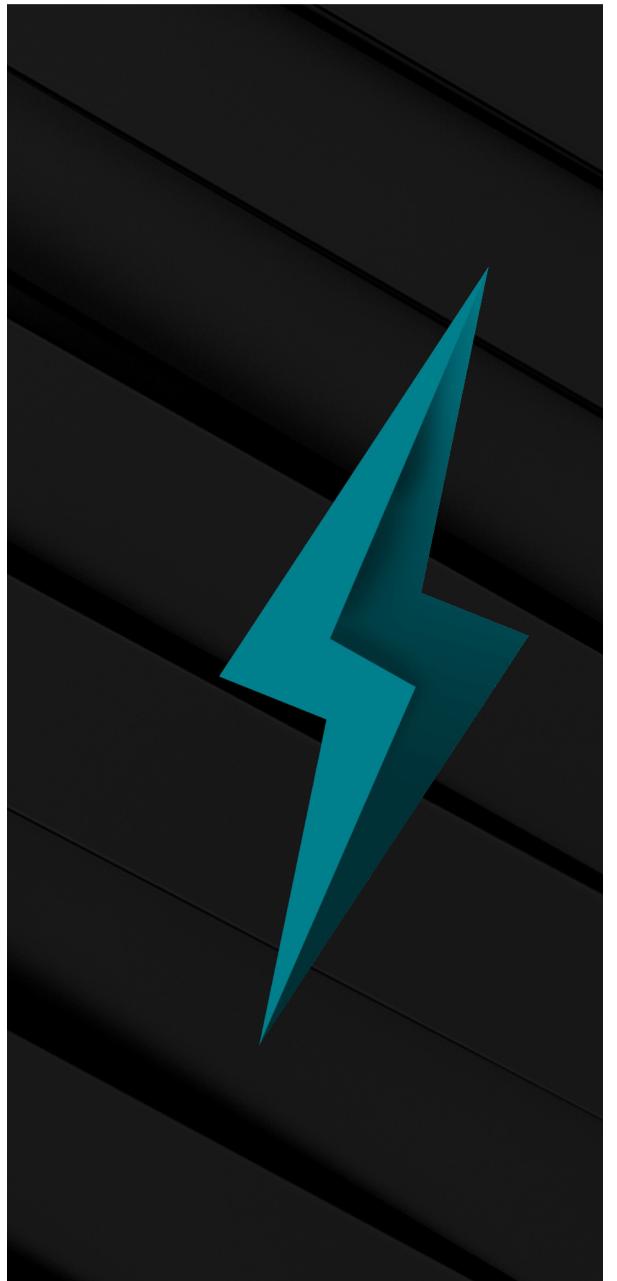
A list is a data structure with the following characteristics:

- It is a collection of elements.
- It is ordered.
- It is heterogenous (can hold different data types).
- It has a zero-based index.





Lists can hold different data types,
**but they commonly hold elements
of a single data type to represent
a conceptual category or group,**
e.g., a list of cars or a group of
people.

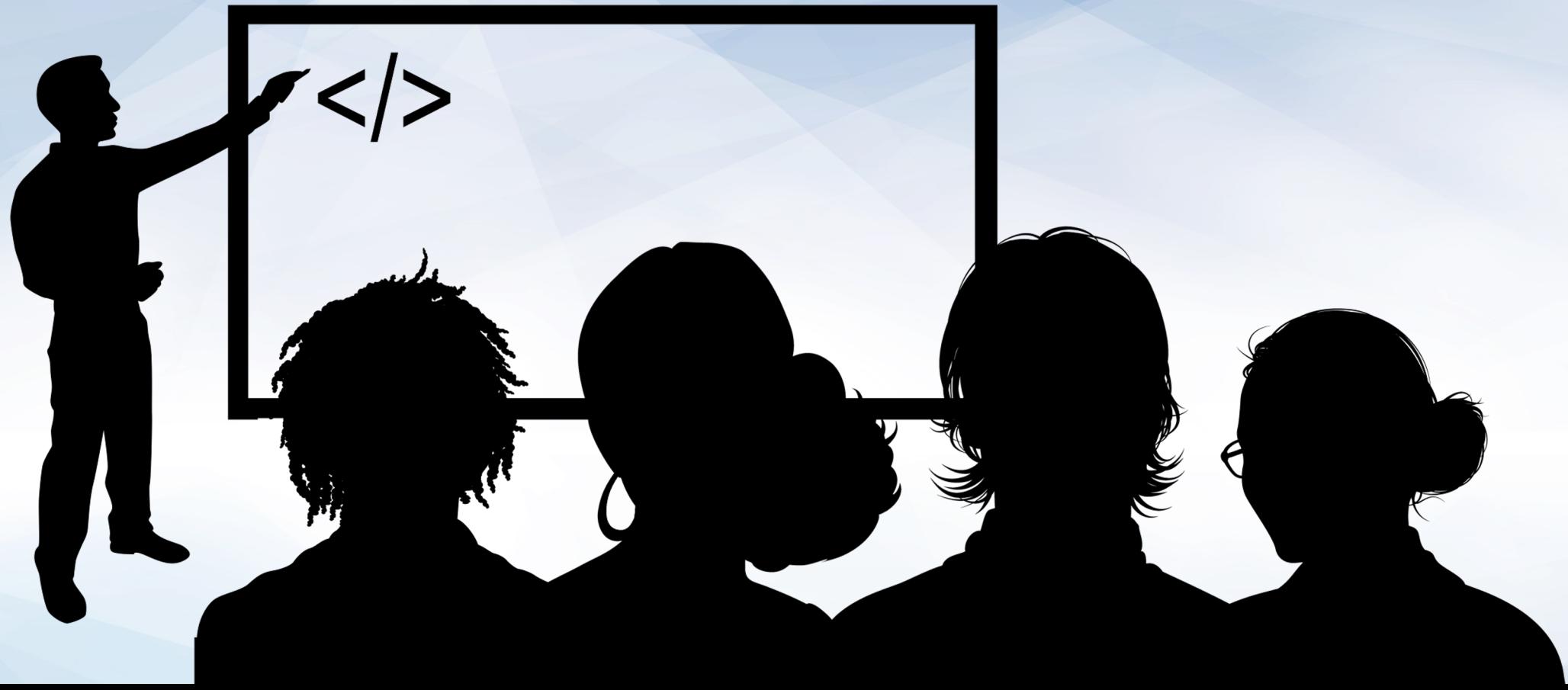


List in Python

List = [10, 'Favtutor', 10, [5, 10, 15]]

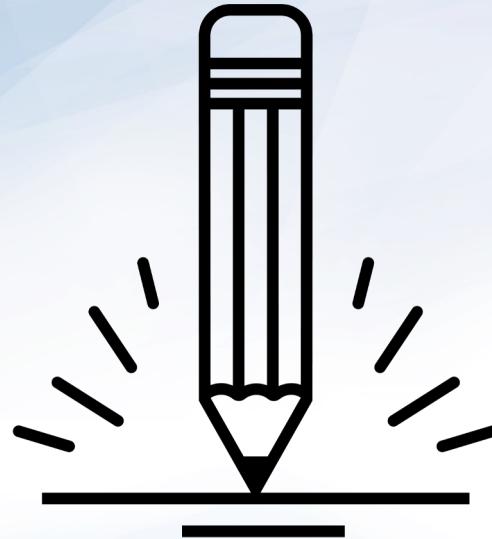
List[0] List[1] List[2] List[3]

- ✓ **Ordered:** Items have defined order which cannot be changed
- ✓ **Mutable:** Items can be modified anytime
- ✓ **Allow duplicates:** Items with the same value is allowed



Instructor Demonstration

01 – Ins_Lists



Activity: Sugar, Flour, Butter!

In this activity, you will work with lists to maintain a grocery list. You will create lists, append to lists, retrieve items from a list, and retrieve values by indexes.
(Instructions sent via Slack)

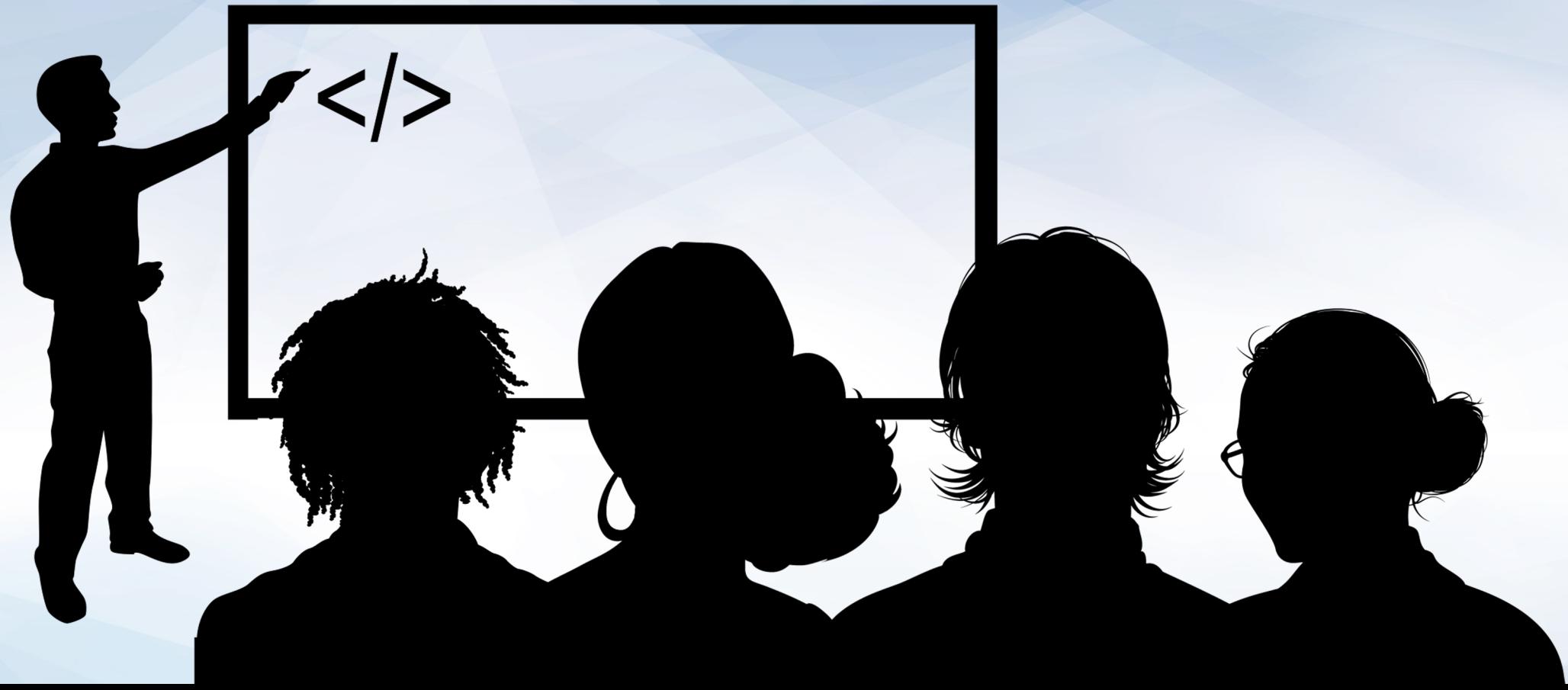
02 – Stu_Lists

Suggested Time:
15 Minutes



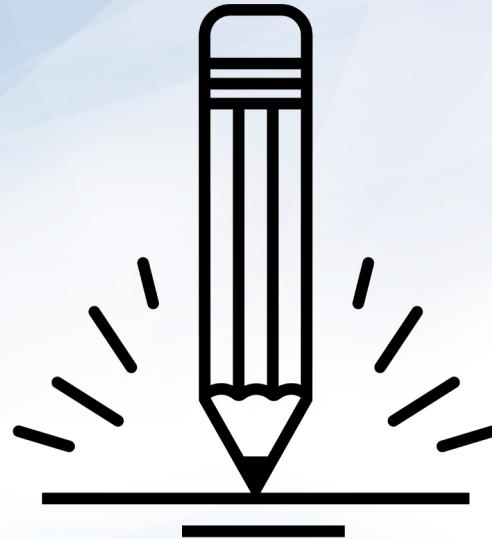


Time's Up! Let's Review.



Instructor Demonstration

03 – Ins_Iterate_Lists



Activity: Trading Log

In this activity, you will use lists to maintain a grocery list. You will create a trading log that tracks profits and losses for each market day of the month. You will iterate over the list to calculate the highest and lowest profit and loss days.

(Instructions sent via Slack)

04 – Stu_Iterate_Lists

Suggested Time:
15 Minutes





Time's Up! Let's Review.

Dicts

Dicts

Dicts are mutable (changeable), ~~unordered~~ data structures with the following key characteristics:



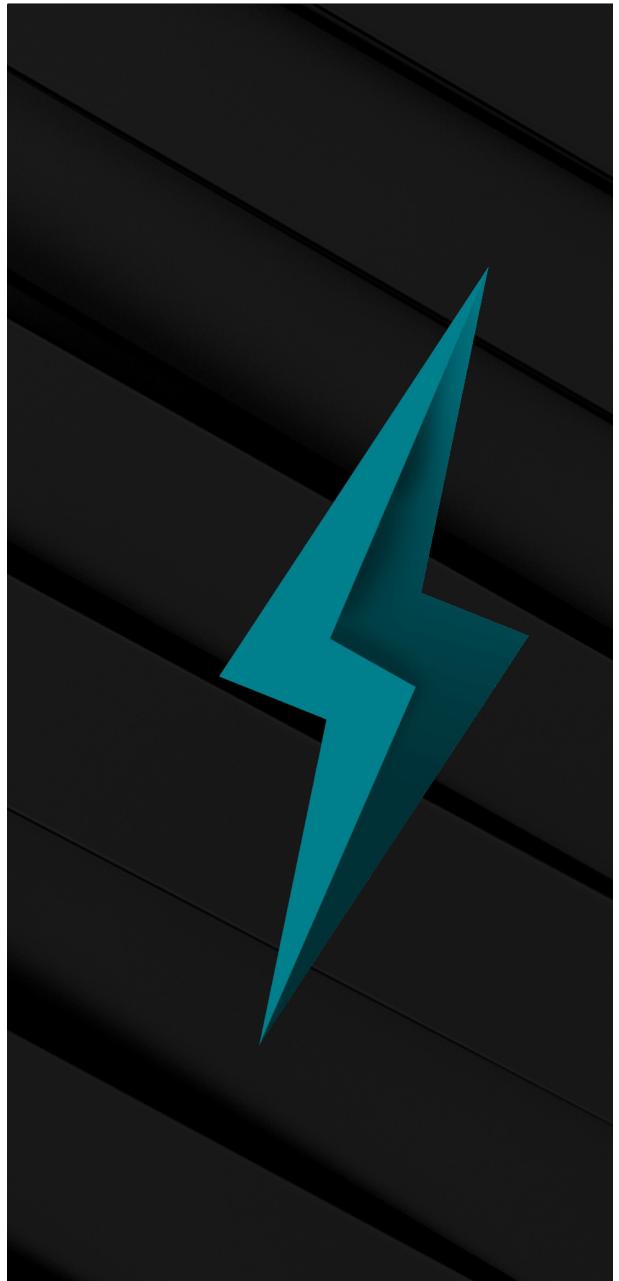
A collection of key-value pairs



~~Unordered~~ ***Now Ordered by default with Python 3.7 !***



Heterogeneous (can contain different data types)

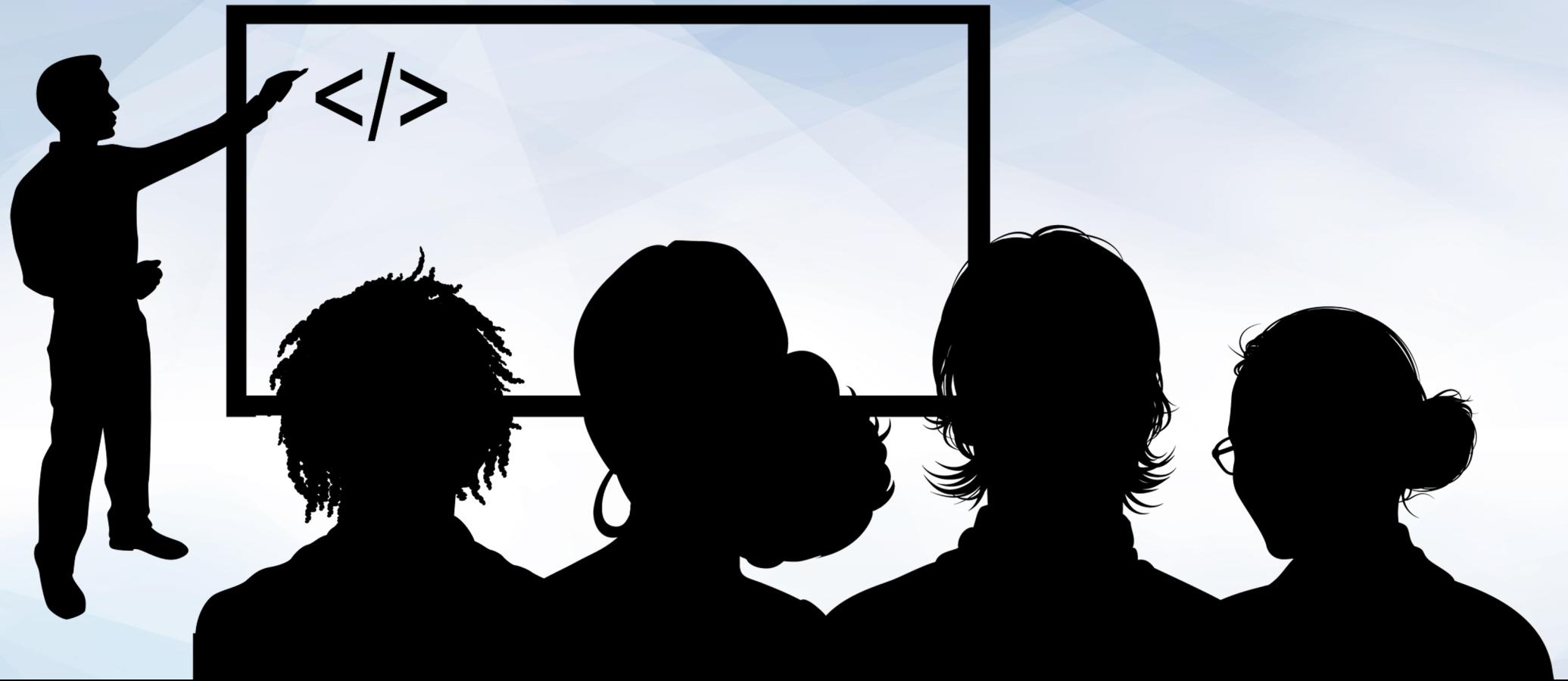


Dictionary in Python

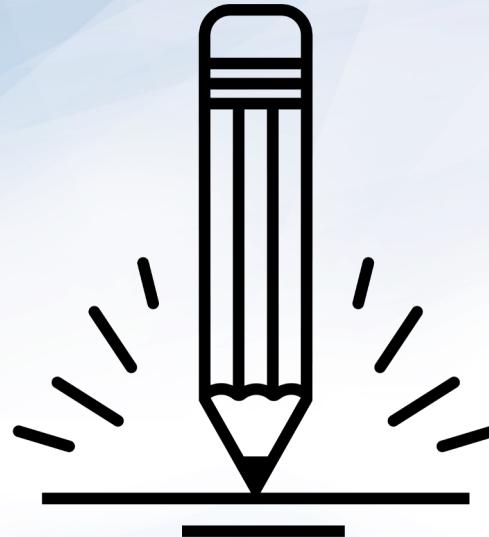
Dict = {1: "FavTutor", 2: "Python"}



- ✓ **Ordered:** Key-value pairs have defined ordered and cannot be changed
- ✓ **Mutable:** Dictionaries are mutable but keys are immutable
- ✗ **Duplicates:** Do not allow duplicates Items with same keys



Instructor Demonstration 05 – Ins_Dictionaries



Activity: Market Capitalization

In this activity, you will practice creating a dictionary, as well as updating, removing, and extracting values in/from the dictionary.

(Instructions sent via Slack)

06 – Stu_Dictionaries

Suggested Time:
15 Minutes





Time's Up! Let's Review.

Break



Nested Lists and Dicts

List

Dictionary

List is a data structure of **index-values** pairs

List is created by placing elements in `[]` separated by commas `,`

The indices of list are integers starting from 0.

The elements are accessed via indices.

Dictionary is a hashed structure of **keys-values** pairs

Dictionary is created by placing elements in `{}` as `"key": "value"`, each key value pair is separated by commas `,`

The keys of dictionary can be of any data type.

The elements are accessed via key-values.



Nested Lists and Dicts

A nested object is an iterable object that contains one or more iterable objects, thereby having “nested” levels of iteration.

Types of nested lists and dicts:



List of lists



List of dicts



Dictionary of lists



Dictionary of dicts

Nested Lists and Dicts

List of lists:

```
# List
ceo_list = ["Warren", "Jack", "Harry"]

# List of Lists
ceo_nested_list = [
    ["Warren Buffet", 88, "CEO of Berkshire Hathaway"],
    ["Jeff Bezos", 55, "CEO of Amazon"],
    ["Harry Markowitz", 91, "Professor of Finance"]
]

# Retrieve first entry of ceo_nested_list
first_entry = ceo_nested_list[0]

# Retrieve name of first entry
first_entry_name = ceo_nested_list[0][0]

# Retrieve age of first entry
first_entry_age = ceo_nested_list[0][1]

# Retrieve occupation of first entry
first_entry_occupation = ceo_nested_list[0][2]

# Print results to screen
print("The first entry in ceo_nested_list is:", first_entry)
print(f"{first_entry_name} is {first_entry_age} years old, serving as {first_entry_occupation}.")
```

Nested Lists and Dicts

Dict of lists:

```
# Dictionary of Lists
stocks_nested_list = {
    "APPL": ["Apple", 101.32, "NASDAQ", 937.7],
    "MU": ["Micron Technology", 32.12, "NASDAQ", 48.03],
    "AMD": ["Advanced Micro Devices", 23.12, "NASDAQ", 29.94],
    "TWTR": ["Twitter", 34.40, "NASDAQ", 26.42]
}

# Retrieve entry for APPL
appl_entry = stocks_nested_list["APPL"]

# Retrieve name, stock_price, and exchange for APPL entry
appl_name = stocks_nested_list["APPL"][0]
appl_stock_price = stocks_nested_list["APPL"][1]
appl_exchange = stocks_nested_list["APPL"][2]

# Print results to screen
print(f"APPL ticker stands for {appl_name}. APPL stock price is currently {appl_stock_price}, and it is available on {appl_exchange}.")
```

Nested Lists and Dicts

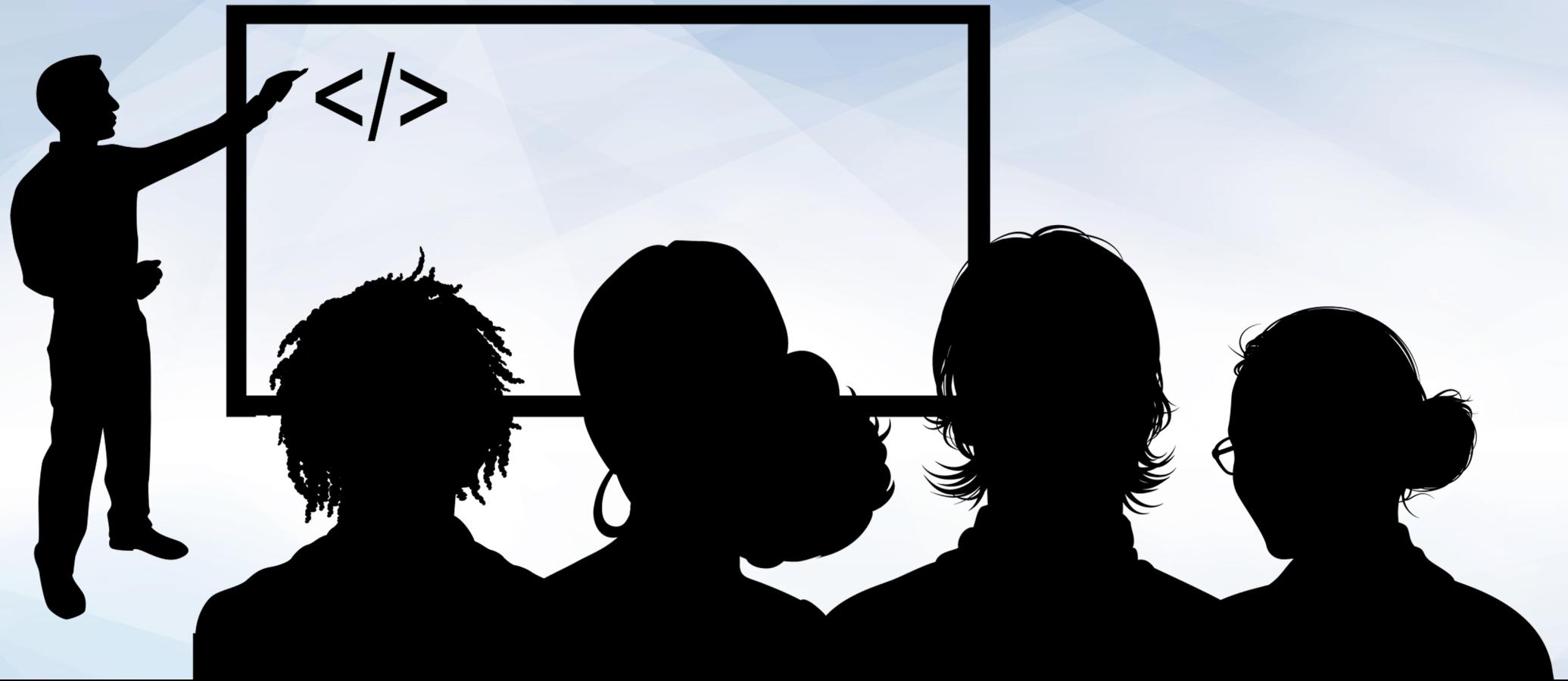
Dict of dicts:

```
# Dictionary of Dicts
stocks_nested_dict = {
    "APPL": {
        "name": "Apple",
        "exchange": "NASDAQ",
        "market_cap": 937.7
    },
    "MU": {
        "name": "Micron Technology",
        "exchange": "NASDAQ",
        "market_cap": 48.03
    },
    "AMD": {
        "name": "Advanced Micro Devices",
        "exchange": "NASDAQ",
        "market_cap": 29.94
    },
    "TWTR": {
        "name": "Twitter",
        "exchange": "NASDAQ",
        "market_cap": 26.42
    }
}

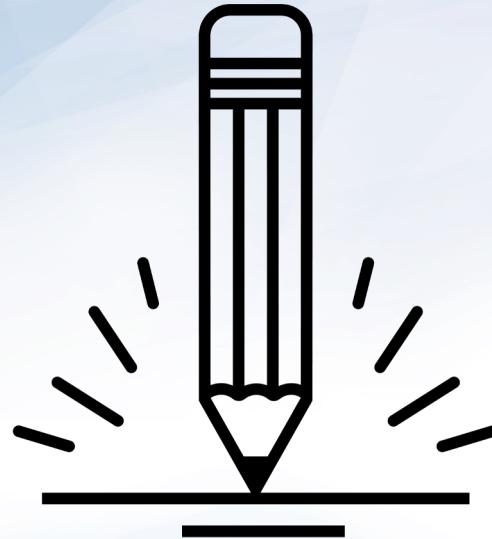
# Retrieve Twitter entry
twitter_entry = stocks_nested_dict["TWTR"]

# Retrieve TWTR name, exchange, and market_cap
twitter_name = stocks_nested_dict["TWTR"]["name"]
twitter_exchange = stocks_nested_dict["TWTR"]["exchange"]
twitter_market_cap = stocks_nested_dict["TWTR"]["market_cap"]

# Print results to screen
print(f"Name of TWTR ticker is {twitter_name}. TWTR is available on {twitter_exchange}, and it currently has a market capitalization of {twitter_market_cap}.)")
```



Instructor Demonstration 07 – Ins_Nesting



Activity: Weekly Gains

In this activity, you will work with nested data structures in a Python file. You will store daily stock data in a list and then store that list in a dictionary. The key of the dictionary will be the stock tickers. You will then retrieve stock data from the dictionary for specific days.

(Instructions sent via Slack)

08 – Stu_Nesting

Suggested Time:
20 Minutes





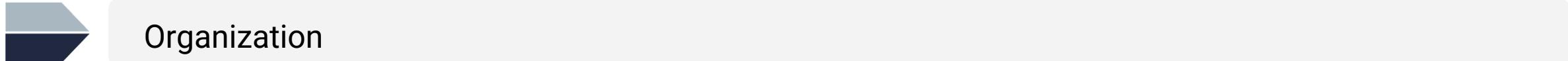
Time's Up! Let's Review.

Functions

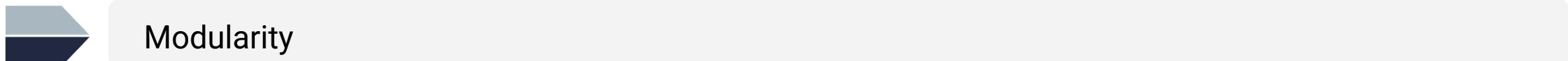
Functions

A function is a block of reusable code that can be used to perform an action.

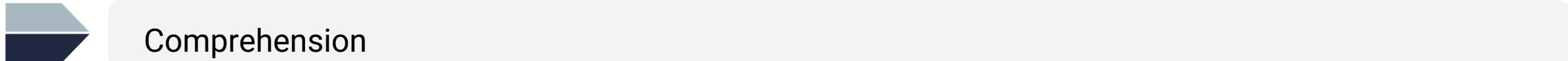
A function provides better:



- Functions make code more readable because they wrap blocks of operational code into a single, callable name.



- Functions can be called multiple times and used over and over again.
- Functions take in optional inputs and generate output. Function inputs are not bound to a specific variable, but rather a specific data type.



- Functions are often annotated with docstrings, comments that help users understand the specific purpose of a defined function.
- Function names are often good indicators of what the function will be trying to achieve.

Functions

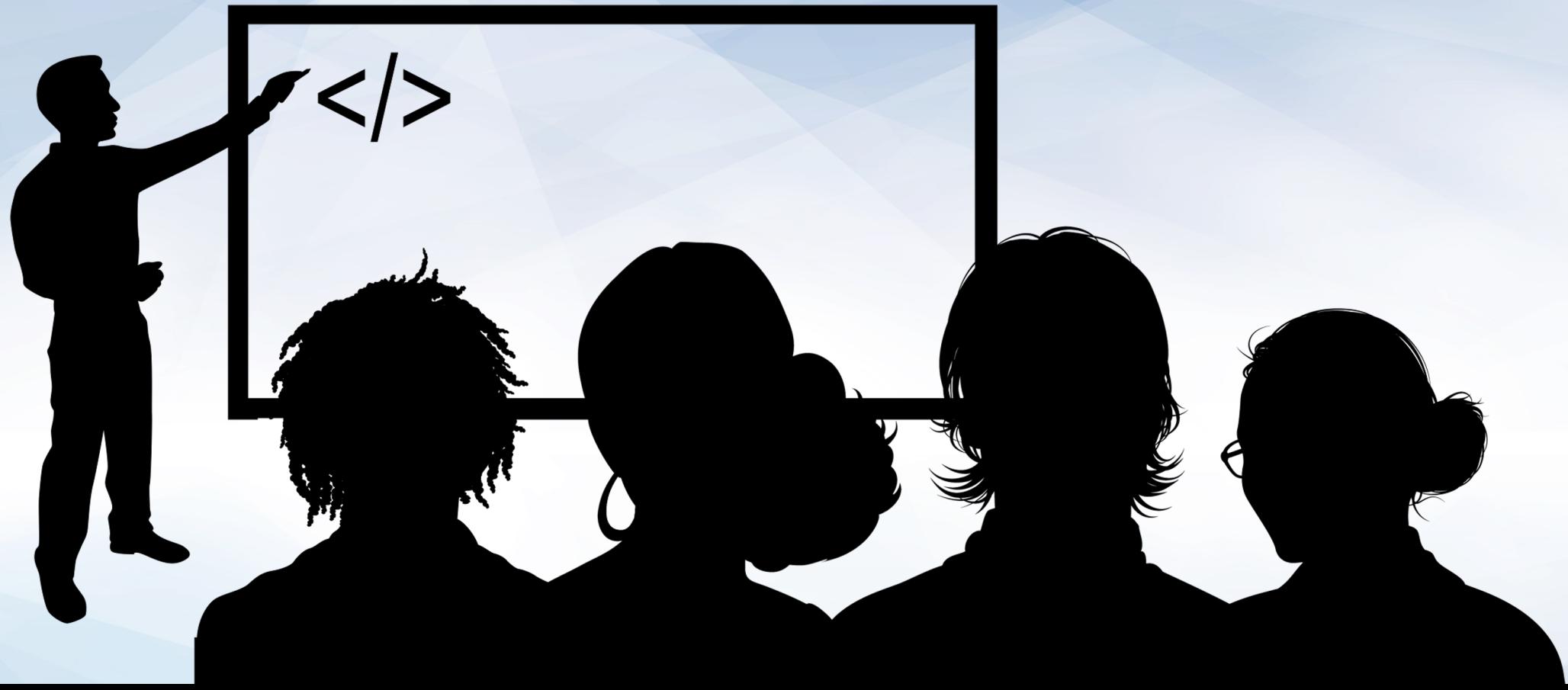
Calling a function:

```
def calculate_market_cap(market_price, number_of_shares):
    cap = market_price * number_of_shares
    return cap

market_price = 76.06
number_of_shares = 1243600000

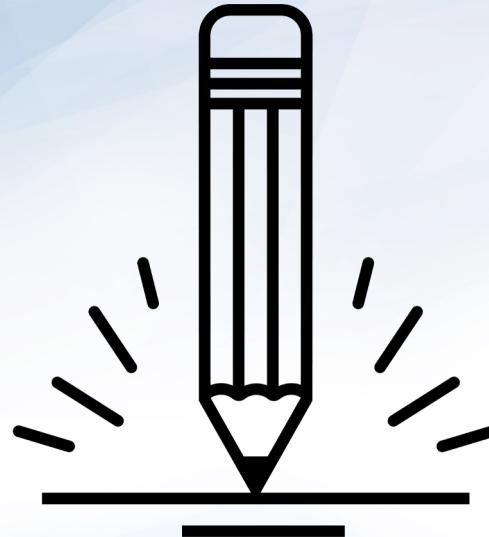
market_cap = calculate_market_cap(market_price, number_of_shares)
print(f"Market Capitalization: {market_cap}")
```

Market Capitalization: 94588216000.0



Instructor Demonstration

09 – Ins_Functions



Activity: Finally Functioning

In this activity, you will define a function to calculate compound annual growth rate (CAGR) for an investment portfolio.

(Instructions sent via Slack)

10 – Stu_Functions

Suggested Time:
20 Minutes





Time's Up! Let's Review.

You Made It!

Congratulations, you've completed Day 2 of Python! Let's recap what you learned:



Lists



Iterating lists



Dictionaries



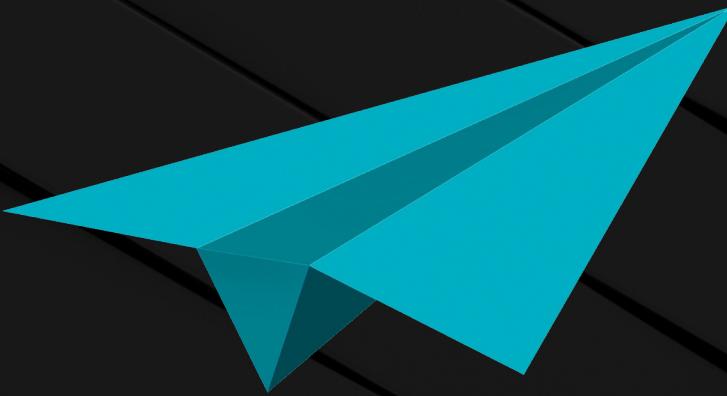
Nested data structures



Functions

The
End

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Office Hours

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Office Hours

Suggested Time:

