

Introduction to Python

Data Boot Camp

Lesson 3.1



Class Objectives

By the end of today's class, you will be able to:



Perform Python 3 installation.



Navigate through folders and files via the terminal.



Create Python scripts and run them in the terminal.



Understand basic programming concepts in Python.



Python

A few things to note before we start:



Python is a traditional programming language.



The fundamental difference between VBA and Python is the syntax.



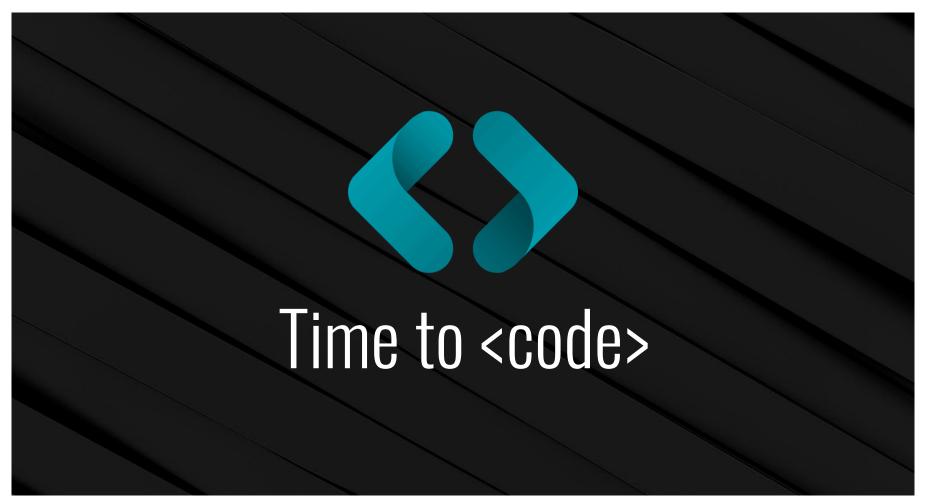
Some basic commands

cd	changes the directory.
cd ~	changes to the home directory.
cd	moves up one directory.
ls	lists files in the folder.
pwd	shows the current directory.
Mkdir <foldername></foldername>	creates a new directory with the FOLDERNAME
touch <filename></filename>	creates a new file with the FILENAME.
rm <filename></filename>	deletes a file.
rm -r <foldername></foldername>	deletes a folder; note the -r.
open .	opens the current folder on Macs.
explorer .	opens the current folder on Windows.
open <filename></filename>	opens a specific file on Macs.
explorer <filename></filename>	opens a specific file on Windows.

Common Commands

```
bash-3.2$ mkdir PythonStuff
bash-3.2$ cd PythonStuff
bash-3.2$ touch first_file.py
bash-3.2$ open first_file.py
```

```
bash-3.2$ python first_file.py
bash-3.2$ This is my first_file.py
```





Activity: Terminal

In this activity, you will create three folders and a pair of Python files to print strings of your own creation to the console.

Suggested Time:

Activity: Terminal

Write and execute the following commands:

- Create a folder called LearnPython.
- Navigate into the folder.
- Inside LearnPython, create another folder called Assignment1.
- Inside Assignment1, create a file called quick_python.py.
- Add a print statement to quick_python.py.
- Run quick_python.py.
- Return to the LearnPython folder.
- Inside LearnPython, create another folder called Assignment2.
- Inside Assignment2, create a file called quick_python2.py.
- Add a different print statement to quick_python2.py.
- Run quick_python2.py.





Check Your Anaconda Installation

Suggested Time:

Check Your Anaconda Installation

Check if Anaconda is properly installed by doing the following:



Open the terminal.



Run conda --version and press Enter.



The terminal output should return conda 4.x.x



Create a Virtual Environment

Suggested Time:

Create a Virtual Environment

What is a virtual environment?



Virtual environments create an isolated environment for Python projects.



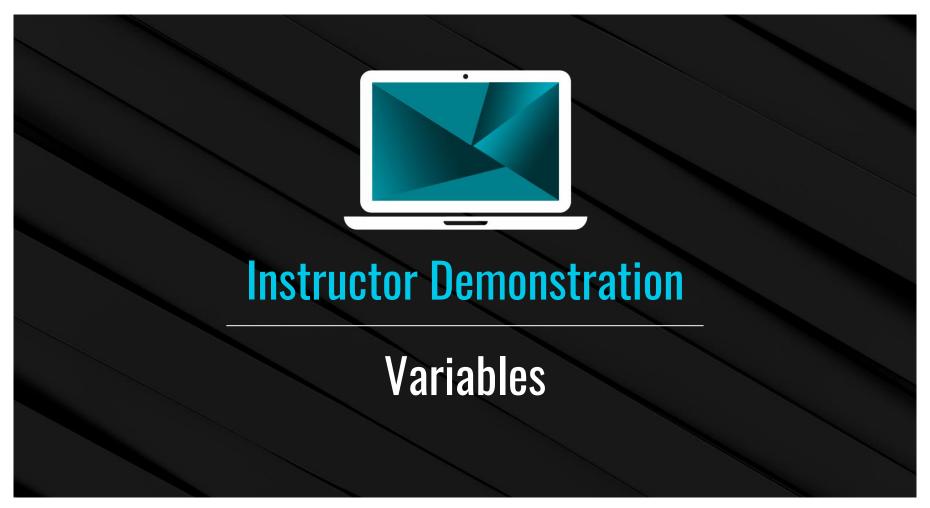
You may work on different projects that have different dependencies.



Different projects might also use different types and versions of libraries.



This virtual environment ensures you have the required dependencies for future class activities.



Variables



Variables are similar to values stored in VBA cells.

In Python, a value is being stored and named.

Variables can store different data types, like strings, integers, and an entirely new data type called Booleans, which hold true or false values.

```
# Creates a variable with a string "Frankfurter"
title = "Frankfurter"

# Creates a variable with an integer 80
years = 80

# Creates a variable with the boolean value of True
years = True
```

Print Statements

We can print statements that include variables, but traditional Python formatting won't concatenate strings with other data types. This means integers and Booleans must be cast as strings by using the str() function.

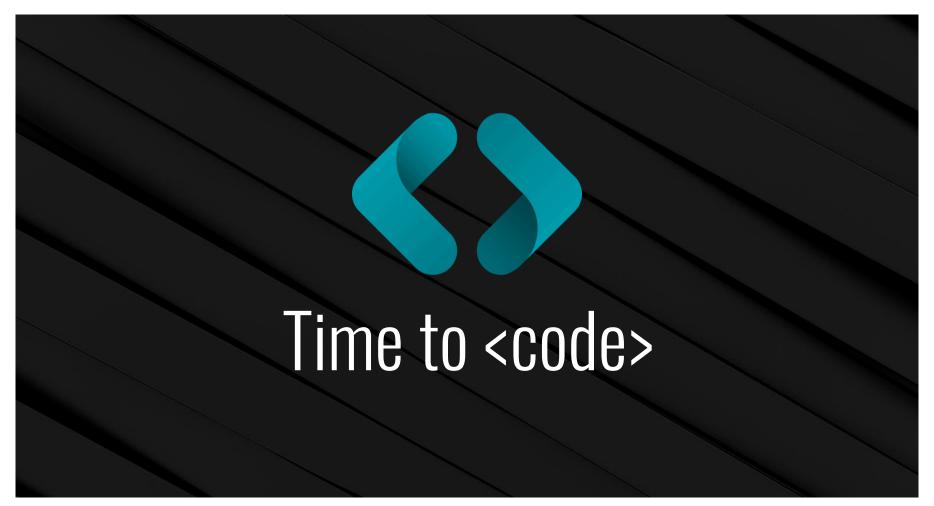
```
# Prints a statement adding the variable
print("Nick is a professional" + title)

# Convert the integer years into a string and prints
print("He has been coding for " + str(years) + " years")

# Convert a boolean into a string and prints
print("Expert status:" + str(expert_status))
```

Alternatively, the f-string method of string interpolation allows strings to be formatted with different data types.

```
# An f-string accepts all data types without conversion
print(f"Expert status: {expert_status}")
```





Activity: Hello, Variable World!

In this activity, you will create a simple Python application that uses variables to run calculations on integers and print strings out to the console.

Suggested Time:

Activity: Hello, Variable World!

Instructions:



Create two variables, called name and country, that will hold strings.



Create two variables, called age and hourly_wage, that will hold integers.



Create a variable called satisfied, which will hold a Boolean.



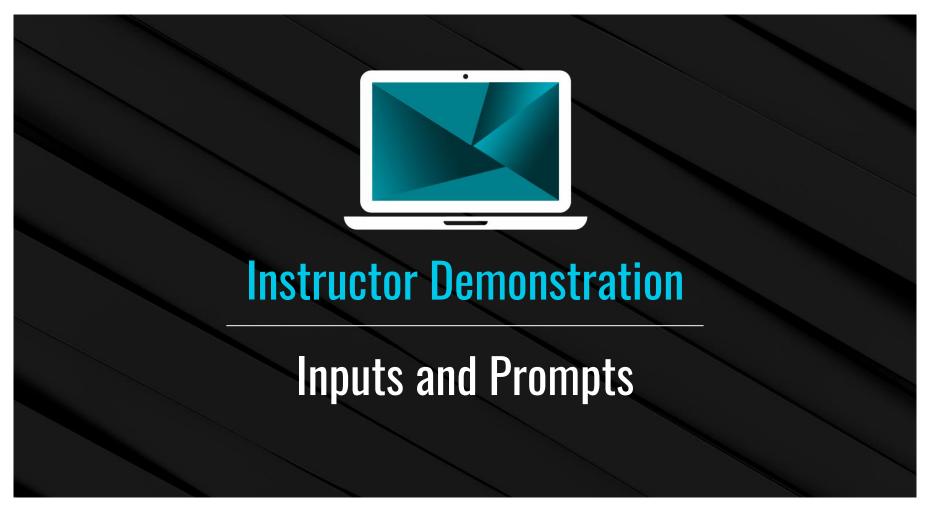
Create a variable called daily_wage, which will hold the value of hourly_wage multiplied by 8.



With an f-string, print the daily_wage and satisfied variables.

HelloVariableWorld.py
You live in the United States
You are 25 years old
You make 120 per day
Are you satisfied with your current wage? True





Inputs and Prompts

```
(PytonData) $ python inputs.py
What is your name? Gary
How old are you? 33
Is this statement true? yes
My name is Gary
I am 33 years old.
The statement was True
```





Activity: Down to Input

In this activity, you will store inputs from the command line and run code based on the values entered.

Suggested Time:

Activity: Down to Input

Instructions



Create two different variables, one to take the input of your first name and one for your neighbor's first name.



Create two more inputs to ask how many months you and your neighbor have been coding.



Finally, display a result with both your names and the total amount of months you've been coding.





Conditionals

A few things to keep in mind!

- Conditionals in Python feature nearly the same logic as VBA. The primary differences are the syntax and indentation.
- Python uses if, elif, and else to create contionals.
- Conditional statements are concluded with a colon. Because Python reads blocks of code based on indentation, all lines after the colon must be indented to be considered a part of that code block.
- All sorts of operators, like greater than, less than, and equal to, can be used to create logic tests for conditionals.
- The condition is equal to uses ==, while variable assignment uses one equal sign.
- Multiple logic tests can be checked within a single conditional statement. If we use the term and, both tests must return True, while or requires that only one test return as True.
- Conditionals can even be nested, allowing programmers to run logic tests based on whether or not the original logic test returned as True.

Conditionals

Indentation matters in Python!



Hint: Count four space strokes on your keyboard, or press the Tab key once.

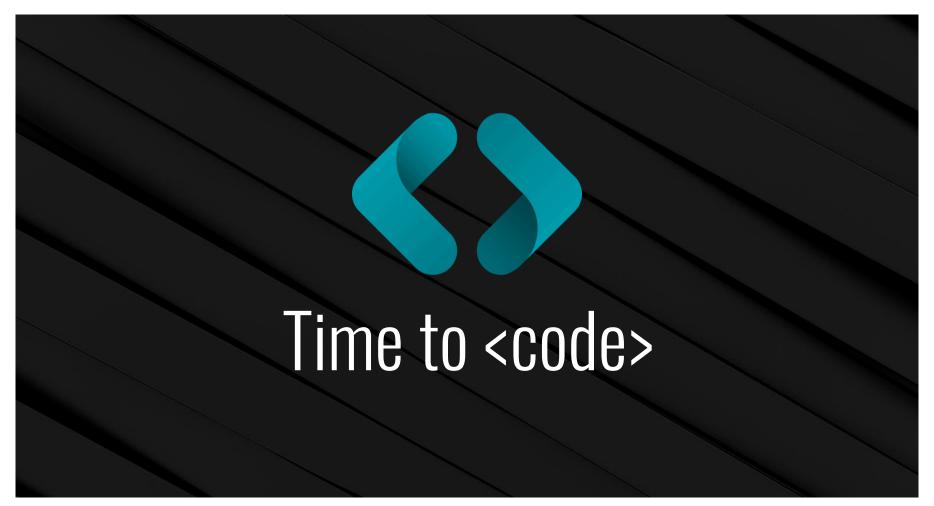
```
>>> x = 1
>>> y = 10
>>>
>>> # Look what happens w/o indentation
... if x == 1:
... print('x is equal to 1')
File "<stdin>", line 3
    print('x is equal to 1')
    ^
IndentationError: expected an indented block
```

```
>>> if x == 1:[]
```

Conditionals

```
>>> # Checks if one value is equal to another
... if x == 1:
             print("x is equal to 1")
x is equal to 1
>>> # Checks if one value is NOT equal to another
... if y != 1:
            print("y is not equal to 1")
y is not equal to 1
>>> # Checks if one value is less than another
\dots if x < y:
            print("x is less than y")
x is less than y
>>> # Checks if one value is greater than another
\dots if y > x:
            print("y is greater than x")
y is greater than x
```

```
>>> # Checks if one value is greater than or equal to another
... if x >= 1:
               print("x is greater than or equal to 1")
x is greater than or equal to 1
>>> # Checks for two conditions to be met using "and"
... if x == 1 and y == 10:
               print("Both values returned true")
Both values returned true
>>> # Checks if either of two conditions is met
... if x < 45 or y < 5:
        print("One or more of the statements were true")
One or more of the statements were true
>>> # Nested if statements
... if x < 10:
               if y < 5:
                          print("x is less than 10 and y is less than
        elif v == 5:
                          print("x is less than 10 and y is equal to 5
        else:
                          print("x is less than 10 and y is greater th
```





Activity: Conditional Conundrum

In this activity, you will review some prewritten conditionals and predict which lines will be printed to the console.

Suggested Time:

Activity: Conditional Conundrum

Instructions

Go through the conditionals in the provided code, and predict which lines will be printed to the console.

Do not run the application at first. Try to follow the thought process for each code chunk and then make a guess. You should only run the application after coming up with a guess for each section.

Bonus

After figuring out the output for all of the code chunks, create your own series of conditionals to test your fellow classmates. Once you have completed your puzzle, slack it out to everyone so they can test it.







Lists

A few points to keep in mind:



Lists are the Python equivalent of arrays in VBA. Like arrays, lists hold multiple pieces of data within one variable.



Lists can hold multiple types of data, such as strings, integers, and Boolean values, all within a single list!

List Methods in Python

Python has a set of built-in methods that you can use on lists:

append	method adds elements to the end of a list.	
index	method returns the numeric location of a given value within a list.	
len	function returns the length of a list.	<pre># Create a variable and set it as an List myList = ["Jacob", 25, "Ahmed", 80] print(myList)</pre>
remove	method deletes a given value from a list.	<pre># Adds an element onto the end of a List myList.append("Matt") print(myList)</pre>
рор	method can remove a value by index.	<pre># Changes a specified element within an List at the given index myList[3] = 85 print(myList)</pre>
		<pre># Returns the index of the first object with a matching value print(myList.index("Matt")) # Returns the length of the List print(len(myList)) # Removes a specified object from an List myList.remove("Matt") print(myList) # Removes the object at the index specified myList.pop(0) myList.pop(0) print(myList)</pre>

Tuples

Tuples are functionally similar to lists in what they can store, but they are immutable.

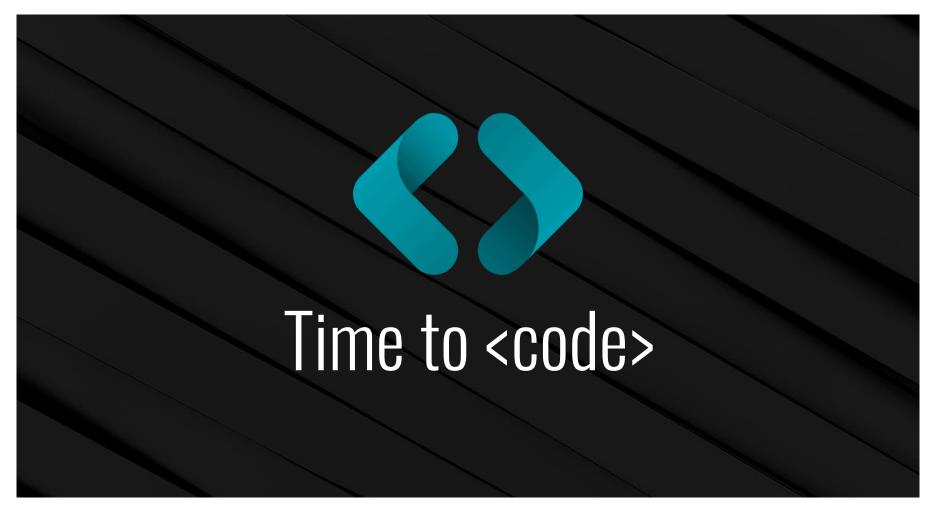


While lists in Python can be modified after their creation, tuples can never be modified after their declaration.



Tuples tend to be more efficient to navigate through than lists and also protect the data stored within from being changed.

```
# Creates a tuple, a sequence of immutable Python objects that cannot be changed
myTuple = ('Python', 100, 'VBA', False)
print(myTuple)
```





Activity: Rock, Paper, Scissors

In this activity, you will create a simple game of Rock, Paper, Scissors that will run within the console.

Suggested Time:

15 minutes

Activity: Rock, Paper, Scissors

Instructions



Using the terminal, take an input of r, o, or s for rock, paper, or scissors.



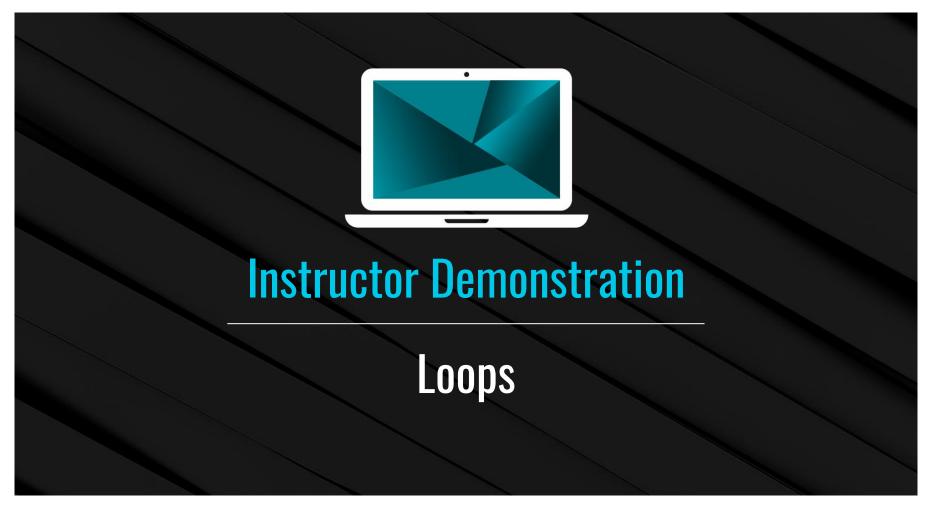
Have the computer randomly pick one of these three choices.



Compare the user's input to the computer's choice to determine if the user won, lost, or tied.

```
(PythonData) $ python RPS_Solved.py
Let's Play Rock Paper Scissors!
Make your Choice: (r)ock, (p)aper, (s)cissors? P
You choose paper. The computer choose rock.
Yay! You won.
```





Loops

Loops are another concept that we learned with VBA!

- The variable x is created within the loop statement and could theoretically take on any name as long as it is unique.
- When looping through a range of numbers, Python will halt the loop one number before the final number. For example, when looping from 0 to 5, the code will run 5 times, but will only ever be printed as 0 through 4.
- When provided with a single number, range() will always start the loop at 0. However, when provided with two numbers, the code will loop from the first number until it reaches one fewer than the second number.

```
# Loop through a range of numbers (0 through 4)
for x in range(5):
    print(x)

print("-----")

# # Loop through a range of numbers (2 through 6)
for x in range(2, 7):
    print(x)

print("-----")
```

Looping through strings

Python can also loop through all the letters within a string.

The syntax is for <variable> in <string>:

```
# Iterate through letters in a string
word = "Peace"
for letters in word:
    print(letters)

print("______")
```

Looping through lists

Python can also loop through all the values within a list.

The syntax is for <variable> in t>:

```
# Iterate through a list
zoo = ['cow', 'dog', 'bee', 'zebra']
for animal in zoo:
    print(animal)

print("______")
```

while Loops

These are just like for loop but will continue looping for as long as a condition is met.

```
# Loop while a condition is being met
run = 'y'
while run == 'y':
    print('Hi!')
    run = input("To run again. Enter 'y'")
```



Activity: Number Chain

In this activity, you will take user input and print out a string of numbers.

Suggested Time:

15 minutes

Activity: Number Chain

Instructions

Using a while loop, ask the user "How many numbers?", and then print out a chain of numbers in increasing order from 0 to the user-input number.

After the results have printed, ask the user if they would like to continue. If "y" is entered, keep the chain running by inputting a new number and starting a new count from 0 to the new user-input number. If "n" is entered, exit the application.

Bonus

Rather than just displaying numbers starting from 0, have the numbers begin at the end of the previous chain.

```
python NumberChainBonus_Solved.py
How many numbers?
```



