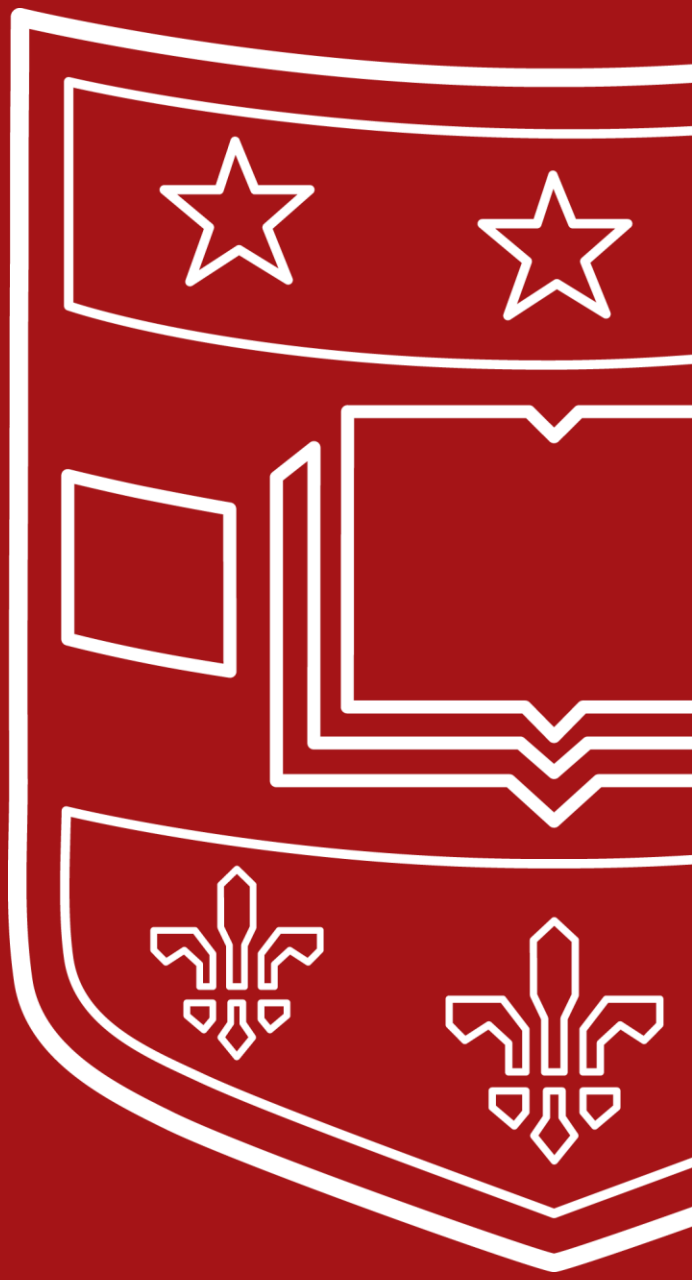
Introduction to Python
Session 1/4

TRIADS Training Series
Instructor: Claudia Carroll



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Python: Fastest Growing Programming Language

Worldwide, Jan 2024 :

Rank	Change	Language	Share	1-year trend
1		Python	28.2 %	+0.5 %
2		Java	15.73 %	-0.9 %
3		JavaScript	8.91 %	-0.6 %
4	↑	C/C++	6.8 %	-0.0 %
5	↓	C#	6.67 %	-0.3 %
6	↑	R	4.59 %	+0.6 %
7	↓	PHP	4.54 %	-0.7 %
8		TypeScript	2.92 %	+0.2 %
9		Swift	2.77 %	+0.6 %
10		Objective-C	2.34 %	+0.2 %

Strengths: Readability and Concision

Java:

```java
class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, World!");
    }
}
```

Python:

```python

print("Hello, world!")

```

Strengths: Flexibility

- Natural Language Processing
- Machine Learning
- Web and game development (back-end)
- Data Analysis

Goals of the Class

- Learn the basic building blocks of Python programs (lists, loops, functions etc.)
- Become familiar with coding logic
- Develop basic skills in text and numerical data analysis

Class Plan

1	Variables, lists, indices and slicing
2	Comparisons, conditionals and loops
3	Opening and reading files, file encoding, manipulating dataframes
4	Creating your own functions

Today's Lesson

1. Lecture: Basic Python Concepts and Syntax
2. Data types and variables
3. Manipulating Variables: Operators, Indices and Slices

Python Syntax

Indentation:

- Improves readability
- Affects how code is interpreted and executed
- Especially crucial for control flow structures (loops and conditionals)

Case sensitive:

- Python treats **name** and **Name** as two different things
- Built-in keywords (like **print**, **True**, and **if**) are also case sensitive

Quotation marks:

- used to define and delimit text (strings)
- Single ‘ or double “ quotes are both acceptable—choose one and stick with it

Python Syntax cont.

Parentheses ( ):

- used to call and define functions and to define tuples
- Contain the arguments or parameters of a function
- Also used in math expressions to control order of operations

Commas , :

- used to separate elements of data structures like lists, tuples, sets, strings, dictionaries, etc., as well as function arguments

Square brackets [ ]:

- defining and accessing lists, as well as performing list operations

Variables

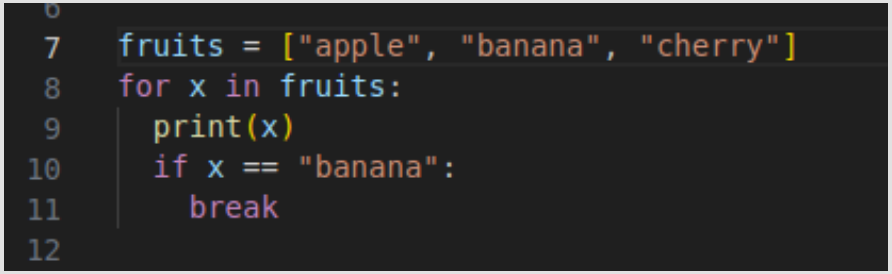
- Used to store data
- Different data types can be assigned to variables
- Variables are used within code

```python
# Assigning values to variables
x = 10
name = "Alice"
numbers = [1, 2, 3, 4, 5]

# Using variables in operations
y = x + 5
greeting = "Hello, " + name

# Accessing and printing variables
print(x)          # Output: 10
print(greeting)   # Output: "Hello, Alice"
print(numbers)    # Output: [1, 2, 3, 4, 5]
```

Python Main Data Types

Strings	"Heuston, we have a problem"
Integers	35
Floats	35.6
Lists (data collection type)	["apple", 12, "computer science", "apple", 13.2] • Order is saved • Can be rearranged after list is defined • Can contain duplicates • Elements can be added or removed • Indicated by square brackets

```
x = 42
y = "Hello, World!"
z = [1, 2, 3]
w = {"name": "Alice", "age": 30}
b = ["ringo", "paul", "george", "john"]

```



Python for loop containing:

- List
- Strings—denoted by quotation marks
- Indents
- function
- Square brackets
- Variable
- Parentheses
- argument

Errors

- Syntax Error
- Name Error
- Type Error
- Index Error

Syntax Errors

```
>>> print ("Hello, world!)
  File "<stdin>", line 1
    print ("Hello, world!)
           ^
SyntaxError: unterminated string literal (detected
at line 1)
```

Name Error

```
>>> age = 12
>>> print(age, other)
    Traceback (most recent call last):
        File "<stdin>", line 1, in <module>
    NameError: name 'other' is not defined. Did you mean: 'iter'?
```

Type Error

```
>>>x = "10"
>>>y = 5
>>>z = x + y
>>>print(z)
   Traceback (most recent call last call):
      File "c:\Users\name\OneDrive\Desktop\demo.py", line 3, in <module>
         Z = x + y
             ~~^~~
TypeError: can only concatenate str (not "int") to str
```

Index Error

```
>>>my_list = [100, 200, 300, 400, 500]
>>>print(my_list[7])
    Traceback (most recent call last):
        File "c:\Users\name\OneDrive\Desktop\demo.py", line 2, in <module>
            print(my_list[p
                ~~^~~
IndexError: list index out of range
```

GitHub Repo

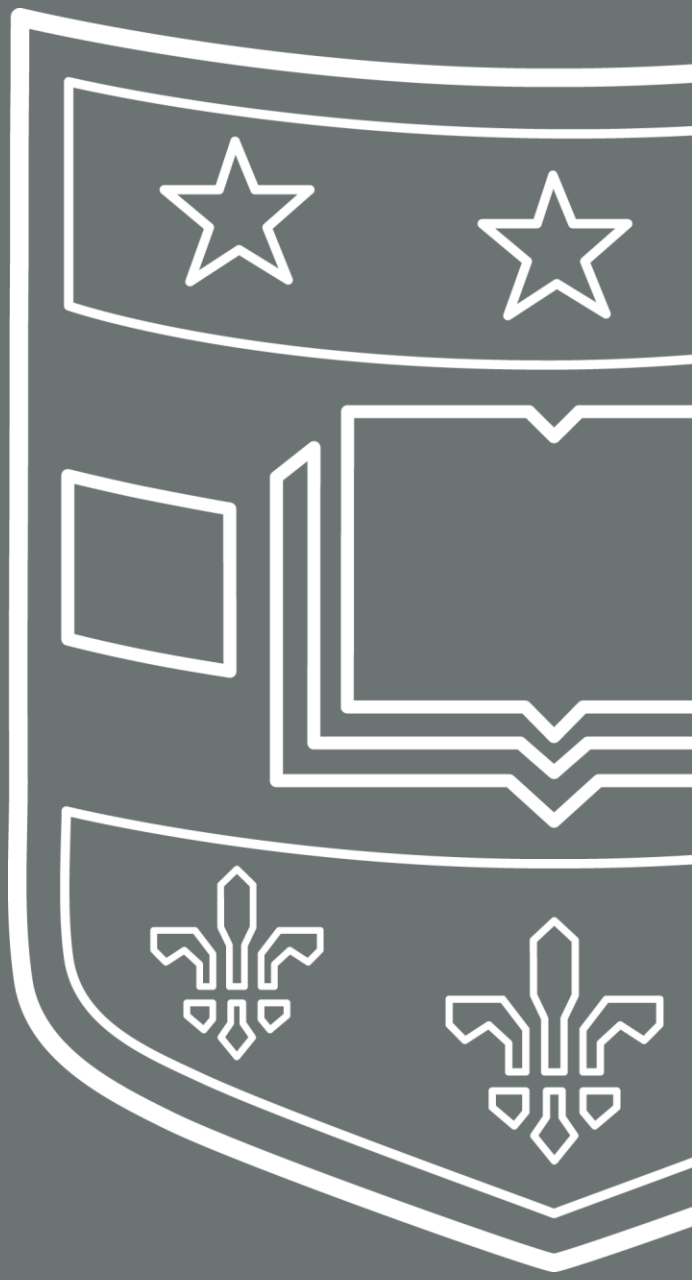
https://github.com/ClaudiaECarroll/triads_intro_python

Google Colab

https://colab.research.google.com/

Demo 1

Getting Started with Python: Data types and variables



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Exercise 1

Write the code to ask you how many years you have been at Wash U, and what department you work in. The output should be “Congratulations on working at the X department at Wash U for Y years”.

Solution

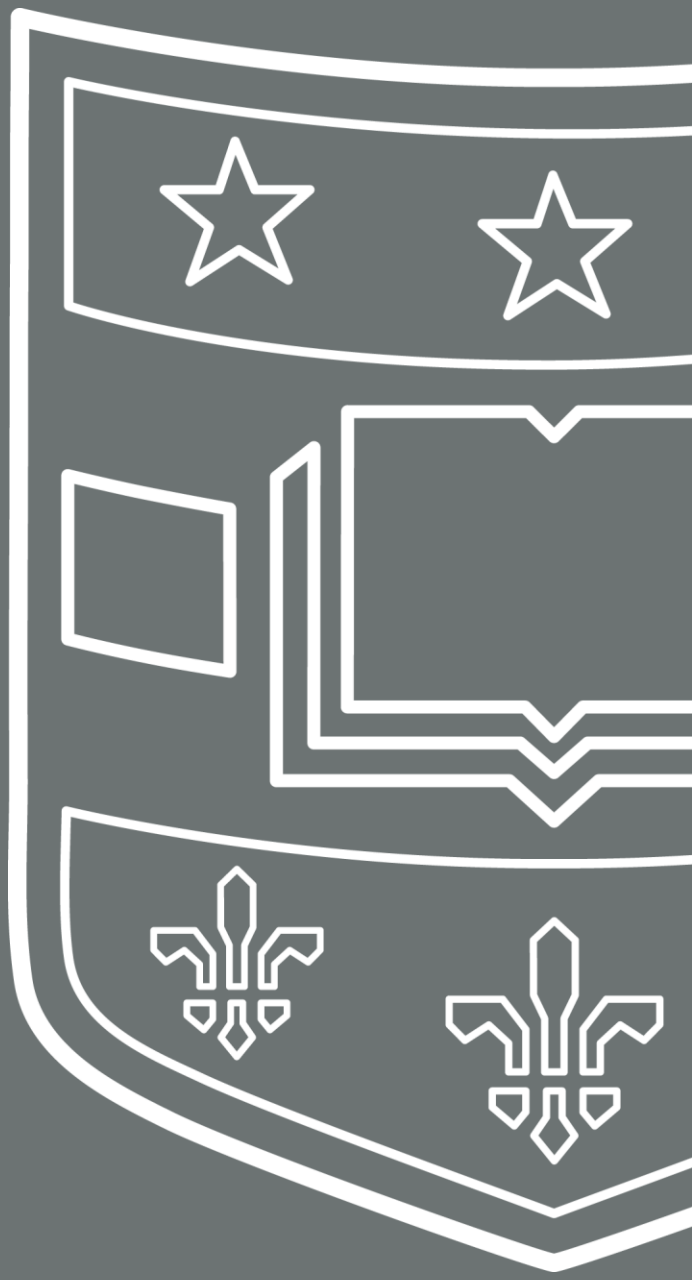
```
years = input("how many years have you worked at WashU? ")

department = input("what department do you work in? ")

print("Congratulations on working at the", department, "department at Wash U for", years, "years")
```

Demo 2

Manipulating Variables: Operators, Indices and Slices



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Exercise 2

Create the following list to track your groceries and prices:

Groceries = [“apples”, “4”, “milk”, “5.9”, “bread”, “3”, “wine”, “15.5”]

1. Use indices to list out only the food items,
2. Use mathematical operators to list the number of food items
3. Write the code to extract the prices from the list, calculate the total, then output the following statement: *The total cost of the groceries is $X*

Hint: Watch your parentheses!

Solution

groceries = [“apples”, “4”, “milk”, “5.9”, “bread”, “3”, “wine”, “15.5”]

1. print(groceries[0], groceries[2], groceries[4], groceries[6])
2. len(groceries)/2
3. print("The total cost of the groceries is $", int(groceries[1])
   + float(groceries[3]) + int(groceries[5]) + float(groceries[7]))

- The total cost of the groceries is $28.4

Homework!

For our next class:

1. Complete in-class exercises
2. Complete Class 1 Homework Exercises

All materials available at:

GitHub Repo:

https://github.com/ClaudiaECarroll/triads_intro_python