

# Python Beginner's Workshop

In Collaboration with the Pikes Peak Library District 21st  
Century Library

Ryan E. Freckleton

PySprints

2018-03-15



# Conduct

- ▶ Treat everyone with the respect due their inherent dignity.
- ▶ All communication should be appropriate for a professional audience including people of many different backgrounds.
- ▶ Be kind to others. Make an environment conducive to learning. Behave professionally.
- ▶ Thank you for helping make this a welcoming, friendly event for all.
- ▶ Contact the organizers at [pysprings@pysprings.org](mailto:pysprings@pysprings.org) or <https://sayat.me/pysprings> (anonymous)



# Learning Goals

## 1-2-4-All

- ▶ What's one thing you know about programming in Python?
- ▶ What's one thing that you'd like to learn about programming in Python?

# Learning Cycle

**Introduction** Short lecture introducing a new concept from Python

**Exploration** Hands-on application of the concept introduced.  
Work in groups and collaborate if you prefer! Explore the material in a hands-on manner

**Invention** What have we learned through our exploration?  
What surprises did we encounter? What mysteries did we uncover?

**Application** With our newly “invented” knowledge, what can we do? This leads into a new exploration phase

# Learning Cycle

**Introduction** Short lecture introducing a new concept from Python

**Exploration** Hands-on application of the concept introduced.  
Work in groups and collaborate if you prefer! Explore the material in a hands-on manner

**Invention** What have we learned through our exploration?  
What surprises did we encounter? What mysteries did we uncover?

**Application** With our newly “invented” knowledge, what can we do? This leads into a new exploration phase

# Learning Cycle

**Introduction** Short lecture introducing a new concept from Python

**Exploration** Hands-on application of the concept introduced.  
Work in groups and collaborate if you prefer! Explore the material in a hands-on manner

**Invention** What have we learned through our exploration?  
What surprises did we encounter? What mysteries did we uncover?

**Application** With our newly “invented” knowledge, what can we do? This leads into a new exploration phase



# Learning Cycle

**Introduction** Short lecture introducing a new concept from Python

**Exploration** Hands-on application of the concept introduced.  
Work in groups and collaborate if you prefer! Explore the material in a hands-on manner

**Invention** What have we learned through our exploration?  
What surprises did we encounter? What mysteries did we uncover?

**Application** With our newly “invented” knowledge, what can we do? This leads into a new exploration phase

# What is Programming?

- ▶ Programming is a creative activity
- ▶ It doesn't involve much math
- ▶ Programming is simply the act of entering instructions for the computer to perform

# What is Programming?

- ▶ Programming is a creative activity
- ▶ It doesn't involve much math
- ▶ Programming is simply the act of entering instructions for the computer to perform

# What is Programming?

- ▶ Programming is a creative activity
- ▶ It doesn't involve much math
- ▶ Programming is simply the act of entering instructions for the computer to perform

## An Example

```
passwordFile = open('SecretPasswordFile.txt') 1
secretPassword = passwordFile.read()           2
print('Enter your password.')                  3
typedPassword = input()                        4
if typedPassword == secretPassword:            5
    print('Access granted')                     6
    if typedPassword == '12345':               7
        print('That one is used on luggage.') 8
else:                                          9
    print('Access denied')                     10
```

Introduction  
○○○○

First Steps  
●○○○○  
○○○○○○○

Data Types  
○○○○○○○○  
○○○○  
○○○○

Libraries  
○○  
○○○○

Control Flow  
○○  
○○○○○○○○○○○○○○

Running Python

# Outline

Introduction

First Steps

Running Python

Expressions

Data Types

Strings

Lists

Dictionaries

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



# Running Python

## Example

run python with:

```
$ python3
```

enter the following into the interactive prompt:

```
>>> print("Hello, World!")
```

and

```
>>> import this
```

exit with:

```
>>> exit()
```

## Running a Python Script

Let's create script.py now

```
print("Hello, World!")
```

and run it with

```
$ python3 script.py
```









## Notation

When you see an example like:

```
>>> print("Hello, World!")
```

it means to type that out in the interactive prompt. When you see an example like:

`example.py`

```
print("Hello, World!")
```

1

it means to type that out into a file, in this case, named *example.py*.

# Outline

Introduction

First Steps

Running Python

Expressions

Data Types

Strings

Lists

Dictionaries

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



# Python as a Calculator

```
>>> 100 * 2
200
>>> (1 + 2 + 3 + 4 + 5 + 6) / 6
3.5
>>> 1 - 2*100 + 3*12
-163
>>> abs(-163)
163
```







# Python Math Operations

## Operators:

▶ + - \* /

▶ % \*\* //

▶ Does python obey order of operations?

## Functions:

▶ abs bin hex oct ord round

▶ divmod min max pow

▶ What's the difference between these two lists of functions?



# Python Math Operations

## Operators:

- ▶ **+** **-** **\*** **/**
- ▶ **%** **\*\*** **//**
- ▶ Does python obey order of operations?

## Functions:

- ▶ **abs** **bin** **hex** **oct** **ord** **round**
- ▶ **divmod** **min** **max** **pow**
- ▶ What's the difference between these two lists of functions?

# Python Math Operations

## Operators:

- ▶ **+** **-** **\*** **/**
- ▶ **%** **\*\*** **//**
- ▶ Does python obey order of operations?

## Functions:

- ▶ **abs bin hex oct ord round**
- ▶ **divmod min max pow**
- ▶ What's the difference between these two lists of functions?

# Python Math Operations

## Operators:

- ▶ **+ - \* /**
- ▶ **% \*\* //**
- ▶ Does python obey order of operations?

## Functions:

- ▶ **abs bin hex oct ord round**
- ▶ **divmod min max pow**
- ▶ What's the difference between these two lists of functions?

# Python Math Operations

## Operators:

- ▶ **+ - \* /**
- ▶ **% \*\* //**
- ▶ Does python obey order of operations?

## Functions:

- ▶ **abs bin hex oct ord round**
- ▶ **divmod min max pow**
- ▶ What's the difference between these two lists of functions?









# Functions

```
def hello():  
    print('Howdy!')  
    print('Howdy!!!')  
    print('Hello there.')
```

```
hello()  
hello()  
hello()
```

1  
2  
3  
4  
5  
6  
7  
8

# Functions

```
def hello(name):  
    print('Hello ' + name)  
  
hello('Alice')  
hello('Bob')
```

1  
2  
3  
4  
5

# Functions

```
def add(a, b):  
    return a + b  
  
print(add(1,2))  
print(add(1,2) + add(3,4))
```

1  
2  
3  
4  
5

## Outline

## Introduction

## First Steps

## Running Python

## Expressions

## Data Types

## Strings

## Lists

## Dictionaries

Libraries

## Environments

## Third-Party Packages

## Control Flow

## Booleans

## Looping and Branching



# Strings

## Examples

```
"This is a string."  
'This is also a string.'  
"This is 'a' string"  
'This is "a" string'
```

We can also get more information from python:

```
>>> help(str)
```

# Strings

## Examples

```
"This is a string."  
'This is also a string.'  
"This is 'a' string"  
'This is "a" string'
```

We can also get more information from python:

```
>>> help(str)
```

# Strings

## Examples

```
"This is a string."  
'This is also a string.'  
"This is 'a' string"  
'This is "a" string'
```

We can also get more information from python:

```
>>> help(str)
```



# Strings

## More Examples

```
>>> 'this is a string'.title()
'This Is A String'
>>> 'this is a string'.upper()
'THIS IS A STRING'
>>> 'what ARE you doing!?.lower()
'what are you doing!?'
>>> "  there's whitespace in this  ".strip()
"there's whitespace in this string."
```

# Hello again

hello.py

```
name = input('What is your name? ')
print('Hello, ' + name + '!')
```

let's try it!

```
$ python3 hello.py
```



## Invention

- ▶ What problems, if any, did you encounter?
- ▶ What mysteries, if any, did you encounter?
- ▶ What other take-aways are there from this session, what could you use from it in the future?



# Indexing

```
>>> s = 'We are the Knights who say ni!'  
>>> s[0]  
'W'  
>>> s[-1]  
'!'  
>>> s[7:10]  
'the'  
>>> s[-7:-4]  
'say'
```











# Outline

Introduction

First Steps

Running Python

Expressions

Data Types

Strings

**Lists**

Dictionaries

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



# Lists

```
>>> mylist = [1, 2, 'three', "4", 5.3]
>>> s = "What are the words in this string?"
>>> s.split()
['What', 'are', 'the', 'words', 'in', 'this',
 'string?']
>>> words = s.split()
>>> words.sort()
>>> words
['What', 'are', 'in', 'string?', 'the', 'this',
 'words']
```











Introduction  
○○○○

First Steps  
○○○○  
○○○○○○○

**Data Types**  
○○○○○○○○  
○○○○  
●○○○

Libraries  
○○  
○○○○

Control Flow  
○○  
○○○○○○○○○○○○○○

Dictionaries

# Outline

Introduction

First Steps

Running Python

Expressions

**Data Types**

Strings

Lists

**Dictionaries**

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



## Dictionaries

```
>>> myCat = {'size': 'fat', 'color': 'gray',  
...         'disposition': 'loud'}  
>>> myCat['size']  
'fat'  
>>> 'My cat has ' + myCat['color'] + ' fur.'  
'My cat has gray fur.'
```

# Dictionaries

What are the methods of list?

Remember:

```
>>> help(dict)
```

```
>>> dir(dict)
```

## Invention

- ▶ What problems, if any, did you encounter?
- ▶ What mysteries, if any, did you encounter?
- ▶ What other take-aways are there from this session, what could you use from it in the future?





Introduction  
○○○○

First Steps  
○○○○  
○○○○○○○

Data Types  
○○○○○○○○  
○○○○  
○○○○

Libraries  
●○  
○○○○

Control Flow  
○○  
○○○○○○○○○○○○○○

Environments

# Outline

Introduction

First Steps

Running Python

Expressions

Data Types

Strings

Lists

Dictionaries

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



# Environments

virtualenv

```
$ virtualenv raindrop
```

```
$ . raindrop/source/bin/activate # Linux and OSX
```

```
$ randrop\Scripts\activate # Windows
```



Introduction  
○○○○

First Steps  
○○○○  
○○○○○○○

Data Types  
○○○○○○○○  
○○○○  
○○○○

Libraries  
○○  
●○○○

Control Flow  
○○  
○○○○○○○○○○○○○○

## Third-Party Packages

# Outline

Introduction

First Steps

Running Python

Expressions

Data Types

Strings

Lists

Dictionaries

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



# Installing Third-Party Packages

```
$ pip3 install requests
```



## Requests Example

requests\_script.py

```
import requests  
resp = requests.get('http://httpbin.org/ip')  
print(resp.json())
```

1  
2  
3

# Outline

Introduction

First Steps

Running Python

Expressions

Data Types

Strings

Lists

Dictionaries

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



# Booleans

```
>>> bool(1)
True
>>> bool(0)
False
>>> bool("no")
True
>>> bool("")
False
>>> bool([])
False
>>> bool([42])
True
```

# Outline

Introduction

First Steps

Running Python

Expressions

Data Types

Strings

Lists

Dictionaries

Libraries

Environments

Third-Party Packages

Control Flow

Booleans

Looping and Branching



# Looping and Branching

```
>>> words = 'this is a list of words'.split()
>>> for word in words:
...     print(word.title())
```

```
...
This
Is
A
List
Of
Words
```



## Looping and Branching

```
password = input(  
    "Enter the secret word: "  
)  
if password == "sesame":  
    print("Access granted.")  
else:  
    print("Access denied!")
```

Boolean operators:

▶ == != <= >= > < in

## Looping and Branching

```
password = input(  
    "Enter the secret word: "  
)  
if password == "sesame":  
    print("Access granted.")  
else:  
    print("Access denied!")
```

Boolean operators:

► == != <= >= > < in







# Looping and Branching

## While Loop

```
while True:
    password = input("Enter the secret word: ")
    if password == "sesame":
        print("Access granted.")
        break
    else:
        print("Access denied!")
```

## Invention

- ▶ What problems, if any, did you encounter?
- ▶ What mysteries, if any, did you encounter?
- ▶ What other take-aways are there from this session, what could you use from it in the future?







# Looping and Branching

elif

```
age = int(input("How old are you? "))  
if age < 18:  
    print("You're not old enough dance.")  
elif age == 18:  
    print("Welcome, is it your first time here?")  
else:  
    print("You can dance if you want to, you can le
```

## Practice Problems

- ▶ Write code that prints Hello if 1 is stored in spam, prints Howdy if 2 is stored in spam, and prints Greetings! if anything else is stored in spam.
- ▶ Write a short program that prints the numbers 1 to 10 using a for loop. Then write an equivalent program that prints the numbers 1 to 10 using a while loop.
- ▶ Write a function named collatz() that has one parameter named number. If number is even, then collatz() should print number // 2 and return this value. If number is odd, then collatz() should print and return  $3 * \text{number} + 1$ .

## Practice Problems

- ▶ Say you have a list value like this:

```
spam = [ 'apples' , 'bananas' , 'tofu' , 'cats' ]
```

Write a function that takes a list value as an argument and returns a string with all the items separated by a comma and a space, with the word “and” inserted before the last item. For example, passing the previous spam list to the function would return `'apples, bananas, tofu, and cats'`. But your function should be able to work with any list value passed to it.

## Practice Problems

- ▶ You are creating a fantasy video game. The data structure to model the player's inventory will be a dictionary where the keys are string values describing the item in the inventory and the value is an integer value detailing how many of that item the player has. For example, the dictionary value

```
{ 'rope': 1, 'torch': 6, 'gold coin': 42,  
  'dagger': 1, 'arrow': 12 }
```

means the player has 1 rope, 6 torches, 42 gold coins, and so on.

## Practice Problems

Write a function named `displayInventory()` that would take any possible “inventory” and display it like the following:

Inventory :

12 arrow

42 gold coin

1 rope

6 torch

1 dagger

Total number of items: 62



# Projects!

- ▶ Daily Programmer  
<https://www.reddit.com/r/dailyprogrammer/>
  - ▶ Game of Threes <https://redd.it/3r7wxz>
  - ▶ Rövarspråket (Robber's Language)  
<https://redd.it/341c03>
- ▶ WordPlay <https://github.com/jesstess/Wordplay>
- ▶ Colorwall  
<https://github.com/jesstess/ColorWall>