

# Python Beginner's Workshop

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

Tim McFadden

PySprings: <https://www.meetup.com/pysprings/>

2018-DEC-07

# Outline

Introduction

First Steps

- Running Python

- Expressions

- Functions

Data Types

- Strings

- Numbers

- Lists

- Dictionaries

Libraries

- Environments

- Third-Party Packages

Control Flow

- Booleans

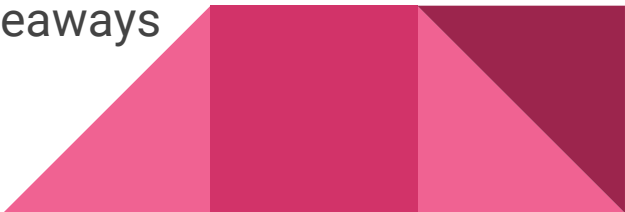
- Looping and Branching

Conclusion


- Practice Problems

- Final Takeaways

- Projects!



# 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)
- 

# Greetings

1. Your name
2. How did you get here?



# 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

# What is Programming?

- ❖ Programming is a creative activity.
- ❖ It doesn't involve much math (unless you want it to!)
- ❖ Programming is simply the act of entering instructions for the computer to perform.



# An Example

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



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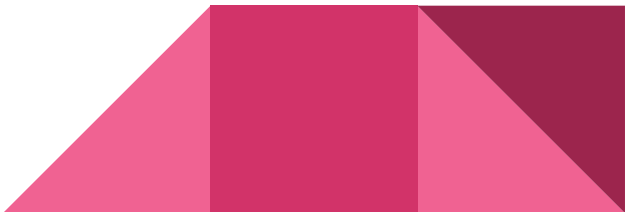
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# Running Python

Run Python's interactive prompt with:

```
$ python
```

Enter the following:

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

Followed by:

```
>>> import this
```

Exit the interactive prompt with:

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



# Running a Python Script

Let's create a file named "script.py" and give it the following text:

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

Now open up "powershell.exe", change to the directory you saved your script, and run it with:

```
$ python script.py
```



# Invention

- ❖ What problems, if any, did you encounter?
- ❖ What mysteries, if any, did you encounter?
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- ❖ What could you use from it in the future?



# Notation

When you see an example like:

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

It means “type it out in the interactive prompt.” Always ignore the “>>>” characters!

When you see an example like:

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

It means “type it out in a file and run it as a script.”



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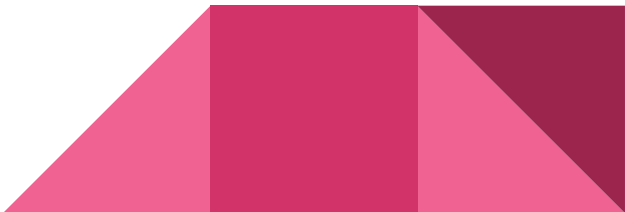
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# Python as a Calculator

```
>>> 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 the order of operations?

## Functions:

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

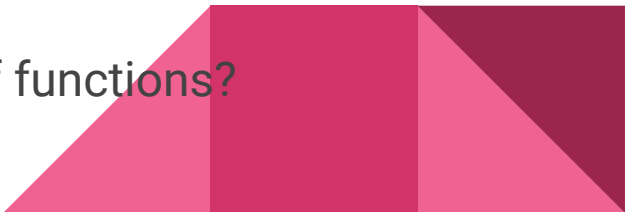


# Python Math Operations

## Operators:

- ❖ `+ - * /`
- ❖ `% ** //`
- ❖ Does python obey the order of operations?

## Functions:

- ❖ `abs bin hex oct ord round`
  - ❖ `divmod min max pow`
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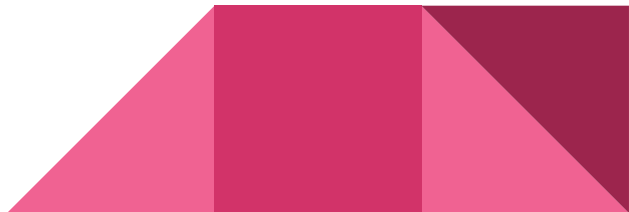
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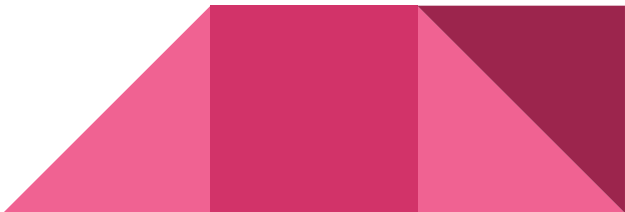
Projects!



# Functions

A function is a set of “reusable” instructions.

```
1 def hello():  
2     print('Howdy!')  
3     print('Howdy!!!')  
4     print('Hello there.')  
5  
6 hello()  
7 hello()  
8 hello()
```



# Functions

Function can take inputs too! We call these “parameters”.

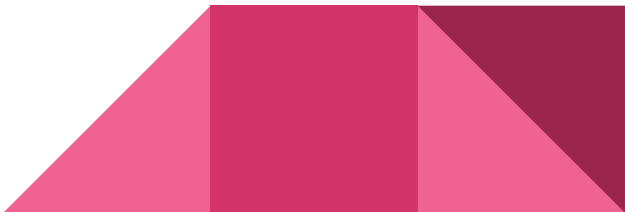
```
1 def hello(name):  
2     print('Hello ' + name)  
3  
4 hello('Alice')  
5 hello('Bob')
```



# Functions

Function can take any number of parameters and even return a result. Here's a function that takes 2 parameters and returns the result of adding them together:

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



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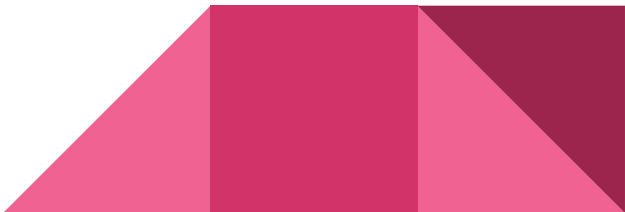
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# Strings

## Examples

```
"This is a string."  
'This is also a string.'  
"This is 'a' string."  
'This is "a" string.'  
"This is an \"ugly\" 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? ')\nprint('Hello, ' + name + '!')
```

Let's try it!

```
$ python hello.py
```



# Invention

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# String Indexing and Slicing

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



# String Indexing

+	-	-	-	+	-	-	-	+	-	-	-	+	-	-	-	+	-	-	-	+
	P		y		t		h		o		n									
+	-	-	-	+	-	-	-	+	-	-	-	+	-	-	-	+	-	-	-	+
0		1		2		3		4		5		6								
-6		-5		-4		-3		-2		-1										

```
>>> s = 'Python'
>>> s[1:4]
'yth'
>>> s[5]
'n'
```

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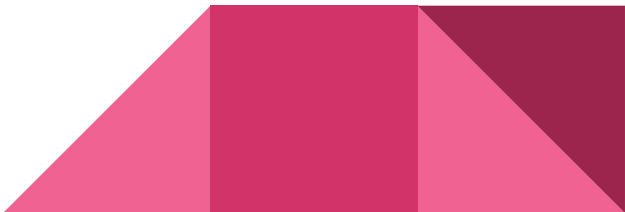
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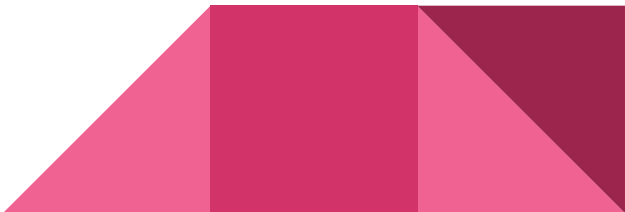
# Numbers

There are two basic types of numbers in Python:

`int` This is the “integer” type. Think of these as whole numbers: 1, 42, 10000000

`float` This is the “floating point” type. These are *non-whole* numbers: 3.1415, 9.99

```
>>> -1 / 4
-0.25
>>> 1 // 4
0
>>> 1 + 4
5
>>> 1 + 4.5
5.5
```



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# 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']
```



# Lists

What are the methods of list?

Remember:

```
>>> help(list)
```

Also try out:

```
>>> dir(list)
```



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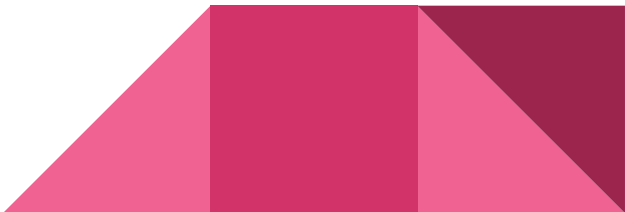
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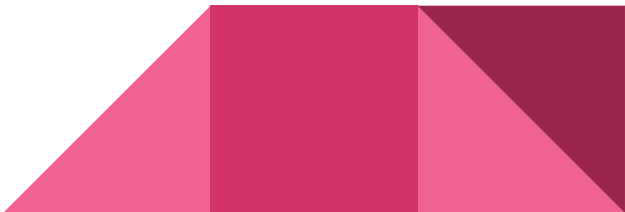
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# Dictionaries

Dictionaries are like lists, but they have “key value” pairs.

```
>>> 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 dict?

Remember:

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

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





# Invention

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# Environments

Python uses *environments* to keep projects separate.

One way to do this is to use “virtualenv”. Create the environment with:

```
$ virtualenv raindrop
```

Windows:

```
$ raindrop\Scripts\activate
```

Linux and OSX:

```
$ . raindrop/source/bin/activate
```



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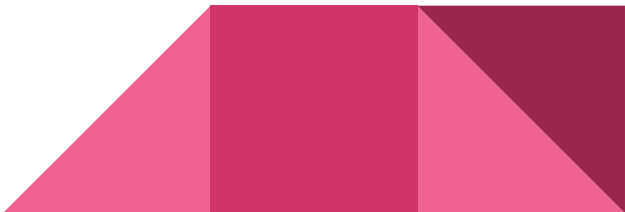
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# Installing Third-Party Packages

We generally use the “pip” command-line application to install third-party packages.

```
$ pip install requests
```

This should install the requests library into your virtual environment.



# Requests Example

This script will talk to a website which returns your public IP address.

requests\_script.py

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



# Finding Third-Party Packages

Here are the websites that house *most* Python packages

- <https://pypi.org> (newer)
- <https://pypi.python.org> (original)



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# Booleans

```
>>> bool(1)
```

```
True
```

```
>>> bool(0)
```

```
False
```

```
>>> bool("no")
```

```
True
```

```
>>> bool("")
```

```
False
```

```
>>> bool([])
```

```
False
```

```
>>> bool([42])
```

```
True
```



# Booleans

You can combine boolean operations with “and” and “or”.

```
>>> True or False
```

```
True
```

```
>>> True and False
```

```
False
```

```
>>> True and False or True and True or False
```


```
True
```

```
>>>> (True or False) and (False or True)
```

```
True
```

```
>>> (True or False) and (False and True)
```

```
False
```



# Booleans

There are a few more “boolean operators” that we can use.

`==` “Is equal to”.

Example: `2 == 2`

`!=` “Is NOT equal to”.

Example: `2 != 3`

`<=` “Is less than or equal to”.

Example: `2 <= 3`

`>=` “Is greater then or equal to”.

Example: `3 >= 2`

`>` “Is greater than”.

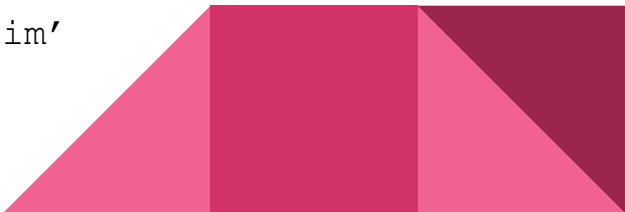
Example: `10 > 1`

`<` “Is less than”.

Example: `1 < 10`

`in` “Is the needle in the haystack”.

Example: `'i' in 'Tim'`



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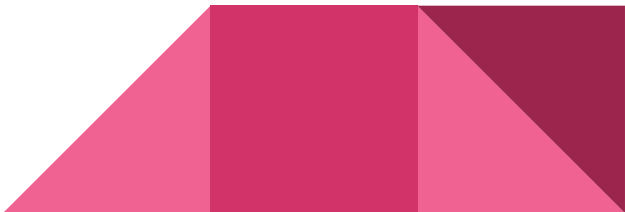
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# Looping and Branching

We use the “if/else” conditional to test some value.

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



# Looping and Branching


We can extend our “if/else” to any number of conditions using one or more “elif” clauses.

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

# Looping and Branching

The “for” loop is used when you want to loop over a collection of things.

```
>>> words = 'this is a list of words'.split()
>>> for word in words:
...     print(word.title())
...
This
Is
A
List
Of
Words
```

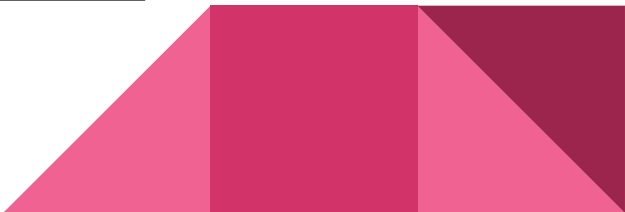




# Looping and Branching

The “while” loop is used when you aren’t sure when to stop.

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



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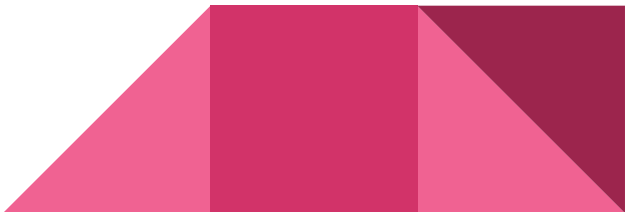
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# Practice Problems

- ❖ Write code that prints **Hello** if 1 is stored in the variable *spam*, prints **Howdy** if 2 is stored in the variable *spam*, and prints **Greetings!** if anything else is stored in the variable *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 the value of **number** is even, then **collatz()** should print and return **number//2**. If the number is odd, then **collatz()** should print and return **3\*number+1**

# Practice Problems

Say you have defined the following list:

```
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 **spam** as defined above, the function would return the string “**apples, bananas, tofu, and cats**”. But your function should be able to work with any list value passed to it!

HINT: `help(str.join)`



# 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.


(continued on next slide)



# Practice Problems

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

```
Inventory:
12 arrow
42 gold coin
1 rope
6 torch
1 dagger
Total number of items: 62
```



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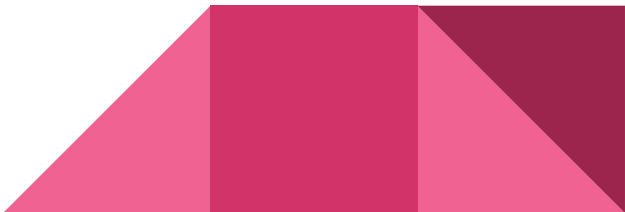
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# Conclusion

- ❖ Final Takeaways (1-2-4-all)
- ❖ Survey: <https://goo.gl/forms/ZpNI0z8pw5J8J8Rv1>
- ❖ Anonymous feedback: <https://sayat.me/pysprings>
- ❖ Material based on <https://automatetheboringstuff.com/> released under [CC BY-NC-SA 3.0](#)



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# Projects!

Here are some resources we thought you could use to practice your Python.

- ❖ Reddit 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>

