What to Add Next Time You Are Updating These Slides

- Update slides to have more animation in the bullet lists
- Verify that each slide has stand alone speaker notes

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PYTHON 3 RUNNING THE PYTHON INTERPRETER

A Python class for my Mechatronics Engineering @ SVCTE. Last Updated for 2017 – 2018 school year

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These slides are an adaption, to better target my SVCTE High School Mechatronics Engineering class, primarily from Dr. Charles R. Severance's Python for Everybody class https://www.py4e.com/ … but from other sources as well. See Appendix A

SEE APPENDIX A, FOR LICENSING & ATTRIBUTION INFORMATION

OK, Remember where to get Resource Support? Dr. Charles R. Severance

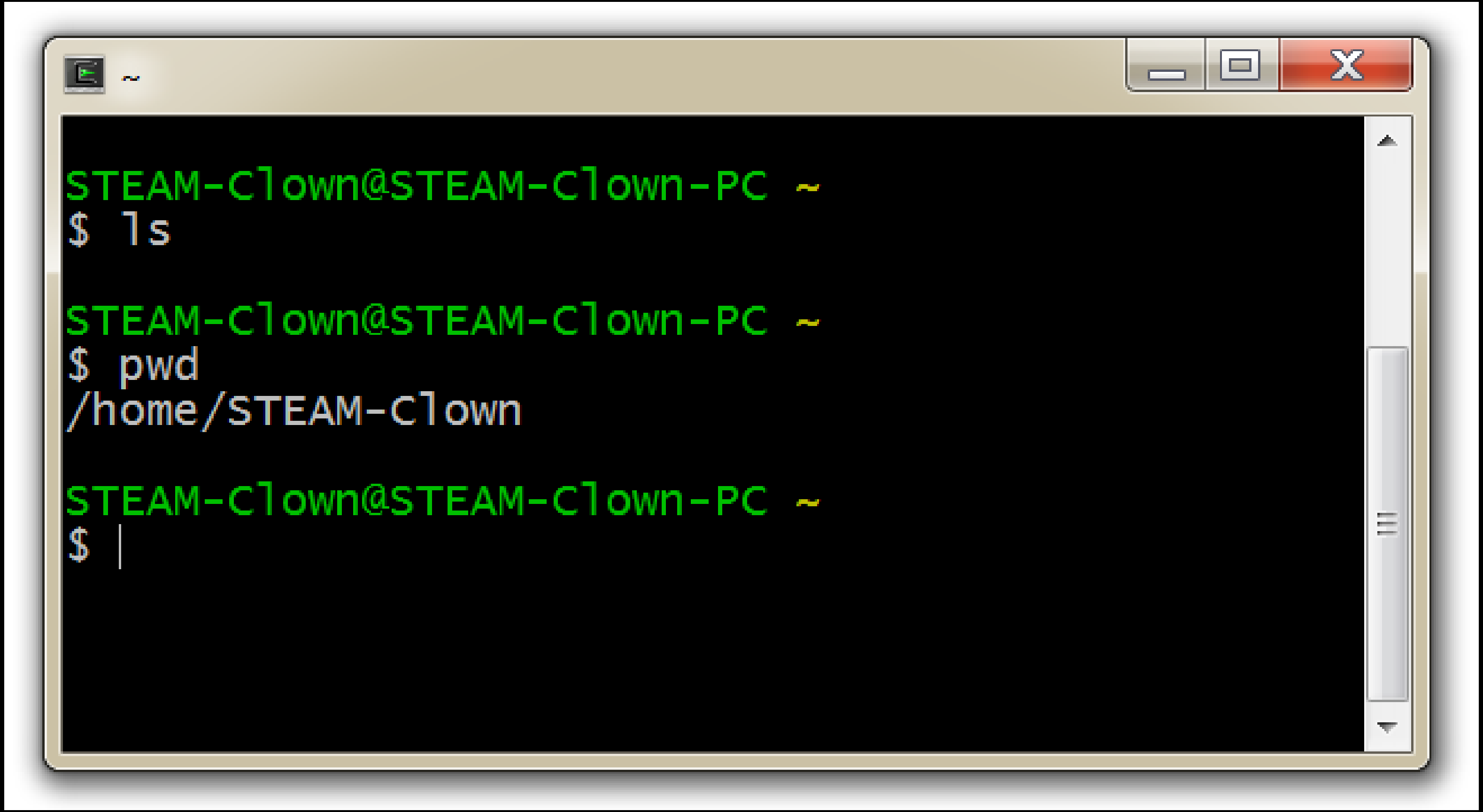
- We are going to use a few resources on the internet…
- Bookmark and remember a few sites…
  - SVCTE Mechatronics Python Resource link
    - Python Resources
- Python 4 Everybody - https://www.py4e.com/

Interpreter vs Compiler

- Compiled language like C++
  - Write source code – Human readable
  - Then you compile the code to an executable (.exe)
  - Double click the .exe and it will run
- Interpreted language like Python
  - Run source code directly, because you are running with/through the Python interpreter
  - Actually running the Python program and passing it your source code
  - Not Stand alone. Requires the Python interpreter to be installed or accessed

Open a Cygwin Terminal

- Open a Cygwin terminal
- `$ ls`
- `$ pwd`



```
STEAM-Clown@STEAM-Clown-PC ~
$ ls

STEAM-Clown@STEAM-Clown-PC ~
$ pwd
/home/STEAM-Clown

STEAM-Clown@STEAM-Clown-PC ~
$ |
```

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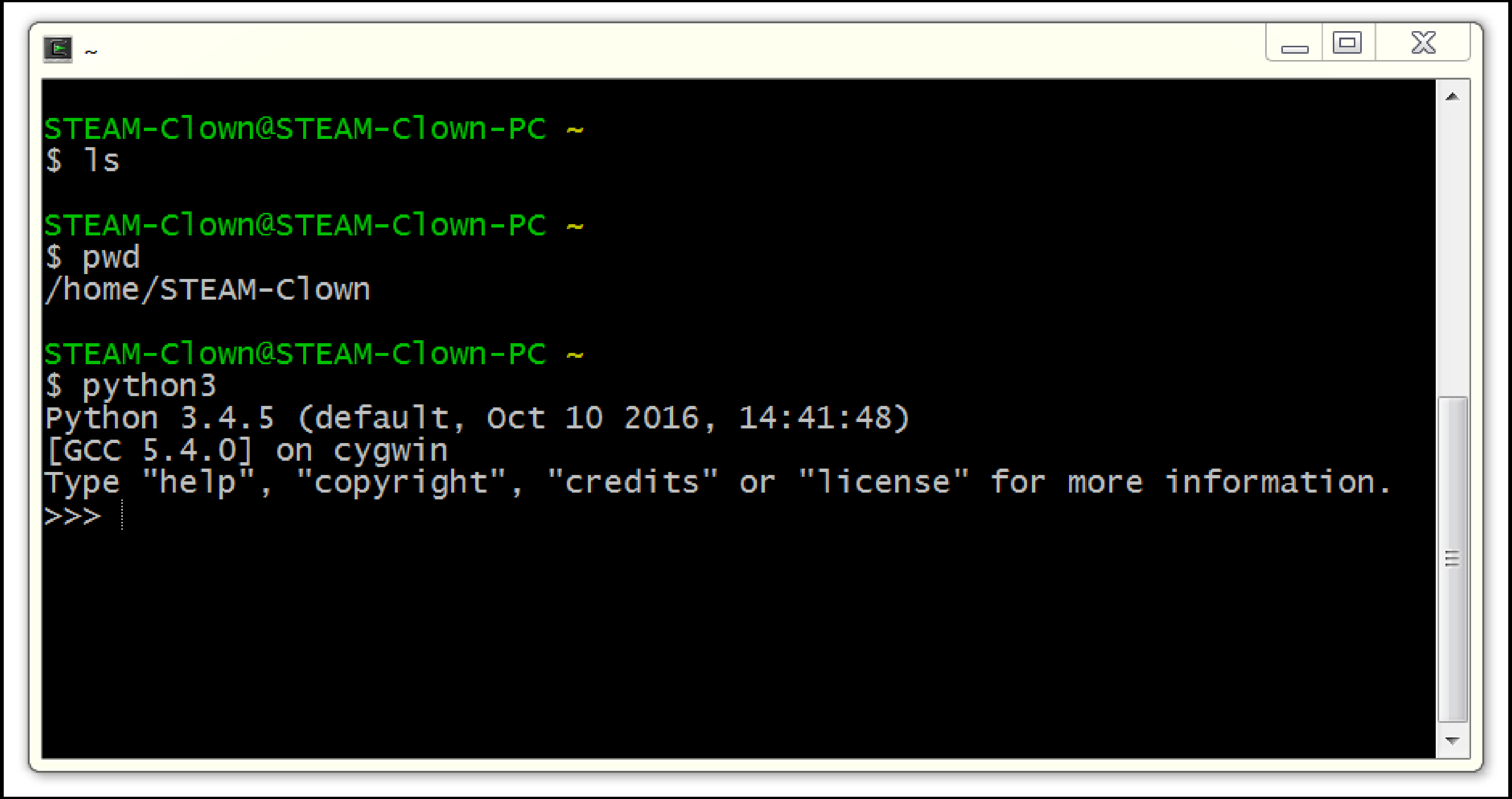
Start Python3



```
STEAM-Clown@STEAM-Clown-PC ~
$ ls

STEAM-Clown@STEAM-Clown-PC ~
$ pwd
/home/STEAM-Clown

STEAM-Clown@STEAM-Clown-PC ~
$ python3
Python 3.4.5 (default, Oct 10 2016, 14:41:48)
[GCC 5.4.0] on cygwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

Remember… Hello World?

- The “>>>” is a Python *prompt* indicating that Python is ready for us to give it a command. These commands are called *statements*

```
>>> print("Hello World")
Hello World
>>> print(2+3)
5
>>> print("2+3=", 2+3)
2+3= 5
>>>
```

Python does it's best to interpret

- At The “>>>” *prompt,* Python will make a lot of assumptions about what you are trying to do or infer
- Here it is assuming integer math

```
>>> 2+3
5
>>> 2+3*3
11
>>> (2+3)*3
15
```

Types of Results as We Do Math

- Integer
- Float
- Long

```
>>> 2+3
5
>>> 2+3.14
5.15
>>> 10**100
```

Reserved Words

- You cannot use reserved words as variable names / identifiers

False	class	return	is	finally
None	if	for	lambda	continue
True	def	from	while	nonlocal
and	del	global	not	with
as	elif	try	or	yield
assert	else	import	pass	
break	except	in	raise	

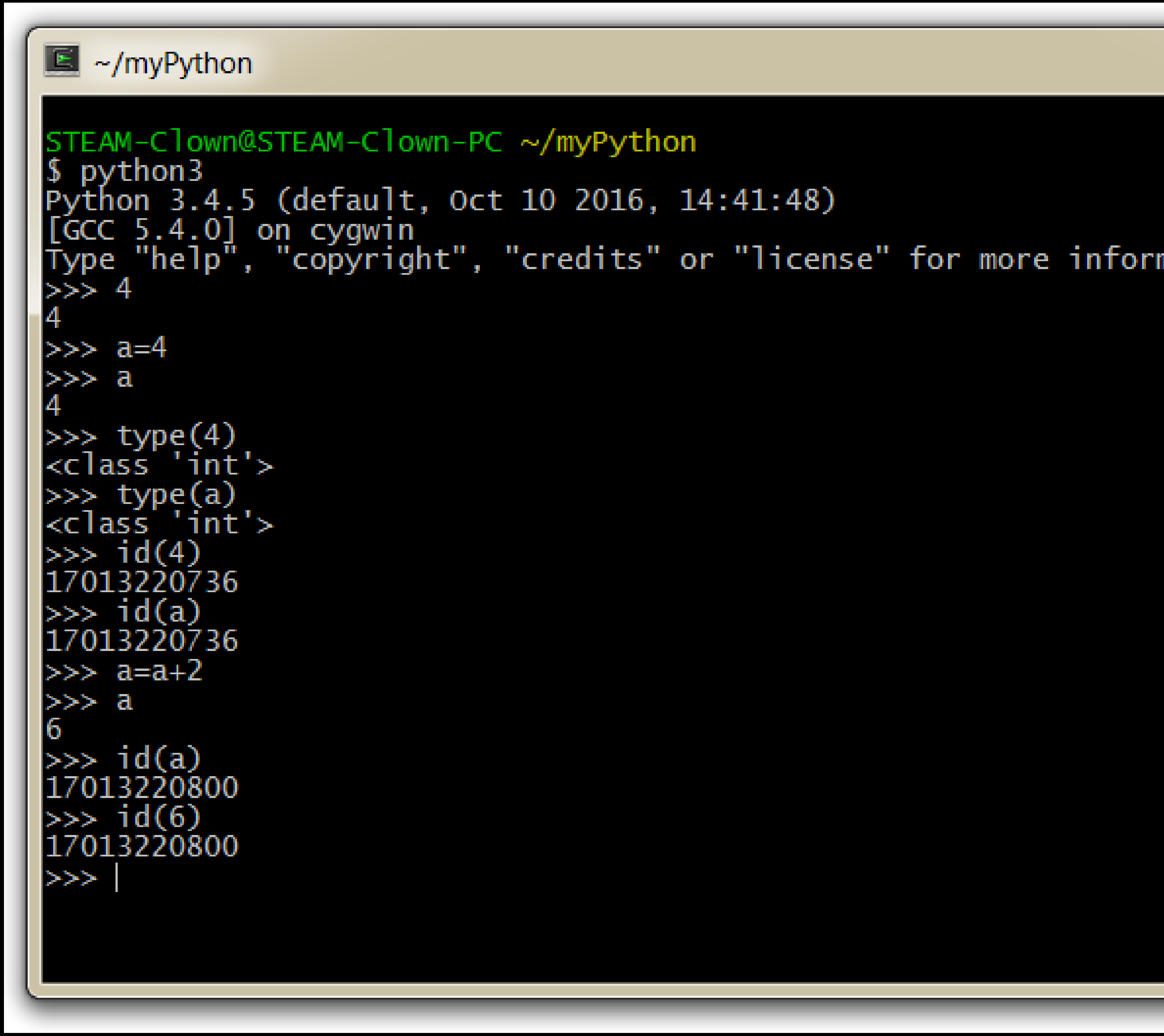
Parts of Speech…

```
x = 2            ←  Assignment statement
x = x + 2        ←  Assignment with expression
print(x)         ←  Print statement
```

Variable   Operator   Constant   Function

Objects

- Everything in *Python is an object that has:*
  - an *identity (id)*
  - a *type*
  - a *value (mutable or immutable)*



~/myPython

```
STEAM-Clown@STEAM-Clown-PC ~/myPython
$ python3
Python 3.4.5 (default, Oct 10 2016, 14:41:48)
[GCC 5.4.0] on cygwin
Type "help", "copyright", "credits" or "license" for more inforr
>>> 4
4
>>> a=4
>>> a
4
>>> type(4)
<class 'int'>
>>> type(a)
<class 'int'>
>>> id(4)
17013220736
>>> id(a)
17013220736
>>> a=a+2
>>> a
6
>>> id(a)
17013220800
>>> id(6)
17013220800
>>> |
```

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VALUE

- **Mutable**: When you alter the item, the id is still
- the same. Variables, Dictionary, List
  - `a=a+1`

- **Immutable**: String, Integer, Tuple
  - 5
  - 3.14
  - “Hello”, “X”, “C”
  - “4”

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LAB#1.1

- Do some math

- Make some variable assignments

```
>>>i=90
>>>print i*(i+10)
9000
```

- Can you run more than 1 line of code?

Python Function

- You can mix types in evaluations
- You can create structures like an **`If`** statement

```
>>> x = 34 - 23
>>> y = "Hello"
>>> z = 3.45
>>> if z == 3.45 or y == "Hello":
...         x = x + 1
...         y = y + " World"

>>>
```

```
>>> print(x)
???
>>> print(y)
???
```

Python Function

- Usually we want to execute several statements together that solve a common problem. One way to do this is to use a *function*

```
>>> def hello():
        print("Hello")
        print("Computers are 
Fun")



>>>
```

Parsing a Function

```
>>> def hello():
        print("Hello")
        print("Computers are Fun")

>>>
```

- The first line tells Python we are defining a new function called hello
- The following lines are indented to show that they are part of the hello function
- The blank line (hit enter twice) lets Python know the definition is finished

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Productions

Running a Python Function

```
>>> def hello():
        print("Hello")
        print("Computers are Fun")

>>>
```

- Nothing has happened yet! We've defined the function, but we haven't told Python to run the function!
- A function is invoked by typing its name

```
>>> hello()
Hello
Computers are Fun
>>>
```

Passing Parameters or Variables

- What’s the deal with the ()’s?
- Commands can have changeable parts called parameters that are placed between the ()’s

```
>>> def greet(name):
        print("Hello",name)
        print ("I’m Sorry",name,"I'm afraid I can't do 
that")

>>>
```

https://www.youtube.com/watch?v=ARJ8cAGm6JE

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Calling a Function with a Parameter

```
>>> greet("Terry")
Hello Terry
I’m Sorry, I can’t do that Terry
>>> greet("Paula")
Hello Paula
I’m Sorry, I can’t do that Paula >>>
```

- When we use parameters, we can customize the output of our function

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LAB#1.2

- Create a Function
  - That takes a int variable and a string variable
  - Do some math and string concatenation
  - Print some results

The Magic of Python

- When we exit the Python prompt, the functions we’ve defined cease to exist!
- Programs are usually composed of functions, modules, or scripts that are saved on disk so that they can be used again and again
- A module file is a text file created in text editing software (saved as “plain text”) that contains function definitions.
- A programming environment is designed to help programmers write programs and usually includes automatic indenting, highlighting, etc

Why is the Python Run Time Interpreter?

- Great for testing some code really quick
- If you want to debug some code
- See if you have the syntax right

But you would not want to use it for complex or lots of lines of code…

SUMMARY

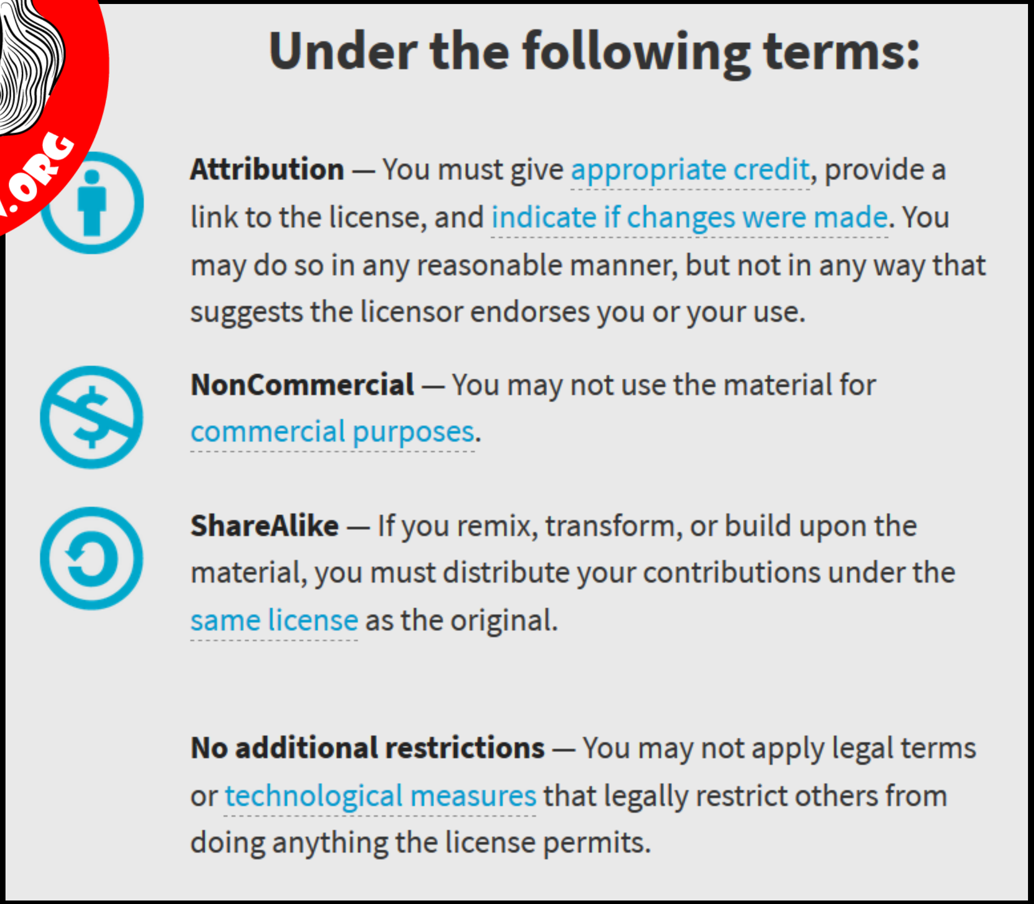
- int, float, long, string
- Functions
  - Making Code Modular
  - Passing Variable

- Next Steps? Running code outside the >>> Interpreter

APPENDIX

APPENDIX A: LICENSE & ATTRIBUTION

- These slides are an adaption, primarily from Dr. Charles R. Severance's Python for Everybody class
  - https://www.py4e.com/
- Additionally this interpretation is primarily the Intellectual Property of Jim Burnham, Top STEAM Clown, at www.STEAMClown.org contact @ topClown@steamclown.org
- This presentation and content is distributed under the Creative Commons License CC-by-nc-sa-3.0
- My best attempt to properly attribute, or reference any other sources or work I have used are listed in Appendix B



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Appendix B: Attribution for Sources Used

- Another great Python site is Barbara Saurette AKA mechanicalgirl and her Github site
- Additionally used some content from slide deck from Mr Ganesh Bhosale found https://github.com/gdbhosale/python-rpi/blob/master/python1.pdf

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Reference Slides