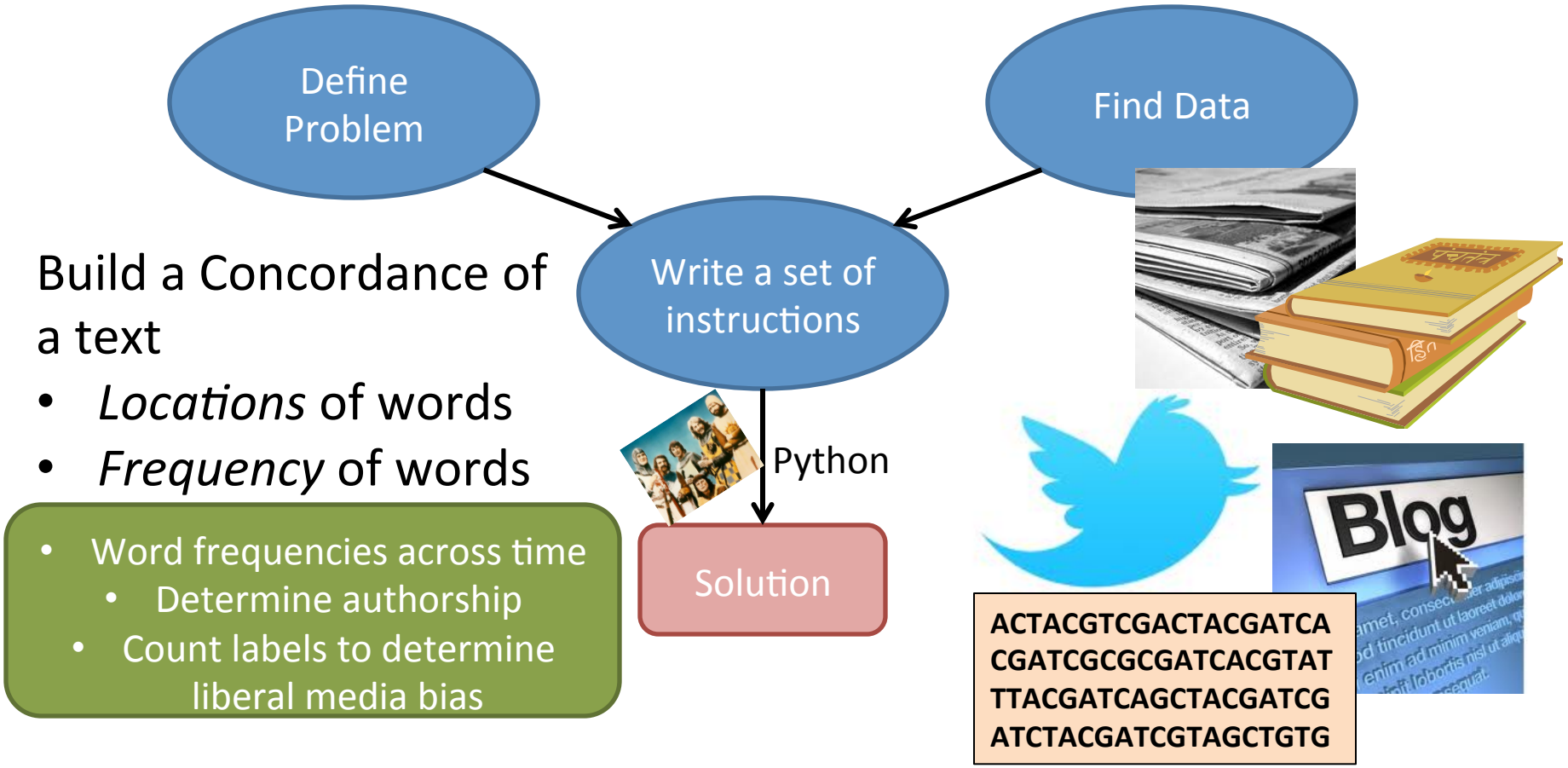
Textual Analysis: Summary Statistics, part 1

Oct 8, 2015

Note

Getting TA help with Python: If you send email, **be sure to cut and paste the error message and your code**

Textual Analysis



The Big Picture

Overall Goal
Build a Concordance of a text
- *Locations* of words
- *Frequency* of words

Today: Summary Statistics
- Review material from last class
- Learn how to read in a text file and create a list of words
- Count the number of words in poem.txt (by Shel Silverstein)
- Count the number of words in Moby Dick
- Compute the average word length of Moby Dick
- Find the longest word in Moby Dick

ACT2-1, Task 1 from last class

- You wrote the `addOne` function
- Goal: takes an input, `t`; computes `t+1` and returns it

Question: What is the difference between *returning* a value and *printing* a value?

```
def addOne(t):
    y = t + 1
    return y
```

vs.

```
def addOne(t):
    y = t + 1
    print(y)
    return
```

ACT2-1

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```

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def addOne(t):
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>>> four = addOne(3)
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>>> four = addOne(3)
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>>> four
>>>
```

addOne(3) returned “nothing”! So four was assigned a “nothing” value

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```
>>> four = addOne(3)
>>> four
4
>>>
```

```
>>> four = addOne(3)
4
>>> four
>>>type(four)
<type 'NoneType'>
```

addOne(3) returned “nothing”! So four was assigned a “nothing” value

ACT2-2

- Try a new function called `split()`
- `split()` returns a list of words in a string separated by whitespace or a specified delimiter
- You'd expect

```
split(myString)
```

- But actually called "on" on a string object:

```
myString.split()
```

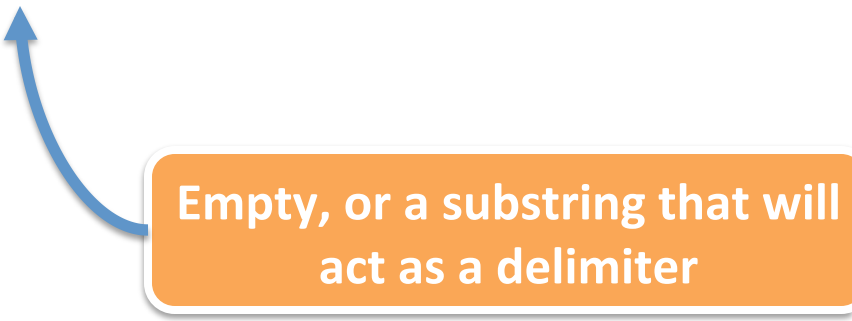
ACT2-2, preparation for task 1

- A new syntax: `<var>.<function>`

- Example: `myString.split()`
- Names a function associated with a particular type of variables
- While `print(...)` works for any type, `split()` works only for strings...
  - So it gets this special form, with the string name as prefix

ACT2-2

```
myString.split()
```



ACT2-2

- In Python, some functions are only defined for certain kinds of objects, others aren't:

  `myString.split()` versus `type()` or our `addOne()`

- Takes practice and patience to learn which functions are written this way
- There's no rule about which form to use, so no *consistent* pattern of use

ACT2-2

- Do Task 1

ACT2-2, Task 2 preparation

- Filenames
  - String with special characters
- File – a new type
- Handling files – brief introduction

String reminders

Escape Characters

'\' means interpret the NEXT character differently.

- \n : "new line"
- \' : "apostrophe"
- \t : "tab"

Escape Characters

'\' means interpret the NEXT character differently in Python, so in order to treat the `\' just as a regular character, you double it (\\).

Filenames

- Files on your computer have names like

`C:\Users\Alexandra\Downloads\poem.txt`

- In Python, names are represented by strings
- Remember that "\" is a special character, so "\t" means "tab character"
- To put filename in a string, use "\\" to get "\":

```
>>> fileName = "C:\\Users\\Alexandra\\Downloads\\poem.txt"
```

Working with Files

"Inputs" are also called *Arguments.*

Preloaded Functions		
Name	Inputs	Outputs
`open`	Two Strings 1. File Name 2. "r" for read (for now)	File
`read` (On a File)	none	String
`close` (On a File)	none	none
`split` (On a String)	(optional) delimiter	List of Strings

Working with Files

1. Save `poem.txt` from the webpage.
2. Right-click and select 'Properties'/ 'Get Info'
3. Note the file location (C:\Users\Alexandra \Downloads…)
4. In Python, write an assignment statement that stores the file location as a string.

```
>>> fileName = "C:\\Users\\Alexandra\\Downloads\\poem.txt"
```

Working with Files

Preloaded Functions		
Name	Inputs	Outputs
`type`	Expression	Type
`open`	Two Strings 1. File Name 2. "r" for read (for now)	File

File is a NEW Type

```
>>> fileName = "C:\\Users\\Alexandra\\Downloads\\poem.txt"
>>>
```

Working with Files

Preloaded Functions		
Name	Inputs	Outputs
`type`	Expression	Type
`open`	Two Strings 1. File Name 2. “r” for read (for now)	File

File is a NEW Type

```
>>> fileName = "C:\\Users\\Alexandra\\Downloads\\poem.txt”
>>> myFile = open(fileName,"r”)
```

Working with Files

Preloaded Functions		
Name	Inputs	Outputs
`type`	Expression	Type
`open`	Two Strings 1. File Name 2. "r" for read (for now)	File
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```
>>> fileName = "C:\\Users\\Alexandra\\Downloads\\poem.txt"
>>> myFile = open(fileName,"r")
>>> fileString = myFile.read()
```

Working with Files

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>>> myFile = open(fileName,"r")
>>> fileString = myFile.read()
>>> myFile.close()
```

Working with Files

```
>>> shelList = readShel()
>>> shelList
['Sarah', 'Cynthia', 'Sylvia', 'Stout', 'Would', 'not',
'take', 'the', 'garbage', 'out!', "She'd", 'scour', 'the',
'pots', 'and', 'scrape', 'the', 'pans,', 'Candy', 'the',
'yams', 'and', 'spice', 'the', 'hams,', 'And', 'though',
'her', 'daddy', 'would', 'scream', 'and', 'shout,', 'She',
'simply', 'would', 'not', 'take', 'the', 'garbage',
'out.', 'And', 'so', 'it', 'piled', 'up', 'to', 'the',
'ceilings:', 'Coffee', 'grounds,', 'potato', 'peelings,',
'Brown',
...
'an', 'awful', 'fate,', 'That', 'I', 'cannot', 'now',
'relate', 'Because', 'the', 'hour', 'is', 'much', 'too',
'late.', 'But', 'children,', 'remember', 'Sarah', 'Stout',
'And', 'always', 'take', 'the', 'garbage', 'out!']
```

Working with Files

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'tak                                                  he',
'pot                                                  ,
'yam                                                  ,
'her                                                  e',
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```

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ACT2-2

- Do Task 2

Python `For` Statements (For Loops)

"For each element in list myList, do something"

```
>>> myList = [1,2,3]
>>>
```

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"For each element in list myList, do something"

```
>>> myList = [1,2,3]
>>> for element in myList:
...     print element


1
2
3
>>>
```

Python `For` Statements (For Loops)

"For each element in list myList, do something"

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>>> myList = [1,2,3]
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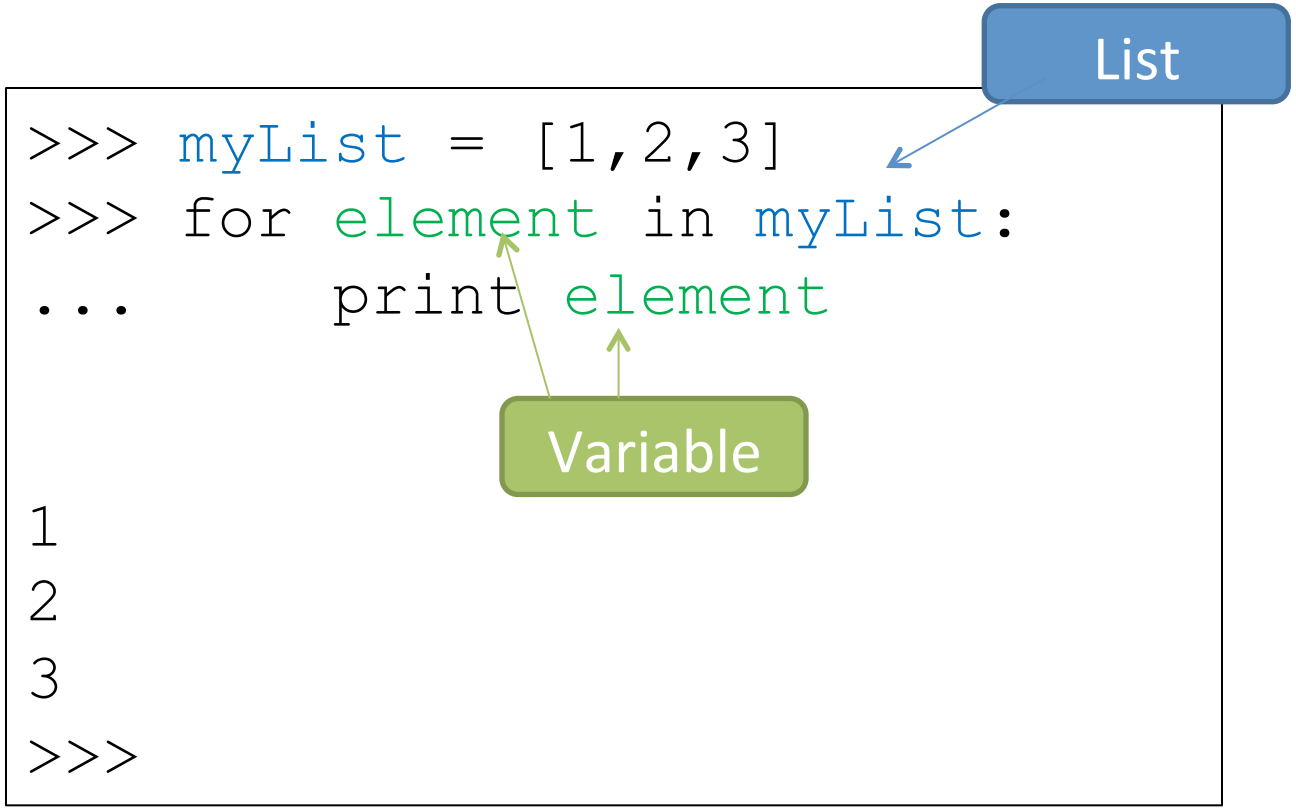

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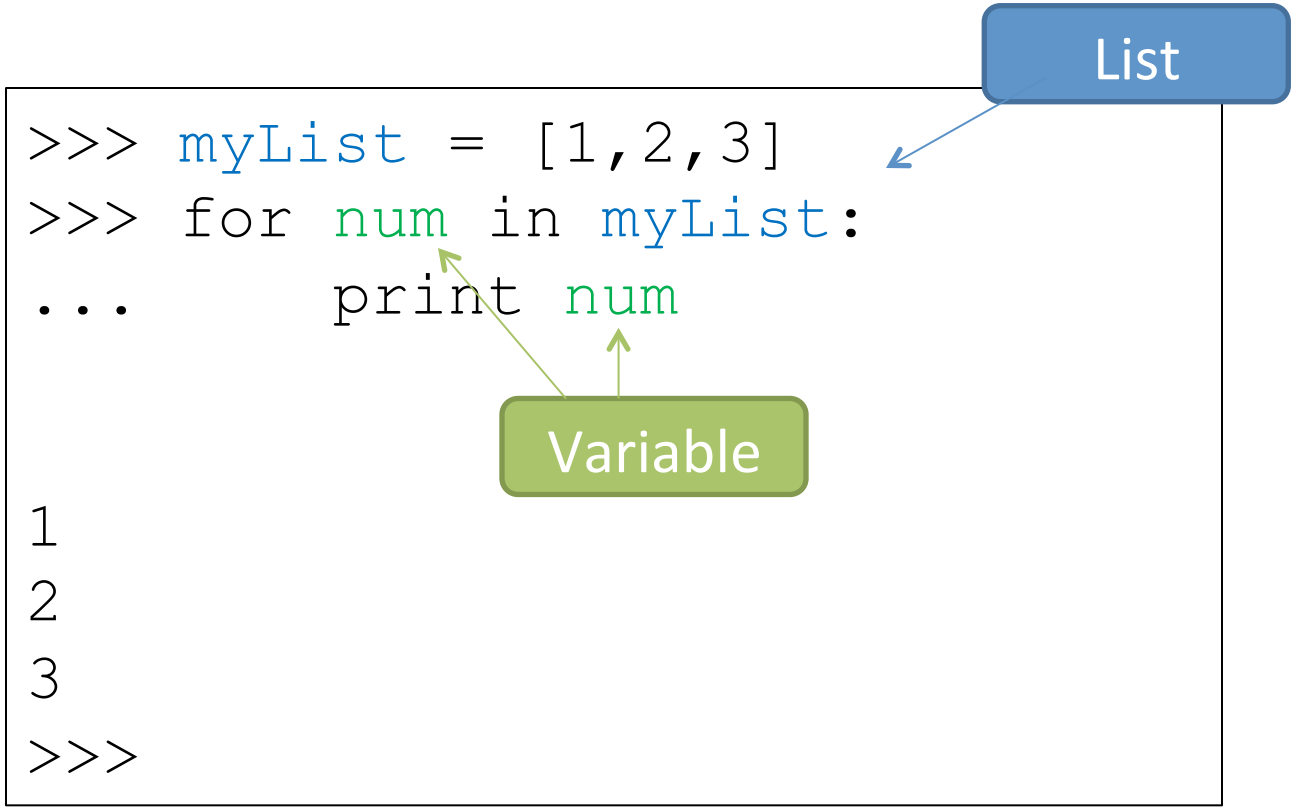

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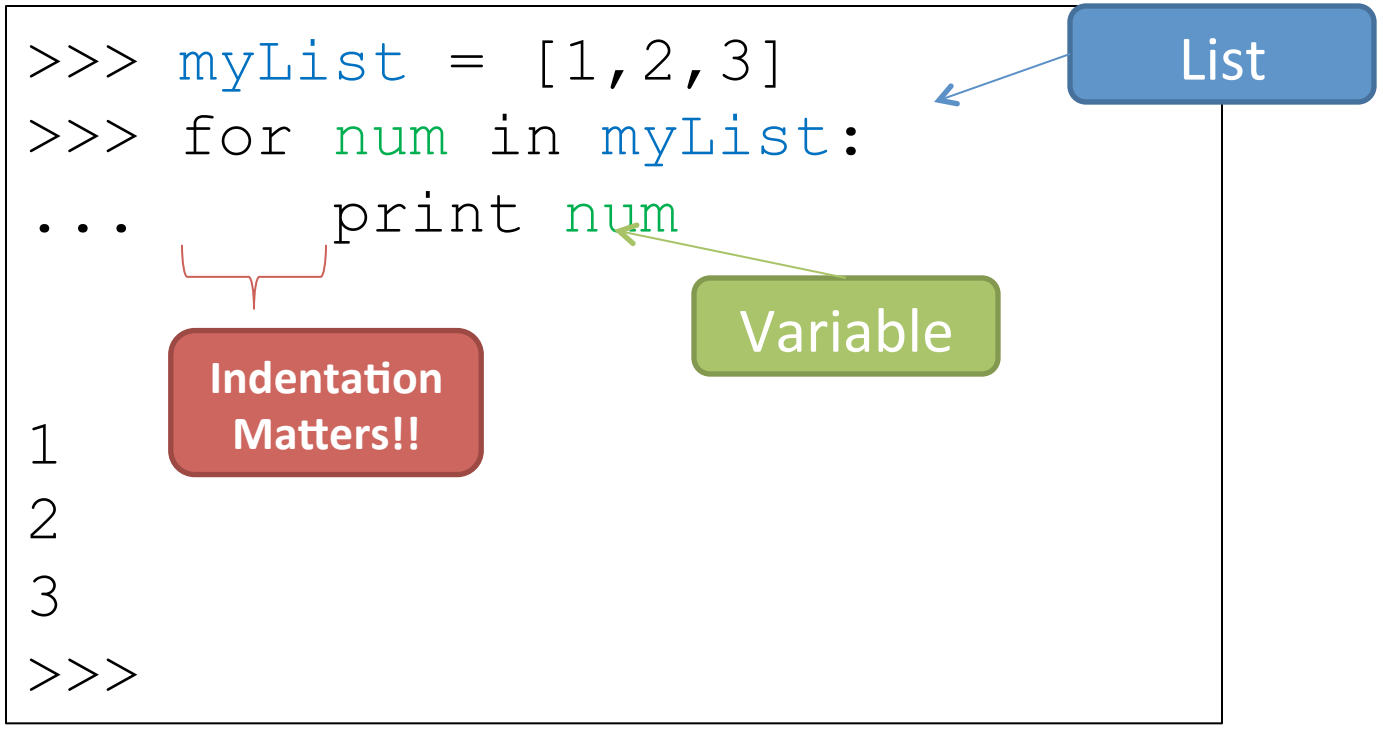

Activity 2-2

- Do Task 3

Word Count for Shel's Poem

```
def countWordsInShel():
    '''Returns the number of words in the poem.'''




    return count
```

Word Count for Shel's Poem

```
def countWordsInShel():
    '''Returns the number of words in the poem.'''
    myList = readShel()
    # the 'count' variable counts the number of words
    count = 0
    for word in myList:
        count = count + 1
    print "There are ",count," words in the poem."
    return count
```

Word Count for Shel's Poem

Good Programming Practices: Documentation!

```
def countWordsInShel():
    '''Returns the number of words in the poem.'''
    myList = readShel()
    # the 'count' variable counts the number of words
    count = 0
    for word in myList:
        count = count + 1
    print "There are ",count," words in the poem."
    return count
```

Program Description (triple quotes)

Comment (#)

Print Statement

Execution model for “for” loops

- If the loop variable isn’t in the memory table...add it
- Repeatedly assign to it sequential items in the list...
- ...and execute the statements within the loop

- Note: when done, the loop variable will be in the memory table, with its last value

The Big Picture

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- Count the number of words in Moby Dick
  - There's a shortcut…
- Compute the average word length of Moby Dick
- Find the longest word in Moby Dick

A Shortcut to List Length

Preloaded Functions		
`len`	List	Integer

```
>>> len(myList)
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Python Functions

Preloaded Functions		
`len`	List OR String	Integer

Python Functions

Preloaded Functions		
`len`	List OR String	Integer
`float`	Number (as an Integer, Float, or String)	Float
`int`	Number (as an Integer, Float, or String)	Integer
`str`	Integer, Float, String, or List	String

These functions *cast* a variable of one type to another type

- `3 / 4 -> 0.75`
- `3/float(4) -> 0.75, float(3)/4 ->0.75, float(3)/float(4)->0.75`
- if an arithmetic expression involves a float, the result will be a float. `3 + 0.0 -> 3.0, 3 + float(0) -> 3.0`
- New shorthand: "->" means "evaluates to"

Python Functions

Preloaded Functions		
`len`	List OR String	Integer
`float`	Number (as an Integer, Float, or String)	Float
`int`	Number (as an Integer, Float, or String)	Integer
`str`	Integer, Float, String, or List	String
`range`	Two Integers 1. Start Index (Inclusive) 2. End Index (Exclusive)	List of Integers

These functions *cast* a variable of one type to another type

Activity

- Do Task 4

Compute the Average Word Length of Moby Dick

```
def avgWordLengthInMobyDick():
    '''Gets the average word length in MobyDick.txt'''
```

Compute the Average Word Length of Moby Dick

```
def avgWordLengthInMobyDick():
    '''Gets the average word length in MobyDick.txt'''
    myList = readMobyDick()
    s = 0
    for word in myList:
        s = s + len(word)
    avg = s/ len(myList)
    return avg
```

Is our Program Correct?

```
>>> MDList = readMobyDick()
>>> MDList[0:99]
['CHAPTER', '1', 'Loomings', 'Call', 'me', 'Ishmael.', 'Some',
'years', 'ago--never', 'mind', 'how', 'long', 'precisely--',
'having', 'little', 'or', 'no', 'money', 'in', 'my', 'purse,',
'and', 'nothing', 'particular', 'to', 'interest', 'me', 'on',
'shore,', 'I', 'thought', 'I', 'would', 'sail', 'about', 'a',
'little', 'and', 'see', 'the', 'watery', 'part', 'of', 'the',
'world.', 'It', 'is', 'a', 'way', 'I', 'have', 'of',
'driving', 'off', 'the', 'spleen', 'and', 'regulating', 'the',
'circulation.', 'Whenever', 'I', 'find', 'myself', 'growing',
'grim', 'about', 'the', 'mouth;', 'whenever', 'it', 'is', 'a',
'damp,', 'drizzly', 'November', 'in', 'my', 'soul;',
'whenever', 'I', 'find', 'myself', 'involuntarily', 'pausing',
'before', 'coffin', 'warehouses,', 'and', 'bringing', 'up',
'the', 'rear', 'of', 'every', 'funeral', 'I', 'meet;', 'and']
```

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New Type: Booleans

- Either `True` or `False`
  - Note the capitalization

```
>>> x = True
>>> x
True
>>> y = False
>>> y
False
```

New Type: Booleans

- Either `True` or `False`
  - Note the capitalization
- New Operators

Remember

Numerical Operators		
Operator	**Example**	**Result**
Sum	`1 + 2`	`3`
Difference	`1 - 2`	`-1`

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Boolean Operators		
Operator	**Example**	**Result**
Equality	`1 == 2`	
Inequality	`1 != 2`	
Less Than	`1 < 2`	
Less Than or Equal To	`1 <= 2`	
Greater Than	`1 > 2`	
Greater Than or Equal To	`1 >= 2`	

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New Type: Booleans

- Either `True` or `False`
  - Note the capitalization
- New Operators
- These are **expressions**
- Assignments have only **one** equals sign.

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Boolean Types

Last Boolean Operators: `and`, `or` and `not`

Boolean Operators			
Operator	**Examples**		**Result**
`and`	`(4<5) and (6<3)`		
`or`	`(4<5) or (6<3)`		
`not`	`not(4<5)`		

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More Examples		**Result**
`(4<5) and ((6<3) or (5==5))`		
`(5==4) or (not(6<3))`		

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`(5==4) or (not(6<3))`	`False or not(False)`	`True`

Boolean Statements (`If` Stmts)

- "If something's true, do A"

```
def compare(x, y):
      if x > y:
            print(x, ' is greater than', y)
```

Boolean Statements (`If` Stmts)

- "If something's true, do A, otherwise, do B"

```
def compare(x, y):
        if x > y:
                print(x, ' is greater than ', y)
        else:
                print(x, ' is less than or equal to ', y)
```

Boolean Statements (`If` Stmts)

- "If something's true, do A, otherwise, check something else; if that's true, do B, otherwise, do C"

```
def compare(x, y):
        if x > y:
                print(x, ' is greater than ', y)
        else:
                if x < y:
                        print(x, ' is less than ', y)
                else:
                        print(x, ' is equal to ', y)
```

Get the Longest Word in Moby Dick

```
def getLongestWordInMobyDick():
    '''Returns the longest word in MobyDick.txt'''




    return longestword
```

Get the Longest Word in Moby Dick

```
def getLongestWordInMobyDick():
    '''Returns the longest word in MobyDick.txt'''
    myList = readMobyDick()
    longestLen = 0
    longestWord = ""
    for word in myList:
        if len(word) > longestLen:
            longestLen = len(word)
            longestWord = word
    return longestWord
```

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'yams', 'and', 'spice', 'the', 'hams,', 'And', 'though',
'her', 'daddy', 'would', 'scream', 'and', 'shout,', 'She',
'simply', 'would', 'not', 'take', 'the', 'garbage',
'out.', 'And', 'so', 'it', 'piled', 'up', 'to', 'the',
'ceilings:', 'Coffee', 'grounds,', 'potato', 'peelings,',
'Brown',
...
'an', 'awful', 'fate,', 'That', 'I', 'cannot', 'now',
'relate', 'Because', 'the', 'hour', 'is', 'much', 'too',
'late.', 'But', 'children,', 'remember', 'Sarah', 'Stout',
'And', 'always', 'take', 'the', 'garbage', 'out!']
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We'll come back to this…**next class**