Objectives

- Reading from files
  - Numbers!
- Writing to files

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Review

- What is the major [implementation] difference between strings and lists?
  - What are the implications of that difference?
- Why should we care about files?
- How do we create a file object?
- How can we read from a file? (3 ways)
- How is a line in a file represented?

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Review: Lists vs. Strings

- Strings are **immutable**
  - Can't be mutated?
  - Err, can't be modified/changed
- Lists are **mutable**
  - Can be changed
  - Changes how we call/use methods

Implications:

- Think of `list` variables as ***pointing*** to the list
- Assigning a list to another variable does ***not* make a copy** of the list
- list methods ***modify*** the list on which the method was called
  → Don't return a copy of the object, modified
- When you pass a list into a function, you ***can modify*** the list

Testing List Functions

Testing a function that modifies the list parameter, nothing returned

```
def testDescendSort3Nums():
    origList = [1, 2, 3]
    descendSort3Nums(origList)
    # test that the list sorted is in reverse order
    test.testEqual( origList, [3, 2, 1] )
```

Testing a pure function that returns a copy of the list, modified

```
def testCreateDescendingSort3Nums():
    origList = [1, 2, 3]
    test.testEqual( createDescendingList(origList), [3, 2, 1])
    # verify that the original list didn't change.
    test.testEqual( origList, [1, 2, 3] )
```

Review: Files

- Conceptually, a file is a ***sequence*** of data stored in memory
- To use a file in a Python script, create an object of type `file`
  - `file` is a *data type*
  - `<varname> = open(<filename>,<mode>)`
    - `<filename>`: `string`
    - `<mode>`: `string`, "r" for read, "w" for write, "a" for append (and others)
  - Ex: `dataFile = open( "temps.dat", "r" )`

Built-in function

"constructs" a file object

Searching a File

- Display which lines and how many lines a search term is in a file
- Example output:

```
dog is found in data/wikipedia.txt on lines:
4 The dog or domestic dog (Canis familiaris[4][5] or Canis lupus familiaris[5]) is a
6 The dog is derived from an ancient, extinct wolf,[6][7] and the modern wolf is the
7 dog's nearest living relative.[8] The dog was the first species to be
11 Due to their long association with humans, dogs have expanded to a large number of
13 that would be inadequate for other canids.[11] Over the millennia, dogs became
17 The dog has been selectively bred over millennia for various behaviors, sensory
for a total of 6 lines
```

Writing to a File

- Create a file object in **write** mode:
  - `myFile = open("myfile.txt", "w")`
- Example: create a file from user input
  - `file_write.py`

What happens if you execute the program again with different user input?

Handling Numeric Data

- We have been dealing with reading and writing *strings* so far
  - Read from a file: get a string
  - Write to file: use a string
- What do we need to do to **read numbers** from a file?
- How can we **write numbers** to a file?

Handling Numeric Data

- We have been dealing with reading and writing *strings* so far
  - Read from a file: get a string
  - Write to file: use a string
- What do we need to do to **read numbers** from a file?
  - Cast as a numeric type, e.g., `int` or `float`
- How can we **write numbers** to a file?
  - Cast number as a `str` or use `format` method

Problem: Temperature Data

- **Given**: data file that contains the daily high temperatures for last year at one location
  - Data file contains one temperature per line
  - Example: `data/florida.dat`
- **Problem**: What is the average high temperature for the location?

```
def calculateAvgTemp( datafileName ):
```

Rule of Thumb: Always look at data file before processing it

Problem: Report of Avg Temperature

- **Given**: data files that contains the daily high temperatures for last year at various locations
  - Data file contains one temperature per line
  - Example: `data/florida.dat`
- **Problem**: Write a report of the locations and the average temperature in the form
  - Average tem splayed to two decimal plac

```
<location1> <avgtemp1>
<location2> <avgtemp2>
…
```


Looking Ahead

- Pre lab 8 due tomorrow
- Lab 8 tomorrow!
  - Lists, Files, Modules
- Broader Issue: Cryptocurrency