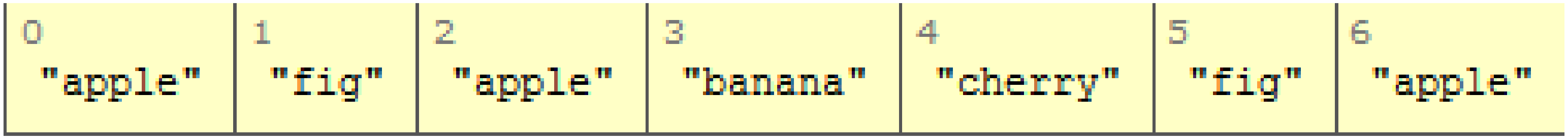
CompSci 101
Introduction to Computer Science

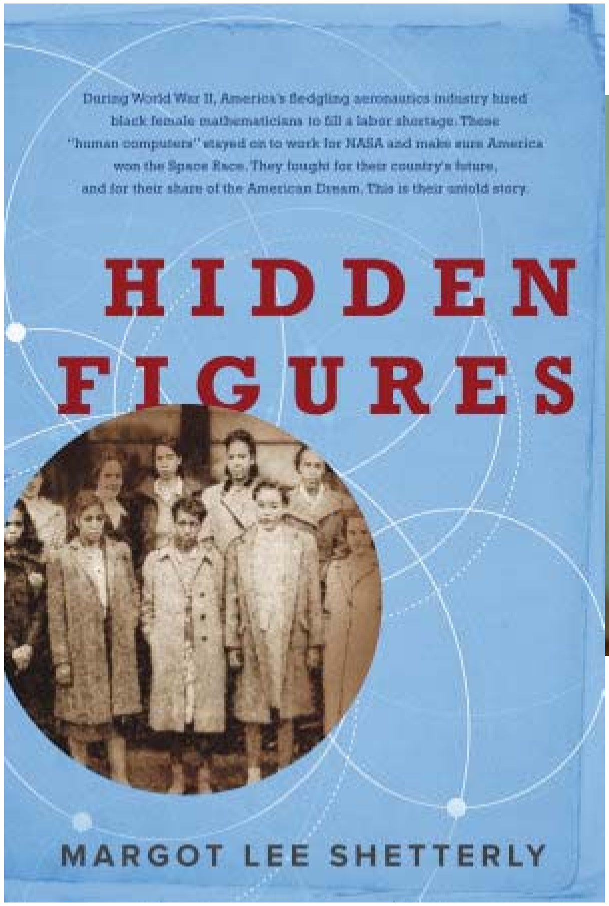
Nov 8, 2016

Prof. Rodger



0	1	2	3	4	5	6
"apple"	"fig"	"apple"	"banana"	"cherry"	"fig"	"apple"

Hidden Figures Author At Duke
Wed, 7pm, Reynolds Theatre



During World War II, America's fledgling aeronautics industry hired black female mathematicians to fill a labor shortage. These "human computers" stayed on to work for NASA and make sure America won the Space Race. They fought for their country's future, and for their share of the American Dream. This is their untold story.

Katherine
Johnson

BASED ON THE UNTOLD TRUE STORY
MEET THE WOMEN YOU DON'T KNOW, BEHIND THE MISSION YOU DO.
HIDDEN
FIGURES
NASA
1.13.17
HiddenFiguresMovie.com

Announcements

- No RQs until after Exam 2
- Assignment 6 due Thursday
- APT Quiz 2 due tonight
- APT 7 due today, APT 8 out
- Exam 2 is Nov. 16
- Lab this week!

- Today:
  - More practice with Dictionaries

Python shortcut you can ignore

- The zip function, tuples from two lists
- Does something right if lists have different sizes. Look it up

```
words = ['dog', 'cat', 'fish', 'guava']
counts = [3, 2, 1, 5]
cc = zip(word,counts)

[('dog', 3), ('cat', 2), ('fish', 1), ('guava', 5)]
```

Python functions you CANNOT ignore

- We know how to sort, we call sorted
  - Example: sorting tuples
  - Function sorted returns a new list, original not changed

```
xx = [('dog', 3), ('cat', 2), ('fish', 1),  ('guava', 2)]
yy = sorted(xx)

[('cat', 2), ('dog', 3), ('fish', 1), ('guava', 2)]
```

  - What if sort by numbers instead of words?

Use what you know

- You can re-organize data to sort it as you'd like, list comprehensions are your friend

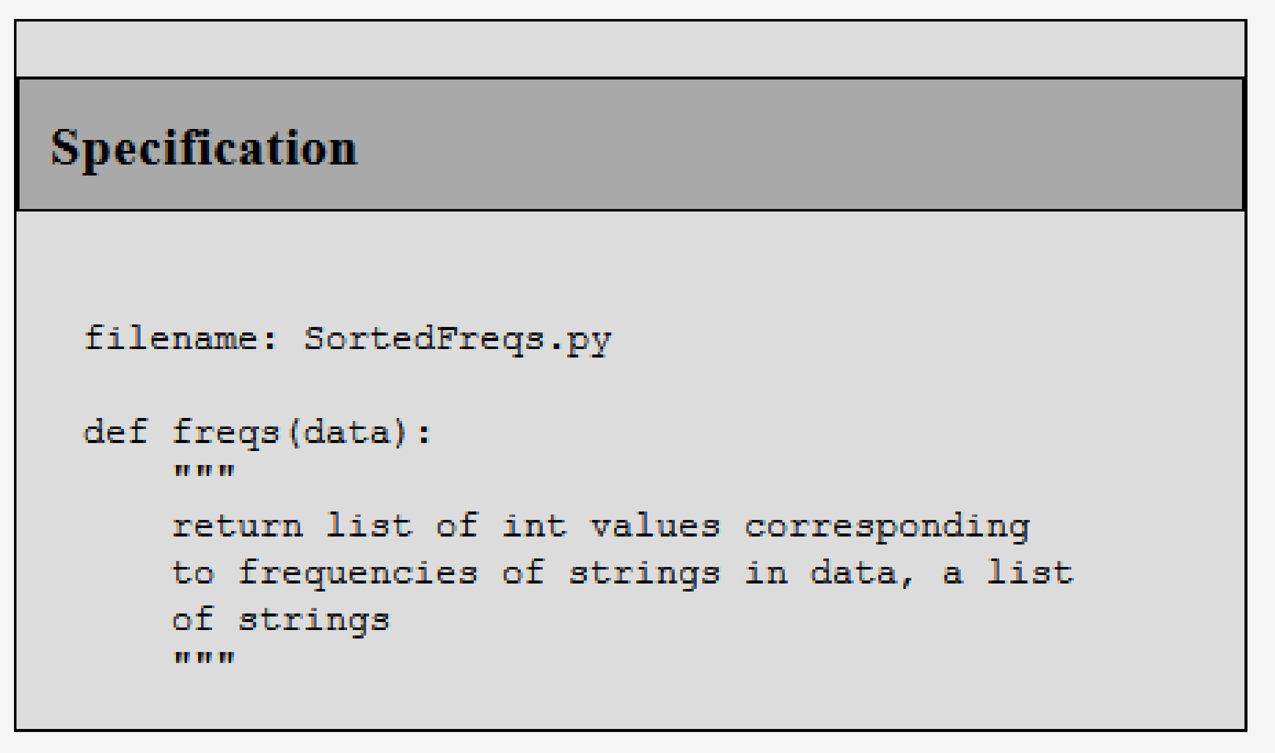
```
xx = [('dog', 3), ('cat', 2), ('fish', 1),  ('guava', 2)]
...
nlist = [(t[1],t[0]) for t in xx]

[(3, 'dog'), (2, 'cat'), (1, 'fish'),  (2, 'guava')]

yy = sorted(nlist)

[(1, 'fish'), (2, 'cat'), (2, 'guava'),  (3, 'dog')]
```

APT – SortedFreqs
bit.ly/101f16-1108-1

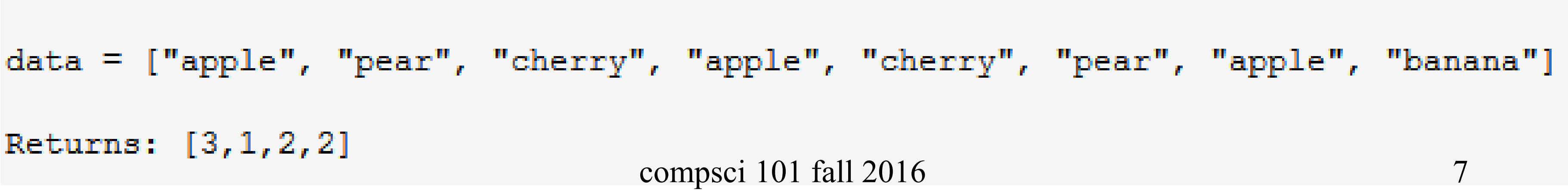


Specification

```
filename: SortedFreqs.py

def freqs(data):
    """
    return list of int values corresponding
    to frequencies of strings in data, a list
    of strings
    """
```

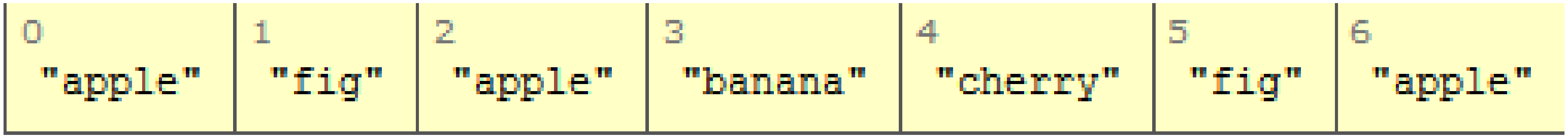
The returned frequencies represent an alphabetic/lexicographic ordering of the unique words, so the first frequency is how many times the alphabetically first word occurs and the last frequency is the number of times the alphabetically last word occurs



```
data = ["apple", "pear", "cherry", "apple", "cherry", "pear", "apple", "banana"]

Returns: [3,1,2,2]
```

Ways to count?
bit.ly/101f16-1108-2



0	1	2	3	4	5	6
"apple"	"fig"	"apple"	"banana"	"cherry"	"fig"	"apple"

- Dictionaries are faster than using lists?
- How fast is list.count(x) for each x?

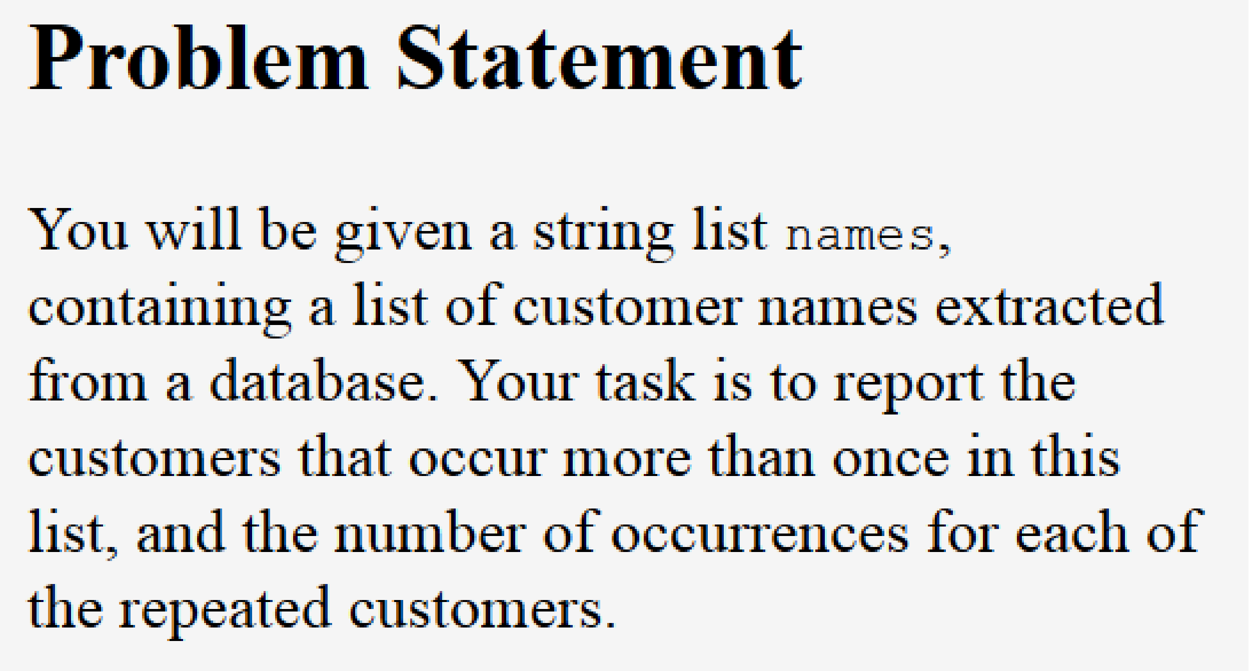
Shafi Goldwasser

- 2012 Turing Award Winner
- RCS professor of computer science at MIT
  - Twice Godel Prize winner
  - Grace Murray Hopper Award
  - National Academy
  - Co-inventor of zero-knowledge proof protocols

  How do you convince someone that you know [a secret] without revealing the knowledge?
- Honesty and Privacy

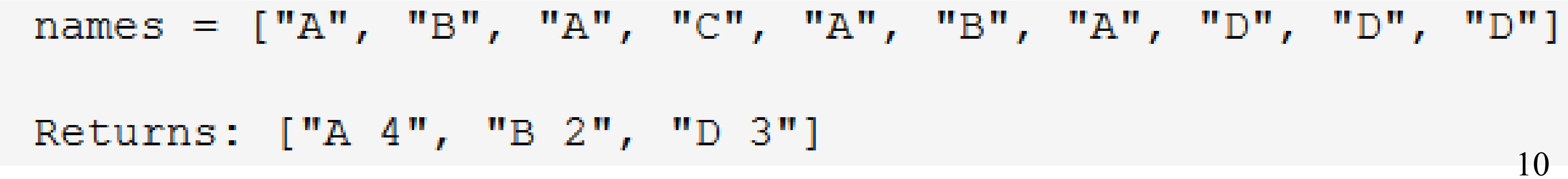
Work on what you like, what feels right, I know of no other way to end up doing creative work

APT Customer Statistics
bit.ly/101f16-1108-3



Problem Statement

You will be given a string list `names`, containing a list of customer names extracted from a database. Your task is to report the customers that occur more than once in this list, and the number of occurrences for each of the repeated customers.



```
names = ["A", "B", "A", "C", "A", "B", "A", "D", "D", "D"]

Returns: ["A 4", "B 2", "D 3"]
```

Review Dictionaries

- Map keys to values
  - – Counting: count how many times a key appears
    - Key to number
  - – Store associated values
    - Key to list or set
- Get all
  - – Keys, values or (key,value) pairs
- What question do you want to answer?
  - – How to organize data to answer the question

Dictionary problems
Number of students in ACM clubs
bit.ly/101f16-1108-4

```
d = {'duke':30, 'unc':50, 'ncsu':40}


d['duke'] = 80
d.update({'ecu':40, 'uncc':70})
print  d.values()
```

Dictionary problems – part 2 bit.ly/101f16-1108-5

- Consider the Python dictionary below on schools that map schools to number of students

```
d = {'duke':30, 'unc':50, 'ncsu':40, 'wfu':50,
'ecu': 80, 'meridith':30, 'clemson':80,
'gatech':50, 'uva':120, 'vtech':110}
```