

CompSci 101

Introduction to Computer Science

dict

"Mary"	list 0 "White"
"Jackie"	list 0 "Long" 1 "Johnson"
"Susan"	list 0 "Smith" 1 "Brandt" 2 "Rodger"

Nov. 3, 2016

Prof. Rodger

dict

"Mary"	1
"Jackie"	2
"Susan"	3

Announcements

- No Reading or RQ until after exam
- Assignment 6 out today
- APT 7 due Tues
- APT Quiz 2 – Sunday - Tuesday
 - Pick 3 hours to take it
- Today:
 - Finish from last time
 - Dictionaries – a way to organize data for fast lookup

LAST TIME:

Problem: Popular Name

- Given a list of names, determine the **most popular first name** and print that name with all of its last names.
- Input: Names are always two words, names are in a file. If multiple names are on the same line they are separated by a “:”
- Output: Most popular first name, followed by a “:”, followed by corresponding last names separated by a blank

Example Input File with 5 lines

```
Susan Smith:Jackie Long:Mary White  
Susan Brandt  
Jackie Johnson:Susan Rodger:Mary Rodger  
Eric Long:Susan Crackers:Mary Velios  
Jack Frost:Eric Lund
```

Corresponding Output

```
Susan: Smith Brandt Rodger Crackers
```

Example – two lists

firstNames	lastNames
0 'Susan'	0 ['Smith', 'Brandt', 'Rodger', 'Crackers']
1 'Jackie'	1 ['Long', 'Johnson']
2 'Mary'	2 ['White', 'Rodger', 'Velios']
3 'Eric'	3 ['Long', 'Lund']
4 'Jack'	4 ['Frost']

Now can we solve the problem?

- Compute those two lists that are associated with each other
 - List of unique first names
 - List of corresponding last names
- Compute the max list of last names
- Now easy to print the answer.
- See popular.py

This function generates the list of lists
of corresponding last names

```
def correspondingLastNames(data, firstNames):  
    lastNames = [ ]  
    for name in firstNames:  
        lastNames.append(allLastNames(data,name))  
    return lastNames
```

Answer questions about bit.ly/101f16-1103-1

- Printing first names with corresponding last names
- Reading data from files

Finish

```
maxnum = max([len(item) for item in lastNames])  
print maxnum  
lastIndex = [index for (index, v) in  
enumerate(lastNames) if len(v) == maxnum]  
print "first name with most last names is:"
```

Expanding the Problem

- Suppose we want to read from multiple data files

names1.txt, names2.txt, names3.txt

See processFiles in popular.py

Another way – list of lists

First word in each list is a first name

The rest are last names.

0	['Susan', 'Smith', 'Brandt', 'Rodger', 'Crackers']
1	['Jackie', 'Long', 'Johnson']
2	['Mary', 'White', 'Rodger', 'Velios']
3	['Eric', 'Long', 'Lund']
4	['Jack', 'Frost']

ACM Turing Award Winners 2015



MORE ACM AWARDS







A.M. TURING AWARD WINNERS BY...

ALPHABETICAL LISTING

YEAR OF THE AWARD

RESEARCH SUBJECT



2015 AWARD WINNERS:

**Whitfield Diffie and
Martin Hellman**

Cryptography Pioneers Receive 2015 ACM A.M. Turing Award

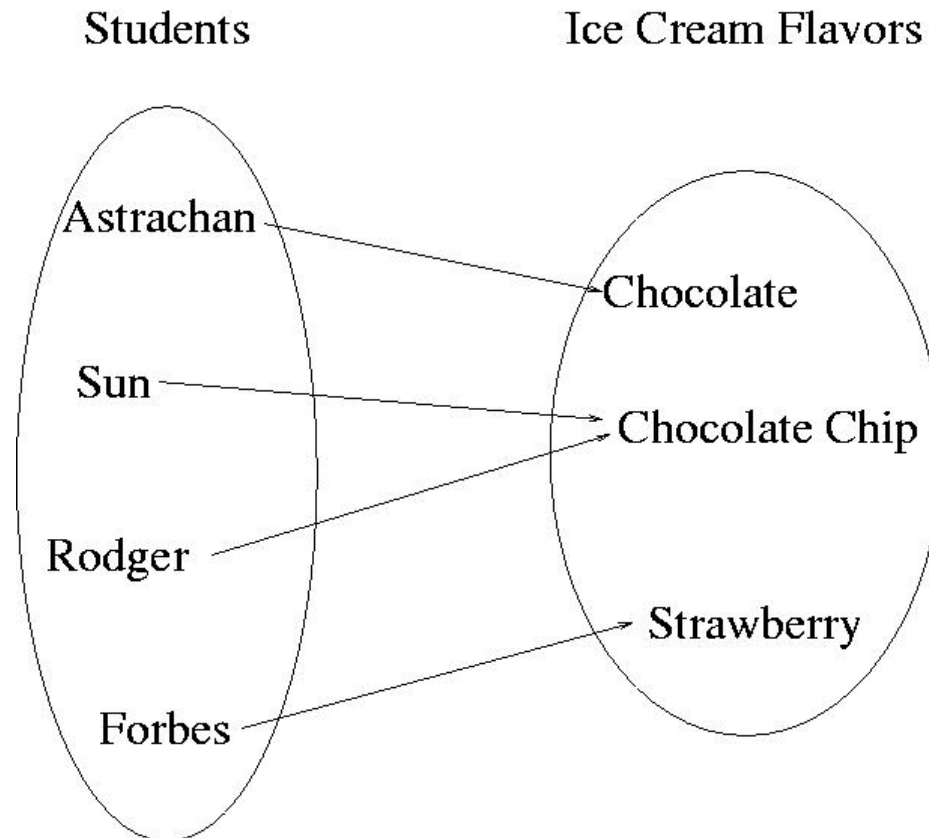
Whitfield Diffie, former Chief Security Officer of Sun Microsystems and **Martin E. Hellman**, Professor Emeritus of Electrical Engineering at Stanford University, are the recipients of the 2015 ACM A.M. Turing Award, for critical contributions to modern cryptography. The ability for two parties to communicate privately over a secure channel is fundamental for billions of people around

Dictionaries/Maps

- Dictionaries/maps are another way of organizing data
- Keys and Values
 - Each key maps to a value
 - Some keys can map to the same value
 - Can change the value a key maps to

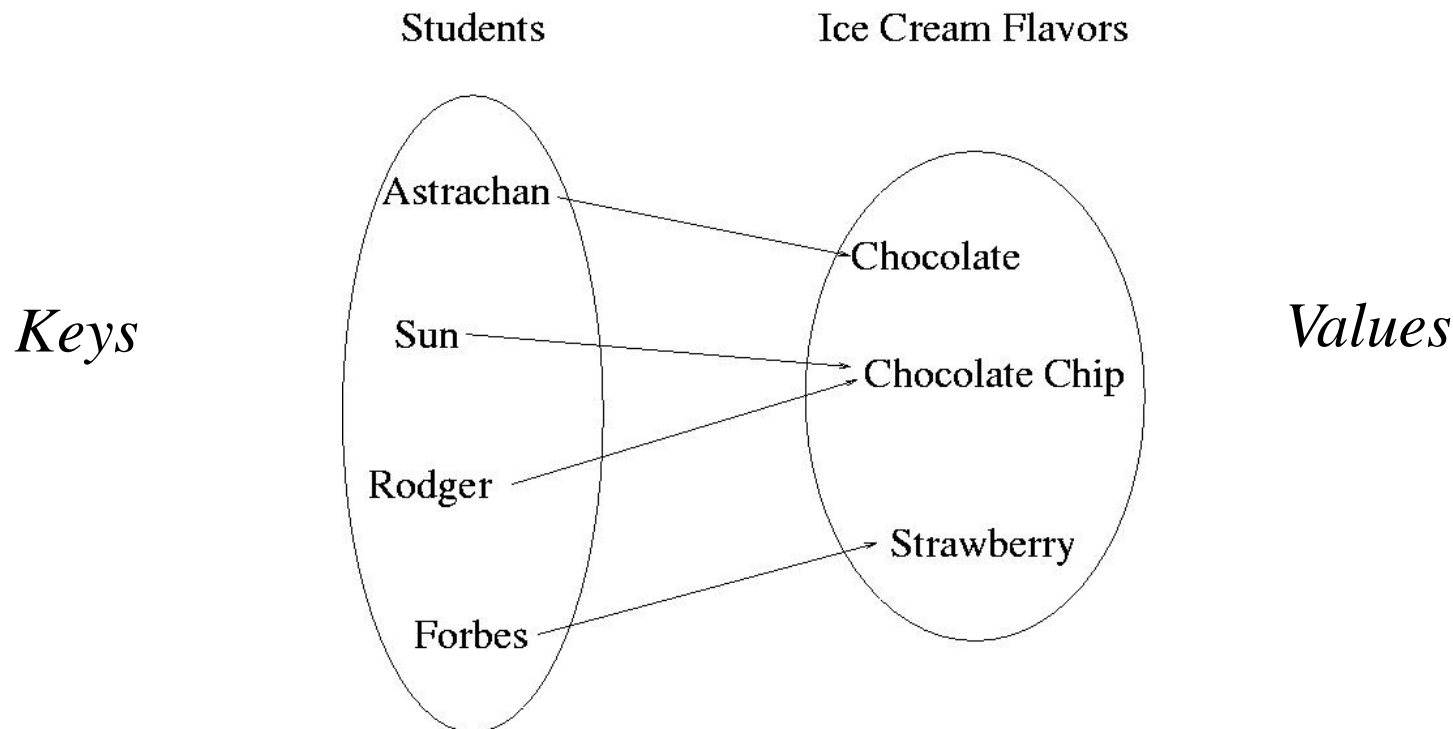
Example

- Each student could be mapped to their favorite ice cream flavor



How is dictionary different than a list?

- List – have to search for name first
- Dictionary – each key maps to a value
- getting name (or key) is automatic! Fast!



Implementing a Dictionary/Map

Keys map to values

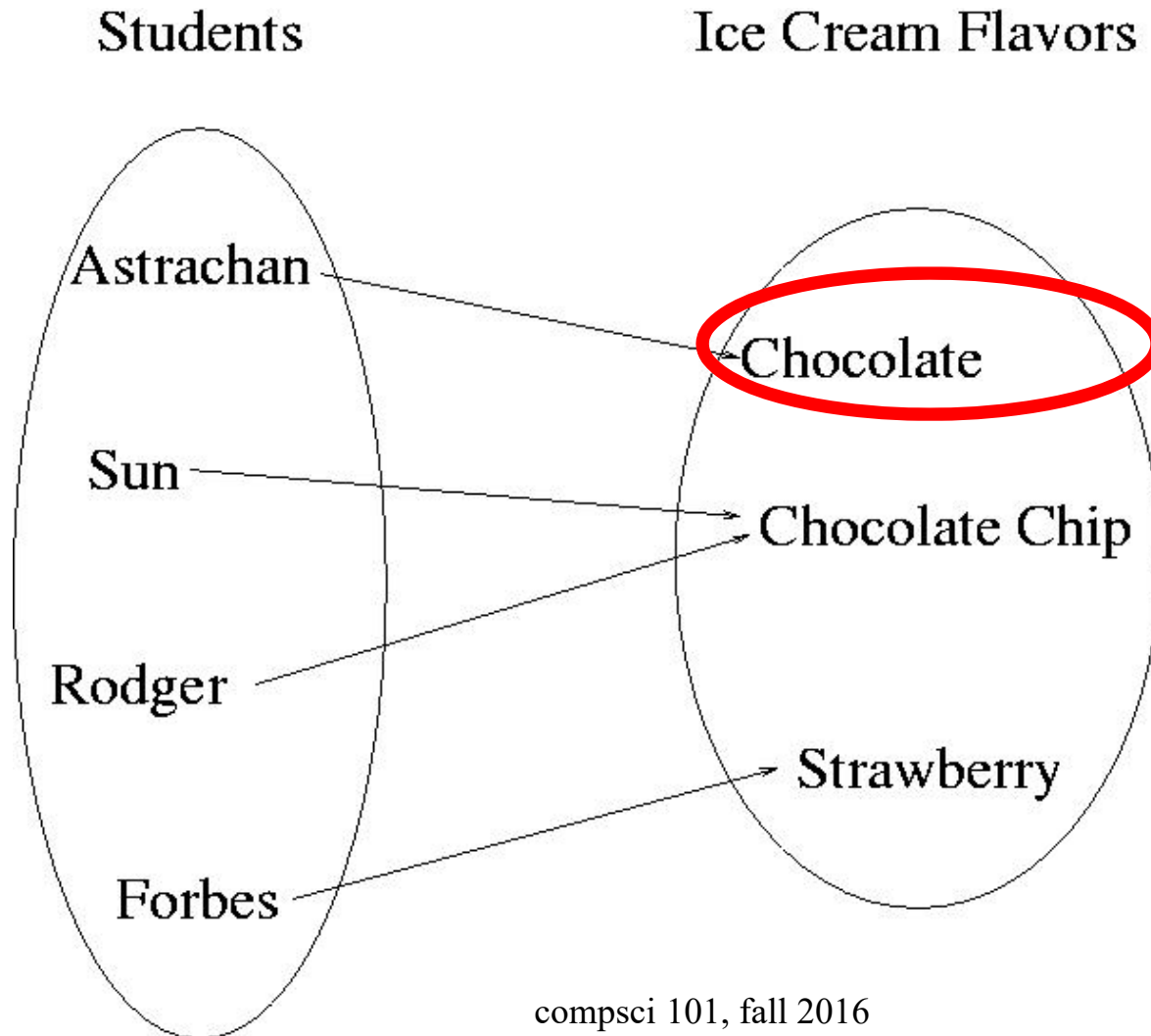
- Create Empty dictionary
somemap = {}
- Put in a key and its value
somemap["Forbes"] = "Strawberry"
- Get a value for a dictionary
value = somemap["Forbes"]
OR value = somemap.get("Forbes", "default")
- Change a value for a dictionary
somemap["Forbes"] = "Chocolate"

More on using a Dictionary/Map

- Get all the keys (as a list)
 - `listKeys = somemap.keys()`
- Get all the values (as a list)
 - `listValues = somemap.values()`
- Other methods
 - `clear` – empty dictionary
 - `items` – return (key,value) pairs
 - `iteritems` – return (key,value) pairs more efficiently, *iterator – must use with for*
 - `update` – update with another dictionary

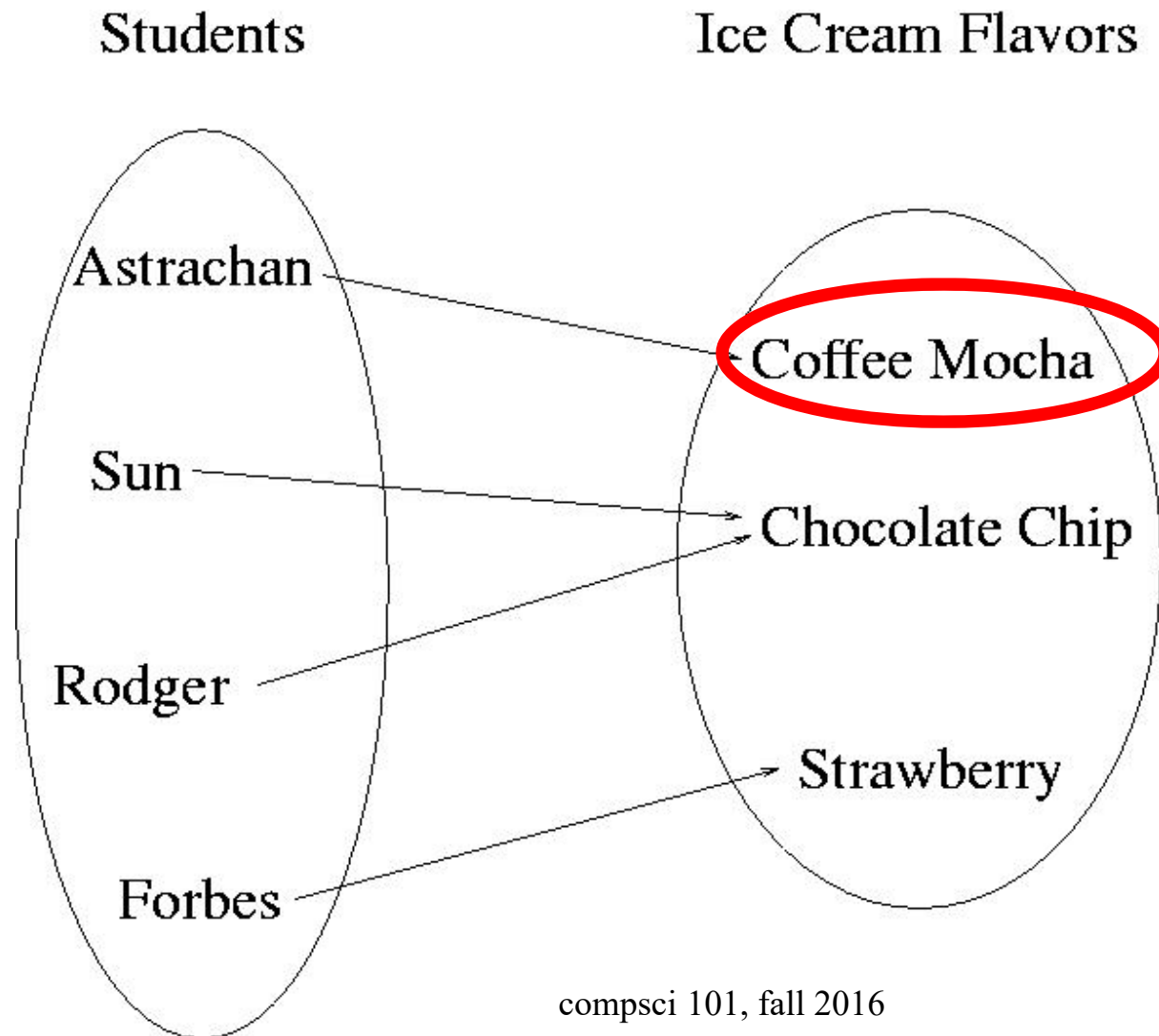
Change Astrachan's value

`somemap["Astrachan"] = Coffee Mocha`

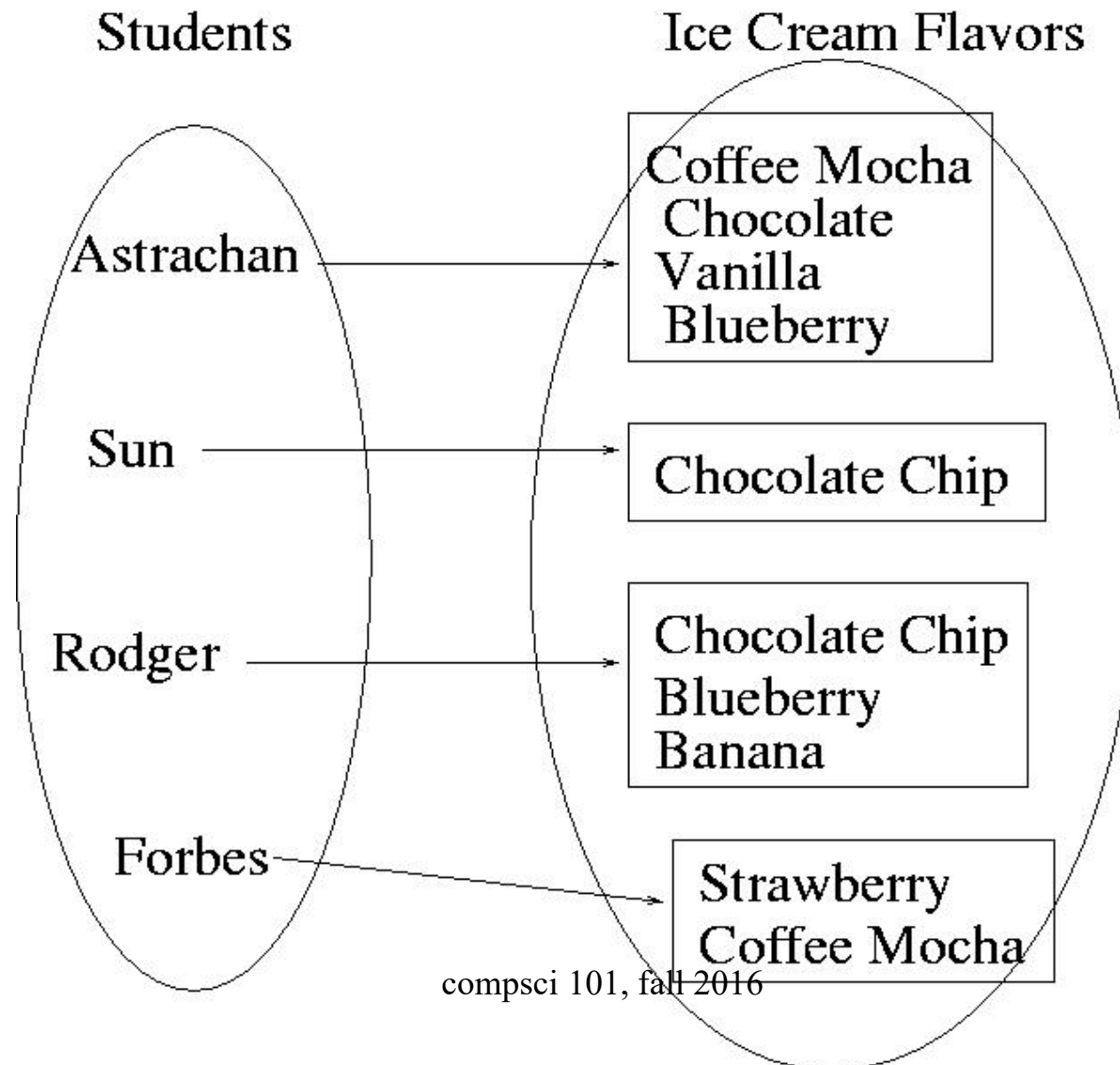


Change Astrachan's value

`somemap["Astrachan"] = Coffee Mocha`



Value could be a set or list



Back to Popular Name Problem:

- Given a list of names, determine the most popular first name and print that name with all of its last names.
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Jack Frost:Eric Lund
```

Corresponding Output

```
Susan: Smith Brandt Rodger Crackers
```

Use a dictionary/map
www.bit.ly/101f16-1103-2

- Map first names to **count** of corresponding last names

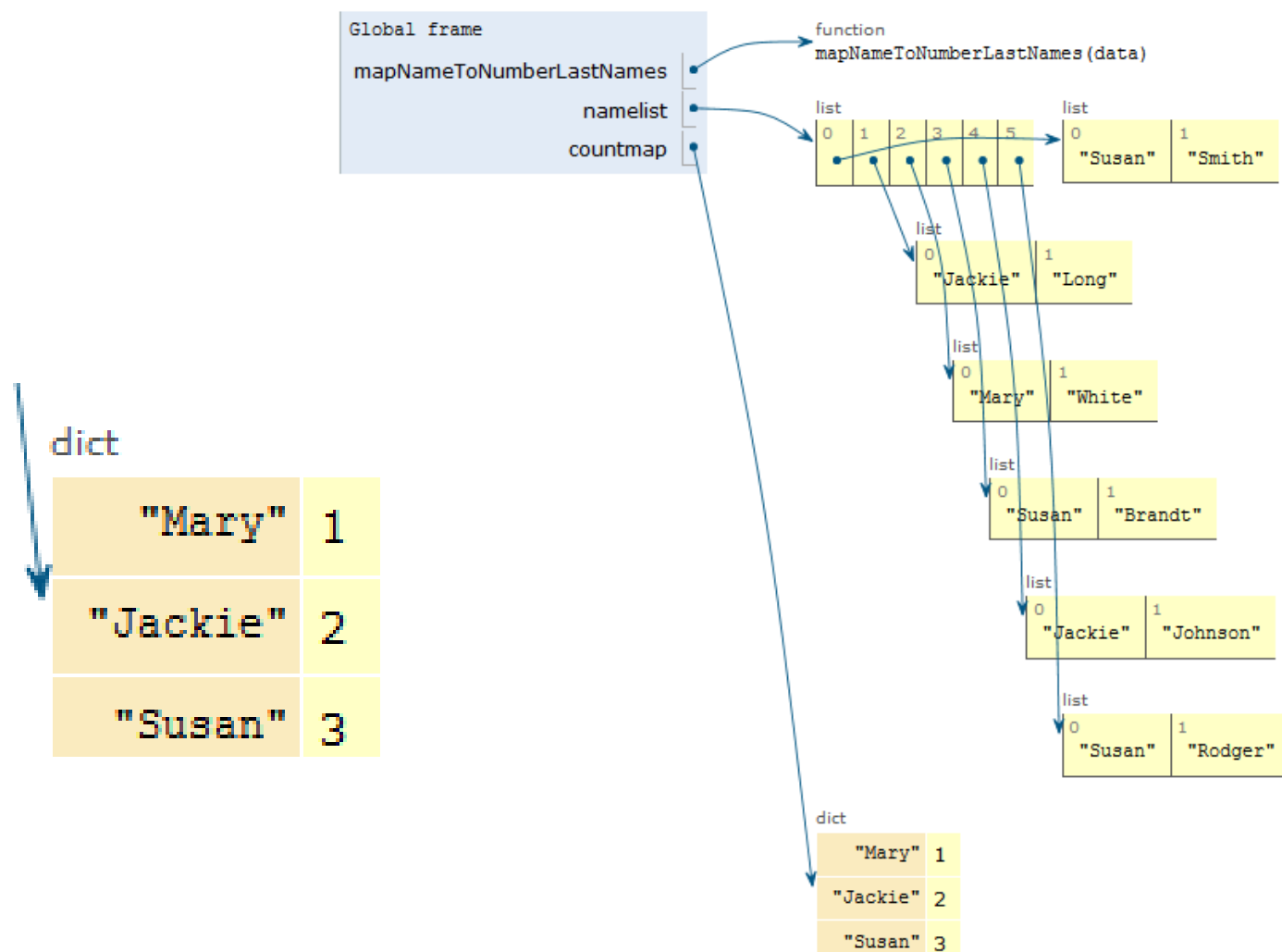
def mapNameToNumberLastNames(data):

Use a dictionary/map

- popularMap.py

Trace example with Python Tutor

see popularMapSolnSmall.py




Use a dictionary/map
www.bit.ly/101f16-1103-3

- Map first name to **list** of corresponding last names

def mapNameToLastNames(data):

Trace through example with Python Tutor

- See the small example `popularMapSolnSmall.py`



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Use a dictionary/map
www.bit.ly/101f16-1103-4

- Map first name to **set** of corresponding last names

def mapNameToSetLastNames(data):

Compare

- Using two parallel lists?
- Using one dictionary/map
- Which dictionary is most useful to solve the most popular name problem?