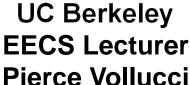


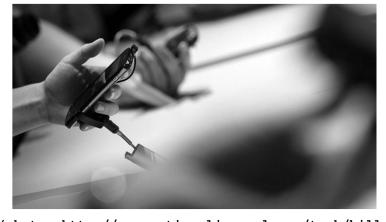
The Beauty and Joy of Computing



Beyond Blocks Python

Session 2: Data Structures





(photo: http://www.nationaljournal.com/tech/billto-legalize-cell-phone-unlocking-heads-to-obamas-desk-20140725)

Unlocking Phones Legally
The House passed a bill
allowing phones to be unlocked
legally. Environmentally, this
can help phone reuse.
Economically this could stall
new phone production and
sales. Thoughts?

http://www.npr.org/blogs/thetwo-way/2014/07/25/335351105/bill-allowing-americans-to-unlock-cellphones-passes-house-heads-to-obama (thanks to <u>Glenn Sugden</u> for the first version of these slides)

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Data Structures (Overview)

- Review (and some new introductions)
- Sequences
 - Operators
- Sets
 - Operators
- Dictionaries
- Higher-Order Functions







Review

- Typing, Build-In Types
 - Int, function, string, list, etc
- Variables
- Looping and Conditionals
 - For loops,
 - While loops
- Functions
 - Recursion
- This week's content
 - Sequences, APIs







Sequences

- Contain an ORDERED set of data
- str short for a "string of text"
- list ['a', 'group', 'of', 'items']
- range(start, stop, step)
- tuple a list that can't be modified
- Supports very easy iteration:
- for item in sequence:
 print(item)







Sequence (General) Operators

- elem in & not in sequence
- **+** & *
- slice [START:END:STEP=1]
- len()
- min() & max()
- Even map() filter() & reduce()!
- count(item)
- Many, many more: http://docs.python.org/library/stdtypes.html#typesseq







Strings and String Operators

- Sequence (or "list" or "array") of chars
- Quoting
 - Single Quotes, Double Quotes
 - Triple Quotes (this keeps formatting and line) breaks)
- Concatenation, finding length, etc.
 - help("string")
- Slicing Supported [START: END: STEP]
- http://docs.python.org/library/stdtypes.html #string-methods





bjc Lists

- Collection of any type
 - Including itself!
- Indexing list[item]
 - Indexed from 0, NOT 1, unlike Snap!
- Modifying list[item] = new_item
- Slicing and slicing notation i.e. [::]
 - Exactly the same as string notation!
- Operators
 - append(x), insert(i,x), count(x), sort(), etc.
- http://docs.python.org/library/stdtypes.html#mut
 able-sequence-types







Dictionaries

- Very fast access (by <u>key</u>, not number)
- "Map" from a key to a value
- Syntax

```
- { key1 : value1, key2 : value2, ... }
```

- Adding elements
 - dict[key] = value
- Accessing elements; dict[key]
- Keys
 - Looking for specific keys (has_key() & "in")
 - Iterating over (iterkeys())







API (Application Programming Interface)

- Set of agreements for sharing information
- Programming APIs:
 - "Building Blocks" for common elements such as Open or Save prompts
- Web APIs
 - "Special" URLs for accessing data directly
- Example: Open Weather Map API
 - Map: http://openweathermap.org/Maps
 - Raw data: http://api.openweathermap.org/data/2.5/weat her?q=Berkeley,CA







Demo (reference)

- Code files are all on the website
- fractals.py
 - Some fractals in Turtle Graphics
- ttt.py
 - Tic-Tac-Toe in Python
 - Uses the Games Crafters API for getting information about best moves







More Information

- Sequences & Methods
 - http://docs.python.org/library/stdtypes.html
- Coding Bat (*Great* practice!)
 - http://codingbat.com/python
- Google's Python Class
 - http://code.google.com/edu/languages/googlepython-class/
- Exercises (More practice!)
 - http://code.google.com/edu/languages/googlepython-class/exercises/basic.html



