Compsci 6/101: Sept 6-10

- We've looked at the language Python
  - Names and types: int, float, long, String, file, ...
  - Operations: *, +, -, /, %, **

- Types and values different from "real life"
  - What is 7/3 in Python?
  - What is "champion"[2:5]
  - What's String+String and String*int and String+int

- For useful work: organizing code/programs
  - Functions, modules, indentation, naming

Functions: abstractions over code

- Naming something gives you power
  - How do you find absolute value?
  - What is length of a string?

- We can write and call functions
  - Re-use and/or modify
  - Store in module, import and re-use functions
  - Import standard modules and use functions from them

- Functions can (should?) return a value
  - We've seen len return an int, what about file.read?
  - Other functions return Strings, floats, or other types

Anatomy of a Python function

```
def name(params):
    body
```

- Define a function, provide a name, provide parameters, provide a function body
  - How to decide on name?
  - Do we need parameters?
  - What does body of function do

- Functions provide a named abstraction over code
  - Huh? What is math.isinf(...) or math.sqrt(?)

Design, Implementation, Testing

- Designing Python code and functions
  - What do you want the code to do?
  - Other aspects of code, e.g., portability, efficiency, size, ...
  - Understand how to solve a problem without computer

- Implementing design in code
  - Translation of ideas into vocabulary of Python
  - We don't have a large vocabulary, but it will grow!

- Testing code, functions
  - How do you know when function is right?
  - What confidence can testing provide?
Nancy Leveson: Software Safety

- Mathematical and engineering aspects, invented the discipline
  - Air traffic control
  - Microsoft word

There will always be another software bug; never trust human life solely on software.

- Therac 25: Radiation machine

String functions in Python

- Strings are objects, some functions 'builtin'
  - Use web, or Python: strip, startswith, find, count, ...
  - Strings are immutable: "hello".replace("h","j")

- Python operators/functions that work with strings
  - We've seen len, what about in? What's going on?
  - Slicing review, modify or create new?

- Views of strings: what are they?
  - From an abstract point of view, from Pythonic POV?

Writing and testing functions

- Review of slicing operator for strings
  - What is an index, where does indexing begin?
  - Value of s[a:b] compare s[a:] compare s[:b]

- Review problems from last set of notes
  - Pounds to ..., BMI, Heron's formula

- Algorithm Problem Test (APT)
  - Role in Compsci 6/101 and other courses
  - Similar to Unit Testing, part of Agile Development

Jon Kleinberg

- 2005 MacArthur Fellow, 2008 Infosys Award, 2008 Discover “20 Best Brains under 40”
- Networks course and book
  - Duke course 96 Spring 2010

"....Try to keep an open mind about topics and areas going on....It’s much easier to make progress on a problem when you are enjoying what you are doing. In addition to finding work that is important, find work that has some personal interest for you....I’ve benefited from a lot of mentoring throughout my career. I think it’s important to pass it on to the next generation and work in a mentoring capacity or a teaching capacity with people entering the field....”

ACM Infosys Interview