CSCI 136
Data Structures &
Advanced Programming

Jeannie Albrecht
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Administrative Details

- Class roster
- About me
- Handout: Class syllabus
- Class meeting time: MWF 10-10:50
- Lecture location: Griffin 6
- Lab: Wed 12-2 and 2-4
- Lab location: TCL 217a and 216
- Lab code?
- Course Webpage:
  http://www.cs.williams.edu/~jeannie/cs136/index.html

Today's Outline

- Course Overview

- Java refresher

Why Take CS136?

- To learn about:
  - Data Structures
    - Common ways to store and manipulate data
  - Advanced Programming
    - Use structures to write programs that solve (interesting) problems

- Note to students who have not taken 134: If (after a few days) you feel you are not ready for 136, you can probably switch to 134. Come see me about this.

Goals

- Identify basic data structures
  - Examples?
  - list, stack, array, tree
- Implement these structures in Java
- Learn how to evaluate and visualize data structures
  - Linked lists and vectors both represent lists of items
  - Different representations of data
  - Different algorithms for manipulating/accessing/storing data
- Learn how to design large programs that are easy to modify, extend, and debug
- **Have fun!**

Example Programs

- Find a way to drive from Williamstown, MA to San Diego, CA
- Find the **shortest** way to drive from Williamstown, MA to San Diego, CA
- Schedule a flight with the fewest layovers from Albany, NY to Beijing, China
- Schedule exams so no students have conflicts

Common Themes

1. Identify data for problem
2. Identify questions to answer about data
3. Design data structures and algorithms to solve questions *correctly* and *efficiently* (Note: not all correct solutions are efficient, and vice versa!)
4. Implement solutions that are robust, adaptable, and reusable

Example: Boggle

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Course Outline

- Java review
- Foundations of programming
  - Vocabulary
  - Analysis tools
  - Recursion
  - Methodology
- Basic structures
  - Lists, vectors, queues, stacks
- Advanced structures
  - Graphs, heaps, trees, dictionaries

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Why CS136 == Awesome

- CS134 teaches you the basic mechanics of programming
- CS136 teaches you how to unlock the power of computers to solve problems in CS, econ, math, physics, etc.
  - Data representation
  - Algorithms
  - Abstraction

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Syllabus

- How to contact me
  - Office: TCL 304
  - Office hours: MTh 1:30p – 3:00p
    (or anytime when I'm in my office…email me)
  - Phone: x4251
  - Webpage: http://www.cs.williams.edu/~jeannie
  - Email: jeannie@cs.williams.edu
  - Anonymous feedback: See form on webpage
- Textbook
  - Java Structures: Data Structures in Java for the Principled Programmer, $\sqrt{7}$ Edition (by Duane Bailey)
  - Pick it up from Amanda Turner in TCL 303

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Honor Code and Ethics

- The student handbook describes the Honor Code and Computer Ethics guidelines.
- You should also know the CS Dept computer usage policy.
  - http://www.cs.williams.edu/the-cs-honor-code-and-computer-usage-policy/
  - If you are not familiar with these items, please review them.
- We take these things very seriously…

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Your Responsibilities

- Come to lab and lecture on time.
- Read assigned chapters before class and lab.
  - Bring textbook to lab (or be prepared to use PDF)
- **Come to lab prepared!!!**
  - Bring design docs for program
  - 1 prof + several TAs = lots of attention for you—take advantage of this!
- Do NOT remain confused. Get help.
- Don't cheat.
- Participate in class discussions.

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Why Java?

- There are lots of programming languages…
  - C, Pascal, C++, Java, C#, Python
- Java was designed in 1990s to ease Internet programming
- Java is good because:
  - It's easy (well, easier than predecessors like C++) to write correct programs
  - Object-oriented – good for large systems
  - Easy support for abstraction

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This semester, we will…

- …NOT use BlueJ. :-)
- …focus more on structures and algorithms than on graphics, networks, etc. (we can always add graphics later)
- …use Emacs and Java.
- …compile from a terminal rather than by clicking a button.

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Java Review

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Java Review Goals

- Review the big ideas
- Use lab/book/TAs/web to fill in any gaps
- Don't hesitate to ask me or the TAs for a refresher on any topic
- We're going to go fast…interrupt anytime

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Java

- Variable types
  - int, double, boolean, String, …
- Statements
  - int x = 3;
  - x = x + 2;
  - if (x > 3) { … } else { … }
  - while (x < 2) { … }
  - for (int i = 0; i < x; i++) { …}
- Comments
  - //this is a comment
  - /* so is this */

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Sample Programs

- Hello.java
  - Write a program that prints "Hello" to the terminal.

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