CSE8A: Introduction to Programming in Java
Fall 2013

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My Background

• Over 15 years of teaching technology courses

• University of California San Diego (UCSD), New York University (NYU), San Diego State University (SDSU)

• Courses
  – Java, C/C++, Object-Oriented Programming, Software Engineering, Data Security, C#, VB.NET

• Currently CEO of a startup firm here in San Diego
  – Retail Marketing with Social Media
  – http://www.CooponTree.com
My job

• Help jumpstart your computing career
  – Help you learn concepts, facts, skills
  – Help you develop good intellectual and professional habits

• Help you apply computing in your career
  – Art, Film, Biology, Math, Physics, Medicine, etc.

• Explore and illuminate the hardest concepts

• Answer your questions
How Are All These Related to CSE 8A?
Your job

• Give it a chance even though it may seem difficult
  – Don’t give up
  – Utilize the help around you to the max

• Learn the fundamentals and the rest is easy
  – It’s not about memorizing but mapping your way of thinking to computers …
Learning Goals: By the end of CSE8A you will be able to...

1. **Design computational solutions to problems.** This requires applying the following skills to problem statements or code: explain, compare and contrast, argue, diagram a memory model, and design a class.

2. **Code a Java implementation to problems.** This requires applying skills including code writing, code modification (including of others‘ code), and explaining what code does.

3. **Analyze and debug Java programs.** This requires applying skills including reading and understanding code, tracing variable values, and debugging.

4. **Communicate professionally about Java programs.** This requires applying skills such as explaining code you wrote, arguing about coding and design decisions, and drawing memory models to explain behavior.

5. **Solve basic problems by applying goals 1-4 as steps in a process to create a Java program.**

6. **Apply goals 1-5 in various media-related contexts** to make interesting applications involving digital images (filters, collages, special effects) and digital audio files (mixing music).
What to expect

• Devoting 8-10 hours a week to this class

• Learning a profession
  – Requires practice and application

• Me to be your guide and mentor in understanding concepts
  – Not a regurgitator of what’s in the book

• You to be actively involved in building and assessing your understanding in class
  – Not sitting and passively copying things down

• Questions
  – Who has been in a class of 150+ people before?
LECTURE

You must **attend** class
You must **prepare** for class
You must **participate** in class
Let’s Explore Our Class Web Site

https://sites.google.com/a/eng.ucsd.edu/cse-8a-fall-2013/home

My Missing Info in Syllabus

Email: haytham.allos@gmail.com

Office Hours: In the lab most likely. Will post the times in couple of days.
About this class: Academic Integrity

• You are working on one of the PSAs with your partner. You are stuck on a tricky problem, so you ask your friend who has taken CSE 8A before for help. Your friend shows you his solution, which you look at, but then put away before going back to your solution. Is this cheating?

• You and your partner are working together on a PSA, but she has to go to work. You stay and finish up the assignment without her and then submit it. Is this cheating?
What Is a Computer?

• Computer
  – Performs computations and makes logical decisions
  – Millions / billions times faster than human beings

• Computer programs
  – Sets of instructions for which computer processes data

• Hardware
  – Physical devices of computer system

• Software
  – Programs that run on computers
Computer Organization

• Six logical units of computer system
  – Input unit
    • Mouse, keyboard
  – Output unit
    • Printer, monitor, audio speakers
  – Memory unit
    • RAM
  – Arithmetic and logic unit (ALU)
    • Performs calculations
  – Central processing unit (CPU)
    • Supervises operation of other devices
Evolution of Operating Systems

• Batch processing
  – One job (task) at a time
  – Operating systems developed
    • Programs to make computers more convenient to use
    • Switch jobs easier

• Multiprogramming
  – “Simultaneous” jobs
  – Timesharing operating systems
Personal, Distributed and Client/Server Computing

• Personal computing
  – Computers for personal use

• Distributed computing
  – Computing performed among several computers

• Client/server computing
  – Servers offer common store of programs and data
  – Clients access programs and data from server
1.6 Machine Languages, Assembly Languages and High-Level Languages

- **Machine language**
  - “Natural language” of computer component
  - Machine dependent

- **Assembly language**
  - English-like abbreviations represent computer operations
  - Translator programs convert to machine language

- **High-level language**
  - Allows for writing more “English-like” instructions
    - Contains commonly used mathematical operations
History of C++

• C++
  – Evolved from C
    • Evolved from BCPL and B
  – Provides object-oriented programming capabilities

• Objects
  – Reusable software components that model real-world items
History of Java

• Java
  – Originally for intelligent consumer-electronic devices
  – Then used for creating Web pages with dynamic content
  – Now also used for:
    • Develop large-scale enterprise applications
    • Enhance WWW server functionality
    • Provide applications for consumer devices (cell phones, etc.)
Java Class Libraries

• Classes
  – Contain *methods* that perform tasks
    • Return information after task completion
  – Used to build Java programs

• Java contains class libraries
  – Known as Java APIs (Application Programming Interfaces)
Other High-Level Languages

• Fortran
  – FORmula TRANslator

• COBOL
  – COmmon Business Oriented Language

• Pascal

• Basic
Structured Programming

- Structured Programming
  - Structured programs
    - Clearer than unstructured programs
    - Easier to test, debug and modify
  - Pascal designed for teaching structured programming
  - ADA
    - Multitasking
  - C
The Internet and the World Wide Web

• Internet
  – Developed over three decades ago with DOD funding
  – Originally for connecting few main computer systems
  – Now accessible by hundreds of millions of computers

• World Wide Web (WWW)
  – Allows for locating/viewing multimedia-based documents
Basics of a Typical Java Environment

• Java systems contain
  – Environment
  – Language
  – APIs
  – Class libraries
Basics of a Typical Java Environment (cont.)

• Java programs normally undergo five phases
  – Edit
    • Programmer writes program (and stores program on disk)
  – Compile
    • Compiler creates bytecodes from program
  – Load
    • Class loader stores bytecodes in memory
  – Verify
    • Verifier ensures bytecodes do not violate security requirements
  – Execute

Fig. 1.1 A typical Java environment.

Phase 1
Editor -> Disk

Program is created in the editor and stored on disk.

Phase 2
Compiler -> Disk

Compiler creates bytecodes and stores them on disk.

Phase 3
Class Loader -> Primary Memory

Class loader puts bytecodes in memory.

Phase 4
Bytecode Verifier -> Primary Memory

Bytecode verifier confirms that all bytecodes are valid and do not violate Java's security restrictions.

Phase 5
Interpreter -> Primary Memory

Interpreter reads bytecodes and translates them into a language that the computer can understand, possibly storing data values as the program executes.
To Do For Next Class:

• Go to the course web site: http://cse8afall.weebly.com

• If you haven’t already: buy a book and a clicker, and register your clicker at iClicker.com (see instructions on the syllabus)

• PSA 0: Post a “get to know you” message on Piazza

• Do the reading for Tuesday’s class (under Course Material)

• Make sure you know the answers to the reading quiz questions

• BRING YOUR CLICKER TO CLASS