Slide 1

Administrivia

- Due dates for Homework 1 posted (but due date for code might get extended). Tentative quiz dates coming soon.
- If you aren't subscribed to CSMajors, it might be a good idea — we circulate announcements of CS-related events, job opportunities, etc. Not just for majors. Instructions for subscribing on department home page.

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More Administrivia

- *Please* do not reboot the machines in this room (HAS 340); people rely on their being available for background work and remote access.

  Also be careful not to inadvertently shut them down when trying to log off.

  If a previous user has left the machine's screen locked, you can use control-alt-backspace to restart the graphical subsystem.

  If you think a reboot is needed, find a faculty member to decide and take responsibility.

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"Object Orientation"?

- A "programming paradigm" — contrast with procedural programming, functional programming, etc.
- No accepted-by-all definition, but most definitions mention encapsulation:
  - Data and functionality grouped together into "objects".
  - Some data/functionality is hidden.
- Origins in simulation/modeling, where the goal is to model complex systems consisting of many (real-world) objects.

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What's An Object?

- Object — set of data (attributes) and associated functions (methods, behaviors, operations) that can act on data.
- Objects interact by calling each other's methods, or by sending each other messages.
- Often makes sense to have many similar objects — hence "classes".

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What's a Class?

- Can be thought of as a blueprint for objects of a given type; individual objects are "instances" of the class.
- Defines attributes and methods each object will have (instance variables/methods), attributes and methods shared by all objects of a class (class variables/methods).
- Public interface — attributes and methods visible from outside the class.

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Java and Object Orientation

- Java is not purely object-oriented — also includes "primitive types" for efficiency — but it's much more strongly object-oriented than a hybrid language such as C++.
- Java programs consist of definitions of classes. (No free-standing functions like the ones in C.)
- Java variables (except primitives) are references to objects, classes define types.
- Classes, attributes, methods have varying "visibilities" (from public to private).

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Program Structure

- In Java, everything (variables and code) is part of a class. Typically have only one class per source code file (exception is inner/nested classes — more about them later).
- Any class can have a `main` method that can be launched by the runtime system (more about that later).

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Defining a Class

- Each class is like a blueprint for objects of a particular kind, and can include:
  - Variables — instance (one copy per object) or static (one copy shared by all objects).
  - Methods — similar to C functions, but can be static or non-static ("instance methods"). Instance methods are "invoked on an object'.
  - Classes (more later).
- Variables and methods can be `public` or `private`. Good practice to define as private, except for constants that need to be used outside the class.

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Tools

- Java programs are text, so you can write them with a text editor and compile and run them from the command line. (In fact I often do.)
- However, many professional programmers use an IDE (Integrated Development Environment), so we will too. We will use Eclipse, which is a free open-source tool written in Java, so you should be able to install a copy on your home machine if you like. (Versions seem to be available for Windows, Linux, and Mac OS X.)

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Naming Conventions

- Java library classes and methods follow these conventions:
  - If it's mixed-case and starts with uppercase, it's a class.
  - If it's mixed-case and starts with lowercase, it's a variable or method.
  - If it's all uppercase, it's a constant.
- You should follow them too, so your code will be easier for experienced Java programmers to read.

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Compiling and Running Programs — Java Versus C/C++

- With C/C++, your program ("source code") is transformed by a compiler into . . .

  "object code" (different for different processors), which is combined with library object code to produce . . .

  an "executable" (different for different operating systems) that can be run like other applications.

- With Java, your program (source code) is transformed by a compiler into . . .

  "byte code" (same on any processor), which is executed by . . .

  a "Java virtual machine" (which has access to library byte code).

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Example(s)

- Let's write a "hello world" program.
- We'll use Eclipse to
  - Define a project, a package, and a class with a `main` method.
  - Compile and run.
  - Generate HTML documentation.
- (Now you should know enough to start trying examples as you do the reading — and you probably should.)

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Minute Essay

- Was there anything today that was particularly unclear?
- If you have programmed in Java before, what tool(s) did you use?