Introduction

CMSC 202H

Fall 2011

Instructor

- Mr. John Park
  - Lecture Section 01
    - Tues/Thu 1:00 – 2:15 pm, Sondheim 110
  - Labs:
    - Tuesday 2:30 – 3:20 pm, Engineering 104

What is CMSC 202?

- An introduction to object-oriented programming (OOP) and object-oriented design (OOD)
  - Uses the Java programming language
  - Uses the Eclipse integrated development environment (IDE)
- Strong emphasis on proper program design
- Course website (note the ‘H’ at the end):

  www.cs.umbc.edu/courses/undergraduate/202/fall11H/

How is CMSC 202H different from regular202 sections?

1. Presumes a basic knowledge of Java syntax
   - Originally designed as an option for students taking 202 who had already taken Java in high school (e.g.: AP Computer Science A)—
     We didn't want these students to be bored in the first half (learning Java), and end up not waking up in time to do well on the second half (applying OOP)!

How is CMSC 202H different from other 202 sections?

1. Prior Java knowledge (cont.):
   - AP CompSci A syllabus only has minimal common denominator; therefore, we spend first part of 202H reviewing all basic Java elements
   - People who don't know Java, but have significant experience with another language–*with similar syntax*– should do fine
     - You know basic Java: perfect!
     - Don't know Java, but do know C/C++: still great
     - Only know JavaScript or Python: possible, but need work

How is CMSC 202H different from other 202 sections?

1. Prior Java knowledge (cont.):
   - Important decision, for those w/only Python experience:
     - How well do I understand the *semantics* of if-statements, while-loops, functions, etc.
     - How easy was it for me to pick up Python *syntax*?

How is CMSC 202H different from other 202 sections?

2. Almost same pace, but deeper coverage:
   - We will move through the basic language elements more quickly than other 202 sections
   - We will then use end of each lecture to explore the concept in greater depth
     - E.g.: we will go deeply into the motivation for generics, its history, and underlying implementation

4. Additional advanced topics at end of term:
   - Will cover threads, Swing, event-driven and asynchronous programming, etc.

How is CMSC 202H different from other 202 sections?

5. Different project structure
   - This is one of the biggest differences between 202 and 202H
   - Single large project broken up into several phases
   - At end of term, you will have built a large system that does something significant and practical.

How is CMSC 202H **NOT** different?

Some misconceptions about 202H vs. 202:

- “202H exams are *much* harder than in 202!”
  - Exams are structured very similarly, and are at roughly equivalent levels of difficulty.
- “The projects are so much more work!”
  - I gauge the assignments to make the number of hours of work across the projects about the same as in regular 202. *However*, it requires more careful THINKING (*quality*, not *quantity)*

Any Other Questions About 202H?

- Are other CMSC courses dependent upon 202H as a prerequisite?
- What does the ‘H’ designation get me?
- Are you an easy grader?
- Do you bite?

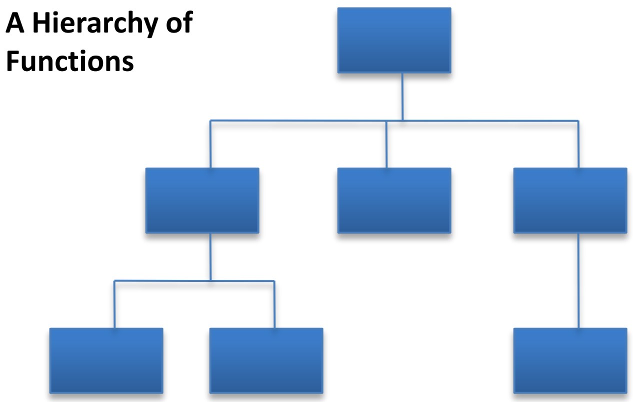
Procedural vs. OO Programming

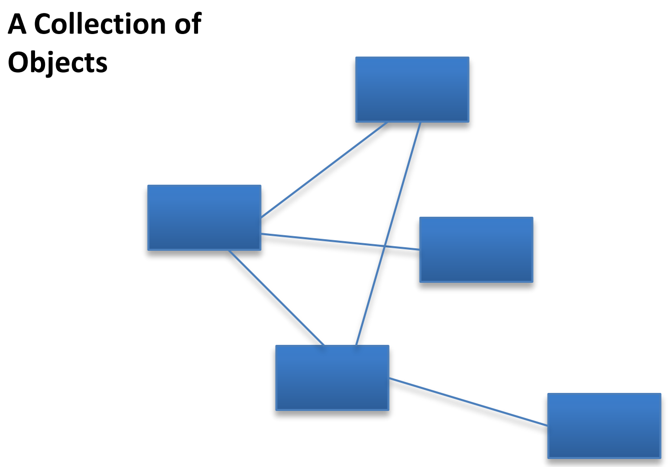
Procedural

- Modular units: functions
- Program structure: hierarchical
- Data and operations **<u>are not</u>** bound to each other
- Examples:
  - C, Pascal, Basic, Python

Object-Oriented (OO)

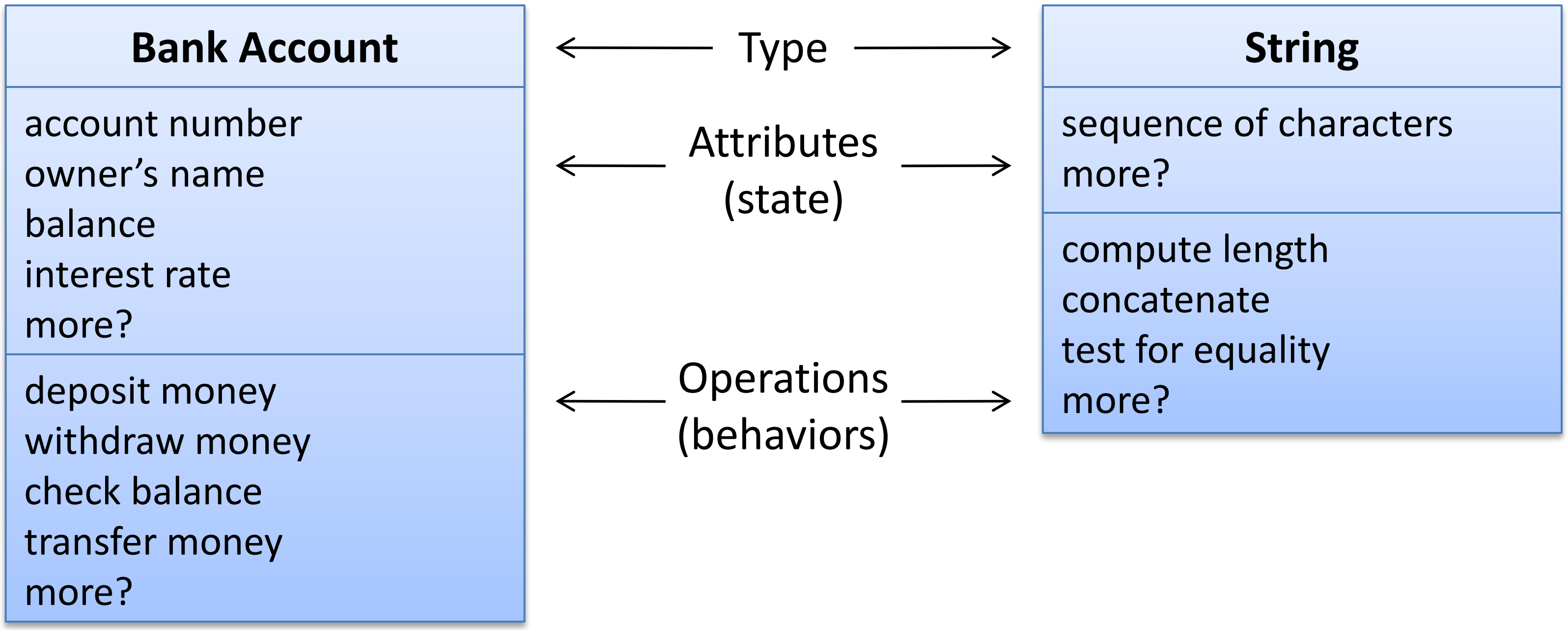
- Modular units: objects
- Program structure: a graph
- Data and operations **<u>are</u>** bound to each other
- Examples:
  - Java, C++, Ruby





What’s an Object?

- Must first define a **class**
  - A data type containing:
    - Attributes – make up the object’s “state”
    - Operations – define the object’s “behaviors”



So, an Object is…

- A particular instance of a class

Bergeron's Account

12-345-6
Ryan Bergeron
$1,250.86
1.5%

Frey's Account

65-432-1
Dennis Frey
$5.50
2.7%

Mitchell's Account

43-261-5
Susan Mitchell
$825.50
2.5%

For any of these accounts, one can…

- Deposit money
- Withdraw money
- Check the balance
- Transfer money

Why Java for 202?

- Popular modern OO language
- Wide industry usage
- Used in many types of applications
- Desirable features
  - Object-oriented
  - Portability (cross-platform)
  - Easy handling of dynamic variables
  - Garbage collection
  - Built-in GUI libraries

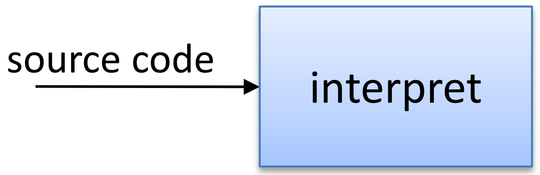
Java History

- Created by **Sun Microsystems** team led by **James Gosling** (1991)

- Originally designed for programming home appliances
  - Difficult task because appliances are controlled by a wide variety of computer processors
  - Writing a compiler (translation program) for each type of appliance processor would have been very costly
  - Solution: **two-step translation process**
    - Compile, then
    - Interpret

Interpreters, Compilers, and the JVM

Interpreted Languages (e.g. JavaScript, Perl, Ruby, Python)

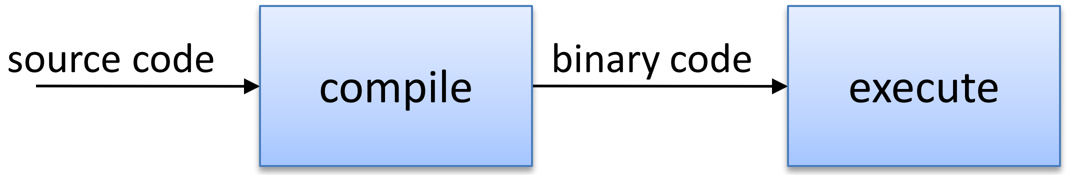


Interpreter translates code into binary and executes it

Small, easy to write

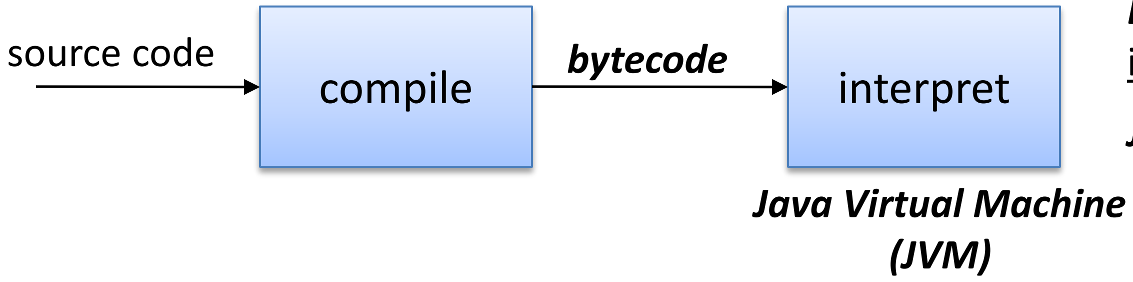
Interpreter is unique to each platform

Compiled Languages (e.g. C, C++)



Compiler is unique to each platform

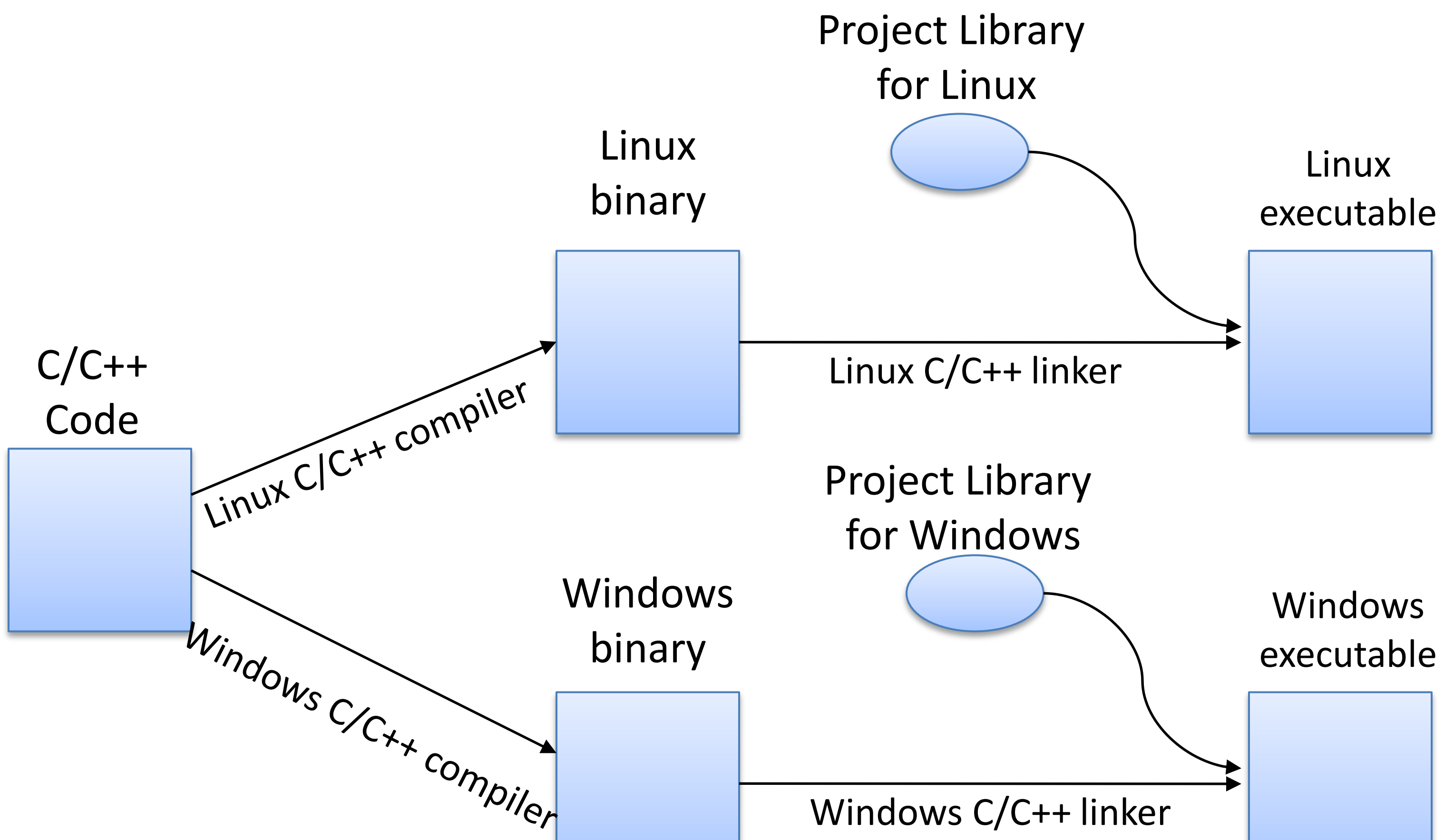
Java



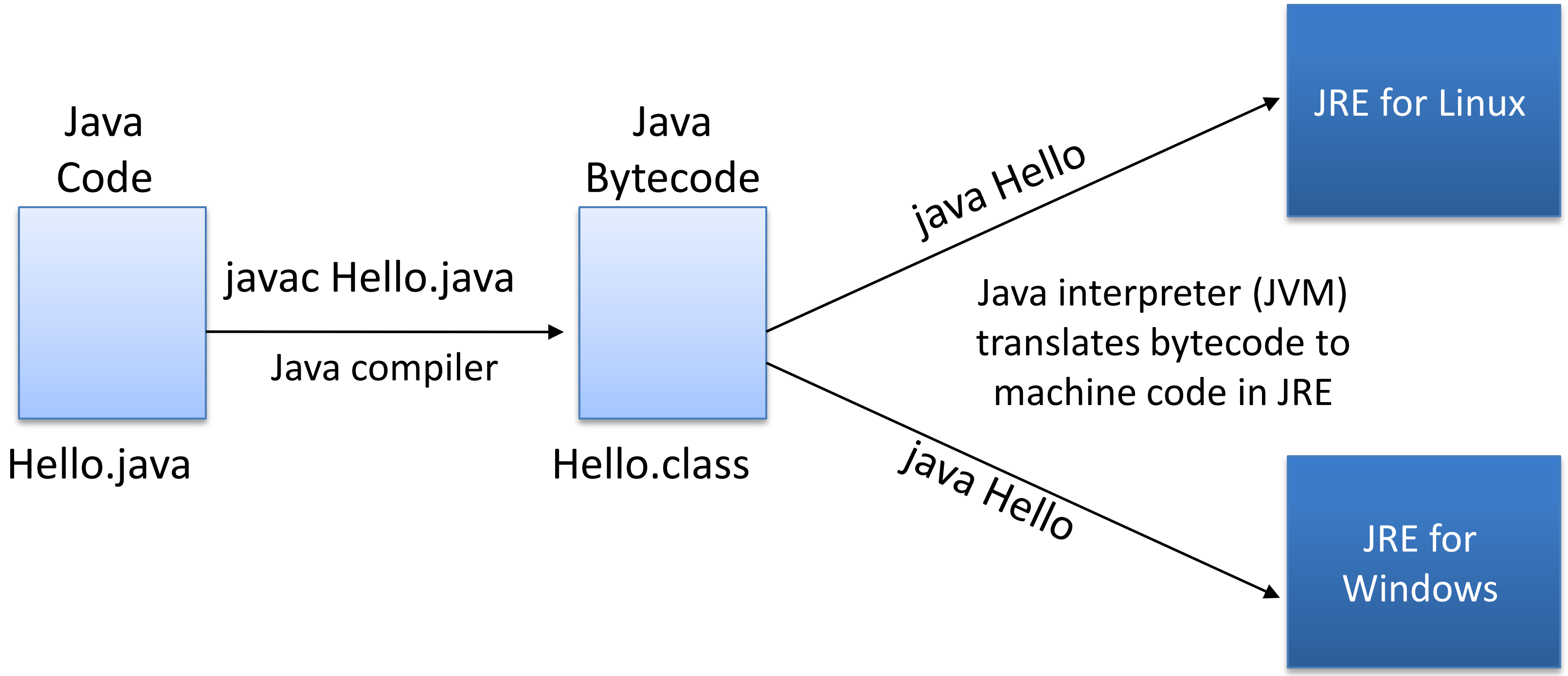
Bytecode is platform independent

JVM is unique to each platform

Compiling and Running C/C++



Compiling and Running Java



Java Terminology

- Java acronyms are plentiful and confusing. Here are the basics.
  - JVM – Java Virtual Machine
    - Translates Java bytecode to machine code
  - API – Application Programming Interface
    - The classes/methods/constants provided by libraries
  - JRE – Java Runtime Environment
    - The JVM and the Java API together
  - JDK (formerly SDK) – Java Development Kit
    - JRE + tools (compiler, debugger) for developing Java applications
  - Java SE – Java Platform, Standard Edition
    - The given edition of the JRE – standard being the most common
    - There are other versions that are tailored toward mobile devices and web environments
- To learn more about JDK, JRE, etc, visit:
  - http://www.oracle.com/technetwork/java/javase/tech/index.html

Java SE Versions

- Current version of Java: Java 7, also known as Java 1.7 or Java 1.7.0

- Previous version: Java 6, also known as Java 1.6, Java 1.6.0 or "Java 2 SE Version 6"
  - This is the version running on GL servers

- To learn more about Java version naming, see:

  http://java.sun.com/javase/namechange.html

Python vs. Java

- Python

```
print "Hello, world"
quotient = 3 / 4
if quotient == 0:
    print "3/4 == 0",
    print "in Python"
else:
    print "3/4 != 0"
```

Things to note:

- Everything has to be in some class
- We need a "main()"
- Statements end with ";"
- Variables must be declared
- "if/else" syntax different
- Statement blocks demarcated by "{...}"
- Comments are different
- Much that is similar

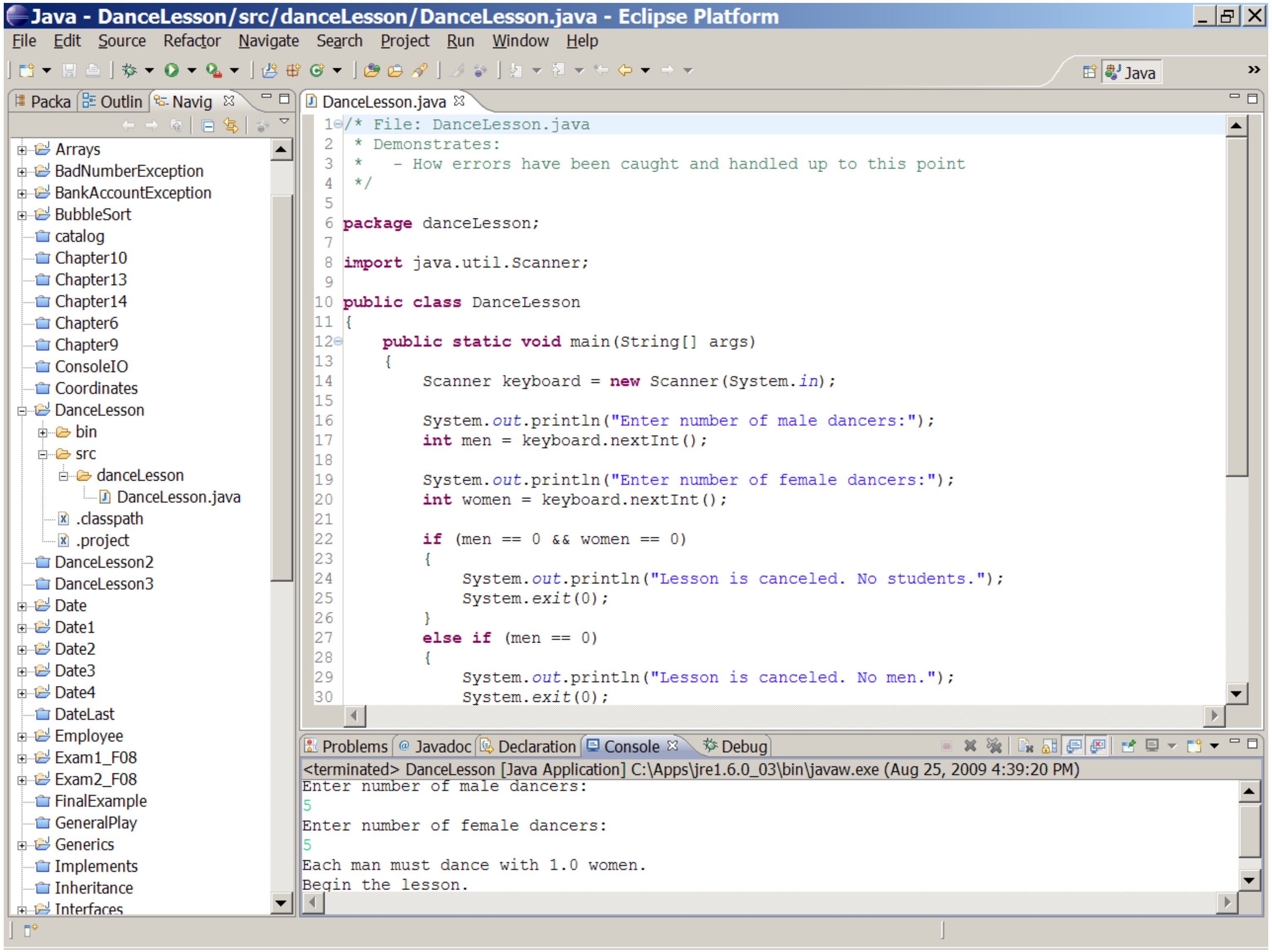
- Java

```
public class Hello {
  public static void main(String[] args) {
    int quotient;
    System.out.println("Hello, world");
    quotient = 3 / 4;
    if (quotient == 0) {
      System.out.print("3/4 == 0");
      System.out.println(" in Java");
    } else {
      System.out.println("3/4 != 0");
    }
  }
}
```

The Eclipse IDE

- An integrated development environment (IDE) for writing Java programs. Contains (minimally):
  - Editor
  - Debugger
  - Java compiler
  - Java JVM
- Free (open source) download for Windows/Linux/Mac
  - See course “Resources” page on the CMSC 202 website
- Available in all OIT labs around campus
  - We’ll show you more in Lab 1

Eclipse IDE Screenshot



```java
/* File: DanceLesson.java
 * Demonstrates:
 *    - How errors have been caught and handled up to this point
 */

package danceLesson;

import java.util.Scanner;

public class DanceLesson
{
    public static void main(String[] args)
    {
        Scanner keyboard = new Scanner(System.in);

        System.out.println("Enter number of male dancers:");
        int men = keyboard.nextInt();

        System.out.println("Enter number of female dancers:");
        int women = keyboard.nextInt();

        if (men == 0 && women == 0)
        {
            System.out.println("Lesson is canceled. No students.");
            System.exit(0);
        }
        else if (men == 0)
        {
            System.out.println("Lesson is canceled. No men.");
            System.exit(0);
```

```
<terminated> DanceLesson [Java Application] C:\Apps\jre1.6.0_03\bin\javaw.exe (Aug 25, 2009 4:39:20 PM)
Enter number of male dancers:
5
Enter number of female dancers:
5
Each man must dance with 1.0 women.
Begin the lesson.
```