Introduction

CMSC 202

Fall 2011

Instructors

- Mr. Ryan Bergeron
  - Lecture Section 01
    - Tues/Thu 1:00 – 2:15 am, Sondheim 111
  - Lecture Section 04
    - Tues/Thu 10:00 – 11:15 am, Sondheim 114
  - Lecture Section 10
    - Mon/Wed 8:30 – 9:45 am, Sondheim 110
- Ms. Susan Mitchell
  - Lecture Section 07
    - Mon/Wed 5:30 – 6:45 pm, Sondheim 204

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:

  www.cs.umbc.edu/courses/undergraduate/202/fall11/

Procedural vs. OO Programming

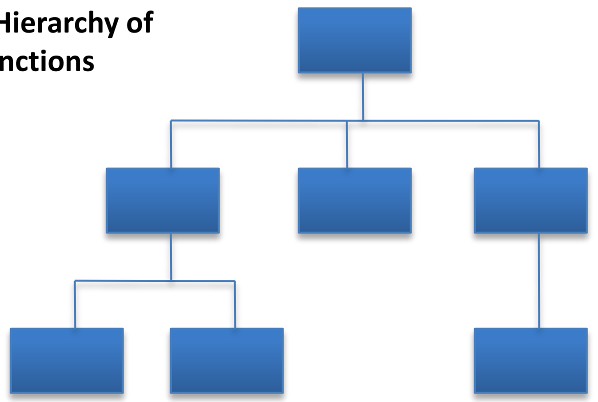
Procedural

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

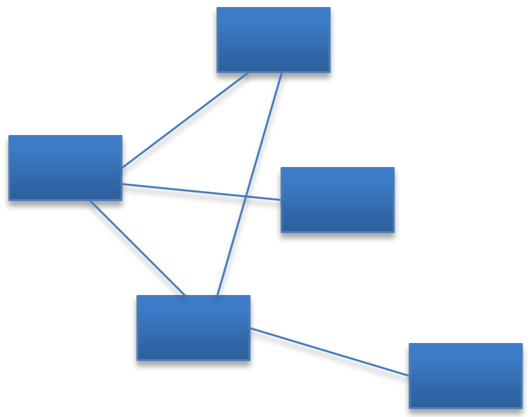
Object-Oriented (OO)

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

A Hierarchy of Functions

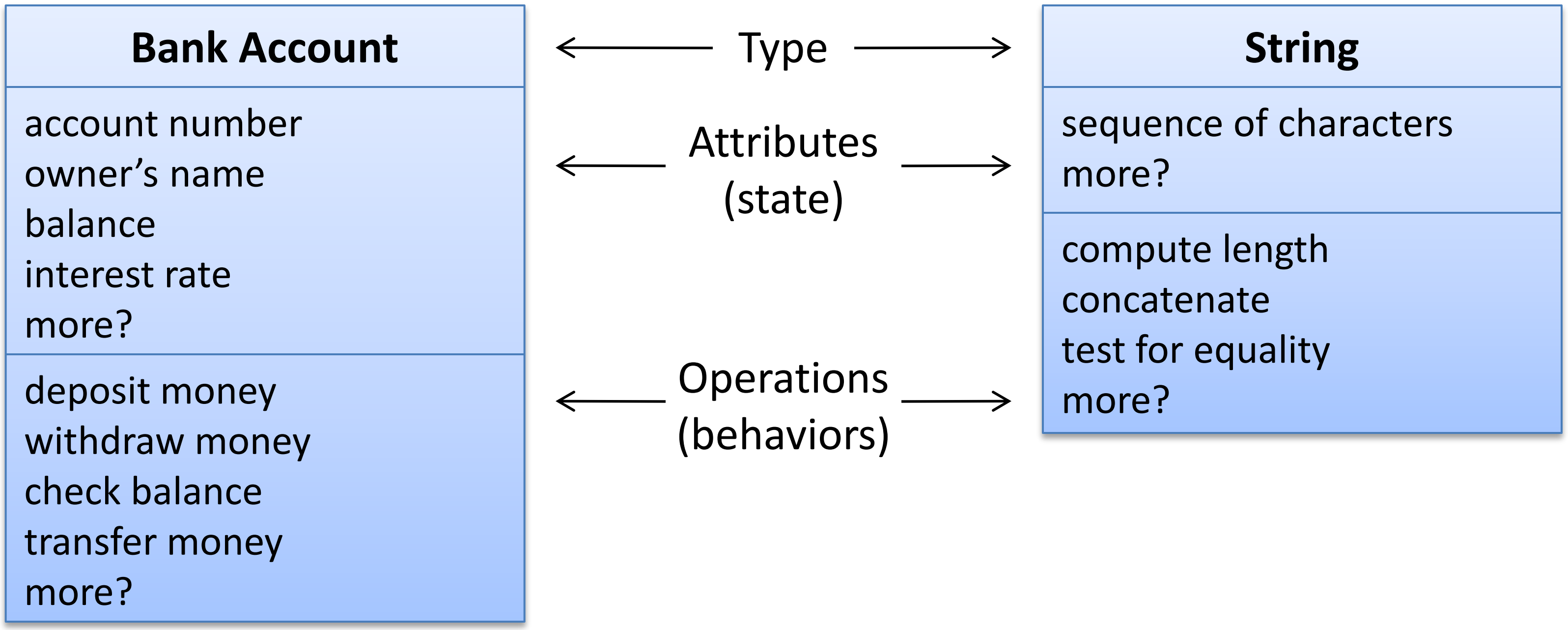


A Collection of Objects



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	**Frey's Account**	**Mitchell's Account**
12-345-6	65-432-1	43-261-5
Ryan Bergeron	Dennis Frey	Susan Mitchell
$1,250.86	$5.50	$825.50
1.5%	2.7%	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

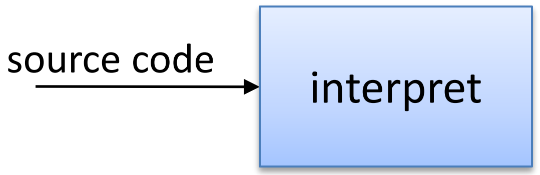
Java History

- 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)

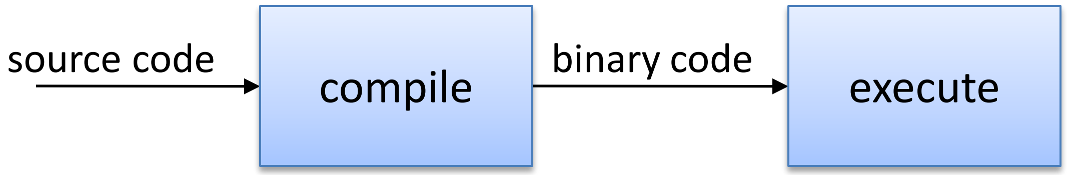


Interpreter translates code into binary and executes it

Small, easy to write

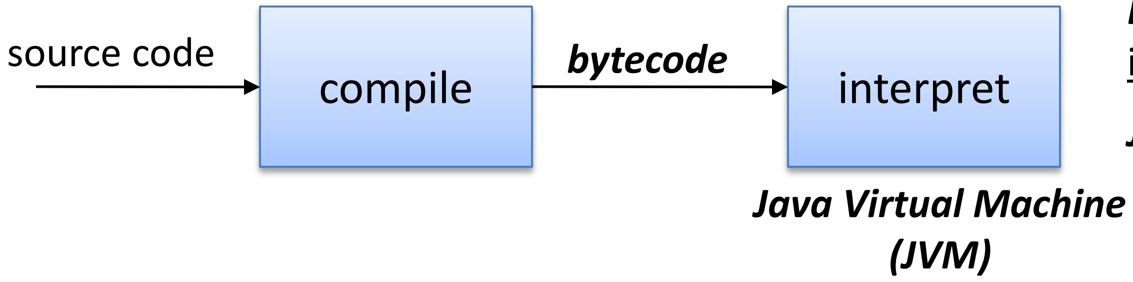
Interpreter is unique to each platform

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



Compiler is unique to each platform

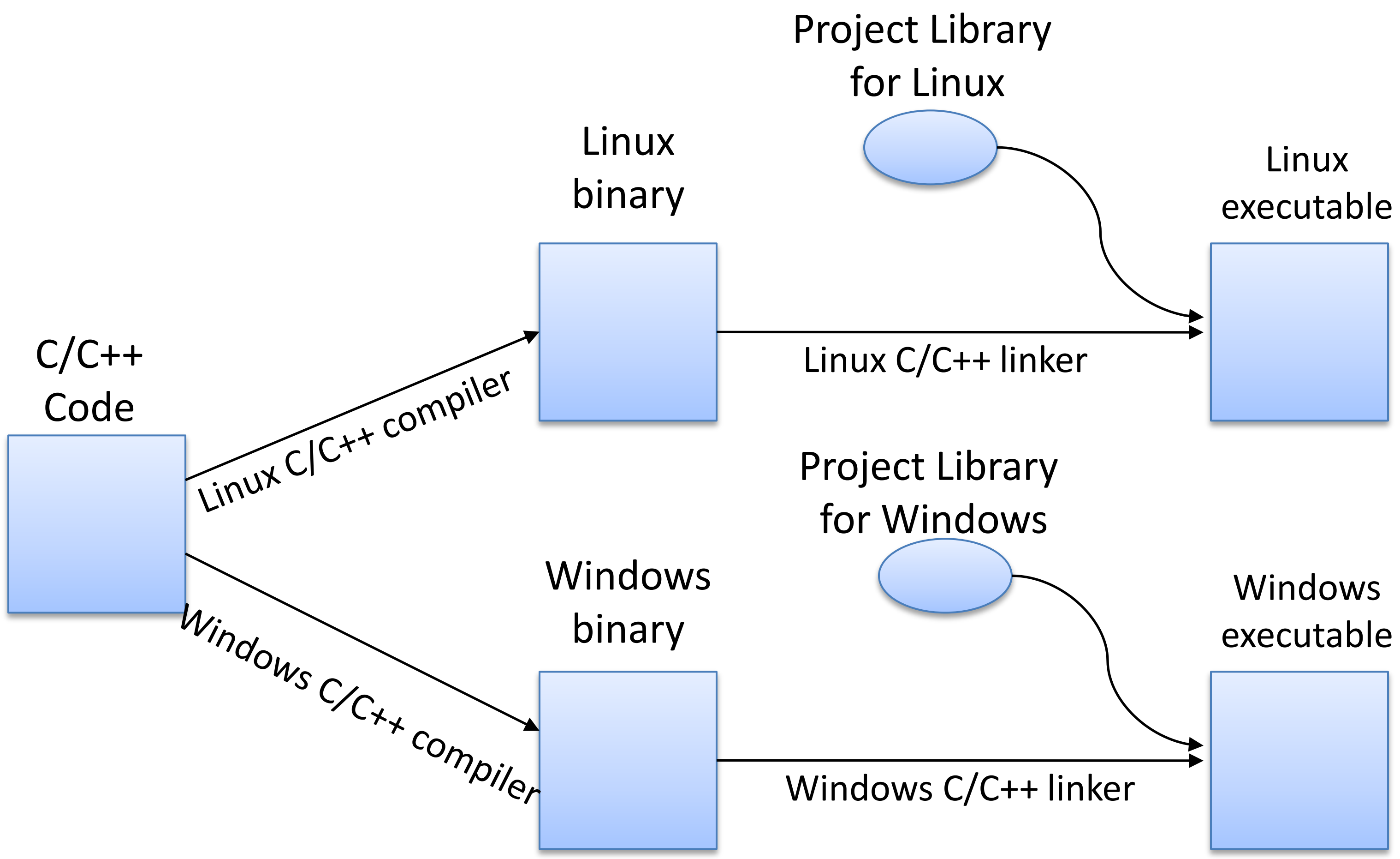
Java



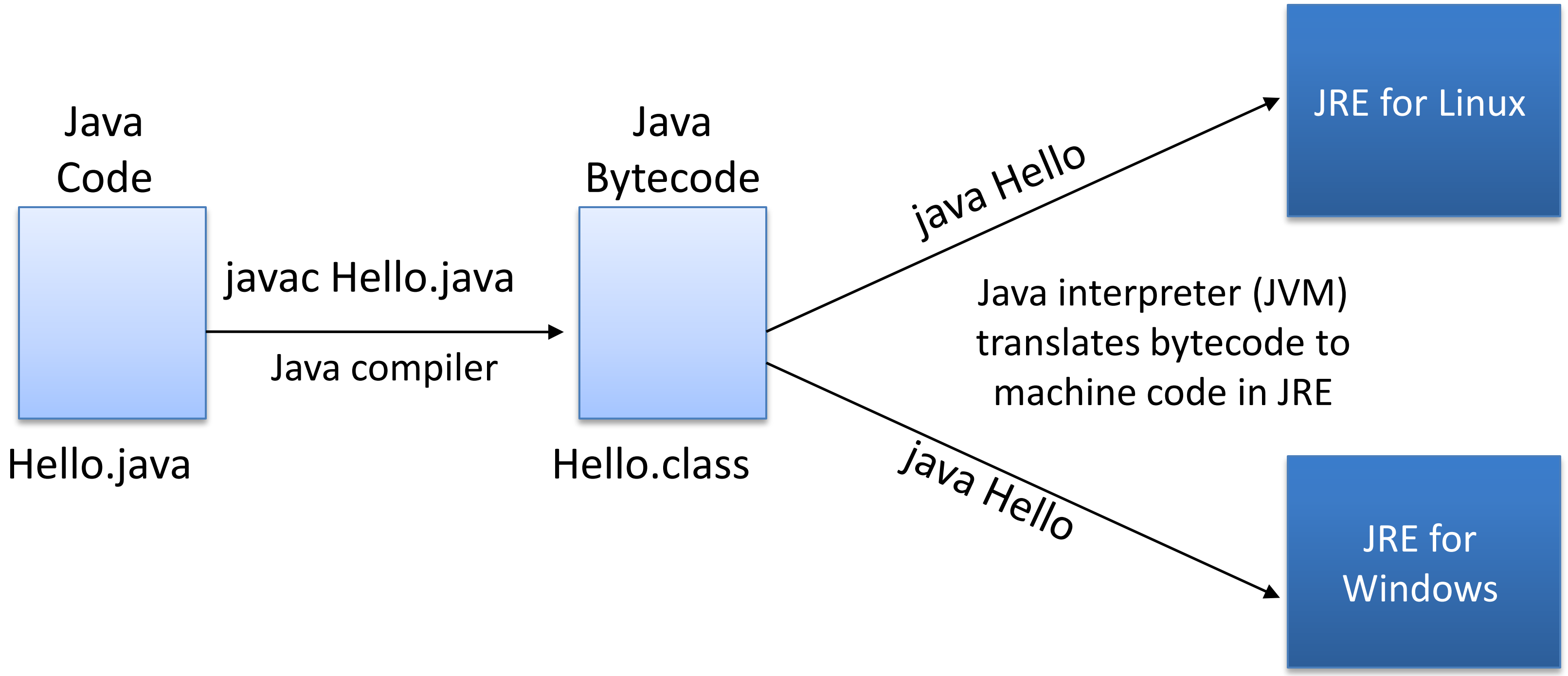
Bytecode is <u>platform independent</u>

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

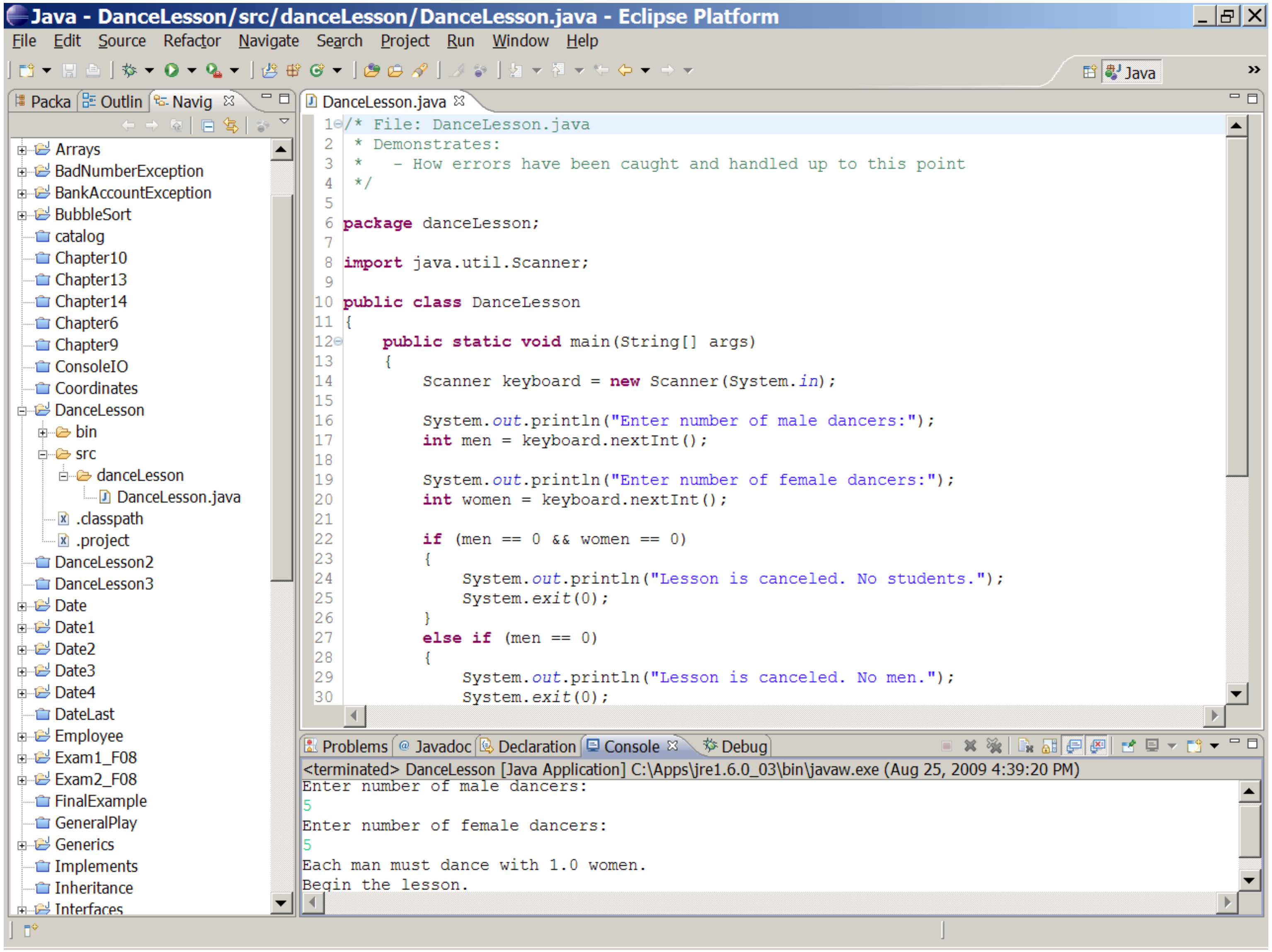
- Java

```
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.
```