CS210
Intermediate Computing with Data Structures (Java)
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Prerequisites

• I expect that you already know the Python programming language at an introductory level (usually gained by taking our CS110)
• You should be familiar with data types, variables, expressions, selection, iteration, functions, and tools in some HLL language
• If not, you should NOT take this course
  – See your advisor for other options such as retaking CS110 or taking CS119
Homework Assignments

• Reading for this class: L&C 1.1 – 1.2
• Lab 1: Read assignment for next week
Why Java?

• I liked Python in CS110. It’s easy to use. Why do I need to learn Java? It’s harder!
• In our ABET accreditation, we state that our graduates will know two languages high in industry usage, i.e. Java and C
• The marketability of the programming languages that you know is critical for getting a job!
• But, how to measure that?
Why Java?

• Four IEEE top ranked languages are*:
  – Java, C, C++, Python


• Two most popular programming languages based on Google tutorial searches**
  – Java (24.1%), Python (12.1%)

** http://pypl.github.io/PYPL.html
Why Java?

• The **TIOBE index** graph from 2002 to 2015 indicates a decades-long **Java** (dark green) and **C** (red) competition for the top position with Objective-C (dark blue) coming on strong recently due to its use in Apple products.

• Python is not even close to the top.

• Depending on how you look at it, a language may have all the latest buzz, but not be the most dominant language in industry use.
Why Java?
Why Java?

• My take on programming languages is that they come and go, but leave a huge legacy.
• There are probably trillions of lines of Java and C code in production use today that won’t be abandoned or rewritten in Python.
• When you look for a job, you will limit your options by concentrating on the latest fads and ignoring these traditional languages.
Introduction to Java

• Programming in Java
• Software Development Tools
  – Oracle/Sun Java Development Kit (JDK)
  – Dr Java
• Hello World example
Programming in Java

• A Java Program consists of multiple classes
• A programmer enters each source file (one class per .java file) and compiles all of them
• From each source, the Java compiler produces a “byte code” representation (a .class file) or provides compiler error messages without generating a .class file
• A programmer must correct all compilation errors before executing the program
Program Development Steps

- Classical “Waterfall” Development Steps

```
Edit and save source code

Compile source code to create program

Run program and evaluate results
```

Errors

Errors
Programming in Java

• A Java program can have three types of errors:
  – The compiler will find syntax errors and other basic problems (*compile-time errors*). If so, an executable version of the program (.class file) is not created
  – Problems can occur during program execution, such as trying to divide by zero, which cause the program to terminate abnormally (*run-time errors*)
  – A program may run, but produce incorrect results, perhaps using an incorrect formula (*logical errors*)
• You must learn to fix any level of error occurring
Programming in Java

• One of the classes contains a main method:
  public static void main(String [ ] args)

• The Java Virtual Machine (JVM) executes the .class files starting at the main method

• The main method can invoke other methods in the same class and/or instantiate objects of other classes and invoke their methods
Software Development Tools

- Using Sun Java SDK alone
Using Sun Java SDK Alone

• Example DOS Commands and Parameters
  C:\> edit HelloWorld.java
    (Create/edit “source file” in an external window)
  C:\> javac HelloWorld.java (creates .class file)
  C:\> java -classpath … HelloWorld
  Hello World
  C:\> exit
Software Development Tools

- We will use a combination of the Dr Java IDE and the Sun Java SDK

Diagram:

- Graphical User Interface
- Dr Java IDE
  - Edit
  - Build
  - Run
- Programmer
- Source File(s) (.java)
- Compiler (javac)
- Class File(s) (.class)
- Virtual Machine (java)
- Program executes

Parts of Sun Java SDK
On-line Demonstration: Dr Java
Software Development Tools

- Download/install the software development tools on your own PC if you wish to do your lab and project assignments at home
  - Oracle/Sun Software Development Kit (SDK)
  - Dr Java Integrated Development Environment (IDE)
  - Junit class library (to support testing)

- Use the PCs in the Healey Library labs as they already have these tools installed
Java “Hello World” Program

• Traditionally the first program taught!

```java
public class HelloWorld {
    public static void main (String [ ] args) {
        System.out.println(“Hello World”);
    }
}
```

• Enter, compile, and execute this Java class to test the development environment on your own PC