Have your iCoders out.

Reading for Thursday’s lecture: pp. 403—408, skipping section 15.1.2
* Recursion can be a difficult topic, but we’ll make it easy.

Prelim: 7:30-9PM Thursday 7 October.
Last name A-K: go to Olin Hall 155. Last name L-Z: go to Olin Hall 255.
If you have a conflict and didn’t receive an acknowledgment email yesterday, email Maria Witlox, mwitlox@cs.cornell.edu TODAY.

• Past prelims are posted to the course website. Use DrJava to check your answers!
• Thursday: A handout will explain what is on prelim 1
• Sunday: Review session, 1-3PM, Phillips Hall 101 (if you miss it, the slides will be posted)
• A3 is due Wed night on the CMS. Form any groups beforehand.

Remainder: Principles and strategies

Develop algorithm step by step, using principles and strategies embodied in “stepwise refinement” or “top-down programming”. READ Sec. 2.5 and Plive p. 2-5.
• Take small steps. Do a little at a time
• Refine. Replace an English statement (what to do) by a sequence of statements to do it (how to do it).
• Refine. Introduce a local variable —but only with a reason
• Compile often
• Intersperse programming and testing
• Write method specifications —before writing the bodies
• Separate your concerns: focus on one issue at a time

Note the similarities to outlining and writing an essay!

Outline for writing class StockQuote

1. What information do we need to store?
   • what objects? what should be in the objects, vs. what should be static? What types should the variables be?
     a) How do we implement a list? (answer: Vectors)
   b) How do we implement list-based methods?
   c) How do we actually get stock-quote data?
     i. how can we access web pages?
     ii. can we treat their contents as Strings, since we’re good at that?
     iii. how can we convert String prices to numbers?
     (answer: Wrapper classes)

An application: String processing, stepwise refinement, usefulness of Javadoc, problem solving

Strings are a particularly important type, because lots of information (especially non-numerical data) is stored in Strings.

For example, many webpages can, for many intents and purposes, be considered to be Strings.

Application: “scraping” (extracting) live stock quotes from the Web:
getQuote( "goog") will print out Google’s [ticker symbol: "GOOG"] current stock price, and store a list of all previous stock-price requests;

showRecord() will return something like this:
"[aapl @ Mon Sep 27 10:00:40 EDT 2010: $294.05, aapl @ Mon Sep 27 10:00:48 EDT 2010: $293.7, goog @ Mon Sep 27 10:09:02 EDT 2010: $534.38]"
Let's answer question one. Below, we've omitted "private" for brevity.

A. String symbol; // ticker symbol (case insensitive)
   Date time; // time the quote was taken;
   double price; // price of the stock when quote was recorded
   public static void getQuote(String s);

B. Same as A, but getQuote(String s) is not static

C. String symbol; // ticker symbol (case insensitive)
   Date time; // time the quote was taken;
   double price; // price of the stock when quote was recorded
   static ListOfStockQuotes record; // list of all requested quotes
   public static void getQuote(String s);

D. Same as C, but getQuote(String s) is not static

E. None of the above

Wrapper classes – a way to treat primitive types as objects

- Sometimes objects are required; e.g., Vectors can only store objects:
  v.add(new Integer(5)); // Integer is an object version of int
- wrapper objects provide a place to store useful methods
  An instance of class Integer contains, or "wraps", one (immutable) int value.

<table>
<thead>
<tr>
<th>Primitive type</th>
<th>Wrapper class</th>
<th>Each wrapper class has:</th>
</tr>
</thead>
<tbody>
<tr>
<td>int</td>
<td>Integer</td>
<td>• Instance methods, e.g. equals, constructors, toString,</td>
</tr>
<tr>
<td>long</td>
<td>Long</td>
<td>• Useful static constants and methods.</td>
</tr>
<tr>
<td>float</td>
<td>Float</td>
<td></td>
</tr>
<tr>
<td>double</td>
<td>Double</td>
<td></td>
</tr>
<tr>
<td>char</td>
<td>Character</td>
<td></td>
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<tr>
<td>boolean</td>
<td>Boolean</td>
<td></td>
</tr>
</tbody>
</table>

Each primitive type has a corresponding wrapper class.

Class Vector – for maintaining lists of objects [more in lab]

In the interactions pane, you can try the following (Person.java and StockQuote.java need to be in the working directory and compiled):

```java
import java.util.*;
import javax.swing.*;
Vector v = new Vector(); // v can store any object
v.add(new JFrame());
v.add(new Person("Smith", 1990, false));
void getStockQuote(); // returns toString for "Smith" (indexing starts at 0)
v.toString(); // contents of entire vector, using each object's toString()

// Important syntax: record can only store (names of) StockQuotes.
Vector<StockQuote> record= new Vector<StockQuote>();
```

You don't have to memorize the methods of the wrapper classes. But be aware of them and look them up when necessary. Use Gries/Gries, Section 5.1, and ProgramLive, 5-1 and 5-2, as references.