

## CS61B Lecture #11: Some Loose Ends and Tricks

**Readings:** Chapters 4 and 5 of the Blue Reader for next week.

**Today:** Wrapping up some loose ends and leaving explicit material on Java for now.

**Question:** Have you started Project #1 yet?

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## Loose End #1: Importing

- Writing `java.util.List` every time you mean `List` or `java.lang.regex.Pattern` every time you mean `Pattern` is annoying.
- The purpose of the **import** clause at the beginning of a source file is to define abbreviations:
  - `import java.util.List;` means "within this file, you can use `List` as an abbreviation for `java.util.List`."
  - `import java.util.*;` means "within this file, you can use *any* class name in the package `java.util` without mentioning the package."
- Importing does *not* grant any special access; it *only* allows abbreviation.
- In effect, your program always contains `import java.lang.*;`

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## Loose End #2: Static importing

- One can easily get tired of writing `System.out` and `Math.sqrt`. Do you really need to be reminded with each use that `out` is in the `java.lang.System` package and that `sqrt` is in the `Math` package (duh)?
- Both examples are of *static* members. New feature of Java allows you to abbreviate such references:
  - `import static java.lang.System.out;` means "within this file, you can use `out` as an abbreviation for `System.out`."
  - `import static java.lang.System.*;` means "within this file, you can use *any* static member name in `System` without mentioning the package."
- Again, this is *only* an abbreviation. No special access.
- Alas, you can't do this for classes in the anonymous package.

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## Loose End #3: Nesting Classes

- Sometimes, it makes sense to *nest* one class in another. The nested class might
  - be used only in the implementation of the other, or
  - be conceptually "subservient" to the other
- Nesting such classes can help avoid name clashes or "pollution of the name space" with names that will never be used anywhere else.
- Example: Polynomials can be thought of as sequences of terms. Terms aren't meaningful outside of Polynomials, so you might define a class to represent a term *inside* the Polynomial class:

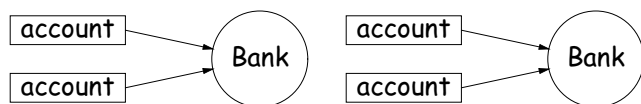
```
class Polynomial {  
  
    methods on polynomials  
  
    private Term[] terms;  
    private static class Term {  
        ...  
    }  
}
```

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## Inner Classes

- Last slide showed a static nested class. Static nested classes are just like any other, except that they can be private or protected, and they can see private variables of the enclosing class.
- Non-static nested classes are called *inner classes*.
- Somewhat rare (and syntax is odd); used when each instance of the nested class is created by and naturally associated with an instance of the containing class, like Banks and Accounts:



```
class Bank {  
    private void connectTo (...) {...}  
    public class Account {  
        public void call (int number) {  
            Bank.this.connectTo (...); ...  
        } // Bank.this means "the bank that  
        } // created me"  
    }  
}
```

```
| Bank e = new Bank(...);  
| Bank.Account p0 =  
|     e.new Account (...);  
| Bank.Account p1 =  
|     e.new Account (...);  
|  
|  
|
```

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## Loose End #4: Using an Overridden Method

- Suppose that you wish to *add* to the action defined by a superclass's method, rather than to completely override it.
- The overriding method can refer to overridden methods by using the special prefix *super*.
- For example, you have a class with expensive functions, and you'd like a memoizing version of the class.

```
class ComputeHard {  
    int cogitate (String x, int y) { ... }  
    ...  
}
```

```
class ComputeLazily extends ComputeHard {  
    int cogitate (String x, int y) {  
        if (already have answer for this x and y) return memoized result;  
        else  
            int result = super.cogitate (x, y);  
            memoize (save) result;  
            return result;  
    }  
}
```

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## Trick: Delegation and Wrappers

- Not always appropriate to use inheritance to extend something.
- Homework gives example of a TrReader, which *contains* another Reader, to which it *delegates* the task of actually going out and reading characters.
- Another example: an "interface monitor:"

```
interface Storage {  
    void put (Object x);  
    Object get ();  
}
```

```
| class Monitor implements Storage {  
|     int gets, puts;  
|     private Storage store;  
|     Monitor (Storage x) { store = x; gets = puts = 0; }  
|     public void put (Object x) { puts += 1; store.put (x); }  
|     public Object get () { gets += 1; return store.get (); }  
| }
```

- So now, you can *instrument* a program:

```
// ORIGINAL  
Storage S = something;  
f (S);
```

```
// INSTRUMENTED  
Monitor S = new Monitor (something);  
f(S);  
System.out.println (S.gets + " gets");
```

- Monitor is called a *wrapper class*.

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## Loose End #5: instanceof

- It is possible to ask about the dynamic type of something:

```
void typeChecker (Reader r) {  
    if (r instanceof TrReader)  
        System.out.print ("Translated characters: ");  
    else  
        System.out.print ("Characters: ");  
    ...  
}
```

- However, this is *seldom* what you want to do. Why do this:

```
if (x instanceof StringReader)  
    read from (StringReader) x;  
else if (x instanceof FileReader)  
    read from (FileReader) x;  
...
```

when you can just call `x.read()?!`

- In general, use instance methods rather than *instanceof*.

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