CSSE 220 Day 5

Implementing Classes in Java

Check out *ImplementingClasses* from SVN

Questions?

- Reading (Chapters 4-5)?
- Homework?
- Fraction Class?
- Drawing in Swing?
- Anything else?

- Homework grading: I will be the final arbitrator. But talk to (or email) grader first.
- List of who has graded what is online
- HW 5 programs due **Friday.**

View Grader Comments in Eclipse

- Now posted:
  - HW2: ObjectsAndMethods
  - HW3: JavadocsAndUnitTesting
- Right-click and choose Team → Update
- Look in Task view for:
  - CONSIDER
  - POINTS

Today

- Encapsulation
- Java classes:
  - Implementation details
  - Continue Fraction example
- Work on homework
  - Enhanced car class

Encapsulation in Object-Oriented Software

- *Encapsulation*—separating implementation details from how an object is used
  - Client code sees a *black box* with a known *interface*
  - Implementation can change without changing client

	Functions	Objects
Black box exposes	Function signature	Constructor and method signatures
Encapsulated inside the box	Operation implementation	Data storage and operation implementation

Q1, 2

Bank Account Example

- Essentially based on Big Java
  - But using explicit `this` references
  - And putting fields at the top of the class
- Comparing and contrasting with Python
- Source code with (Python examples in comment) is in SVN for reference

Class Definitions

```
/** javadoc… */
public class BankAccount {
    …
}
```

```
class BankAccount:
    """docstring..."""
    …
```

Access specifier, one of:
public,
protected,
private, or
default (i.e., no specifier)

Java classes are usually declared public

Java

Python

Q3

Method Definitions

```
/** javadoc… */
public void deposit(double
                    amount) {
    …
}
```

```
def deposit(self, amount):
    """docstring..."""
    …
```

Access specifier

Return type

Parameters with types, do not list "self"

Java methods usually are a mix of public and private

Java

Python

Q4,5

Constructor Definitions

```
/** javadoc… */
public BankAccount() {
    …
}
```

Access specifier

```
/** javadoc… */
public BankAccount(double
                   initAmt) {
    …
}
```

No explicit return type

Constructor name is same as class name

```
def __init__(self,
             initAmt=0.0):
    """docstring..."""
    …
```

Parameters with types, do not list "self"

Use *overloading* to handle default argument values

Java

Java constructors usually public

Python

Public Interface

- The *public interface* of an object is:
  - `public` constructors of its class, plus
  - `public` methods of its class
- The inputs and outputs of the black box
- Defines how we access the object as a user

BankAccount
BankAccount() **BankAccount**(double initAmt) void **deposit**(double amount) void **withdraw**(double amount) double **getBalance**()

Instance Field Definitions

```
/** javadoc… */
private double balance;
```

Access specifier

Type

Name

No instance field definitions in Python

Java instance fields usually `private`

An object is an *instance* of a class

Java

Python

Q10

Constructor Implementation

```java
/** javadoc… */
public BankAccount(double
                   initAmt) {
    this.balance = initAmt;
}
```

```python
def __init__(self,
             initAmt=0.0):
    """docstring..."""
    self.balance = initAmt
```

Use this inside constructors and methods to refer to implicit argument

Java

Python

Q11

Method Implementation

```java
/** javadoc… */
public double getBalance()
{
    return this.balance;
}

/** javadoc… */
public void deposit(double
    amount) {
    double newBal =
      this.balance + amount;
    this.balance = newBal;
}
```

Java

Can omit **return** for void methods

```python
def getBalance(self):
    """docstring..."""
    return self.balance

def deposit(self, amount):
    """docstring..."""
    newBal =
        self.balance + amount
    self.balance = newBal
```

Python

How To: Implement a Class

1. Find out which methods you are asked to supply
2. Specify the public interface
3. Document the public interface
4. Determine instance fields
5. ~~Implement constructors and methods~~
6. ~~Test your class~~
5. Test and implement each constructor and method

Live Coding

- Some more Fraction methods and tests

Interlude

- Ivan Sutherland's Sketchpad
  - 1962
  - The first GUI?
  - The first object-oriented system
- Alan Kay narrating video of Sketchpad:
  - http://www.youtube.com/watch?v=495nCzxM9PI

Work on Homework

- Enhance the Car example from *Big Java* Chapter 3