CSSE 220 Day 20

Inheritance recap
Object: the superest class of all
Inheritance and text in GUIs

Check out *Inheritance2* from SVN

Questions?

Exam 2 is on Tuesday, May 1, 2012 (7 – 9 PM)
Section 1: Olin 231
Section 2: Olin 233

Project Team Preference Survey

- On ANGEL, under Lessons → Assignments
- Preferences help me to choose teams; I also consider your performance so far in the course
- Complete the survey by **Monday, April 30, 2012, noon**
- Most teams will have 3 students
- Are you willing to be on a team of 2
- List up to 5 students you'd like to work with, highest preference first.
  - You may not get your first choices, so it's a good idea to list more than two
  - Best to choose partners whose commitment level and current Java coding/debugging ability is similar to yours
- List up to 2 students you'd prefer NOT to work with
  - I'll do my best to honor this, but I must find a team for everyone.

Inheritance Review

- A quick recap of last session

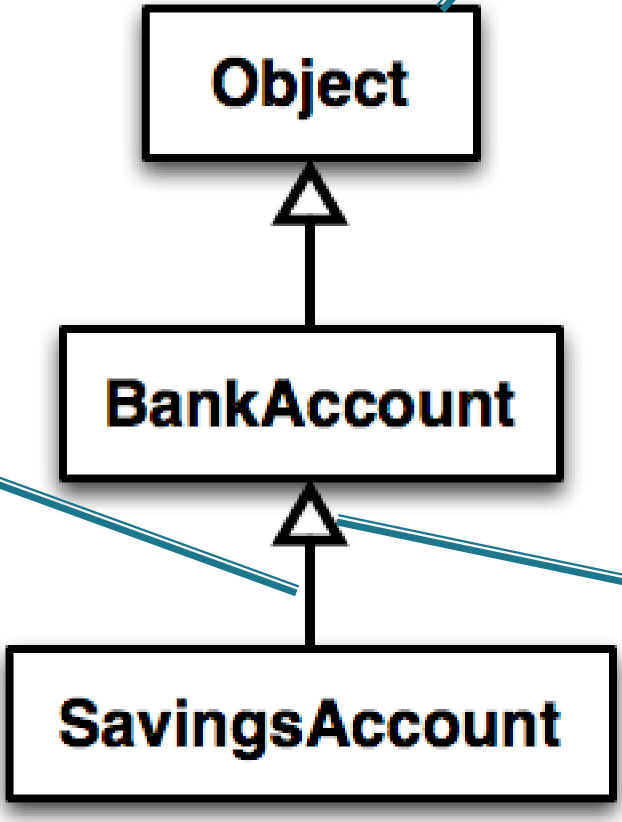
Inheritance

- Sometimes a new class is a special case of the concept represented by another
- Can "borrow" from an existing class, changing just what we need
- The new class inherits from the existing one:
  - all methods
  - all instance fields

Notation and Terminology

-
  ```
  class SavingsAccount extends BankAccount {
      // added fields
      // added methods
  }
  ```
- Say “*SavingsAccount* **is a** *BankAccount*”
- **Superclass**: *BankAccount*
- **Subclass**: *SavingsAccount*

Inheritance in UML



The "superest" class in Java

Solid line shows inheritance

Still means "is a"

With Methods, Subclasses can:

- Inherit methods unchanged

- Override methods
  - Declare a new method with same signature to use instead of superclass method

- Add entirely new methods not in superclass

With Fields, Subclasses:

- **ALWAYS inherit** all fields unchanged

- **Can add** entirely new fields not in superclass

DANGER! Don't use the same name as a superclass field!

Super Calls

- Calling superclass **method**:
  - *`super.methodName(args);`*

- Calling superclass **constructor**:
  - *`super(args);`*

Must be the first line of the subclass constructor

Access Modifiers

- *`public`*—any code can see it
- *`private`*—only the class itself can see it
- **default** (i.e., no modifier)—only code in the same **package** can see it
- *`protected`*—like default, but subclasses also have access

I, Object

- The superest class in Java

Object

- **Every** class in Java inherits from *`Object`*
  - Directly and **explicitly**:
    - *`public class String extends Object {…}`*
  - Directly and **implicitly**:
    - *`class BankAccount {…}`*
  - **Indirectly**:
    - *`class SavingsAccount extends BankAccount {…}`*

Q1

`Object` Provides Several Methods

- `String toString()`
- `boolean equals(Object otherObject)`
- `Class getClass()`
- `Object clone()`
- …

Often overridden

Sometimes useful

Often dangerous!

Q2

Overriding *toString()*

- Return a concise, human-readable summary of the object state

- Very useful because it's called automatically:
  - During string concatenation
  - For printing
  - In the debugger

- ***getClass().getName()*** comes in handy here…

Q3

Overriding `equals(Object o)`

- Should return true when comparing two objects of same type with same "meaning"
- How?
  - Must check types—use *`instanceof`*
  - Must compare state—use **cast**
- Example…

Q4

Polymorphism

- Review and Practice

Polymorphism and Subclasses

- A subclass instance **is a** superclass instance
  - Polymorphism still works!
  - `BankAccount ba = new SavingsAccount();`
    `ba.deposit(100);`
- But not the other way around!
  - `SavingsAccount sa = new BankAccount();`
    `sa.addInterest();`
- Why not?

BOOM!

Another Example

- Can use:

  -
    ```
    public void transfer(double amt, BankAccount o){
        this.withdraw(amount);
        o.deposit(amount);
    }
    ```
    in BankAccount
- To transfer between different accounts:
  - `SavingsAccount sa = …;`
  - `CheckingAccount ca = …;`
  - `sa.transfer(100, ca);`

Summary

- If B extends or implements A, we can write

  A x = new B();

Declared type tells which methods x can access. Compile-time error if try to use method not in A.

The actual type tells which class' version of the method to use.

- Can cast to recover methods from B:

  ((B)x).foo()

Now we can access all of B's methods too.

If x isn't an instance of B, it gives a run-time error (class cast exception)

Q5-7, hand in when done, then start reading BallWorlds spec

BallWorlds

- Meet your partner
- Carefully read the requirements and provided code
- Ask questions (instructor and TAs).

BallWorlds Teams – Section 1

csse220-201230-BW01, andrewca, meltonej
csse220-201230-BW02, heidlapt, mooretr
csse220-201230-BW03, thomaszk, alvareap, andersjr
csse220-201230-BW04, kohlscd, weissna
csse220-201230-BW05, shomerrt, padillbt
csse220-201230-BW06, jonescd, mccormjt
csse220-201230-BW07, antleyp, beckerja
csse220-201230-BW08, dionkm, yeomanms
csse220-201230-BW09, rodriga, fagglr
csse220-201230-BW10, johnsom2, yoons1
csse220-201230-BW11, wintoncc, bearder
csse220-201230-BW12, armacoce, patterda

Check out *BallWorlds* from SVN

BallWorlds Teams – Section 2

csse220-201230-BW21, yadavy, kowalsdj

csse220-201230-BW22, brindldc, bromenad

csse220-201230-BW23, earlesja, wellsdb

csse220-201230-BW24, huangf, hallami

csse220-201230-BW25, jennedj, petryjc

csse220-201230-BW26, finneysm, depratc

csse220-201230-BW27, brophywa, maibacmw

csse220-201230-BW28, fritzdn, phillijk

csse220-201230-BW29, lashmd, turnerrs

csse220-201230-BW30, brokllh, almisbmn

csse220-201230-BW31, abadbg, darttrf

csse220-201230-BW32, solomovl, iversoda

Check out *BallWorlds* from SVN

BallWorlds Worktime

- Pulsar, Mover, etc.

You can turn BallWorlds in on Monday before noon for full credit. If you miss that deadline, you may turn it in by Tuesday at 11:59 p.m. for 90% credit.