CSSE 220 Day 20

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

Check out *Inheritance2* from SVN

Questions?

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 Wednesday 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
  - 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. (What if you don't complete the survey?)

Inheritance Review

A quick recap of last session

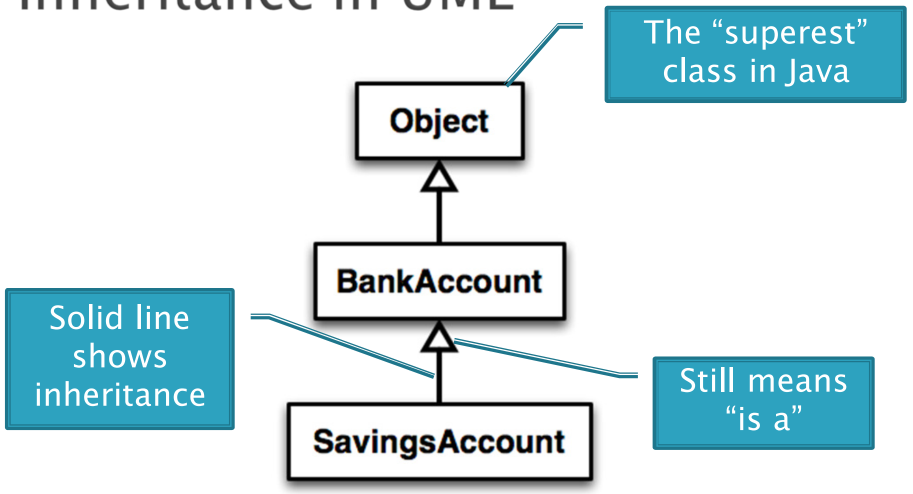
Inheritance

- 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



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

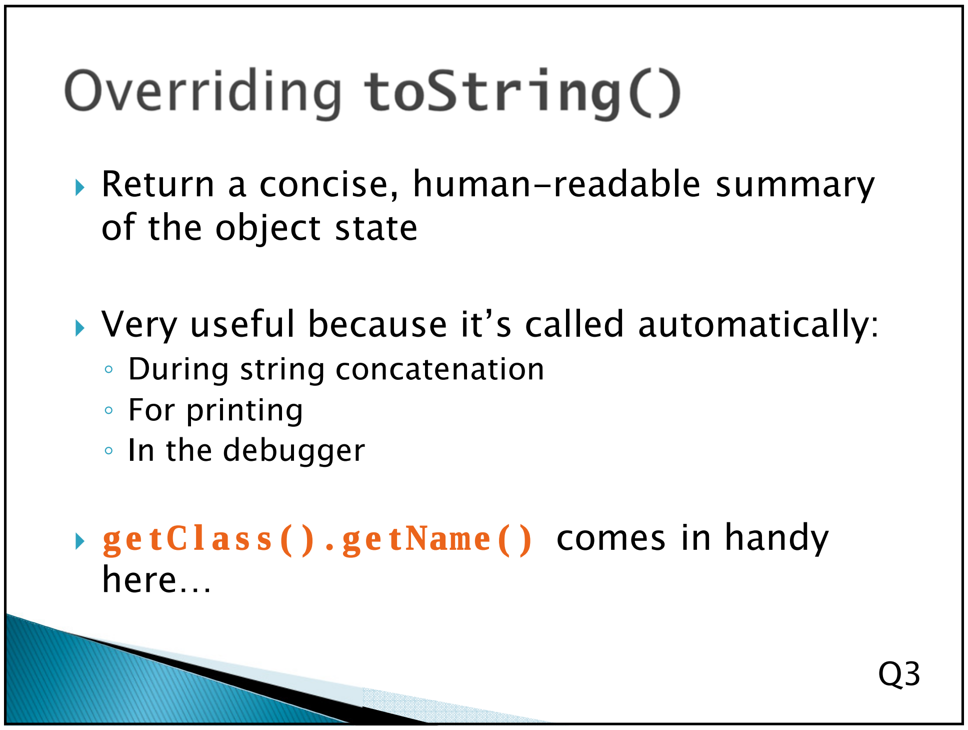
- `String toString()`
- `boolean equals(Object otherObject)`
- `Class getClass()`
- `Object clone()`
- …

Often overridden

Sometimes useful

Often dangerous!

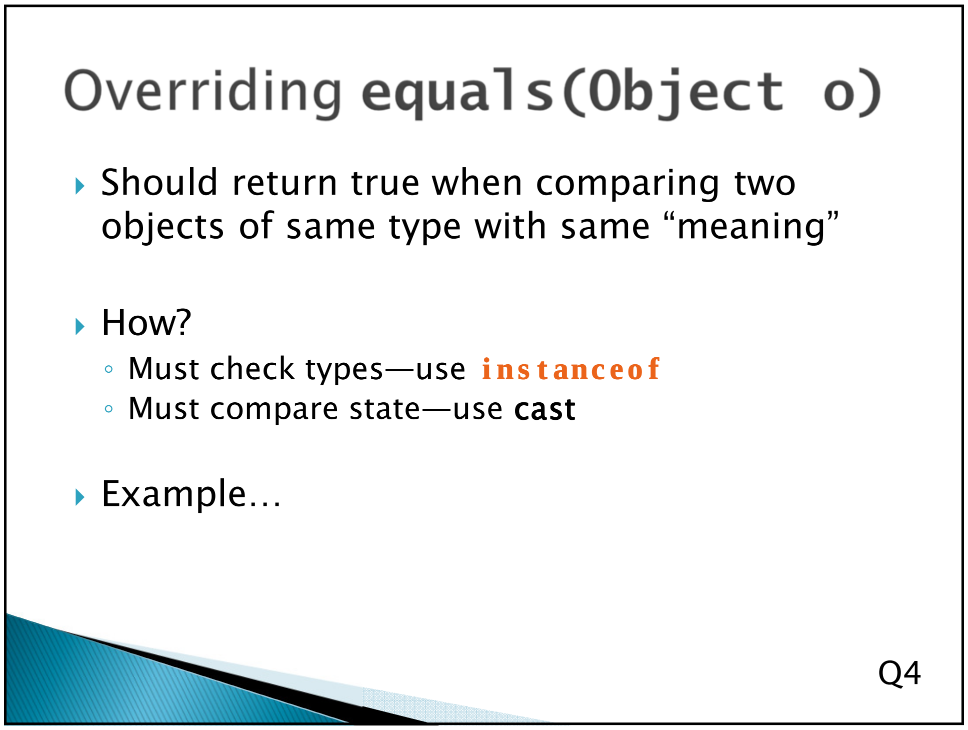
Q2



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…

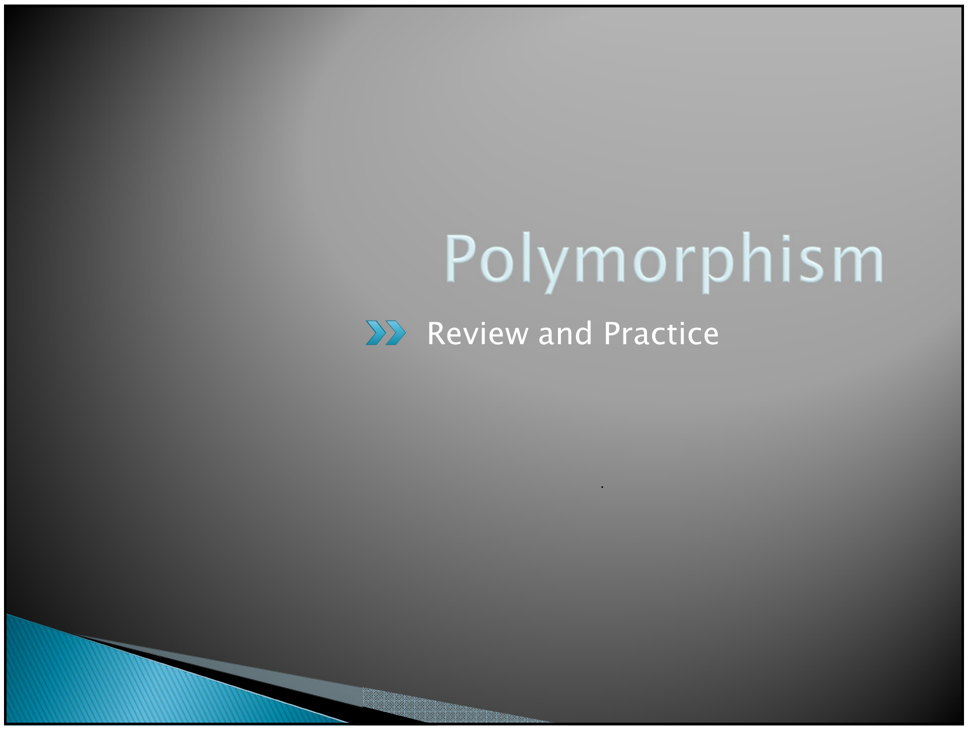
Q3



Overriding **equals(Object o)**

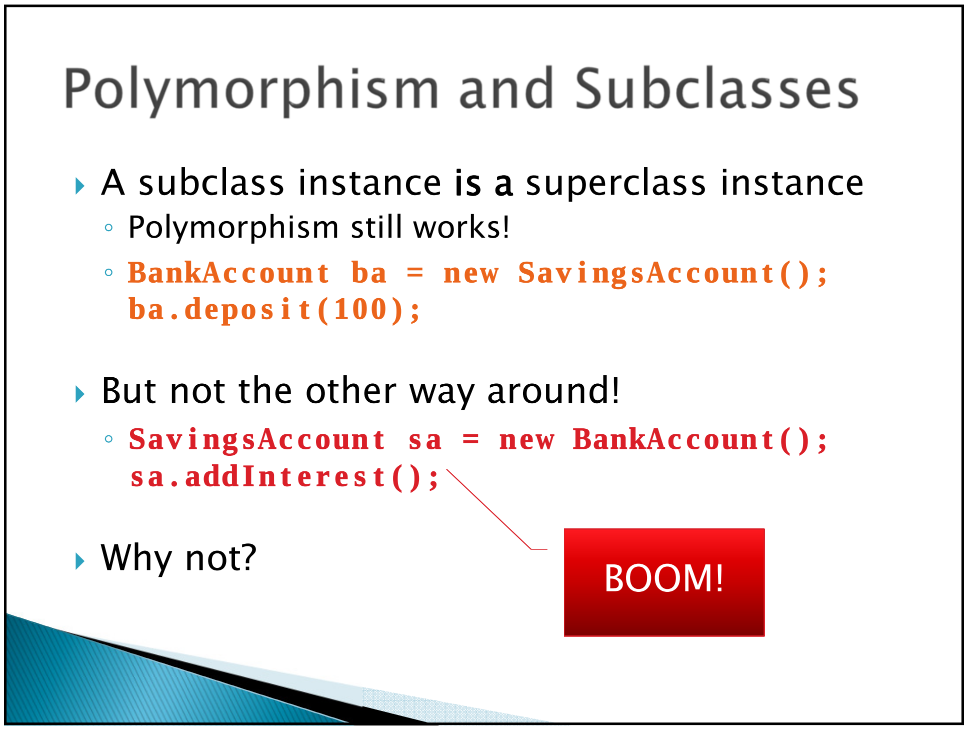
- Should return true when comparing two objects of same type with same "meaning"
- How?
  - Must check types—use **instanceof**
  - Must compare state—use **cast**
- Example…

Q4



Polymorphism

Review and Practice



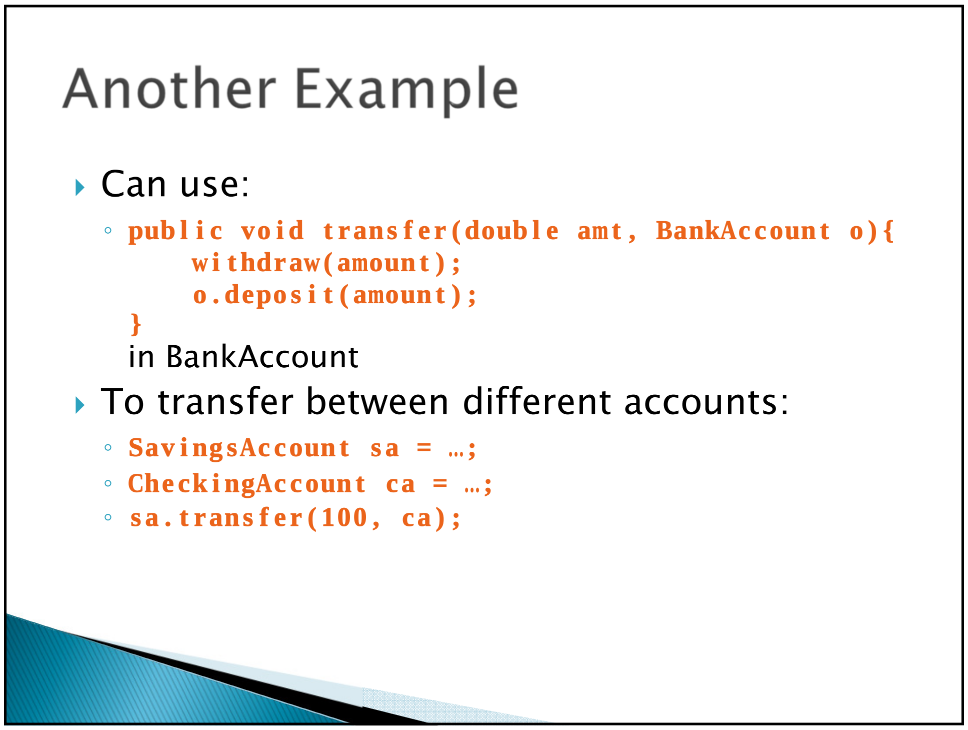
Polymorphism and Subclasses

- 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?

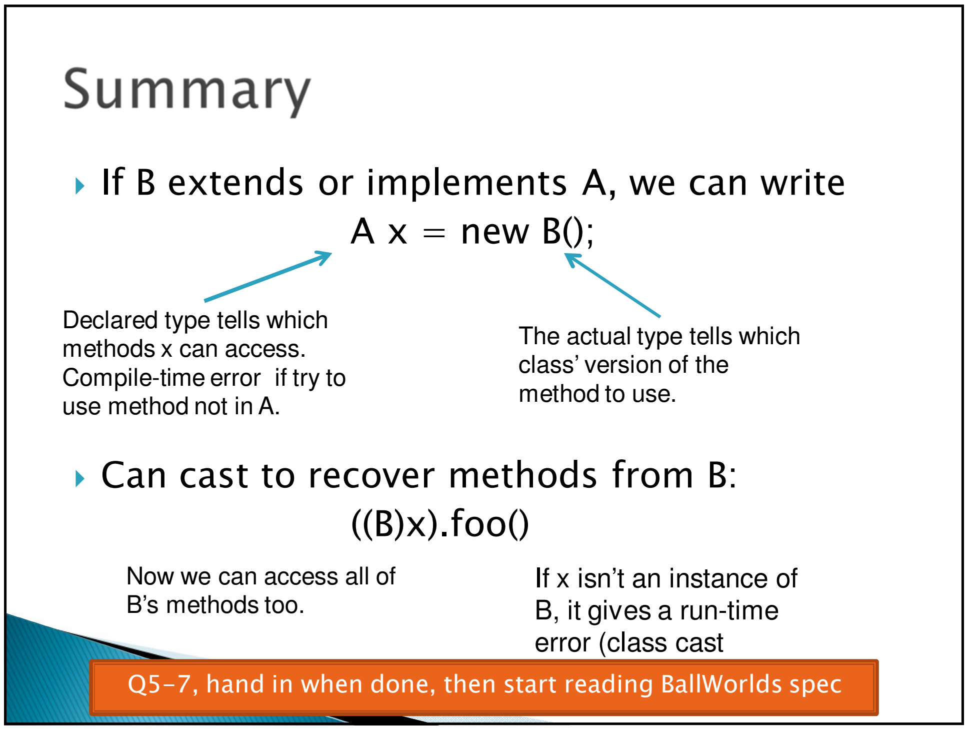
BOOM!



Another Example

- Can use:

  -
    ```
    public void transfer(double amt, BankAccount o){
        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

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

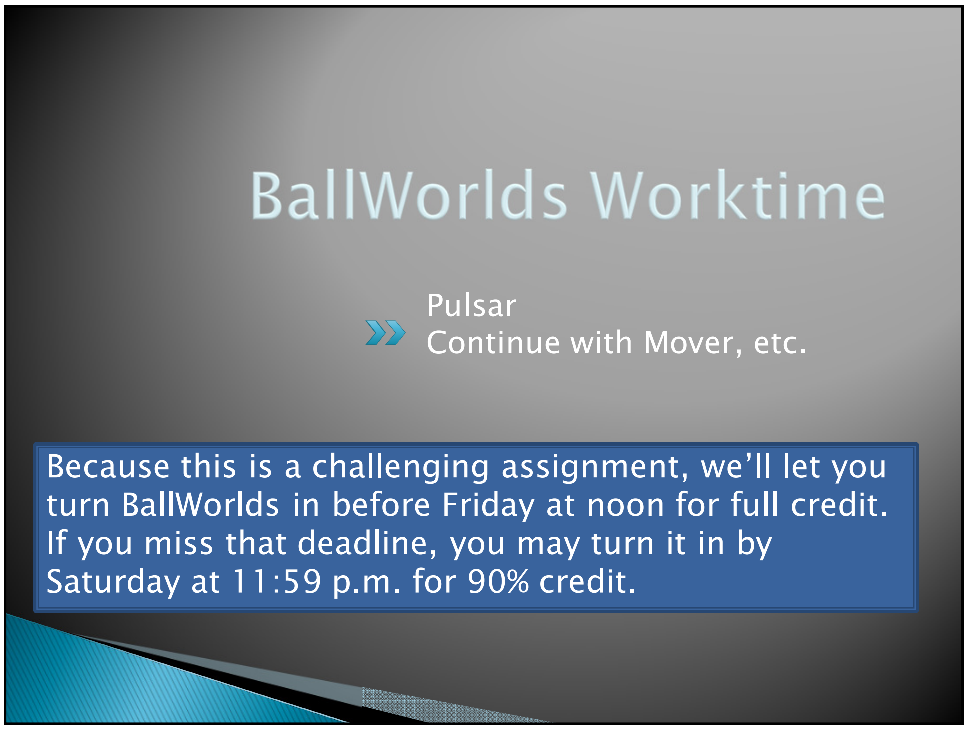
BallWorlds

- Meet your partner
- Carefully read the requirements and provided code
- Ask questions (instructor and TAs).
- Do the design exercise
- In a few minutes, we'll code Pulsar together

BallWorlds Teams – Anderson

csse220-201210-bw-11,collinka,kleinerk
csse220-201210-bw-12,dooleykh,mitchesm
csse220-201210-bw-13,huangz,manganpt
csse220-201210-bw-14,kowalsif,pfeiffkm
csse220-201210-bw-15,lius,weil
csse220-201210-bw-16,millerns,richarsm
csse220-201210-bw-17,dykestm,niz
csse220-201210-bw-18,stopkadj,yuhasmj
csse220-201210-bw-19,ryanlf

Check out *BallWorlds* from SVN



BallWorlds Worktime

- Pulsar
  Continue with Mover, etc.

Because this is a challenging assignment, we'll let you turn BallWorlds in before Friday at noon for full credit. If you miss that deadline, you may turn it in by Saturday at 11:59 p.m. for 90% credit.