CSSE 220 Day 19

Inheritance

Check out *Inheritance* from SVN

Questions?

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

Q1

Examples

- *class SavingsAccount extends BankAccount*
  - adds interest earning, keeps other traits
- *class Employee extends Person*
  - adds pay information and methods, keeps other traits
- *class Manager extends Employee*
  - adds information about employees managed, changes the pay mechanism, keeps other traits

Notation and Terminology

- ```
  class SavingsAccount extends BankAccount {
      // added fields
      // added methods
  }
  ```

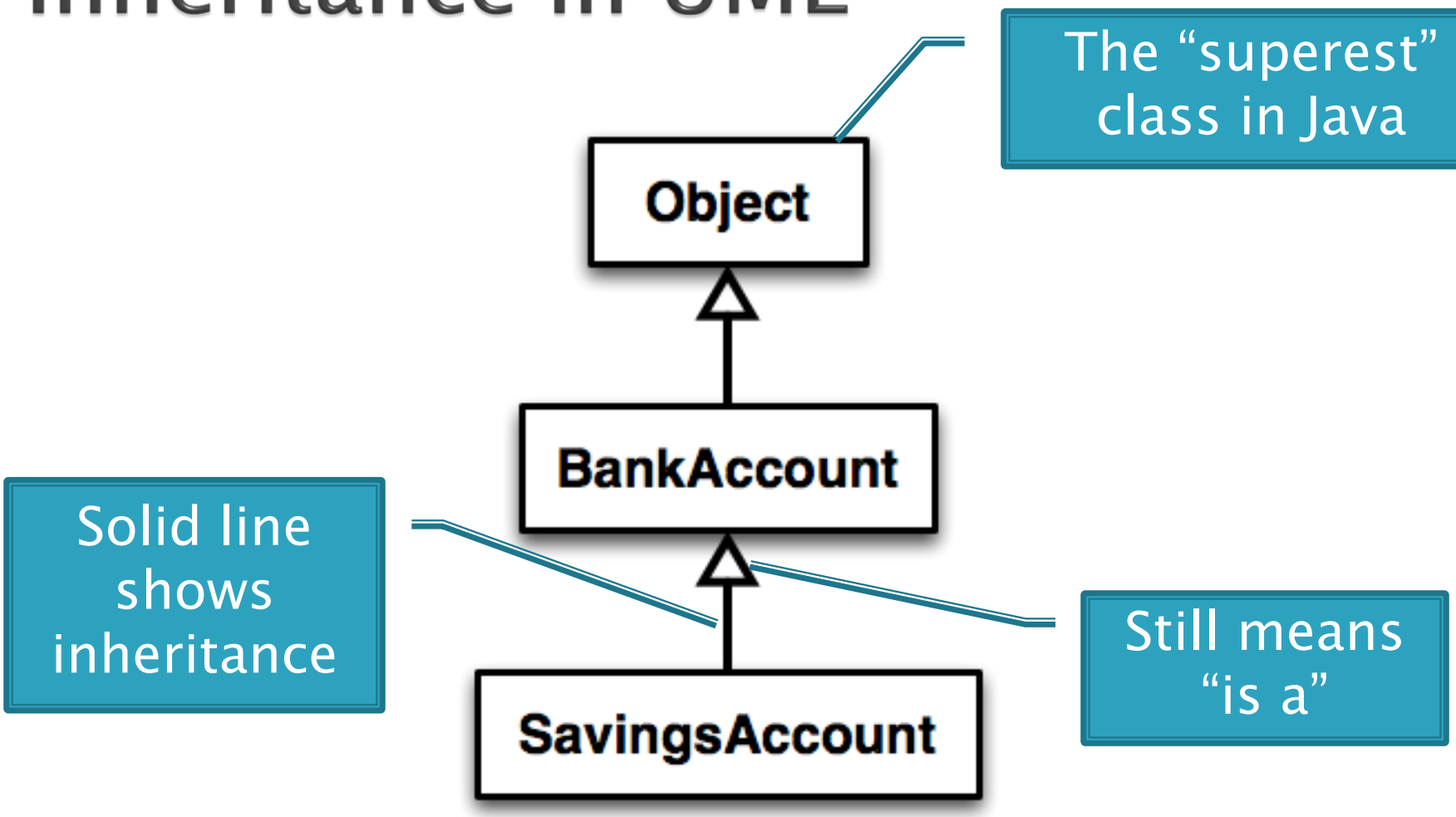
- Say "*SavingsAccount* **is a** *BankAccount*"

- **Superclass**: *BankAccount*

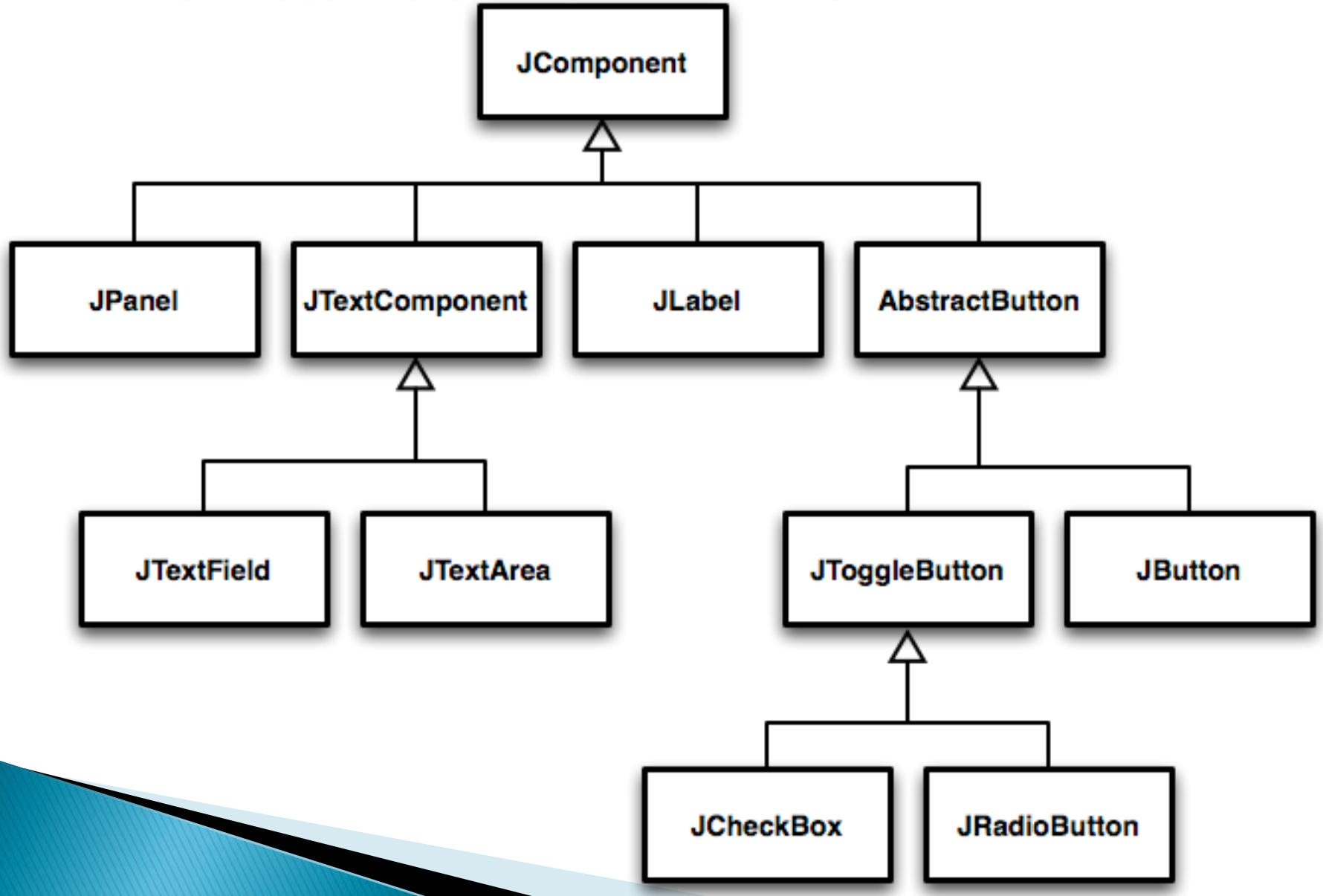
- **Subclass**: *SavingsAccount*

Q2
  ```

Inheritance in UML



Inheritance Run Amok?



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

Q4

With Fields, Subclasses:

- **ALWAYS inherit** all fields **unchanged**

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

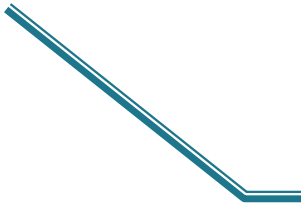
DANGER! Don't use the same name as a superclass field!

Q5

Super Calls

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

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



Must be the first line of the subclass constructor

Q6

Polymorphism and Subclasses

- A subclass instance **is a** superclass instance
  - Polymorphism still works!
  - ```
    BankAccount ba = new CheckingAccount();
    ba.deposit(100);
    ```

For client code reuse

- But not the other way around!
  - ```
    CheckingAccount ca = new BankAccount();
    ca.deductFees();
    ```
- Why not?

BOOM!

Q7

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);
    ```

Abstract Classes

- Hybrid of superclasses and interfaces
  - Like regular superclasses:
    - Provide implementation of some methods
  - Like interfaces
    - Just provide signatures and docs of other methods
    - Can't be instantiated
- Example:
  - ```
    public abstract class BankAccount {
        /** documentation here */
        public abstract void deductFees();
        …
    }
    ```

Elided methods as before

Also look at the code in the shapes package, especially ShapesDemo (during or after class)
    ```

Access Modifiers

- Review
  - *public*—any code can see it
  - *private*—only the class itself can see it

- Others
  - **default** (i.e., no modifier)—only code in the same package can see it
    - good choice for classes
  - *protected*—like default, but subclasses also have access
    - sometimes useful for helper methods

Bad for fields!

Q8

Work Time

- Linear Lights Out

It's a solo project, but feel free to talk with others as you do it.

And to ask instructor/assistants for help

Q9-Q10

BallWorlds Introduction

- Demo
  UML Design Questions