Announcements

- P6 due Dec 1 (last Thursday of classes!)
- Final exam conflict: You must inform us by 3pm on Friday, 11/17. You need to provide your entire exam schedule during the exam period.
- CIT survey on classroom technologies available online (see course website). Please help us evaluate, and improve, the use of classroom technologies! Thanks in advance!

- Previous Lecture:
  - Inheritance—extending a class
  - Constructor in the subclass
- Today's Lecture:
  - Overriding methods
  - Using super to access members from the superclass
  - What is "polymorphism"?
- Reading:
  - Sec 7.2. Optional: Sec 7.3

Calling one constructor from another

- In a subclass' constructor, call the superclass' constructor with the keyword super instead of the superclass' (constructor's) name
- To call another constructor from a constructor in the same class, use the keyword this
- Always make a call to a constructor (super or this) as the 1st statement in a constructor in a subclass!

Overriding methods

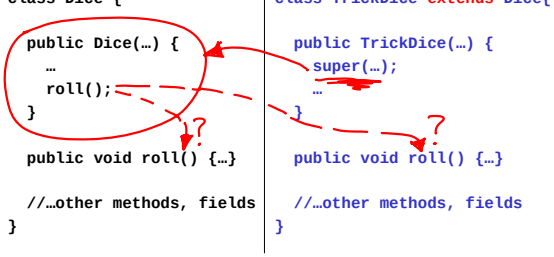
- Subclass can *override* definition of inherited method
- New method in subclass must have same signature as superclass (but has different method body)
- Which method gets used??

  The object that is used to invoke a method determines which version is used
- Method declared to be **`final`** cannot be overridden
- Do not confuse *overriding* with *overloading*!

Overridden methods: which version gets invoked?
To create TrickDice: call the TrickDice constructor, which calls the Dice constructor, which calls the roll method.
Which roll method gets invoked?

```
class Dice {

  public Dice(…) {
    …
    roll();
  }

  public void roll() {…}

  //…other methods, fields
}
```

```
class TrickDice extends Dice{

  public TrickDice(…) {
    super(…);
    …
  }

  public void roll() {…}

  //…other methods, fields
}
```



Accessing members in superclass

super

- From constructor in subclass, call superclass' constructor
- Access superclass' version of a overridden method. E.g.:

super.toString()

`static` methods & variables

- Do not re-declare `static` components!
- Same rules for inheritance (accessibility) with respect to visibility modifiers
- Static method: implicitly **`final`**
- Static variable: same memory space as superclass

Important ideas in inheritance

- Single inheritance
- Keep common features as high in the hierarchy as reasonably possible
- Use the superclass' features as much as possible
- "Inherited" ⇒ "can be accessed as though declared locally"
  (**`private`** variables in superclass *exists* in subclasses; they just cannot be accessed directly)
- Inherited features are continually passed down the line
- Use different hierarchies for different problems

Polymorphism

- "Have many forms"
- A *polymorphic* reference refers to different objects (related through inheritance) at different times

Suppose class Plane extends Vehicle

```
Vehicle mover; //a Vehicle reference
Plane flyer;   //a Plane reference
mover= new Vehicle(...);
flyer= new Plane(...);
// A plane is a vehicle
   mover= new Plane(...);
   mover= flyer;
// A vehicle is not a plane
   flyer= new Vehicle(...); //invalid
```


Another polymorphic example

```
Vehicle[] mover = new Vehicle[5];

mover[0]= new Vehicle(...);
mover[1]= new Plane(...);
mover[2]= new Plane(...);
mover[3]= mover[1];
```

The reference type may not be the same as the object type!

Accessing methods/variables through a polymorphic reference

Dice d= new TrickDice(...);

Consider the reference type and object type:

1. Which type determines whether a method/variable can be accessed?
2. For an overridden method, which type determines which version gets invoked?