CS100J Classes, stepwise refinement 20 September 2007

Miscellaneous points about classes.
More on stepwise refinement.

Prelim 7:30-9:00 Tuesday, 25 Sept.

Review session: 1:00-3:00, Sunday, 23 Sept., in Philips 101

Rsrecah on spleilng

Aoccdrnig to a rscheearch at Cmabirgde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is that the frsit and lsat ltteer be at the rghit pclae. The rset can be a total mses and you can sitll raed it wouthit porbelm.Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

Help: Get it now if you need it!!

- One-on-one help from TAs. For info, get on the course website and click "Staff-info".
- Call Cindy Pakkala 255-8240 for an appointment with Gries.
- See a consultant in the ACCEL Sun, Mon, Tues, Thurs 2:30pm to 11pm. Wed, 3:35-11:00pm..
- Peer tutoring (free). On http://www.engineering.cornell.edu, click on "student services". On the page that comes up, click on "Learning Initiatives (L.I.F.E.) in the left column, upper part. Then, click on "peer tutoring" in the left column.
- Take an AEW courses. Ask in Olin 167.

Content of this lecture

This lecture contains some final miscellaneous points to round out your knowledge of classes and subclasses. There are a few more things to learn after this, but we"ll handle them much later.

- Inheriting fields and methods and Overriding methods. Sec. 4.1 and 4.1.1: pp. 142–145
- Purpose of **super** and **this**. Sec. 4.1.1, pp. 144–145.
- More than one constructor in a class; another use of **this**. Sec. 3.1.3, pp. 110–112.
- Method equals in class Object. Sec. 4.3 and 4.3.1, pp. 154–155. (We do not cover the method at the end of Sec. 4.3.1.)
- Constructors in a subclass — calling a constructor of the super-class. Sec. 4.1.3, pp. 147–148.


```
public class Employee {/** Instance: a person's name, year hired, and salary */
  private String name;     // Employee's name
  private int start;       // Year hired
  private double salary= 50000;   // Salary
  /** Constructor: a person with name n, year hired d, salary s */
  public Employee(String n, int d) { name= n; start= d; salary= s;}
  /** = name of this Employee */
  public String getName() { return name; }
  /** Set the name of this Employee to n */
  public void setName(String n)  { name= n; }
  /** = year this Employee was hired */
  public int getStart() { return start; }
  /** Set the year this Employee was hired to y */
  public void setStart(int y) { start= y; }
  /** = Employee's total compensation (here, the salary) */
  public double getCompensation() { return salary; }
  /** Change this Employee's salary to d */
  public void changeSalary(double d)  { salary= d; }
  /** = String representation of this Employee */
  public String toString()
    { return getName() + ", year " + getStart() + ", salary " + salary; }
}
```

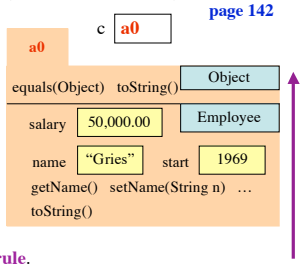
This class is on page 105 of the text.

Employee c= **new** Employee("Gries", 1969, 50000);
c.toString()

Sec. 4.1, page 142

Which method toString() is called?

Overriding rule:
To find out which is used, start at the bottom of the class and search upward until a matching one is found.



Also called the **bottom-up rule**.

Terminology. Employee **inherits** methods and fields from Object. Employee **overrides** function toString.

Purpose of super and this

Sec. 4.1, pages 144-145

In a method, **this** equals the name of the object in which it appears. **super** is similar but refers only to components in the super-class partition of the object (and above).

```
/** = String representation of this Employee */
public String toString() {
    return this.getName() + ", year " + getStart() + ", salary " + salary;
}
```

ok, but unnecessary

```
/** = toString value from superclass */
public String toStringUp() {
    return super.toString();
}
```

necessary

A second constructor in Employee
Provide flexibility, ease of use, to user

Sec. 3.1.3, page 110

```
/** Constructor: a person with name n, year hired d, salary s */
public Employee(String n, int d, double s) {
      name= n; start= d; salary= s;
 }
```
First constructor

```
/** Constructor: a person with name n, year hired d, salary 50,000 */
   public Employee(String n, int d) {
      name= n; start= d; salary= 50000;
}
```
Second constructor; salary is always 50,000

```
/** Constructor: a person with name n, year hired d, salary 50,000 */
   public Employee(String n, int d) {
      this(n, d, 50000);
}
```
Another version of second constructor; calls first constructor

Here, **this** refers to the other constructor.
You HAVE to do it this way

Subclass Executive

```
/** An executive: an employee with a bonus. */
public class Executive extends Employee {
   private double bonus; // yearly bonus
   /** Constructor: name n, year hired d, salary 50,000, bonus b */
   public Executive(String n, int d, double b) {
      super(n, d);
      bonus= b;
   }
   /** = this executive's bonus */
   public double getBonus()   { return bonus; }
   /** = this executive's yearly compensation */
   public double getCompensation()
      { return super.getCompensation() + bonus; }
   /** = a representation of this executive */
   public String toString()
      { return super.toString() + ", bonus " + bonus; }
}
```

super(n,d) calls a constructor in the superclass to initialize the superclass fields

super. means that the function in the superclass will be called.

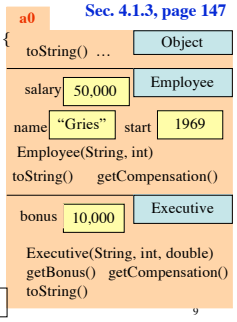
Calling a superclass constructor from the subclass constructor

Sec. 4.1.3, page 147

```
public class Executive extends Employee {
  private double bonus;
  /** Constructor: name n, year hired
          d, salary 50,000, bonus b */
  public Executive(String n, int d, double b) {
     super(n, d);
     bonus= b;
   }
}
```

The first (and only the first) statement in a constructor has to be a call to a constructor of the superclass. If you don't put one in, then this one is automatically used:

```
super();
```

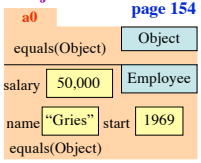


Principle: Fill in superclass fields first.

Method equals in class Object.

Sec. 4.3.1, page 154

```
/** = "the name of this object is the same
       as the name of obj */
public boolean equals(Object obj)
      { return this == obj; }
```



Write equals in class Employee

```
/** = "e is an Employee, with the same fields as this Employee */
public boolean equals(Employee e) {
     return e != null
        && this.name.equals(e.name)
        && this.start == e.start
        && this.salary == e.salary;
  }
```

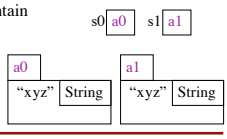
Don't use == with Strings

Function does not override equals in Object because the parameter has a different type. It's a new, different function. We'll fix redo this function later in the course.

More about equals

To test whether two String values contain the same string, use function equals.

s1.equals(s2) is true.
s1 == s2 asks whether a0 == a1, which is false



To test whether two Rhinos are the same Rhino, use ==.

To test whether r2's father is r1, use r2.father == r1

a3 == a3