CS1110 9 Feb 2009
Testing; class Object; toString; static fields/methods

Reading for this lecture: Testing with JUnit (Appendix I.2.4 & pp. 385--388), the class Object (pp. 153-154), function toString (pp. 112-113), static variables and methods (Sec. 1.5, p. 47).

Reading for next two lectures: Executing method calls, if-statements, the return statement in a function, local variables. Section 2 except 2.3.8.

Note: this will some clarify some concepts, such as method parameters, that we've had to gloss over so far.

Prelim 1. Thu, 25 Feb, 7:30PM
Prelim 2. Thu, 18 Mar, 7:30PM
Prelim 3. Tue, 20 Apr, 7:30PM
Final B, Thu, 13 May, 9:00AM

Assignment 1 due Saturday on CMS.
Help available at office and consulting hours; see "Staff" webpage.

Organizing and streamlining the testing process

Testing: Process of analyzing, running program, looking for bugs (errors).
Test case: A set of input values, together with the expected output.

Develop test cases for a method from its specification ---even before you write the method's body.

```
/** = number of vowels in word w.
Precondition: w contains at least 1 letters and nothing else. */
public int numberOfVowels(String w) {
 // (nothing here yet!)
}
```

Developing test cases first, in "critique" mode, can prevent wasted work.

```
/** An instance is a worker in a certain organization */
public class Worker {
    private String name; /* Last name (null if unknown/none,
                               o.w. at least one character) */
    private int ssn;           // Social security #: in 0..999999999
    private Worker boss;  // Immediate boss (null if none)

    /** Constructor: a worker with last name n
          (null if unknown/none),  SSN s, and boss b (null if none).
      * Precondition: if n not null, it has at least one character.
      * Precondition: s in 0..999999999 with no leading zeros,
      * so SSN 012-34-5678 should be given as 12345678.*/
    public Worker(String n, int s, Worker b) {
        name= n;
        ssn= s;
        boss= b;
        }

    .
}
```

Test that the boss field is filled in correctly (also tests getter method)

File->new JUnit test case … [save in same directory as Worker.java] imports junit.framework.TestCase, with key methods.

```
  /** Test constructor*/
  public void testConstructor() {
      Worker w1= new Worker("Obama", 123456789, null);
      assertEquals(null, w1.getBoss());

      Worker w2= new Worker("Biden", 2, w1);
      assertEquals(w1, w2.getBoss());
  }
```

assertEquals(x,y): test whether **x** equals **y** ; print an error message and stop the method if they are not equal.

x: expected value,
y: actual value.

See page 488 for some other methods.

Every time you click button Test in DrJava, this method (and all other testX methods) will be called.

Class Object: The superest class of them all

A minor mystery: since Worker doesn't extend anything, it seems that it should only have the methods we wrote for it. *But it has some other methods, too.*

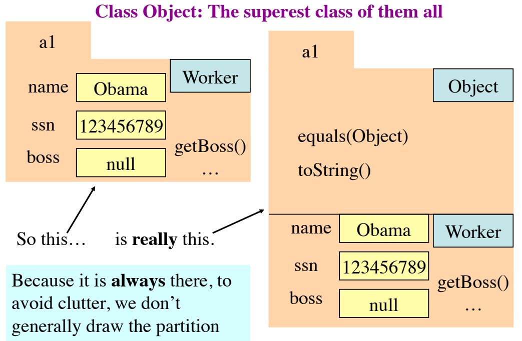
Java feature: Every class that does not extend another one automatically extends class Object. That is,

public class C { … }

is equivalent to

public class C **extends** Object { …}

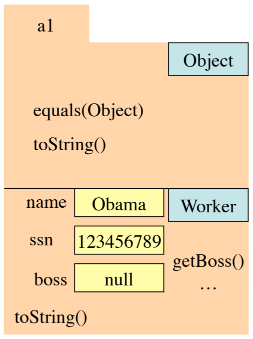
Class Object: The superest class of them all



Because it is **always** there, to avoid clutter, we don't generally draw the partition for superclass Object.

Method toString()

Convention: c.toString() returns a representation of folder c, giving info about the values in its fields.



Put following method in Worker.

```
/** = representation of this Worker
* [etc., see full program] */
public String toString() {
    return name + ", XXX-XX-" +
              ssn4 + ", Boss:" + boss;
}
```

In appropriate places, the expression c automatically does c.toString()

Another example of toString()

```
/** An instance represents a point (x, y) in the plane */
public class Point {
    private int x;  // the x-coordinate
    private int y;  // the y-coordinate
    /** Constructor: An instance for point (xx, yy) */
    public Point(int xx, int yy) {

    }
    /** = a representation of this point in form "(x, y)" */
    public String toString() {
        return ;
    }
}
```

Getter and setter methods are not given on this slide

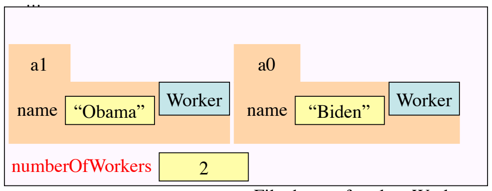
Fill these in

Example: "(3, 5)"

Function toString should give the values in the fields in a format that makes sense for the class.

A **static field** appears not in each folder, but is a *single entity in the file drawer.* It can be used to maintain information about many objects.

```
…
private String name; //last name of this Worker (null if unknown/none)
public static int numberOfWorkers= 0; // no. of Worker objects created
…
```



File drawer for class Worker

Reference the variable by Worker.numberOfWorkers.

A **static method** appears not in each folder but only once, in *the file drawer*.
Make a method static if it doesn't need to be in a folder because it doesn't reference the contents of the "containing" folder.

```
/** = "this object is the c's boss".
      Precondition: c is not null. */
public boolean isBoss(Worker c) {
    return this == c.getBoss();
}
```

keyword **this** refers to the name of the object in which it appears

```
/** = "b is c's boss".
      Precondition: b and c are not null. */
public  static  boolean isBoss(Worker b, Worker c) {
    return b == c.getBoss();
}
```