Announcements for This Lecture

Readings

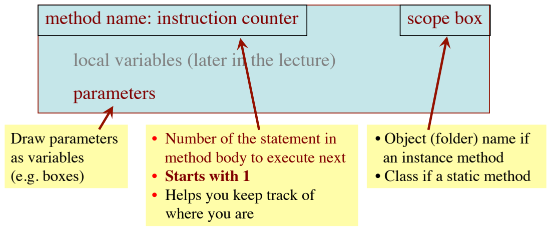
- Sections 2.5 and 5.1
- PLive 5-1 and 5-2

Assignments

- Assignment 2 due Tuesday
  - Turn in during class
  - Not accepting on CMS
- Assignment 1 being graded
  - Graded so far: 128 of 195
  - Keep revising until Tuesday
- Assignment 3 will go up this weekend (to give 1.5 weeks)
  - Extension of Assignment 1

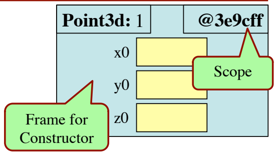
Method Frames

- The formal representation of a method call


method name: instruction counter
scope box
local variables (later in the lecture)
parameters
Draw parameters as variables (e.g. boxes)
• Number of the statement in method body to execute next
• Starts with 1
• Helps you keep track of where you are
• Object (folder) name if an instance method
• Class if a static method

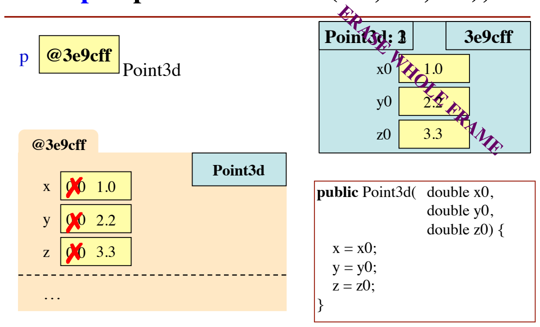
Constructors are Instance Methods

1. Make a new object (folder)
   - Java gives the folder a name
   - All fields are defauls (0 or null)
2. Draw a frame for the call
3. Assign the argument value to the parameter (in frame)
4. Execute the method body
   - Look for variables in the frame
   - Execute statements to initialize the fields to non-default values
   - Give the folder as the result
5. Erase the frame for the call



```
public Point3d(  double x0,
                 double y0,
                 double z0) {
   x = x0;
   y = y0;
   z = z0;
}
```

Example: p = new Point3d(1.0, 2.2, 3.3);



```
public Point3d(  double x0,
                 double y0,
                 double z0) {
   x = x0;
   y = y0;
   z = z0;
}
```

Types of Method Calls

With a Dot (.)

- **Instance method call**
  - Method applied to an object
  - <object>.<method-call>
  - **Example**: p.getX()
- **Static method call**
  - Definition in file drawer
  - <class>.<method-call>
  - **Ex**: Integer.parseInt("123")

Without a Dot (.)

- **Helper method call**
  - Call is executed inside body of another method
  - Both are in same class file
- Scope box contains scope of the method that called it
- **Example**: firstName(s)

Exercise: Anglicizing an Integer

- anglicize(1) is "one"
- anglicize(15) is "fifteen"
- anglicize(123) is "one hundred twenty three"
- anglicize(10570) is "ten thousand five hundred

```
/** Yields: the anglicization of n.
 * Precondition: 0 < n < 1,000,000 */
public static String anglicize(int n) {
    // ???
}
```

String: Revisited

- String is an unusual object
  - Do not create with new
  - Does not have named fields (that we know of)
- Data arranged in a “list”
  - List of characters
  - Access characters by position, not field name
  - **Method**: charAt(int)
  - Position starts at 0

- String s = "abc d";

0	1	2	3	4
a	b	c		d

- String s = "one\ntwo";

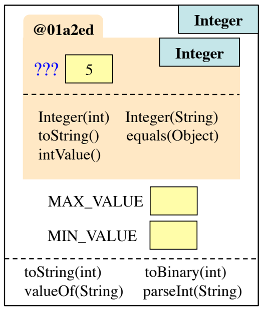
0	1	2	3	4	5	6
o	n	e	\n	t	w	o

Containers

- **Container**: an object that holds a list of objects
  - **But cannot hold primitive values (e.g. int, double, etc.)!**
- Java has several container classes
  - The are all in package `java.util`
  - **Generic classes**: type depends on what is contained
  - Put contained type in < >
- **Example**: Vector
  - Vector<String>: Vector that holds String objects
  - Vector<AcornProfile>: Holds AcornProfile objects
  - Vector<Vector<String>>: ????
  - ~~Vector<int>~~: NOT ALLOWED!

Wrappers: Turn Primitives into Objects

- Want Vector<int>
  - int is primitive type, not class
  - Need to convert an int value (e.g. 9) into an object
- Integer: a **wrapper class**
  - Contains or wraps one value
  - Value cannot be changed: it is *immutable*
- Many useful static features
  - Integer.MAX_VALUE
  - Integer.parseInt(String)



Each Primitive Type Has a Wrapper

- When you need to treat a primitive value as an object, then just wrap the value in an object of the wrapper class.

Primitive Type	Wrapper Class
int	Integer
long	Long
float	Float
double	Double
char	Character
boolean	Boolean

Each wrapper class has:

- Instance methods (e.g. equals, constructors, toString)
- Static variables and methods (for useful computations)

Integer k= **new** Integer(63); **int** j= k.intValue();

You don't have to memorize the methods of the wrapper classes. But be aware of them. See Section 5.1 and PLive 5-1 and 5-2 for more.

Boxing and Unboxing

- Modern (post 1.4) Java boxes/unboxes
- **Boxing**: Automatically add a wrapper
  - Integer s = 4;
  - Same as Integer s = new Integer(4);
- **Unboxing**: Automatically remove a wrapper
  - int x = new Integer(4);
  - Same as int x = new Integer(4).intValue();
- Type is determined by the variable assigned

Example: Vector

- Create an empty vector instance (of Strings)

```
import java.util.Vector;
Vector vec = new Vector<Integer>();
```

- Add some strings to it

```
vec.add(new Integer(2));   // Adds 2 at position 0
vec.add(new Integer(7));   // Adds 7 at position 1
vec.add(new Integer(-3));  // Adds -3 at position 2
```

- Get the String at position 1

```
vec.get(1)                 // Function call, gives 7
```

- Search vector for number 5

```
vec.indexOf(new Integer(5))  // Not found; gives -1
```