As you can see, the **setDim( )** method is used to set the dimensions of each box. For example, when

```
mybox1.setDim(10, 20, 15);
```

is executed, 10 is copied into parameter **w**, 20 is copied into **h**, and 15 is copied into **d**. Inside **setDim( )** the values of **w**, **h**, and **d** are then assigned to **width**, **height**, and **depth**, respectively.

For many readers, the concepts presented in the preceding sections will be familiar. However, if such things as method calls, arguments, and parameters are new to you, then you might want to take some time to experiment before moving on. The concepts of the method invocation, parameters, and return values are fundamental to Java programming.

## Constructors

It can be tedious to initialize all of the variables in a class each time an instance is created. Even when you add convenience functions like **setDim( )**, it would be simpler and more concise to have all of the setup done at the time the object is first created. Because the requirement for initialization is so common, Java allows objects to initialize themselves when they are created. This automatic initialization is performed through the use of a constructor.

A *constructor* initializes an object immediately upon creation. It has the same name as the class in which it resides and is syntactically similar to a method. Once defined, the constructor is automatically called immediately after the object is created, before the **new** operator completes. Constructors look a little strange because they have no return type, not even **void**. This is because the implicit return type of a class' constructor is the class type itself. It is the constructor's job to initialize the internal state of an object so that the code creating an instance will have a fully initialized, usable object immediately.

You can rework the **Box** example so that the dimensions of a box are automatically initialized when an object is constructed. To do so, replace **setDim( )** with a constructor. Let's begin by defining a simple constructor that simply sets the dimensions of each box to the same values. This version is shown here:

```
/* Here, Box uses a constructor to initialize the
   dimensions of a box.
*/
class Box {
  double width;
  double height;
```

```
  double depth;

  // This is the constructor for Box.
  Box() {
    System.out.println("Constructing Box");
    width = 10;
    height = 10;
    depth = 10;
  }

  // compute and return volume
  double volume() {
    return width * height * depth;
  }
}

class BoxDemo6 {
  public static void main(String args[]) {
    // declare, allocate, and initialize Box objects
    Box mybox1 = new Box();
    Box mybox2 = new Box();

    double vol;

    // get volume of first box
    vol = mybox1.volume();
    System.out.println("Volume is " + vol);

    // get volume of second box
    vol = mybox2.volume();
    System.out.println("Volume is " + vol);
  }
}
```

When this program is run, it generates the following results:

```
Constructing Box
Constructing Box
Volume is 1000.0
Volume is 1000.0
```

As you can see, both **mybox1** and **mybox2** were initialized by the **Box( )** constructor when they were created. Since the constructor gives all boxes the same dimensions, 10 by 10 by 10, both **mybox1** and **mybox2** will have the same volume. The **println( )** statement inside **Box( )** is for the sake of illustration only. Most constructors will not display anything. They will simply initialize an object.

Before moving on, let's reexamine the **new** operator. As you know, when you allocate an object, you use the following general form:

*class-var* = new *classname*( );

Now you can understand why the parentheses are needed after the class name. What is actually happening is that the constructor for the class is being called. Thus, in the line

```
Box mybox1 = new Box();
```

**new Box( )** is calling the **Box( )** constructor. When you do not explicitly define a constructor for a class, then Java creates a default constructor for the class. This is why the preceding line of code worked in earlier versions of **Box** that did not define a constructor. The default constructor automatically initializes all instance variables to zero. The default constructor is often sufficient for simple classes, but it usually won't do for more sophisticated ones. Once you define your own constructor, the default constructor is no longer used.

## Parameterized Constructors

While the **Box( )** constructor in the preceding example does initialize a **Box** object, it is not very useful—all boxes have the same dimensions. What is needed is a way to construct **Box** objects of various dimensions. The easy solution is to add parameters to the constructor. As you can probably guess, this makes them much more useful. For example, the following version of **Box** defines a parameterized constructor which sets the dimensions of a box as specified by those parameters. Pay special attention to how **Box** objects are created.

```
/* Here, Box uses a parameterized constructor to
   initialize the dimensions of a box.
*/
class Box {
  double width;
  double height;
  double depth;
```

```
    // This is the constructor for Box.
    Box(double w, double h, double d) {
      width = w;
      height = h;
      depth = d;
    }

    // compute and return volume
    double volume() {
      return width * height * depth;
    }
  }

  class BoxDemo7 {
    public static void main(String args[]) {
      // declare, allocate, and initialize Box objects
      Box mybox1 = new Box(10, 20, 15);
      Box mybox2 = new Box(3, 6, 9);

      double vol;

      // get volume of first box
      vol = mybox1.volume();
      System.out.println("Volume is " + vol);

      // get volume of second box
      vol = mybox2.volume();
      System.out.println("Volume is " + vol);
    }
  }
```

The output from this program is shown here:

```
Volume is 3000.0
Volume is 162.0
```

As you can see, each object is initialized as specified in the parameters to its constructor. For example, in the following line,

```
Box mybox1 = new Box(10, 20, 15);
```

the values 10, 20, and 15 are passed to the **Box( )** constructor when **new** creates the object. Thus, **mybox1**'s copy of **width**, **height**, and **depth** will contain the values 10, 20, and 15, respectively.

## The this Keyword

Sometimes a method will need to refer to the object that invoked it. To allow this, Java defines the **this** keyword. **this** can be used inside any method to refer to the *current* object. That is, **this** is always a reference to the object on which the method was invoked. You can use **this** anywhere a reference to an object of the current class' type is permitted.

To better understand what **this** refers to, consider the following version of **Box( )**:

```
// A redundant use of this.
Box(double w, double h, double d) {
  this.width = w;
  this.height = h;
  this.depth = d;
}
```

This version of **Box( )** operates exactly like the earlier version. The use of **this** is redundant, but perfectly correct. Inside **Box( )**, **this** will always refer to the invoking object. While it is redundant in this case, **this** is useful in other contexts, one of which is explained in the next section.

## Instance Variable Hiding

As you know, it is illegal in Java to declare two local variables with the same name inside the same or enclosing scopes. Interestingly, you can have local variables, including formal parameters to methods, which overlap with the names of the class' instance variables. However, when a local variable has the same name as an instance variable, the local variable *hides* the instance variable. This is why **width**, **height**, and **depth** were not used as the names of the parameters to the **Box( )** constructor inside the **Box** class. If they had been, then **width** would have referred to the formal parameter, hiding the instance variable **width**. While it is usually easier to simply use different names, there is another way around this situation. Because **this** lets you refer directly to the object, you can use it to resolve any name space collisions that might occur between instance variables and local variables. For example, here is another version of