3.5 Primitive Types vs. Reference Types

Java's types are divided into primitive types and **reference types**. In Chapter 2, you worked with variables of type `int`—one of the primitive types. The other primitive types are `boolean`, `byte`, `char`, `short`, `long`, `float` and `double`, each of which we discuss in this book—these are summarized in Appendix D. All nonprimitive types are *reference types*, so classes, which specify the types of objects, are reference types.

A primitive-type variable can hold exactly *one* value of its declared type at a time. For example, an `int` variable can store one integer at a time. When another value is assigned to that variable, the new value replaces the previous one—which is *lost*.

Recall that local variables are *not* initialized by default. Primitive-type instance variables *are* initialized by default—instance variables of types `byte`, `char`, `short`, `int`, `long`, `float` and `double` are initialized to 0, and variables of type `boolean` are initialized to `false`. You can specify your own initial value for a primitive-type variable by assigning the variable a value in its declaration, as in

```
private int numberOfStudents = 10;
```

Programs use variables of reference types (normally called **references**) to store the *locations* of objects. Such a variable is said to **refer to an object** in the program. *Objects* that are referenced may each contain *many* instance variables. Line 8 of Fig. 3.2:

```
Scanner input = new Scanner(System.in);
```

creates an object of class `Scanner`, then assigns to the variable `input` a *reference* to that `Scanner` object. Line 11 of Fig. 3.2:

```
Account myAccount = new Account();
```

creates an object of class `Account`, then assigns to the variable `myAccount` a *reference* to that `Account` object. *Reference-type instance variables, if not explicitly initialized, are initialized by default to the value null*—which represents a "reference to nothing." That's why the first call to `getName` in line 14 of Fig. 3.2 returns `null`—the value of `name` has *not* yet been set, so the *default initial value* `null` is returned.

To call methods on an object, you need a reference to the object. In Fig. 3.2, the statements in method `main` use the variable `myAccount` to call methods `getName` (lines 14 and 24) and `setName` (line 19) to interact with the `Account`

object. Primitive-type variables do *not* refer to objects, so such variables *cannot* be used to call methods.