



Special Topic 6.2

Variables Declared in a for Loop Header

As mentioned, it is legal in Java to declare a variable in the header of a for loop. Here is the most common form of this syntax:

```
for (int i = 1; i <= n; i++)  
{  
    . . .  
}
```

// i no longer defined here

The scope of the variable extends to the end of the for loop. Therefore, `i` is no longer defined after the loop ends. If you need to use the value of the variable beyond the end of the loop, then you need to declare it outside the loop. In this loop, you don't need the value of `i`—you know it is `n + 1` when the loop is finished. (Actually, that is not quite true—it is possible to break out of a loop before its end; see Special Topic 6.4 on page 246). When you have two or more exit conditions, though, you may still need the variable. For example, consider the loop

```
for (i = 1; balance < targetBalance && i <= n; i++)  
{  
    . . .  
}
```

You want the balance to reach the target, but you are willing to wait only a certain number of years. If the balance doubles sooner, you may want to know the value of `i`. Therefore, in this case, it is not appropriate to declare the variable in the loop header.

Note that the variables named `i` in the following pair of for loops are independent:

```
for (int i = 1; i <= 10; i++)  
    System.out.println(i * i);
```

```
for (int i = 1; i <= 10; i++) // Declares a new variable i
    System.out.println(i * i * i);
```

In the loop header, you can declare multiple variables, as long as they are of the same type, and you can include multiple update expressions, separated by commas:

```
for (int i = 0, j = 10; i <= 10; i++, j--)
{
    . . .
}
```

However, many people find it confusing if a for loop controls more than one variable. I recommend that you not use this form of the for statement (see Quality Tip 6.1 on page 232). Instead, make the for loop control a single counter, and update the other variable explicitly:

```
int j = 10;
for (int i = 0; i <= 10; i++)
{
    . . .
    j--;
}
```
