

7.13 Variable-Length Argument Lists

With **variable-length argument lists**, you can create methods that receive an unspecified number of arguments. A type followed by an **ellipsis (...)** in a method's parameter list indicates that the method receives a variable number of arguments of that particular type. This use of the ellipsis can occur only *once* in a parameter list, and the ellipsis, together with its type and the parameter name, must be placed at the *end* of the parameter list. While you can use method overloading and array passing to accomplish much of what is accomplished with variable-length argument lists, using an ellipsis in a method's parameter list is more concise.

Figure 7.20 demonstrates method **average** (lines 6–15), which receives a variable-length sequence of **doubles**. Java treats the variable-length argument list as an array whose elements are all of the same type. So, the method body can manipulate the parameter **numbers** as an array of **doubles**. Lines 10–12 use the enhanced **for** loop to walk through the array and calculate the total of the **doubles** in the array. Line 14 accesses **numbers.length** to obtain the size of the **numbers** array for use in the averaging calculation. Lines 27, 29 and 31 in **main** call method **average** with two, three and four arguments, respectively. Method **average** has a variable-length argument list (line 6), so it can average as

many `double` arguments as the caller passes. The output shows that each call to method `average` returns the correct value.



Common Programming Error 7.5

Placing an ellipsis indicating a variable-length argument list in the middle of a parameter list is a syntax error. An ellipsis may be placed only at the end of the parameter list.

```
1  // Fig. 7.20: VarargsTest.java
2  // Using variable-length argument lists.
3
4  public class VarargsTest {
5      // calculate average
6  public static double average(double... numbers)
7      double total = 0.0;
8
9      // calculate total using the enhanced for
10     for (double d : numbers) {
11         total += d;
12     }
13
14     return total / numbers.length;
15 }
16
17 public static void main(String[] args) {
18     double d1 = 10.0;
19     double d2 = 20.0;
20     double d3 = 30.0;
21     double d4 = 40.0;
22 }
```

```
23     System.out.printf("d1 = %.1f\n" + "d2 = %.1f\n" +  
24             d1, d2, d3, d4);  
25  
26     System.out.printf("Average of d1 and d2 is  
27             average(d1, d2));  
28     System.out.printf("Average of d1, d2 and d  
29             average(d1, d2, d3));  
30     System.out.printf("Average of d1, d2, d3 a  
31             average(d1, d2, d3, d4));  
32     }  
33 }
```



```
d1 = 10.0  
d2 = 20.0  
d3 = 30.0  
d4 = 40.0
```

```
Average of d1 and d2 is 15.0  
Average of d1, d2 and d3 is 20.0  
Average of d1, d2, d3 and d4 is 25.0
```



Fig. 7.20

Using variable-length argument lists.