WORKED EXAMPLE 7.2   A World Population Table

Problem Statement   You are to print the following population data in tabular format and add column totals that show the total world populations in the given years.

Population Per Continent (in millions)							
Year	1750	1800	1850	1900	1950	2000	2050
Africa	106	107	111	133	221	767	1766
Asia	502	635	809	947	1402	3634	5268
Australia	2	2	2	6	13	30	46
Europe	163	203	276	408	547	729	628
North America	2	7	26	82	172	307	392
South America	16	24	38	74	167	511	809

Step 1   First, we break down the task into steps:

> Initialize the table data.
> Print the table.
> Compute and print the column totals.

Step 2   Initialize the table as a sequence of rows:

```
int[][] populations =
   {
      { 106, 107, 111, 133, 221, 767, 1766 },
      { 502, 635, 809, 947, 1402, 3634, 5268 },
      { 2, 2, 2, 6, 13, 30, 46 },
      { 163, 203, 276, 408, 547, 729, 628 },
      { 2, 7, 26, 82, 172, 307, 392 },
      { 16, 24, 38, 74, 167, 511, 809 }
   };
```

Step 3   To print the row headers, we also need a one-dimensional array of the continent names. Note that it has the same number of rows as our table.

```
String[] continents =
   {
      "Africa",
      "Asia",
      "Australia",
      "Europe",
      "North America",
      "South America"
   };
```

To print a row, we first print the continent name, then all columns. This is achieved with two nested loops. The outer loop prints each row:

```
// Print population data
for (int i = 0; i < ROWS; i++)
{
    // Print the ith row
    . . .
    System.out.println(); // Start a new line at the end of the row
}
```

To print a row, we first print the row header, then all columns:

```
System.out.printf("%20s", continents[i]);
for (int j = 0; j < COLUMNS; j++)
{
    System.out.printf("%5d", populations[i][j]);
}
```

Step 4   To print the column sums, we use the algorithm that was described in Section 7.6.4. We carry out that computation once for each column.

```
for (int j = 0; j < COLUMNS; j++)
{
    int total = 0;
    for (int i = 0; i < ROWS; i++)
    {
        total = total + populations[i][j];
    }
    System.out.printf("%5d", total);
}
```

Here is the complete program:

worked_example_2/WorldPopulation.java

```
 1  /**
 2      This program prints a table showing the world population growth over 300 years.
 3  */
 4  public class WorldPopulation
 5  {
 6     public static void main(String[] args)
 7     {
 8        final int ROWS = 6;
 9        final int COLUMNS = 7;
10
11        int[][] populations =
12           {
13              { 106, 107, 111, 133, 221, 767, 1766 },
14              { 502, 635, 809, 947, 1402, 3634, 5268 },
15              { 2, 2, 2, 6, 13, 30v 46 },
16              { 163, 203, 276, 408, 547, 729, 628 },
17              { 2, 7, 26, 82, 172, 307, 392 },
18              { 16, 24, 38, 74, 167, 511, 809 }
19           };
20
21        String[] continents =
22           {
23              "Africa",
24              "Asia",
25              "Australia",
26              "Europe",
```

```
27                  "North America",
28                  "South America"
29          };
30
31          System.out.println("                     Year 1750 1800 1850 1900 1950 2000 2050");
32
33          // Print population data
34
35          for (int i = 0; i < ROWS; i++)
36          {
37             // Print the ith row
38             System.out.printf("%20s", continents[i]);
39             for (int j = 0; j < COLUMNS; j++)
40             {
41                System.out.printf("%5d", populations[i][j]);
42             }
43             System.out.println(); // Start a new line at the end of the row
44          }
45
46          // Print column totals
47
48          System.out.print("                     World");
49          for (int j = 0; j < COLUMNS; j++)
50          {
51             int total = 0;
52             for (int i = 0; i < ROWS; i++)
53             {
54                total = total + populations[i][j];
55             }
56             System.out.printf("%5d", total);
57          }
58          System.out.println();
59       }
60  }
```

Program Run

	Year	1750	1800	1850	1900	1950	2000	2050
Africa		106	107	111	133	221	767	1766
Asia		502	635	809	947	1402	3634	5268
Australia		2	2	2	6	13	30	46
Europe		163	203	276	408	547	729	628
North America		2	7	26	82	172	307	392
South America		16	24	38	74	167	511	809
World		791	978	1262	1650	2522	5978	8909