Programming Fundamentals II

Lab 7: Single-Dimensional Arrays

Learning Objectives:

- Understanding and Utilizing Arrays

Requisite knowledge:

- Chapter 7 Elementary Programming from “Introduction to Java Programming Brief Version” Reference (See lms.uofk.edu).
- Lecture 7 (See lms.uofk.edu).

Lab 7 Assignment: Check Lab 7_8 Assignment file.

Case Study: Analyzing Numbers:

```
public class AnalyzeNumbers {
    public static void main(String[] args) {
        java.util.Scanner input = new
java.util.Scanner(System.in);
        System.out.print("Enter the number of items: ");
        int n = input.nextInt();
        double[] numbers = new double[n];
        double sum = 0;

        System.out.print("Enter the numbers: ");
        for (int i = 0; i < n; i++) {
            numbers[i] = input.nextDouble();
            sum += numbers[i];
        }

        double average = sum / n;

        int count = 0; // The number of elements above average
        for (int i = 0; i < n; i++) {
            if (numbers[i] > average) {
                count++;
            }
        }
        System.out.println("Average is " + average);
        System.out.println("Number of elements above the average
is " + count);
    }
}
```

```
Enter the number of items: 10 Enter
Enter the numbers: 3.4 5 6 1 6.5 7.8 3.5 8.5 6.3 9.5 Enter
Average is 5.75
Number of elements above the average is 6
```

Case Study: Counting the Occurrences of Each Letter

The program given in Listing 7.4 does the following:

1. Generates `100` lowercase letters randomly and assigns them to an array of characters, as shown in Figure 7.7a. You can obtain a random letter by using the `getRandomLowerCaseLetter()` method in the `RandomCharacter` class in Listing 6.10.
2. Count the occurrences of each letter in the array. To do so, create an array, say `counts`, of `26 int` values, each of which counts the occurrences of a letter, as shown in Figure 7.7b. That is, `counts[0]` counts the number of `a`'s, `counts[1]` counts the number of `b`'s, and so on.

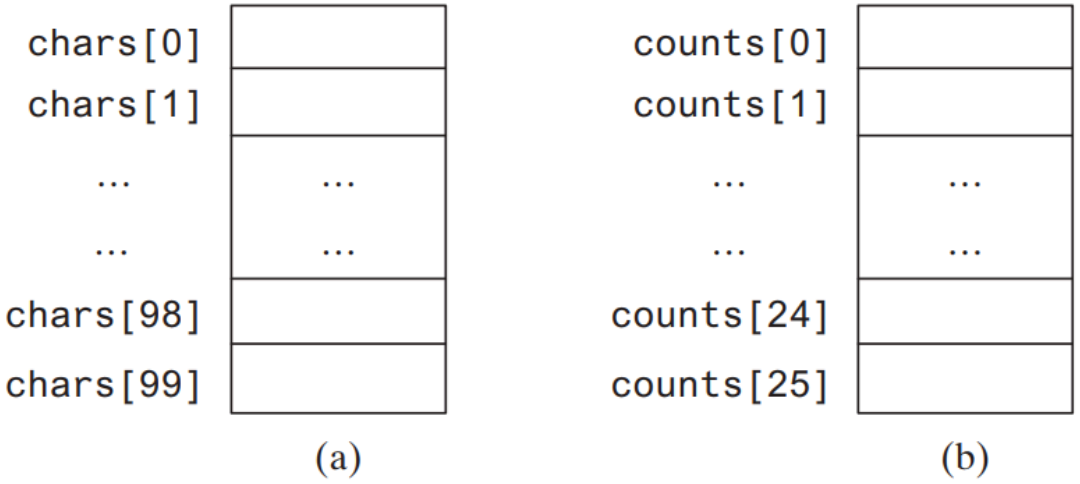

FIGURE 7.7 The `chars` array stores `100` characters, and the `counts` array stores `26` counts, each of which counts the occurrences of a letter.

```
The lowercase letters are:
e y l s r i b k j v j h a b z n w b t v
s c c k r d w a m p w v u n q a m p l o
a z g d e g f i n d x m z o u l o z j v
h w i w n t g x w c d o t x h y v z y z
q e a m f w p g u q t r e n n w f c r f

The occurrences of each letter are:
5 a 3 b 4 c 4 d 4 e 4 f 4 g 3 h 3 i 3 j
2 k 3 l 4 m 6 n 4 o 3 p 3 q 4 r 2 s 4 t
3 u 5 v 8 w 3 x 3 y 6 z
```

Listing 7.4 CountLettersInArray.java

```java
public class CountLettersInArray {
/** Main method */
public static void main(String[] args) {
// Declare and create an array
char[] chars = createArray();

// Display the array
System.out.println("The lowercase letters are:");
displayArray(chars);

// Count the occurrences of each letter
int[] counts = countLetters(chars);

// Display counts
System.out.println();
System.out.println("The occurrences of each letter are:");
displayCounts(counts);
}

/** Create an array of characters */
public static char[] createArray() {
// Declare an array of characters and create it
char[] chars = new char[100];

// Create lowercase letters randomly and assign
// them to the array
for (int i = 0; i < chars.length; i++)
chars[i] = RandomCharacter.getRandomLowerCaseLetter();

// Return the array
return chars;
}

/** Display the array of characters */
public static void displayArray(char[] chars) {
// Display the characters in the array 20 on each line
```

```
37 for (int i = 0; i < chars.length; i++) {
38 if ((i + 1) % 20 == 0)
39 System.out.println(chars[i]);
40 else
41 System.out.print(chars[i] + " ");
42 }
43 }
44
45 /** Count the occurrences of each letter */
46 public static int[] countLetters(char[] chars) {
47 // Declare and create an array of 26 int
48 int[] counts = new int[26];
49
50 // For each lowercase letter in the array, count it
51 for (int i = 0; i < chars.length; i++)
52 counts[chars[i] - 'a']++;
53
54 return counts;
55 }
56
57 /** Display counts */
58 public static void displayCounts(int[] counts) {
59 for (int i = 0; i < counts.length; i++) {
60 if ((i + 1) % 10 == 0)
61 System.out.println(counts[i] + " " + (char)(i + 'a'));
62 else
63 System.out.print(counts[i] + " " + (char)(i + 'a') + " ");
64 }
65 }
66 }
```

End Of Lab!