CSC 1051 Arrays - Review questions

1) Given the following declarations:
   ```java
   int a = 2;
   int b = 3;
   int c = 5;
   double x = 2.5;
   double y = 1.0;
   double z = 4.32;
   double[] list = {2.1, 3.8, 0.4};
   ```

   Show what value is assigned by each of the following assignments, or state that there is an error, clearly indicating through the use of a decimal point whether values are of type `int` or `double`. In the case of the `list` array, show its contents and circle the element modified by the assignment.

   a) \( z = a / b; \)
   b) \( z = (\text{double}) a / b; \)
   c) \( c = (\text{int}) x * 5; \)
   d) \( c = x + 2; \)
   e) \( c = a \% b; \)
   f) \( z = \text{list}[0]; \)
   g) \( z = \text{list}; \)
   h) \( \text{list} = x; \)
   i) \( \text{list}[0] = a; \)
   j) \( \text{list}[0] = x; \)
   k) \( \text{list}[a] = x; \)
   l) \( \text{list}[y] = 0; \)

2) Draw a diagram showing the array contents after execution of the following code fragment:

   ```java
   int[] list = new int[4];
   for (int i=0; i < list.length; i++)
       list[i] = i * 10;
   ```

3) Draw a diagram showing the array contents after execution of the following code fragment:

   ```java
   int[] list = new int[3];
   for (int i=0; i < list.length; i++)
       list[i] = list.length - i;
   ```

4) Assume the `list` array has been declared and initialized as in the previous question. Write a code fragment that uses a loop to add 2 to each array element.

5) Assume the `list` array has been declared and initialized as in the previous question. Write a code fragment that creates another array called `listToo` of the same size and copies all the elements from `list` to `listToo` BACKWARDS:

   a) Without using a loop
   b) Using a loop
6) Assume an array list has been declared and initialized with some values. Write a code fragment that creates another array called biglist of twice the size and then copies each element from list to biglist twice, as follows:

   a) Copying the entire list first forward and then backwards. Example:

   \[
   \text{list} = \begin{bmatrix}
   0 & 3 \\
   1 & 8 \\
   2 & 2 \\
   3 & 6 \\
   4 & 7 \\
   \end{bmatrix}
   \]

   \[
   \text{biglist} = \begin{bmatrix}
   0 & 3 \\
   1 & 8 \\
   2 & 2 \\
   3 & 6 \\
   4 & 7 \\
   5 & 7 \\
   6 & 6 \\
   7 & 2 \\
   8 & 5 \\
   9 & 3 \\
   \end{bmatrix}
   \]

   b) Copying each element twice in consecutive locations. Example:

   \[
   \text{list} = \begin{bmatrix}
   0 & 3 \\
   1 & 8 \\
   2 & 2 \\
   3 & 6 \\
   4 & 7 \\
   \end{bmatrix}
   \]

   \[
   \text{biglist} = \begin{bmatrix}
   0 & 3 \\
   1 & 3 \\
   2 & 8 \\
   3 & 8 \\
   4 & 2 \\
   5 & 2 \\
   6 & 6 \\
   7 & 6 \\
   8 & 7 \\
   9 & 7 \\
   \end{bmatrix}
   \]

7) Draw a diagram showing the array contents after execution of the following code fragment:

   ```java
   int[] a = {2, 5, 3};
   int[] b = new int[8];

   for (int i=0; i < a.length; i++)
       b[i] = a[i];

   for (int i=a.length; i < b.length; i++)
       b[i] = 5;
   ```
8) Draw a diagram showing the array contents after execution of the following code fragment:

```java
int[] a = {4, 2, 7, 9};
int[] b = new int[10];

for (int i=0; i < a.length; i++)
    b[i] = (a[i] * 10) + i;

for (int i=a.length; i < b.length; i++)
    b[i] = a[a.length-1] * 100;
```

**Exercises on 2D Arrays**

1. Draw a picture showing the array contents after execution of the following code fragments.

```java
int count = 1;
int[][] table = new int[2][3];
for (int i=0; i < 2; i++)
    for (int j=0; j < 3; j++)
        {table[i][j] = count;
         count++;}
```

**ANSWER:**

```
table
```

```
\begin{array}{ccc}
0 & 1 & 2 \\
0 & 1 & 2 & 3 \\
1 & 4 & 5 & 6 \\
\end{array}
```

```java
int[][] tableA = new int[3][3];
```
for (int i=0; i < 3; i++)
    tableA[i][i] = i;

char[][] tableB = new char[4][4];
String sample = “OPEN THIS FIRST”;
for (int i=0; i < 4; i++)
    for (int j=0; j < 4; j++)
        tableB[i][j] = sample.charAt(i+j);

int[][] tableC = new int[3][4];
for (int i=0; i < tableC.length; i++)
    for (int j=0; j < tableC[i].length; j++)
        tableC[i][j] = i * 2 + j;

2. Create a test program to test each of the above code fragments and to show the array contents after execution. Use these programs to verify your answers to the previous question. Note that you will need to write some extra code to display the array contents (see, for example the boldfaced code below).

**EXAMPLE:**

```java
int count = 1;
int[][] table = new int[2][3];
for (int i=0; i < 2; i++)
    for (int j=0; j < 3; j++)
    {
        table[i][j] = count;
        count++;
    }
```
3. Write a method fill2D() that creates and returns a 2D array of dimensions n x m, where n, m are int parameters, and the array is filled with consecutive numbers starting at 1. For example, if invoked as fill2D(2,3) it should return the array:

```
0 1 2
0 1 2 3
1 4 5 6
```

4. Write a method with one int parameter n that creates and returns a two dimensional array of size n x n that consists of values of type double that are all set to zero, except the ones along the diagonal, which are all set to 1. So, for example, if the parameter is 3, the method should return an array with the following contents:

```
0 1 2
0 1 0
1 0 1
2 0 1
```

5. Download, compile, and run SodaSurvey.java (Chapter 8). Modify the code to add static method computeAVG() that computes and returns the average of all the elements in a 2D array; the method should accept a single parameter, a two dimensional array of int, and it should return the average as a double. Use computeAVG() in the main() method of SodaSurvey.java to compute and print the average of all the soda scores (this will be the overall average, not by soda or by person, as computed in the program).

http://www.csc.villanova.edu/~map/1051/Chap08/SodaSurvey.java