Lab 3 Name:_____ Checked:_____

Objectives:

Practice using arrays to store and process values of different types.

a) Simple array example

```
class ArrayDemo
{
     public static void main(String[] args)
     {
          int[] anArray;     // declares an array of integers

          anArray = new int[5];  // allocates memory for 5 integers

          anArray[0] = 100; // initialize first element
          anArray[1] = 200; // initialize second element
          anArray[2] = 300; // etc.
          anArray[3] = 400;
          anArray[4] = 500;

          System.out.println("Element at index 0: " + anArray[0]);
          System.out.println("Element at index 1: " + anArray[1]);
          System.out.println("Element at index 2: " + anArray[2]);
          System.out.println("Element at index 3: " + anArray[3]);
          System.out.println("Element at index 4: " + anArray[4]);
     }
}
```

- Rename the program **Lab3a.java** and modify it so that it uses a for-loop, instead of the repetitive code; similarly, use a for-loop for the initialization.
- What happens if you do not initialize the array's values? Comment out the initialization and see what happens. Do you get an error?

Answer: _____

b) An array of `double`

Make a new version of your program from part (a) and name it **Lab3b.java**
This program should create an array of 100 values of type `double`, set to random values in the range 0….1. (Use Math.random() to generate a random value.)

- What happens if you do not initialize the array's values?

Answer: _____

c) An array of `boolean`

Create a new version of your program **Lab3c.java** that creates instead an array of 100 values of type `boolean`. The values should be set to alternating true/false, i.e., `anArray[0] = true; anArray[1] = false`, etc. (be sure to use a loop here too).

- What happens if you do not initialize the array's values?

Answer: _____

d) An array of `char`

Create a new version of your program **Lab3d.java** that creates instead an array of 26 values of type `char`. The values should be set to the letter 'a' … 'z'.
(Hint: Use a loop and note that 'b' is 'a' + 1, etc.)

- What happens if you do not initialize the array's values?

Answer: _____

e) Reading values from the user and storing them in an array

Starting from Lab3a.java (array of int) create a new version of your program **Lab3e.java,** that uses Scanner to input integer values from the user.

f) A Simple 2D array example

```
//********************************************************************
//  TwoDArray.java       Author: Lewis/Loftus
//  Demonstrates the use of a two-dimensional array.
//********************************************************************
public class TwoDArray
{
   //-----------------------------------------------------------------
   //  Creates a 2D array of integers, fills it with increasing
   //  integer values, then prints them out.
   //-----------------------------------------------------------------
   public static void main (String[] args)
   {
      int[][] table = new int[5][10];
      // Load the table with values
      for (int row=0; row < table.length; row++)
         for (int col=0; col < table[row].length; col++)
            table[row][col] = row * 10 + col;
      // Print the table
      for (int row=0; row < table.length; row++)
      {
         for (int col=0; col < table[row].length; col++)
            System.out.print (table[row][col] + "\t");
         System.out.println();
      }
   }
}
```

- If we were to draw a picture of the array, labeling the rows and columns with the array indices, it would look like this:

```
# |   0     1     2     3     4     5     6     7     8     9
--+-----------------------------------------------------------
0 |   0     1     2     3     4     5     6     7     8     9
1 |   10    11    12    13    14    15    16    17    18    19
2 |   20    21    22    23    24    25    26    27    28    29
3 |   30    31    32    33    34    35    36    37    38    39
4 |   40    41    42    43    44    45    46    47    48    49
```

- Rename the program **Lab3f.java** and modify it so that its output actually looks as shown above (with labels above and to the left).

- Modify the dimensions of the array – make it 3 rows by 4 columns and run the program again. The output should look right without changing anything else in the program. If necessary, adapt your program so that it works with any reasonable dimensions (note that there is a limit to how many columns can be displayed across on one line, so it is not expected to work well with large values for the number of columns).

- What happens if you do not initialize the array's values?

Answer: _____

g) Reading values from a file and storing them in an array

Suppose you have a long list of values stored in a file:
www.csc.villanova.edu/~map/2014/f14/examples/oneHundredInts.inp

and want to store them in an array. Let's modify Lab3e.java – rename it **Lab3g.java** – to do this. You can direct the Scanner to input from a file, instead of from the keyboard. You do this by:
1) replacing `System.in` by the file from which you are "reading" when you set up the Scanner object, i.e.:

```
Scanner scan = new Scanner(new File("oneHundredInts.inp");
```

2) In order to use the `File` class, above, you need to import some classes from java.io:

```
import java.io.*;
```

3) You also need to add "**`throws IOException`**" to the heading of your main method, so it should read:

```
public static void main(String[] args) throws IOException
```

4) Since you want to input 100 numbers, you need to enlarge the array to hold 100 integers.

5) Finally, you need to make sure that the file **oneHundredInts.inp** is saved in the same folder as your program and contains the correct data (a list of 100 numbers).

- Some browsers add extra junk at the beginning and end of the file when saving files from the web—be sure that your file consists of exactly those 100 numbers and nothing else
- Verify that the filename did not get a ".txt" added at the end—if you see a file named *oneHundredInts.inp.txt*, be sure to rename it, because the code given above expects the file to be named **oneHundredInts.inp** (without the ".txt").

h) Expand your knowledge of arrays and all things Java!

This example in part (a) is from the Java online tutorials:
http://docs.oracle.com/javase/tutorial/java/nutsandbolts/arrays.html

- Read the tutorial on arrays. This is one of many online tutorials that are available on Java programming. This is your go-to place to brush up or to learn more about Java.
- Make a note here about something that you learned!