COMP 248 - Tutorial #8

Arrays

Question 1: What is the output of the following code?

```java
class Secret
{
  public static void main(String args[])
  {
    int[] n = {4, 2, 6, 12, 0, -4, 6, 3, 8, 1};

    System.out.println("Array before:");
    for (int i = 0; i < n.length; i++) {
      System.out.println("n["+i+"] = " + n[i]);
    }

    boolean secretProperty = false;

    while (!secretProperty) {
      secretProperty = true;
      for (int i=0; i < (n.length-1); i++) {
        if (n[i] > n[i+1]) {
          int temp = n[i];
          n[i] = n[i+1];
          n[i+1] = temp;
          secretProperty = false;
        }
      }
    }

    System.out.println();
    System.out.println("Array after:");
    for (int i = 0; i < n.length; i++) {
        System.out.println("n["+i+"] = " + n[i]);
    }
  }
}
```

Question 2: What will be displayed by the following segment of code?

```
int i;
int a[] = {5, 2, 3, 1, 1, 0, 2, 1, 0, 1};
for (i = 0; (i < a.length); i++)
{
    if (a[i] == 0)
        break;
    if (i % 3 == 0)
        continue;
    System.out.print(a[i]);
}
```

Question 3: What will be displayed by the following ?

```
int[] data = {1,3,5,8,11,15};
int sum = 0;
for (int i = 1; i < data.length; ++i) {
    sum = sum + data[i] - data[i-1];
    System.out.println("sum   = " + sum);
}
```

Question 4: Consider the following fragment of Java code:

```
int [] x = {0,0,1,1,1,   1,1,1,1,1,   1,1,1,1,1,   1,1,1,1,1,
            1,1,1,1,1,   1,1,1,1,1,   1,1,1,1,1,   1,1,1,1,1,
            1,1,1,1,1, 1,1,1,1,1}; // x has 50 elements
int i, t;

for (i=2; i<8; i++)                    // line 1
  if (x[i]!=0){                        // line 2
    System.out.print(i+ " ");         // line 3 - for question A
    t=2*i;                            // line 4
    while (t<=100){                   // line 5
      x[t]=0;                         // line 6
      t+=i;                           // line 7
    }
  }
System.out.println();                  // line 8 - for question B

for (i=2; i<=50; i++)
  if (x[i]!=0)
    System.out.println(i);
```

A What is the output after the execution of the first `System.out.println` statement (on line 3) ?

B How would you describe the list of numbers displayed by the second `System.out.println` statement (on line 8) ?

Question 5: What is the output of the following code?

```java
public class ArrayOfArraysAnimalDemo
{
   public static void main(String[] args)
   {
      String[][] animals = {
                 { "dog", "cat", "fish", "bird", "worm" },
                 { "lion", "baboon", "bison", "beaver" },
                 { "bear", "bat", "ant", "bobcat", "buffalo",
"elephant"},
                 { "crab", "coyote", "cow", "frog", "goat",
"grissly" }
             };


      for (int i = 0; i < animals.length; i++)
      {
         System.out.print("["+i+"]["+0+"]" + animals[i][0] + " --
");
         for (int j = 1; j < animals[i].length; j++)
         {
            System.out.print("["+i+"]["+j+"]" + animals[i][j] + "
");
         }
         System.out.println();
      }
   }
}
```

Question 6: Write the necessary statement to perform the following operations on single-dimension arrays:

A- Declare and initialise an array of 10 integers with the values -10.

B- Add 1 to each of the 20 elements of an integer array called **values**.

C- Read 7 values for a float array called **dailyTemperatures** from the keyboard.

D- Print the 5 values of an integer array called **bestScores** in column format.

Question 7: Write a program to reverse the elements of an integer array. Note, your program should not just display the elements in reverse order but actually change the content of the array. For example, if the array contains:

1	2	3	4

then after your program, the array should contain:

4	3	2	1

Question 8: Write a program to add the elements on the two diagonals of a square two dimensional integer array and display that sum. Ensure that if there is a middle element in the array it is not counted twice in the sum.

For example, with the array:

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

your program should display 68 (1+6+11+16+4+7+10+13).

With the array:

1	2	3
5	6	7
9	10	11

your program should display 30 (1+6+11+3+9) (note that the 6 is not counted twice).

Question 9: Write a program that compares two arrays of characters (not Strings!) of the same size and determines if they contain the same elements (but not necessarily in the same order).

For example, the following arrays contain the same elements:

'a'	'c'	'k'	'i'	'b'
'b'	'i'	'k'	'a'	'c'

so your program should display `true`.

Question 10: A magic square is an N-by-N matrix of the integers, such that all row, column, and diagonal sums are   equal.

For example,

```
4  9  2
3  5  7
8  1  6
```

is a magic square, because 4+9+2=15   3+5+7=15   8+1+6= 15   and 4+38=15
               9+5+1=15   2+7+6=15   and   4+5+6=15   2+5+8 = 15.

Write a Java program to test if a matrix represents a magic square.

Question 11: One way to generate a magic square of size N when n is odd, is to assign the integers 1 to N^2 in ascending order, starting at the bottom, middle cell. Repeatedly assign the next integer to the cell adjacent diagonally to the right and down. If this cell has already been assigned another integer, instead use the cell adjacently above. If the new column is outside the matrix, start back at the first column. If the new row is outside the matrix, start back at the beginning of the row.

Write a Java program to generate a magic square of a given odd size.

For example, if the user enters 3, you should generate:

```
4   9   2
3   5   7
8   1   6
```

if the user enters 5, you should generate:

```
11  18  25   2   9
10  12  19  21   3
 4   6  13  20  22
23   5   7  14  16
17  24   1   8  15
```