<u>Project 1 (Due by: Sept. 21, 11.30 AM)</u>

Implement the Bubble Sort and Insertion Sort algorithms discussed in Module 1.

You need to generate 'thousand' input arrays, each of size n = 10, 100, 1000, 10000, 100000 filled with random elements (ranging from 1 to m, where m = 500, 5000, 50000) and run the above two algorithms in an automated fashion (i.e., for all the thousand arrays of a particular size and range). For each array size (n) and data range (m), average the running time (measured in an appropriate time unit says, milliseconds or seconds, clearly state it though) observed for each of the two sorting algorithms.

For each value of 'm', plot in Excel the array size 'n' vs. the average running time for each of the two sorting algorithms.

Submission:
Report: (i) Your programming code for the two algorithms
       (ii) Screenshots of sample run of the two algorithms for a particular array size
       (iii) Excel plots (as mentioned above for each value of m) and your interpretation of the plots
Video:
A video recording your explanation of the code for the two sorting algorithms and the interpretation of the plots.

If you are not able to record in Canvas, you could use any of the desktop recording software and upload your recorded video.

You could try using one of the **desktop recording software** (or anything of your choice):

CamStudio: http://sourceforge.net/projects/camstudio/files/legacy/

Debut: http://www.nchsoftware.com/capture/index.html

See next page for sample code

```java
1    import java.util.*;
2
3    class generateRandomIntegers{
4
5        public static void main(String[] args){
6
7            Random randomGenerator = new Random();
8
9            int range[] = {10, 100, 1000};
10           int arraySize[] = {5, 10};
11
12           for (int rangeIndex = 0; rangeIndex < range.length; rangeIndex++){
13
14               for (int sizeIndex = 0; sizeIndex < arraySize.length; sizeIndex++){
15
16                   int array[] = new int[arraySize[sizeIndex]];
17
18                   for (int arrayIndex = 0; arrayIndex < array.length; arrayIndex++){
19                       int randomValue = 1 + randomGenerator.nextInt(range[rangeIndex]);
20                       array[arrayIndex] = randomValue;
21                   }
22
23                   System.out.println("Range: "+range[rangeIndex]+"  Array Size: "+
                     arraySize[sizeIndex]);
24                   for (int arrayIndex = 0; arrayIndex < array.length; arrayIndex++){
25                       System.out.print(array[arrayIndex]+" ");
26                   }
27                   System.out.println();
28
29
30               }
31
32
33           }
34
35       }
36
37   }
```