CSC 145 Project 5 - Fun with Statistics

In this project you will be working with a separate class containing methods and functions that will be called by your main program. The subject of this project is the calculation of means and standard deviations on normal distributions.

Starting with the code provided (see Academic Web page for this course). You will create methods to compute statistical values and then modify the main program to exercise the the StatLib class methods.

1. Create a method to compute the mean of a list of values passed to the method as an array. Add this method to the StatLib class.

2. Create a method to compute the standard deviation of a list of values passed to the method as an array. Add this method to the StatLib class.

3. Create a method to sort an array of doubles into ascending order. Add this method to the StatLib class.

4. Generate arrays of 10, 100, and 1000 normally distributed values with a mean of 5.0 and a standard deviation of 2.0

5. Compute the mean and standard deviation of each of the lists of values generated in (4).

6. Compute the fraction of values in each list that are within +/- 1.0 standard deviation (i.e. 1.0 sigma).

7. Display the means, standard deviations and fractions of values in +/- 1 sigma for all three lists in a table. (Your program should generate this table)

Bonus: Sort the list of 1000 values and compute the mean and standard deviations on each half of the list separately. Discuss/explain your results.
package randomdemo;

public class RandomDemo {
    public static void main(String[] args) {
        int n = 100;
        double S[] = new double[n];
        double T[] = new double[n];
        double R[] = new double[n];
        double m = 10.0;
        double sd = 4.0;

        for (int i = 0; i < n; i++) {
            S[i] = StatLib.uniform();  // creates an array of n uniformly distributed random values between 0.0 and 1.0
        }

        for (int i = 0; i < n; i++) {
            T[i] = StatLib.normal();  // creates an array of n normally distributed random values with mean = 0.0 and stdev = 1.0
        }

        for (int i = 0; i < n; i++) {
            R[i] = StatLib.normal(m, sd);  // creates an array of n normally distributed random values with mean = m and stdev = sd
        }

        showArray(S);
        showArray(T);
        showArray(R);
    }

    public static void showArray(double A[]) {
        for (int i = 0; i < A.length; i++) {
            System.out.println(A[i]);
        }
    }
}

package randomdemo;

public class StatLib {
    public static double uniform() {
        return Math.random();
    }

    public static double normal() {
        return Math.sqrt(-2.0*Math.log(uniform()))*Math.cos(2.0*Math.PI*uniform());
    }

    public static double normal(double mean, double stdev) {
        return mean + stdev*Math.sqrt(-2.0*Math.log(uniform()))*Math.cos(2.0*Math.PI*uniform());
    }
}