CSCI 232 Lab 5

Due Wednesday June 7th @ 11:59 PM. Please submit this assignment (.java files) to the appropriate dropbox on D2L

Background and Instructions

This assignment will be slightly different than other assignments we've done. In this lab, you will conduct an experiment comparing the running time of adding elements to an ArrayList, LinkedList, and HashSet.

You will write code that will add 10,000 random numbers to these three different data structures, and you must measure the time it takes to perform these insertions in **milliseconds**. You can use `System.Nanotime()` to measure the time it takes to complete a series of Java Statements. You can use the built in `.add()` method for each data structure. Before starting this lab, you should make a prediction for what data structure you think will perform the best (the lowest running time). Here is basic code for how to compute the time it takes to run a series of Java statements (in nanoseconds).

```java
long start_time = System.nanoTime();

// code for insertion go here...

long end_time = System.nanoTime();

double elapsed_time = (end_time - start_time)
```

After doing this, you should have three values: the time (in milliseconds) it took to add 10000 numbers into an ArrayList, LinkedList, and HashSet. Once you think you have the correct results from your experiment, you will add a brief print statement at the end of your program that prints out which data structure performed the best. You can hard code this into a print statement, you don't need any if statements.

Using your knowledge of the running times of these different operations, do your results from your experiment make sense?

You can use the Demo class linked below. You do not need to define any other classes, and you don't need define any other methods (unless you would like).

Sample Output

When you run your program, it should look something like this. I don't want to spoil the results of the experiment, so you will discover some of these values when you write your program.

```
Time taken to add 10000 things to an ArrayList: ???
Time taken to add 10000 things to a LinkedList: ???
Time taken to add 10000 things to a HashSet:  ???
The data structure that took the least time was: ???
```

Starting Code

- **Lab5Demo:**
  https://www.cs.montana.edu/pearsall/classes/summer2023/232/labs/Lab5Demo.java

Grading

Grading will be done as follows:

• Your program computes the time taken to add 10000 random numbers to an ArrayList – 3 points

• Your program computes the time taken to add 10000 random numbers to a LinkedList– 3 points

• Your program computes the time taken to add 10000 random numbers to an HashSet – 3 points

• Your program prints out which data structure performed the best – 1 points

NOTE: If your code does not compile, correctness cannot be verified, and you won't receive any points for your code. Turn in code that compiles!