CS136: Computer Science II – Fall 2019

Homework	Points	Announced	Due
#10	30[1]	Nov-11	Nov-15

Introduction

The purpose of this homework is to compare different data structures. Study chapter 15 before attempting this homework.

References

1. Chapter 15 of the textbook; Big Java

General Guidelines

Read the following guidelines carefully before working on this assignment.

1. This is an *individual* homework assignment. You may discuss ideas, ask questions or explain things to your colleagues. Nevertheless, you should solve the problem(s) independently.
2. You should submit your *own work*. Material brought from elsewhere (e.g., the Internet[2], a classmate, submission at a previous offering…) is not acceptable.
3. A program with syntax errors (aka compilation errors) will receive *zero* points.

Submission Instructions

1. Submissions via email will not be accepted. The homework should be submitted via BBLearn by the due date.
2. For question 1, submit Java files (i.e. with .java extension) with the names specified in the problem description. Other file types (e.g. .class, .zip, .jar, .doc, .pdf…) are not acceptable and will receive *zero* points.
3. Make sure that your code compiles and runs without errors when the supplied compilation and execution commands are used.
4. When you use an IDE (e.g., NetBeans, Eclipse…) for writing Java programs, the IDE will automatically use packages and add package statements to your code files. Java files with the package statement will compile but will not run when the below commands are used. So, make sure to remove the package statements from the code you are submitting.
5. Your code must have Javadoc-style comments for all classes, methods, and fields that you write.
6. Make sure that your code compiles without errors when the following command is used:

```
javac CompareTimes.java
```

7. Make sure that your code runs without errors when the following command is used:

```
java CompareTimes
```

[1] The homework will be graded out of 30 points, but it is worth 3% (i.e. 3 points) of the overall course score.
[2] Unless explicitly asked to do so.

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Penalties	
Item	**Points Deducted**
The program doesn't compile using the supplied command(s)	All
The program doesn't run using the supplied command(s)	All
Improper file format	All

Questions

[30 points] Question #1

In this assignment, we will compare the performance of three similar data structures: array, ArrayList and LinkedList. For these three data structures, we will measure the time it takes to create and initialize an object with one million Integer values. To measure the execution time of a code block, you call the method `System.nanoTime()` before and after the code block and the difference between the returned values is the time taken to execute the code block. The following code snippet shows how to measure the execution time of a `for` loop:

```
long startTime = System.nanoTime();

for (int iter = 0; iter < 1000000; iter++) {
}

long endTime = System.nanoTime();

long exeTime = endTime - startTime;

System.out.println("Execution Time:" + exeTime);
```

Create a class named "`CompareTimes`". For each of the three data structures (array, ArrayList and LinkedList), create a method that returns the time it takes to create an object from that data structure and initializing it with the numbers from 0 to 999999. Then, display the results similar to the below sample output:

```
Array:      54952999
ArrayList:  82641648
LinkedList: 127078910
```

The above values depend on many factors, and it is not likely that you get the same numbers.

Grading Rubric	
Item	**Points**
Measuring the time for an array	10
Measuring the time for an ArrayList	10
Measuring the time for a LinkedList	10
Missing JavaDoc comment (per occurrence)	-1

With best wishes
Dr. Mohamed Elwakil