Lab 5 – Sorting Algorithms

Create a Java Project and implement the necessary Java classes in the same package.

For this lab assignment, you need to implement a Quicksort algorithm on an `ArrayList` of integer values and compare your sorting algorithm with Java's built-in sorting methods.
You need to implement two classes, `Main` and `Sorting`. `Sorting` should have your sorting method. In `Main`, you should create an `ArrayList` of 100 integer values, fill it with random numbers, and create a clone before you run your sorting algorithm. First `ArrayList` is for your method to run, and the other is for built-in sorting method.

1. Create an `ArrayList` named `myArrayList`. Fill it with 100 integer values ranged between [1,1000]. You can generate them by using `java.util.Random` library. Also, create another list with the same numbers of `myArrayList` and name this new list as `benchmarkArrayList`. **[10 pts]**
2. Implement the Quicksort algorithm in `Sorting` class. Select the **pivot** as the **first** element of the list. It should take a list as its only parameter. **[40 pts]**
3. Sort the numbers in `myArrayList` using your Quicksort method and print the sorted list. **[10 pts]**
4. Sort the numbers in `benchmarkArrayList` using `Arrays.sort()` and print the sorted list. **[10 pts]**
5. Compare the execution time of your implementation with the built-in sorting method of Java. What is the running time of your algorithm and what is the running time of Java method? Is there a recognizable time difference between them? What could be the reason behind it if there is a difference? Does the running time change if we select the pivot as the last element? Discuss your findings with your own words as a comment to your source code. **[30 pts]**

   You can use the given template method to measure the running time. Keep the list printing operation outside of time calculation so that it will not affect the result.

```
long startTime = System.nanoTime();
// The sorting operation
long endTime = System.nanoTime();
long elapsedTime = endTime - startTime;
// Print sorted list
```

6. Submit your `Main.java` and `Sorting.java` files through Blackboard.

Important note: Any copy from any source will result in a grade of **0**. In that case, submitting nothing at all will be more beneficial for you.

HONOR CODE:

On my honor, as an Izmir University of Economics student, I affirm that I will not give or receive any unauthorized help on this exam, and that all work will be my own. The effort in the exam belongs completely to me.