Lab 3 – Hashing

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

1. You need to implement a simple HashTable for this assignment. You need to use quadratic probing as the underlying method. The hash function you will use for the quadratic probing is `h(x) = h(x) + f(i) (mod size)` and the quadratic function `f(i) = i²`.
   Firstly, you need to use an `array` or `ArrayList` to hold 1000 integer values in your hash table. A random number generator is already given to you in the `Main` class. You will hash this data by using your implementation. You need to implement five essential methods of hashing: `hashFunction` **(10 p)**, `rehash` **(15 p)**, `insert` **(15 p)**, `contains` **(15 p)** and `printTable` **(5 p)**. **(60 pts)**
2. Secondly, you need to use Java implementation of `Hashtable` for hashing operation of another array of integer values that is also given in `Main` class. You have a different data type class implemented, called `MyInteger`, which hashes the integers wrapped in it with using the hashing method of Java.
3. Now, you need to compare the two approaches according to their execution times. You can use the given template method to measure the running time of different hashing implementations. **(15 pts)**

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

4. What do you think about the time complexities of these two methods? Which one performed better? Which one performed worse? Why do you think there is a difference between them? If you have a data of 10 thousand integers, do you think there will be a difference between the running times of these methods? Discuss and write your thoughts as comments in your codes. **(25 pts)**

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.