Lab Assignment 5

CS 302 – Advanced Data Structures and File Processing

Problem 1

You are given an array A of integers and an integer k. Implement an algorithm that determines, in linear time, the smallest integer that appears at least k times in A.

Problem 2

You are given an array A of integers and an integer k. Implement an algorithm that determines in linear time whether there are two distinct indices i and j in the array such that $A[i] = A[j]$ and the difference between i and j is at most k. The algorithm should use a hash table and return i and j. You can assume that such a pair always exists in A.

Implementation

You are given a file *Lab5.java* (which you can download from canvas). The file contains a class `Lab5` with the two functions `problem1` and `problem2`. Implement your solutions in the corresponding functions. **Do not make any changes outside of these two functions (e. g. by adding helper functions); such changes will be undone.** Do not output anything to the terminal.

The program already implemented in the file `Lab5.java` randomly generates test cases. The seed of the random number generator is set to ensure the same test cases whenever to program is executed. Note that the purpose of the tests is for you to avoid major mistakes. **Passing all given tests *does not* imply that your algorithm is correct, especially that is has the expected runtime.**

You can use the class `java.util.HashMap<K,V>` as hash table for your implementation. We assume that the functions `containsKey`, `get`, `put`, and `remove` of this class run in constant time.

Submission

For your submission, upload the file *Lab5.java* with your implementation to canvas.

This is an individual assignment. Therefore, a submission is required from each student.

Deadline: On Canvas.