

## Java Collections

### **What To Do:**

Follow each step carefully. As you complete the lab, submit the source files (.java) problems to the autograder (link is in the Canvas portal). After finishing, please submit your work to the autograder and let one of the TAs know.

**For this lab, please place each method inside its own class file labeled as ProblemX, where X is the problem number. The accompanying test files should be named ProblemXTest.**

## Problem 1

*Anagrams* are strings that are formed by rearranging the letters of another string. For example, “plea” is an anagram for “leap”, but we consider an *alphabetized anagram* to be the alphabetized arrangement of letters for an anagram. As an example, “aelrst” is the alphabetized anagram for “alerts”, “alters”, “slater”, and “staler”. Design the static `Map<String, Set<String>> alphaAnagramGroups(List<String> los)` method, which maps all alphabetized anagrams to the strings *ls* using the above criteria.

The output order of the map is significant: it should be alphabetized by the ordering of the strings. (Which Map type should you use?) Additionally, the fact that we map alphabetized anagrams to strings to sets indicates that duplicates do not matter, and that is true. The ordering of the sets is significant: it should be the insertion order of the strings. (Which Set type should you use?)

Use the following test case as an example, but you need to write **more** tests! If you use only this test, then your JUnit test score will be very low.

```
los = ["presorting", "plea", "introduces", "anger", "leap", "petals",
      "donate", "plates", "range", "reductions", "rediscount", "anger"
      "tapers", "pale", "atoned", "staple", "repast", "reportings"]
alphaAnagramGroups(los)
=> {"adenot", ["donate", "atoned"]},
    {"aegnr", ["anger", "range"]},
    {"aelp", ["plea", "leap", "pale"]},
    {"aelpst", ["petals", "plates", "staple"]},
    {"aeprst", ["tapers", "repast"]}
    {"cdeinorstu", ["introduces", "reductions", "rediscount"]},
    {"eginoprst", ["presorting", "reportings"]}
```

You will need to design a method that creates an “ordered version” of a given string. You **cannot** use any Java sorting methods to do this, e.g., `Arrays.sort`, `Collections.sort`, and so forth. Think about how you can leverage a `PriorityQueue`! Hint: remember Reading Check 9?

## Problem 2

Design the `Set<Integer> moreThanN(int[] A, int n)` method, which receives an `int[] A` and an integer  $n \geq 1$  and returns a new `Set<Integer>` of values containing those values from `A` that occur strictly more than  $n$  times.