Assignment 1

Handout: **Monday, 19 September 2022**
Due: **23:59:59, Monday, 29 September 2022**

Goals:

- To practice the use of Java data types and control structures;
- To get used to the IntelliJ IDEA IDE.

NOTE

JDK 17[1] and IntelliJ IDEA Community Edition Version 2022.2.1[2] will be used in grading your assignments. Make sure you use the same versions of tools for your development.

[1] https://www.oracle.com/java/technologies/javase/jdk17-archive-downloads.html

[2] https://www.jetbrains.com/idea/download/other.html

1. Scientific Notation (20 points)

The scientific notation of a non-zero real number X (i.e., $\mathrm{X} \in R \wedge \mathrm{X} \neq 0$) is of form "AeB", where
- A is called the significand, and it is a real number with its absolute value being between 1 and 10 (i.e., $\mathrm{A} \in R \wedge 1 \leq |\mathrm{A}| < 10$), and
- B is called the exponent, and it is an integer (i.e., $\mathrm{B} \in Z$)

such that X = A * 10^{B}. For example, the scientific notation of -80.5 and 0.017 is -8.05e1 and 1.7e-2, respectively.

What to do: In ScientificNotation.java

[Task 1] Complete method ScientificNotation.getValueFromAeB;
Method getValueFromAeB takes a String in scientific notation form as the argument and returns the corresponding real value.

Note:

- You may assume that the input is always a well-formed scientific notation String, and that the value denoted by the input String is non-zero and always within the range of type double.
- You are not allowed to change the name or argument type of the method, and you may not add other methods to class ScientificNotation.

2. Leading Duplicate Letters Removal (15 points)

Given a string of lowercase English letters, you need to remove all leading letters that are contained in the substring to its right and return the remaining string. Consider a string s=”abcabdc” for example. Since leading letters ‘a’, ‘b’, and ‘c’ are contained in the substrings to their right, namely “bcabdc”, “cabdc”, and “abdc”, they will be removed; Since the second ‘a’ is not contained in the substring “bdc” to its right, it will not be removed, and therefore string “abdc” will be returned.

What to do: In LDLettersRemoval.java

[Task 2] Complete method removeLDLetters in class LDLettersRemoval so that the method returns the remaining string after removing the leading duplicate letters from the argument string.

Note:

- You may assume the input String is never null.
- You are not allowed to change the name or argument type of the method, and you may not add other methods to class LeadingDuplicateLettersRemoval.

3. Base7 (15 points)

Given an integer value X, you need to return the base-7 representation of X as a string. In a base-7 representation, each digit is between 0 and 6, both inclusive, and the value of a digit is based on its position in the representation. For example, given a base-7 representation $r_1 = (d_n \ldots d_3 d_2 d_1 d_0)_7$ $(0 \leq d_i \leq 6, 0 \leq i \leq n)$, the decimal value of r_1 is calculated as $d_n*7^n + \ldots + d_3*7^3 + d_2*7^2 + d_1*7^1 + d_0*7^0$.

What to do: In Base7.java

[Task 3] Complete method convertToBase7 in class Base7 so that the method will take an int value as the argument and return the String representation of the argument based on 7. For example, when the input value is 100, the method should return a string "202".

Note:

- You are not allowed to change the name or argument type of the method, and you may not add other methods to class Base7.

Tests:

You may right-click on class ScientifcNotationTest and select "Run 'ScientificNotationTest'" to execute the tests we prepared for class ScientificNotation. Similarly, you can also execute the tests we prepared for classes LDLettersRemoval and Base7. If any test fails, your implementation is buggy. Note, however, that, since the provided tests only check a small number of input/output pairs, passing all those tests does *not* mean your implementation is correct.

What to hand in:

The whole **Assignment1** folder, including the completed methods, in a ZIP file.

Note:

In your solutions, you may invoke methods defined in the String class, but no methods from the other library classes should be invoked.

The detailed documentation of the String class is at

https://docs.oracle.com/en/java/javase/17/docs/api/java.base/java/lang/String.html.