IT 602: Object-Oriented Programming Lab
Assignment 2: Declarations - Strings, Hashmap, HashSet, and Access control: Exception Handling

January 14, 2022

- **Programming language:** JAVA
- **Due Date:** 27th February 2022 (10:00 PM)

1. Marking scheme and requirements

- Full marks will be given for
    - Working, readable, reasonably efficient, documented code that achieves the assignment goals
    - And for providing appropriate answers to the questions in a prescribed format.
- Please adhere to the lab policies. You are not allowed to copy the codes from the internet. You can discuss the problem with your friends. All the codes should be written by you and submission will be in the prescribed format only.
- Write necessary comments to explain your logic clearly.
- If you submit your work after the deadline, you will get a penalty of 40% of the assignment marks. Your submission will not be accepted if you submit after 48 hours of the deadline.

2. What/how to submit your work

- Please follow the same formatting for creating your submission pdf file.
- You should include these headings for each question in your pdf file:
  Question #1: State the question.
  Code #1: Your code for that respective question.
  Output #1: Put your output screenshots.
  Observations/Remarks #1: In this, you should write any types of remarks or observations you like to highlight regarding your question. If you have taken any assumptions, state those comments clearly.
- **Naming Conventions:** Assignment_1_YOUR-ID.pdf (i.e. Assignment_1_202011017.pdf)
- You have to submit only one PDF file in the Google classroom.

3. Before and in the Introductory lab

In the introductory lab, you will be given introductory information about the declaration of strings, hashmaps, hashsets, and basic informations related to the expectation handling. Implementation details will be shared in the lab regarding the same.

4. Main Assignment

Question 1

On a space expedition, a space explorers' ship crashed on Mars! The designated SOS message is "MAYDAY". The team sends a series of SOS messages to Earth for help. However, due to the cosmic radiation, letters in some of the SOS messages are altered. The signal received by an Earth station is a string. As a space scientist, your task is to determine how many letters of the SOS message have been changed by the radiation so that the actual message can be retrieved.

Example Input: "MAYDXYMAYDAY"
Example Output: 1 (i.e., Only 5th character is altered)

Question 2

Rahul, a great detective has to decode a letter to solve a mystery. He considers a string to be valid if all characters of the string appear the same number of times. He also assumes a string to be valid, if he can remove just 1 character at one index in the string, and the remaining characters will occur the same number of times. Given a string, determine if it is valid. If so, return YES, otherwise return NO.
Example: "app" is a valid string as we can remove 'p' such that: 'a' occurs once and 'p' occurs once. If there is no extra character to be removed just print "YES". Else also print character *ch* that got removed in this format "YES <character_name>".
Input: "madam"
Output: YES d

Question 3

You are playing a very famous game, the "Bulls and cows" with your friend. You write down a secret number and ask your friend to guess what the number is. When your friend makes a guess, you provide a hint with the following info. The number of "bulls", are digits in the guess that are in the correct position. The number of "cows", which are digits in the guess that are in your secret number but are located in the wrong position. Specifically, the non-bull digits in the guess could be rearranged such that they become bulls. Given the secret number **secret** and your friend's guess **guess**, return *the hint for your friend's guess*. The hint should be formatted as "xAyB", where x is the number of bulls and y is the number of cows. Note that both **secret** and **guess** may contain duplicate digits.

Input: secret = "1807", guess = "7810"
Output: "1A3B"

Question 4

Shepherd is a ring master at the grand royal circus. He has n rings. Rings can be either red, green, or blue. There are a total of ten rods that are present on the stage. Shepherd is trying to entertain the audience by putting rings (i.e., 'n' is the number of rings) onto the rods. All the rods are numbered from 0 to 9. As an audience, your job is to find how many rods have all the colored rings. For that, you have one string containing the information telling which ring is onto which rod. For example, the string "R3G2B1" gives a description for 3 rings: a red ring placed onto the rod labeled 3, a green ring placed onto the rod labeled 2, and a blue ring placed onto the rod labeled 1. Here in the given case, the answer would be zero as no rods have all three rings. Your answer should take care of all the possible edge cases.

Input: "R3G2B1G3B3"

Output: 1 (only rod-3 has all three rings)

Question 5

You are appointed as a Data Engineer in XYZ company. Your task is to count the people whose age is below 50. For performing the task, you can assume that you're given a text file in which they have entered their birthdates manually. While collecting data, they have forgotten to tell the people about the prescribed format. Some of the dates contain the alphabet. Your job is to identify the number of faulty dates and correct them into the prescribed format along with calculating the number of people who are below 50. Output the count and the revised list of dates.

Notes:

- The date must be in the prescribed format (i.e., DD-MM-YYYY)
- Your code should not terminate if the file name is not as desired. You should give appropriate warnings/comments to the user.
- Clearly mention which types of exceptions you have handled in the Remarks section
- Write a custom message for each Exception

<u>Example input text file</u>

10-10-1985
05-12-1997
01-jan-1998
30-may-1972
5-10-1997

Question 6

Yashwant has string *str* that is used to build magical string *magic* by repeating the string *str* infinitely many times. For example, if *str* = '*xxyyy*', then *magic* = '*xxyyyxxyyyxxyyy...*' . One of Yashwant's friends, Henry always boasts about his sharp memory and claims that he is very good at counting. To test Henry's ability, Yashwant decided to hold a test for Henry, to check the reality of his claims.

Yashwant will give Henry *q* queries, such that each query consists of two integers *l* and *r*, and a lowercase English letter *ch*. The answer to each query is how many times the letter *c* appears between the *lth* and *rth* letters in string *magic*.

Henry must answer all the queries correctly, in order to prove his claims. Can you help Henry by answering all queries?

Example Input
str: abcabdca
l: 1
r: 8
ch: c
Example Output
2

You have to show the output for the given inputs
str: abcabdca
Query #1:
l: 1 , *r:* 8 , *ch:* c
Query #2:
l: 1 , *r:* 15 , *ch:* b
Query #3:
l: 4 , *r:* 9 , *ch:* a
Query #4:
l: 5 , *r:* 25 , *ch:* d
Query #5:
l: 2 , *r:* 7 , *ch:* c
Query #6:
l: 3 , *r:* 8 , *ch:* c