Assignment Problem 1:

The problem occurs as part of surveilance system in real life applications. IIT B Security has been instructed to monitor and examine the data of all vehicular traffic that enters and exits into its campus. The specifications of the problem are as follows :

1. There is only one Gate (MAIN GATE) through which every vehicle has to enter into and exit from the campus.
2. An entry log is made as each vehicles enters, which comprises of the registration number of the vehicle (alphanumeric string of length max 6, the first two symbols are from [AA to ZZ] concatenated by 4-digit numbers [1000 to 9999] (note that registration number has been simplified as compared to the format used by RTO).
3. An exit log is made as each vehicle exits from the campus, which comprises of the registration number of the vehicle.
4. The entry and exit logs are processed once at the end of each day, say 12:00 midnight.
5. The logs are input text files with unknown number of entries (format as mentioned above) in each file.
6. The entries in both the input files are not in any particular order.
7. The worst case size of the input files may be estimated as follows. There are $26*26*9*10^3$ = 6084000 possible distinct registration numbers and since a vehicle may enter / exit multiple times, the input size can be even larger than 6084000 in the event that owners of all vehicles desire to visit the campus (convocation, for example).

The processing of the logs is to be done to obtain the following information :

- Display of all vehicles that have entered and left the campus, sorted in ascending order of registration numbers. Since a vehicle may enter and exit multiple times, the number of times such a vehicle entered is also to be displayed.
- Display of all vehicles that have entered but not left the campus, also sorted in ascending order of registration numbers. Like in the previous case, the number of times the vehicle has entered is also to be provided.
- Display of all vehicles whose logs are inconsistent - have exited but not entered and others of the same spirit, also sorted in ascending order on registration numbers.

Illustration : **Input Files:**

Entry_log :
MH2011 AP7056 GZ1024 MH1050 AP7056 BH9051 RJ3067 MH1050 GA4078 MH2011 AP7056

Exit_log :
MH1022 GZ1024 MH1050 AP7056 MH2011 BH9015 RJ3067 MH1050 GA2078 MH2011 AP7056 GA2078

Desired Output :

Vehicles Left Campus :

GZ1024 1 MH1050 2 MH2011 2 RJ3067 1

Vehicles Entered but not Left :

AP7056 3 BH9051 1 GA4078 1

Vehicles with Inconsistent Logs:

BH9015 GA2078 MH1022

Design Choices : The program designed by you has to abide by the following instructions.

1. You have to use a linked list representation implementation for solving the problems. Define the list class carefully so that you are able to defend your decisions about the choice of data / function members, the visibility of the members and such choices made. DO NOT USE ANY ADVANCED FEATURE THAT HAS NOT BEEN DISCUSSED IN THE LECTURES, SUCH AS STL / HASH LISTS, in your code.

2. Write a program that can generate as many registration numbers as asked by the user, in a random order. The number may be very large, say 10^{12} and your design should be able to smoothly handle inputs of this scale (speed is not a concern for very large sizes). Use this to create the 2 input files.

3. Run your program with large inputs generated by step 3, either manually or by writing a shell program, as you deem comfortable.

4. Submit the programs, after ensuring that it passes the three steps listed above.

5. Wait for instructions from your TA for details about method of uploading your program and other documents to be submitted, if any.

6. Read the Instructions given separately and follow them.

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