CMPE 160: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING
Project 2

Deadline: 15.05.2016, 23.59 AM.

In this project, you are expected to design and develop a program that can be used to simulate transportations done using freight trains.

1 Description

You are going to simulate a transportation scenario. According to this scenario, you are given several cities. In each city, there exists a train station which consists of two garages; one for locomotives and the other for waggons. Your task consists of several missions. Each mission requires you to assemble a simulated train at the specified city and by following the given route, arrive at the destination city, leaving and taking waggons from the cities you visit. You are expected to create a program that reads the input about the trains from the input files and after completing the missions, produces an output file exhibiting the final state of the stations at each city.

1.1 Cities

- The data about the cities can be found in *data/dests.txt*.
- In this file, you are given several cities as possible destination points for your simulations.

1.2 Stations

- In each city you are given, there exists a train station.
- In a station, there are two garages: a waggon garage and a locomotive garage.
- A waggon garage keeps the waggons in the station.
- In our scenario, waggon garages are modeled as stacks that are following the last-in-first-out policy.
- The initial configuration of waggon garages in each city is given in *data/waggons.txt*.

- A locomotive garage keeps the locomotives in the station.
- In our scenario, locomotive garages are modeled as priority queues. When asked for a locomotive, they should retrieve the most powerful locomotive inside the garage.
- The initial configuration of locomotive garages in each city is given in *data/locs.txt*.
- A train is modeled as a doubly linked list. Keep in mind that *Locomotive* class extends *Waggon* class. Therefore, you will have doubly linked lists of waggons as your trains.

1.3 Missions

- The missions are given in *data/missions.txt*.
- A misson has the following format: A-B-C-x-y-z_1, z_2...
  - A: Starting station.
  - B: Midway station.
  - C: Target station.
  - x: Number of waggons you take from the starting station.
  - y: Number of waggons you take from the midway station.
  - z: Indices of the waggons you must leave at the midway station.
- A complete mission requires you to complete the following procedure:
  1. Assemble a train at the starting city, **A**. Since a train is modeled as a doubly linked list of waggons, you need to start with the most powerful locomotive you have in the locomotive garage and insert it into the head of your list. Afterwards, you need to insert **x** waggons the waggon garage at city A to this list.
  2. Append **y** waggons from the midway station, **B**, to your list.
  3. Leave waggons $\mathbf{z_1}, \mathbf{z_2}$... at midway station.
  4. Continue to your journey and disband the train at target station, **C**. When disbanding the train, put the locomotive into the locomotive garage and waggons into waggon garage at C.
- During a mission you need to pay attention to the order of insertions and removals.
- An example run is given in Section 4.

2 Details

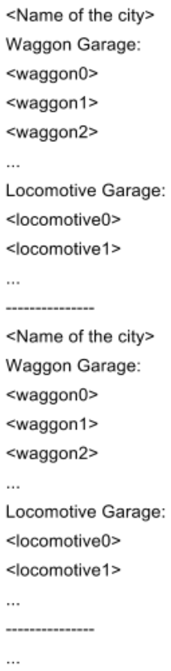
In the source code that is provided to you, there are three packages: **intfs, adts** and **runnable**.

- *runnable* contains your main class, as usual and is responsible for the operation of the program.

- *intfs* package contains three interfaces; **StackIntf, PriorityQueueIntf** and **DoublyLinkedListIntf**. You are expected to design and implement the Abstract Data Types (ADTs) using these interfaces.
- You are expected to develop generic classes as your ADTs. In the *adts* package, there are 3 incomplete classes that will be the ADTs you are expected to use in the project. The most of the structure for creating generic ADTs is given in the code you are provided with.
- During implementation, please pay attention to the markers we placed. Write your code between **// CHANGES START BELOW THIS LINE** and **// CHANGES END ABOVE THIS LINE** lines.
- IMPORTANT: Try to put as small code as possible inside the main method. Create other methods or classes, preferably, and call them in you main method. Main method should be quite comprehensible.

3 Output File

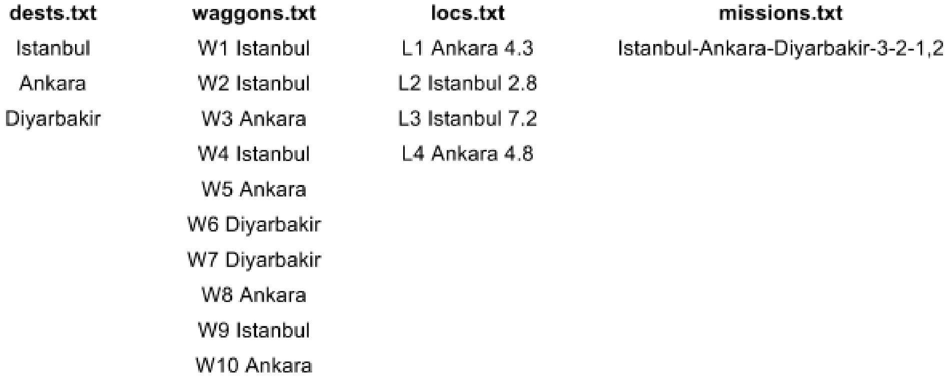
Your program should generate an output file exhibiting the final status of the stations. The output format we picked has to be followed strictly. The format is as follows:



```
<Name of the city>
Waggon Garage:
<waggon0>
<waggon1>
<waggon2>
...
Locomotive Garage:
<locomotive0>
<locomotive1>
...
---------------
<Name of the city>
Waggon Garage:
<waggon0>
<waggon1>
<waggon2>
...
Locomotive Garage:
<locomotive0>
<locomotive1>
...
---------------
...
```

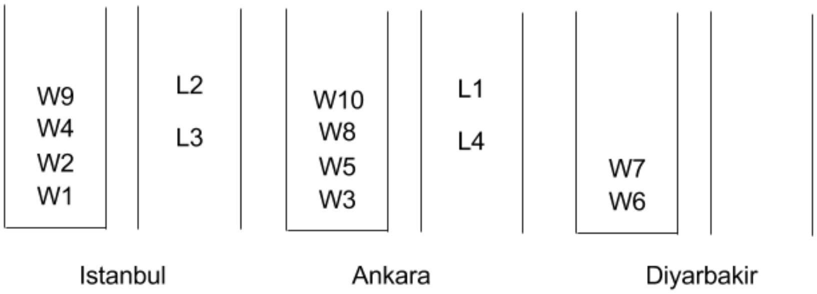
4 Example Run

- Assume that you are given the following files:

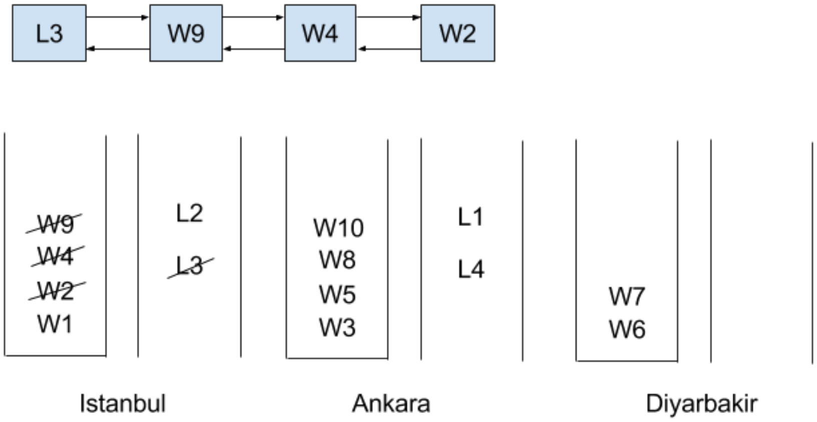


dests.txt	waggons.txt	locs.txt	missions.txt
Istanbul	W1 Istanbul	L1 Ankara 4.3	Istanbul-Ankara-Diyarbakir-3-2-1,2
Ankara	W2 Istanbul	L2 Istanbul 2.8	
Diyarbakir	W3 Ankara	L3 Istanbul 7.2	
	W4 Istanbul	L4 Ankara 4.8	
	W5 Ankara		
	W6 Diyarbakir		
	W7 Diyarbakir		
	W8 Ankara		
	W9 Istanbul		
	W10 Ankara		

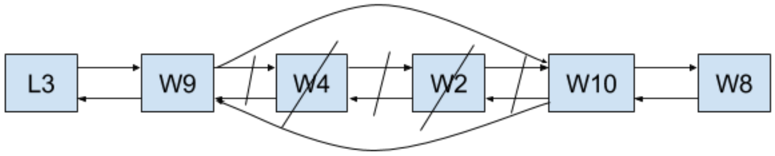
- Reading the input from these files, the initial configuration of the stations as follows:

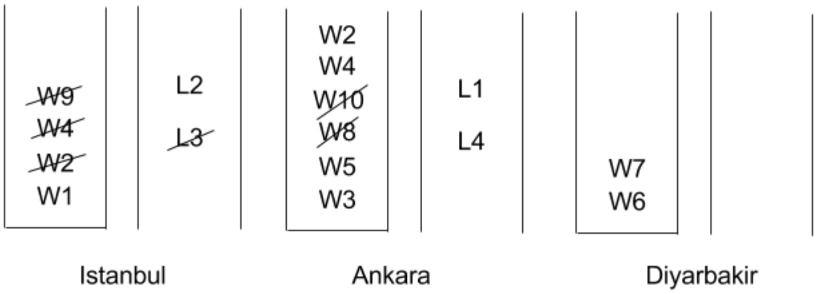


- After reading the mission, assemble the following train, leaving the station in Istanbul as below:

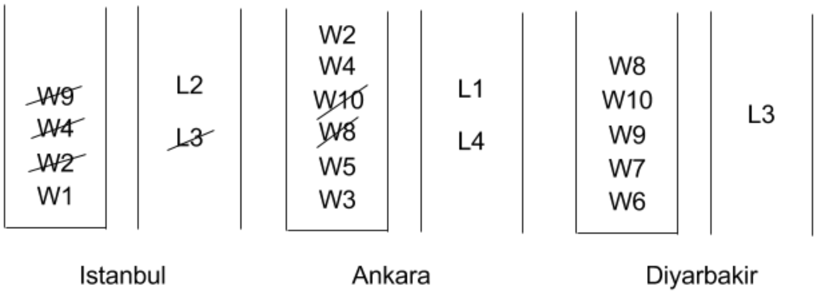


- The train takes 2 waggons from Ankara and leaves the first and second waggon after the locomotive at Ankara (Locomotive is not counted, waggon indices start from 0). Pay attention to the order.

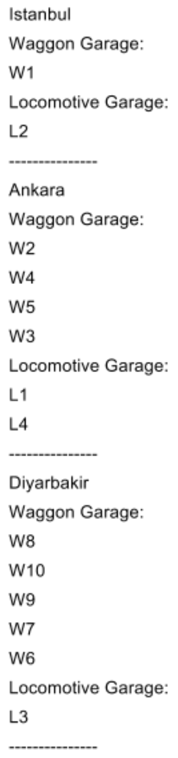




- After the train reaches to Diyarbakir, it is disbanded at this city. Waggons and the locomotive are inserted to the corresponding garages. Again, pay attention to the order.



- The output is given in *data/result.txt* file, as follows:



```
Istanbul
Waggon Garage:
W1
Locomotive Garage:
L2
---------------
Ankara
Waggon Garage:
W2
W4
W5
W3
Locomotive Garage:
L1
L4
---------------
Diyarbakir
Waggon Garage:
W8
W10
W9
W7
W6
Locomotive Garage:
L3
---------------
```