CISC320 Spring 2018
Programming Assignment 3

You may use any of the following programming languages:

Java
C++ / C
Python
PLT Scheme (Racket subset)

If you would like to use a different one please let me know ahead of time. If you are using a specific library other than ones I list please also let me know.

* I have provided a basic python graph library on Canvas as well

Recommended graph libraries:
C++: boost, http://www.boost.org/doc/libs/1_62_0/libs/graph/doc/index.html
Python: NetworkX, http://networkx.github.io/index.html
Java: JGraphT, https://github.com/jgrapht/jgrapht
PLT Scheme: Racket Generic Graph Library, https://docs.racket-lang.org/graph/index.html

Testing

You will be given a file as input with the name "scenario_in.txt" where scenario will be different for each scenario and we will expect whatever programming language you use to write a file as output with the same name as the input file replacing "_in.txt" with "_out.txt" (i.e. if the input file is "simple_in.txt" the output file should be "simple_out.txt").

Please check canvas for updated scenarios. There will be some additional hidden scenarios that we will use to check for correctness of implementation.

Grading

Grading will be 80% for correctness and 20% for performance. As long as you solve the problem in polynomial time you will receive 15% for performance.

Problem

Vladimir has white skin, very long teeth and is 600 years old, but this is no problem because Vladimir is a vampire. Vladimir has never had any problems with being a vampire. In fact, he is a successful doctor who always takes the night shift and so has made many friends among his colleagues. He has an impressive trick which he loves to show at dinner parties: he can tell blood group by taste. Vladimir loves to travel, but being a vampire he must overcome three problems.

1. He can only travel by train, because he must take his coffin with him. Fortunately he can always travel first class because he has made a lot of money through long term investments.
2. He can only travel from dusk till dawn, namely, from 6 P.M. to 6 A.M. During the day he has must stay inside a train station.
3. He has to take something to eat with him. He needs one litre of blood per day, which he drinks at noon (12:00) inside his coffin.

Help Vladimir to find the shortest route between two given cities, so that he can travel with the minimum amount of blood. If he takes too much with him, people ask him funny questions like, "What are you doing with all that blood?"

Input

The first line of the input will contain a single number telling you the number of test cases.

Each test case specification begins with a single number telling you how many route specifications follow. Each route specification consists of the names of two cities, the departure time from city one, and the total traveling time, with all times in hours. Remember, Vladimir cannot use routes departing earlier than 18:00 or arriving later than 6:00.

There will be at most 100 cities and less than 1,000 connections. No route takes less than 1 hour or more than 24 hours, but Vladimir can use only routes within the 12 hours travel time from dusk till dawn.

All city names are at most 32 characters long. The last line contains two city names. The first is Vladimir's start city; the second is Vladimir's destination.

Output

For each test case you should output the number of the test case followed by "`Vladimir needs # litre(s) of blood.`" or "`There is no route Vladimir can take.`"

Sample Input

```
2
3
Ulm Muenchen 17 2
Ulm Muenchen 19 12
Ulm Muenchen 5 2
Ulm Muenchen
10
Lugoj Sibiu 12 6
Lugoj Sibiu 18 6
Lugoj Sibiu 24 5
Lugoj Medias 22 8
Lugoj Medias 18 8
Lugoj Reghin 17 4
Sibiu Reghin 19 9
Sibiu Medias 20 3
Reghin Medias 20 4
Reghin Bacau 24 6
Lugoj Bacau
```

Sample Output

```
Test Case 1.
There is no route Vladimir can take.
Test Case 2.
Vladimir needs 2 litre(s) of blood.
```