UCF "Practice" Local Contest — August 26, 2006

It's a Long Way to Next Door (filename: nextdoor)

The Internet is composed of multiple independent networks. These networks are connected by routers which are responsible for moving information between the independent networks. Each router in the path of communication between two computers is called a "hop." Internet Service Providers (ISPs) provide access to the Internet by creating a large independent network for their users, and using routers to send Internet traffic to users on other ISPs. There is no particular structure to the Internet, and as a result, it is sometimes necessary to visit several "hops" through different ISPs when communicating on the Internet, even if the destination machine is next door.

The designers of the next generation Internet have asked you to help solve the routing problem. Given a list of computers, routers, and physical connections between the routers, your job is to find the minimum number of hops necessary to communicate between pairs of machines.

The Input:

The input consists of multiple data sets. The first line of the input file contains a single positive integer N indicating the number of data sets. Each data set represents one possible layout for the next generation Internet.

The first line of a data set has three integers R ($1 \leq R \leq 50$), C ($1 \leq C \leq 50$), and T ($T \geq 1$), denoting the number of routers, computers, and test cases, respectively. Each of the next R input lines contains two strings. These two strings are the names of two distinct routers with direct connection on the Internet (note that this allows communication in both directions). Each string (router name) will be 1 to 20 characters (inclusive), and will contain only letters and digits. Assume that these input lines start in column 1 and there is exactly one space separating the two router names on a line.

Each of the next C input lines contains the name of a computer and the router to which it is directly connected. No computer will be connected to a router that does not appear in the router connection list, and each computer will be connected to a single router. The computer name will be 1 to 20 characters (inclusive), and will contain only letters and digits. Assume that the computer name (for these input lines) starts in column 1 and there is exactly one space separating the computer name and the router name.

The final T input lines for a data set will be pairs of distinct computers for which the minimum distance should be calculated. These input lines also start in column 1 and there is exactly one space separating the two strings.

The Output:

For each data set, print a data set header. Then print the minimum number of hops required and the list of routers (in order of visit on the pathway) used to communicate between the computers. Assume that a path will always exist between the given computers. If there is more than one possible minimum path, you may print any one of them. Note, if both computers are connected to the same router, a single hop is still required.

Leave a blank line after the output for each data set. Follow the format illustrated in Sample Output.

Sample Input:

```
2
3 4 2
Router1 Router2
Router2 Router3
Router3 Router4
Comp1 Router1
Comp2 Router2
Comp3 Router3
Comp4 Router4
Comp1 Comp2
Comp1 Comp3
1 3 3
Router1 Router2
Comp1 Router1
Comp2 Router1
Comp3 Router2
Comp1 Comp2
Comp2 Comp3
Comp1 Comp3
```

Sample Output:

```
Data set #1:
Comp1 to Comp2 requires 2 hops: Router1 Router2
Comp1 to Comp3 requires 3 hops: Router1 Router2 Router3

Data set #2:
Comp1 to Comp2 requires 1 hops: Router1
Comp2 to Comp3 requires 2 hops: Router1 Router2
Comp1 to Comp3 requires 2 hops: Router1 Router2
```