

The 34<sup>th</sup> Annual  
ACM International Collegiate  
Programming Contest  
ASIA Regional - Seoul



## Problem J

### Jinhan

During the Samhan Period or the Proto-Three Kingdoms Period, which refers to the period after the fall of Gojoseon and before the maturation of Goguryeo, Baekje, and Silla into full-fledged kingdoms, the city-states of central and southern Korean Peninsula were grouped into three confederacies called Mahan, Jinhan, and Byeonhan. Sam means *three*, and Han is a Korean word meaning *great* or *leader*. The names of these confederacies are reflected in the current name of Korea, Daehan Minguk (literally, “Great Han People's Nation”).

One of the city-states called Saro-guk, which was established by King Park Hyeokgeose in 57 BCE, around present-day Gyeongju, was the leader of Jinhan confederacy. As the city-state expanded, it changed its name to Silla, which was the longest sustained dynasty in Asian history. We knew little about other city-states of Jinhan confederacy, with the exception of their names.



Recently, Prof. Choi, who is a highly considered archaeologist, announced that he had found the tomb of King Park Hyeokgeose. By virtue of his major archaeological discovery, we get to know a little of the daily life of Jinhan people. However, even the locations of city-states of Jinhan confederacy except for Saro-guk have been not known as yet. Thanks to his success of deciphering the inscription engraved on the stone wall of the tomb, the distances between some pairs of city-states of Jinhan confederacy including pairs between Saro-guk and every other city-state have been known.

An ambitious research for estimating the locations of all city-states of Jinhan confederacy is initiated by Prof. Choi and his research group. He conjectures that the city-states of Jinhan confederacy were located in a row. His conjecture is based on the knowledge that Jinhan confederacy was located at between the Taebaek Mountains and East Sea. To verify his conjecture, he develops a mathematical model, where the area occupied by Jinhan confederacy is simplified into a straight line, say the  $x$ -axis, and the distance between two city-states is represented by a positive integer. The location of a city-state can be described by a point on the  $x$ -axis. It is assumed that Saro-guk is located at the origin of the  $x$ -axis.

Prof. Choi wants to determine whether or not it is possible to locate all the city-states of Jinhan confederacy on the  $x$ -axis subject to the distance constraints between the city-states. Of course, no two city-states should occupy the same location. Write a program that can help him. We denote by  $n$  the number of city-states of Jinhan confederacy, and assume that the city-states are numbered from 1 to  $n$  inclusive and thus no two city-states have the same number. Saro-guk has a number of 1. The distances between some pairs of city-states including pairs of Saro-guk and every other city-state are given as input.

For example, if  $n$  is equal to three, the distance between city-states numbered 1 and 2 is four, and the distance between city-states 1 and 3 is also four, then it is possible to locate the city-states 1, 2, and 3 at

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positions 0, 4, and  $-4$  on the  $x$ -axis, respectively. They can be located at positions 0,  $-4$ , and 4, too. However, they cannot be located neither at positions 0, 4, and 4 nor at positions 0,  $-4$ , and  $-4$ .

### Input

Your program is to read from standard input. The input consists of  $T$  test cases. The number of test cases  $T$  is given in the first line of the input. The first line of each test case contains two integers. The first integer,  $n$ , is the number of city-states of Jinhan confederacy, and the second integer,  $m$ , is the number of pairs of city-states whose distance is known, where  $1 \leq n \leq 3,000$  and  $1 \leq m \leq 300,000$ . In the following  $m$  lines, each line contains three integers  $u$ ,  $v$ , and  $d$  which represent that  $u$  and  $v$  are known to be at a distance  $d$  apart, where  $1 \leq d \leq 300,000,000$ .

### Output

Your program is to write to standard output. Print exactly two lines for each test case. The first line of each test case should contain the number  $n$  of city-states of Jinhan confederacy. It should follow the second line containing the positions of city-states 1, 2, ..., and  $n$  in order if they can be located on the  $x$ -axis satisfying all the mentioned conditions; otherwise, it should contain just `impossible`. If there are multiple solutions, pick any one of them.

The following shows sample input and output for three test cases.

#### Sample Input

```
3
3 2
1 2 4
1 3 4
3 3
1 2 4
3 2 4
3 1 4
4 6
1 2 1
2 3 1
3 4 1
1 3 2
2 4 2
4 1 3
```

#### Output for the Sample Input

```
3
0 4 -4
3
impossible
4
0 1 2 3
```