Problem BEACON: Beacon

To make navigation easier on the Sea of Tranquility, some radio navigation beacons have been installed at fixed positions. Each beacon transmits a radio signal on a specific frequency, and its signal can be received by ships anywhere on the sea.

You are the navigator of HMS Apollo and your task is to devise a route between two points. For the sake of safety, the captain insisted that the ship should always stay within a triangle defined by beacons operating at the same frequency and the ship's radio should be tuned to that frequency. You are allowed to change the frequency of the radio, but that will take some time during which the ship must be stopped.

Stopping and starting a ship is a complicated and time-consuming procedure, so your route should minimize the number of such manoeuvres.

Note that if more than three beacons operate at the same frequency then the ship can be in a triangle defined by any three of them, and that the edges and vertices of a triangle count as part of the triangle.

Input

The first line contains the x, y coordinates of two points s and t, in metres.

The second line contains a single integer k, $1 \leq k \leq 50$, the number of different frequencies.

Next, each frequency band is described as follows. First a line containing a single integer n_i, $3 \leq n_i$, the number of beacons that operate at that frequency. Then n_i lines follow with the x, y coordinates of each beacon.

Coordinates are integers with absolute value at most 10^6. There are at most $100\,000$ beacons in total. All beacons are in different locations. Not all beacons of the same frequency lie on the same line.

Output

The minimum number of stops needed to go from point s to point t, or the word "`impossible`" if there is no route satisfying the requirements.

Sample Input 1

```
0 -50 150 -50
2
4
100 0
0 100
-100 0
0 -100
4
250 0
150 100
50 0
150 -100
```

Sample Output 1

```
1
```

Sample Input 2

```
0 -50 250 -50
2
4
100 0
0 100
-100 0
0 -100
4
350 0
250 100
150 0
250 -100
```

Sample Output 2

```
impossible
```