

Flights

Time Limit: 1.0s **Memory Limit:** 256M

Burak and Birkan are travelling around the globe with planes. For simplicity, we will model our planet as a perfect sphere of 1 unit radius in this problem. Some areas on the planet are restricted for air transport and no flight can cross such areas.

There are N airports on the planet numbered from 1 to N . An airport is a point on the sphere defined by its latitude and longitude. A flight between two airports always takes the shortest path on the sphere. No two airports are placed on antipodal points(exact opposite points on the sphere).

There are M restricted areas. Defined by two non-antipodal points on the sphere, a restricted area is the shortest path connecting them. There is a flight between a pair of airports if and only if the shortest path connecting the airports does not cross any of the restricted areas. Note that it can not even touch a restricted area endpoint.

Burak and Birkan are in airport S and would like to get to airport T . What is the shortest possible total distance they have to travel?

Input

The first line contains integer N . Each of the next N lines contains two integers separated by a single space which are an airport latitude and longitude respectively. The following line contains integer M . Each of the following M lines contains four integers separated by single spaces: the latitude and longitude of the first restricted area endpoint followed by the latitude and longitude of the second endpoint. The last line contains two integers S and T separated by a single space.

Output

If it is impossible to get from airport S to airport T print -1 . Otherwise print the shortest total distance between them. An output is considered correct if its absolute or relative error does not exceed 10^{-4} .

Constraints

- $1 \leq N, M \leq 100$
- $1 \leq S, T \leq N$
- $-90 \leq \text{latitude} \leq 90$
- $0 \leq \text{longitude} \leq 359$
- No two airports are antipodal.
- No airport is located in a restricted area.
- For each restricted area, its endpoints are not antipodal.

Examples

Input:

```
3
89 0
-89 0
0 180
1
0 10 0 350
1 2
```

Output:

```
3.1764992386
```