



## Problem F Forbidden Spell

Time limit: 3 seconds

Memory limit: 2048 megabytes

### Problem Description

Finn is a wizard who can cast powerful spells that affect very large areas. Recently, he discovered a forbidden spell from ancient books that allows him to set a huge region on fire.

Finn lives in a country with boundaries that can be described as a convex polygon  $A$  on the Cartesian plane. The forbidden spell that he will cast affects a region inside a convex polygon  $B$ . Unfortunately, the regions inside  $A$  and  $B$  have a positive intersection area. To avoid damaging his own country, he has to cast a wind magic that changes the region  $B$ .

Finn can cast wind magic with a positive strength  $s$ , which will move the entire region  $B$  by  $s$  units along the direction parallel to the vector  $(d_x, d_y)$ . Given the vector  $(d_x, d_y)$ , please help Finn find the minimum strength of wind magic he has to cast to make the regions  $A$  and  $B$  no longer intersect each other. You have to answer  $q$  independent queries.

### Input Format

The first line contains of an integer  $n$ . Each of the following  $n$  lines contains two integers  $x$  and  $y$  describing the coordinates of a vertex in  $A$ .

The next line contains of an integer  $m$ . Each of the following  $m$  lines contains two integers  $x$  and  $y$  describing the coordinates of a vertex in  $B$ .

The next line contains of an integer  $q$ . Each of the following  $q$  lines contains two integers  $d_x, d_y$  describe a query.

The vertices of  $A$  and  $B$  are given in counterclockwise order.

### Output Format

For each query, print a real number denoting the minimum strength of the wind magic Finn has to cast. Your answer will be accepted if the absolute or relative error is less than  $10^{-6}$ .

### Technical Specification

- $3 \leq n, m \leq 2 \times 10^5$
- The coordinates of each vertex in  $A$  and  $B$  are within the range  $[-10^8, 10^8]$ .
- Each interior angle of  $A$  and  $B$  is less than 180 degrees.
- The intersection of the interiors of  $A$  and  $B$  has positive area.
- $1 \leq q \leq 10^5$



- $-10^8 \leq d_x, d_y \leq 10^8$
- $(d_x, d_y) \neq (0, 0)$

### Sample Input 1

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

### Sample Output 1

```
1.4142135624
1.0000000000
2.9814239700
```