Problem G
Garden

Time limit: 3 seconds

Memory limit: 1024 megabytes

Problem Description

There is a grassland in front of Alice's house with some beautiful flowers. Alice wants to fence up all of the flowers to be her garden.

The grassland is a 2D plane, and there are m flowers on the grassland. The j-th flower is on the integer position (x_j, y_j). There are also n wood piles on the grassland. The i-th wood pile is on the integer position (X_i, Y_i). She wants her gardan is a *convex polygon*, that means if she wants to move from one place to another place in her garden, she can go in a straight line without leaving her garden. The garden should have a positive area and all of the vertices should be a wood pile on the grassland. All of the flowers should be *strictly* inside the garden, that means the flower can not be outside the garden or on the border of the garden. She needs some fences to fence up her garden, and she wants to minimize the total length of the fences. If she wants to put the fences between the a-th wood pile and the b-th wood pile, she needs $\sqrt{(X_a - X_b)^2 + (Y_a - Y_b)^2}$ length of fences.

She is curious if she can to use the i-th wood piles as one of the vertices in her garden. What is the minimal length of fences she needs? Can you help her?

Input Format

The first line contains one integer n indicating the number of wood piles. Following contains n lines. The i-th line contains two integers X_i, Y_i separated with one space indicating the position of the i-th wood piles. Next line contains one integer m indicating the number of flowers. Following contains m lines. The j-th line contains two integers x_j, y_j separated with one space indicating the position of j-th flowers. Guarantee no three wood piles are collinear and all the positions of flowers and wood piles are distinct.

Output Format

Print n floating number, the i-th number indicates the minimal length of fences if Alice wants to use the i-th wood pile as one of the vertices in her garden. If it is impossible to fence up her garden with the i-th wood pile, please print -1. The answer is considered as correct if its absolute or relative error doesn't exceed 10^{-6}. Namely, if your answer is a, and the jury's answer is b, then your answer is accepted, if $\frac{|a-b|}{max(1,|b|)} \leq 10^{-6}$

Technical Specification

- $1 \leq n \leq 100$
- $-10^9 \leq X_i, Y_i \leq 10^9$
- $1 \leq m \leq 10^5$

- $-10^9 \leq x_j, y_j \leq 10^9$

Sample Input 1

```
5
0 0
2 2
-2 -2
2 -2
-2 2
4
1 1
-1 -1
1 -1
-1 1
```

Sample Output 1

```
-1 16 16 16 16
```