Problem A. Well, Just You Wait!

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	512 megabytes

Vasya, the actor who played the Wolf in russian animated series «Well, Just You Wait!», took a part in scenes of chasing Petya who played the Hare in this series. Nobody ever knew that Vasya actually wants to eat Petya!

The film set is a convex polygon of n vertices on a plane. Petya is a great nature lover. Each of the next m days he will plant a tree right in a film set. Vasya wants to hide somewhere on the film set. In the morning Petya will come to plant a tree, Vasya will jump out of his cover and eat Petya.

Film set is full of surprises. At any moment workers can build a new wall. Wall is a segment that connects two vertices of the polygon. Vasya doesn't want to fail, so he decided to choose a place for a hiding such that it is impossible to install a wall that separates Vasya and Petya (If a wall comes right through Vasya's hiding place, then he can move to the part of the polygon where Petya is located).

Vasya doesn't want Petya to detect him before the attack. Therefore Vasya want to choose a place to hide with maximum possible distance from the place where Petya will plant a tree.

Your task is to help Vasya: for each of the next m days calculate the maximum possible distance from a tree to a possible place to hide.

Input

The first input line contains the only integer n — number of vertices of polygon that represents the film set ($3 \le n \le 2\,000$).

The next n lines contain pairs of integers x_i, y_i — coordinates of points that represent vertices of the polygon ($-200\,000 \le x_i, y_i \le 200\,000$), given in counterclockwise order. It is guaranteed that polygon is convex and there is no three vertices on the same line.

The next line contains single integer m — number of days ($1 \le m \le 1\,000$).

Each of the next m lines contains pairs of integers u_i, v_i — coordinates of points where Petya wants to plant a tree on the i-th day ($-200\,000 \le u_i, v_i \le 200\,000$). It is guaranteed that all of these points lie strictly inside of the polygon and do not lie on a line that connects two vertices of the polygon.

Output

Print m lines.

In the i-th line print single number — the maximum distance that Vasya can hide from location of the tree that Petya will plant on day i. Your answer will be considered correct if it's absolute or relative error related to correct answer is lower than 10^{-6}. Namely: let's assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct, if $\frac{|a-b|}{\max(1,a)} \le 10^{-6}$.

Scoring

Subtasks	Scores	Constraints		
		n	m	x_i, y_i, u_i, v_i
1	6	$3 \le n \le 4$	$1 \le m \le 5$	$\lvert x_i\rvert, \lvert y_i\rvert, \lvert u_i\rvert, \lvert v_i\rvert \le 50$
2	13	$3 \le n \le 15$	$1 \le m \le 5$	$\lvert x_i\rvert, \lvert y_i\rvert, \lvert u_i\rvert, \lvert v_i\rvert \le 100$
3	12	$3 \le n \le 70$	$1 \le m \le 70$	$\lvert x_i\rvert, \lvert y_i\rvert, \lvert u_i\rvert, \lvert v_i\rvert \le 1000$
4	30	$3 \le n \le 200$	$1 \le m \le 200$	$\lvert x_i\rvert, \lvert y_i\rvert, \lvert u_i\rvert, \lvert v_i\rvert \le 10\,000$
5	39	$3 \le n \le 2\,000$	$1 \le m \le 1\,000$	$\lvert x_i\rvert, \lvert y_i\rvert, \lvert u_i\rvert, \lvert v_i\rvert \le 200\,000$

Examples

standard input	standard output
5 5 -2 5 1 2 3 -1 3 -1 -3 1 2 1	1.9166296949998198
3 3 1 10 3 5 7 3 5 2 9 3 6 6	5.0990195135927845 6.324555320336759 5.830951894845301

Note

There is an illustration of the first example below. Dashed lines represent possible locations of wall. Cross represents location of a tree and circle represents an optimal Vasya's position.