Problem F – Filiberto's Party.

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This year Filiberto offered a party due to his birthday in June. This party was intended to have a different format from the ones he has organized before. In this event there were a lot of people wishing to play some videogames that works only with a WIFI network.

The router of the WIFI network have a distance limitation, which means that the internet will be available only to at most a distance d from the router (to any direction). There were some problems with the WIFI connection during the party and that's why Filiberto wants you to help him with this problem.

He will organize an event next year, but he wants to avoid this kind of problems. The party will be held in an apartment of size nxm (the apartment is represented as a matrix of this size). In order to play the videogames, every person will be seated in a point p in the apartment **(No two persons will be seated in the same point** p**)**.

Filiberto does not know which people will attend the party, so he is going to ask you several queries of the following form: $k\ a_1\ a_2\ a_3\ ...\ a_k$ - which represents a query with a number k, meaning that he is going to ask you for k people and then the identifiers of each person (people's identifiers goes from 1 to l).

What you need to print after each query, is the minimum distance d that the router should support in order to let all people in the current query play without any issues.

You can put the router in any position (can be real values coordinates) inside the apartment. You can also put it in the same position where a person will be located.

Input

The first line of input contains three integers n, m and l ($1 \leq n, m \leq 10^9, 1 \leq l \leq 18$) - representing the size of the apartment and the maximum number of people that could attend the party.

Next l lines contain two integers x_i and y_i ($1 \leq x_i \leq n, 1 \leq y_i \leq m$) - representing the point p where the i-th person will be located.

Next line contains an integer q ($1 \leq q \leq 3 * 10^5$) - the number of queries that Filiberto is going to ask you. Next q lines contain each query with the following format: $k\ a_1\ a_2\ a_3\ ...\ a_k$ ($1 \leq k \leq l, 1 \leq ai \leq l \forall i | 1 \leq i \leq k$)- which represents a query with a number k,meaning that he is going to ask you for k people and then the identifiers of each person. In each query each person will appear at most once.

Output

For each query you need to print the minimum distance d that the router of the WIFI network should support considering that you can put the router in any position in the apartment.

Your answer is considered correct if its absolute or relative error does not exceed 10^{-9}

Formally, let your answer be a, and the jury's answer be b. Your answer is accepted if and only if $\frac{|a-b|}{max(1,|b|)} \leq 10^{-9}$.

Sample input 1	**Sample output 1**
10 10 4 10 5 3 6 9 7 4 4 5 1 4 2 1 4 3 1 2 3 2 2 4 3 1 2 4	0.000000000 3.041381265 3.535533906 1.118033989 3.535533906