Problem J: Jog in the Fog

Time limit: 1 second

On the night before the big event, your fellow distance runner Jesse is running a few final laps on the practice track near the Olympic village. You want to join them; however, it is so foggy that you can not even see one metre ahead.

You know the running route of Jesse, which they will repeat in loops. Using an optimal strategy, how long will you need on average to reach Jesse?

Both Jesse and you move in steps on a 2D grid, one grid cell at a time. You both move either up, down, left, or right a full cell. It takes one second to move one cell. Jesse will always be moving along their fixed route in a loop, and this route will visit no cell multiple times, except after they start looping their route. When you start your attempt, Jesse could be on any step of their route, uniformly at random. You may wait in a cell for 1 second instead of moving. If you and Jesse are in neighbouring cells and move towards each other, you will meet after 0.5 seconds.

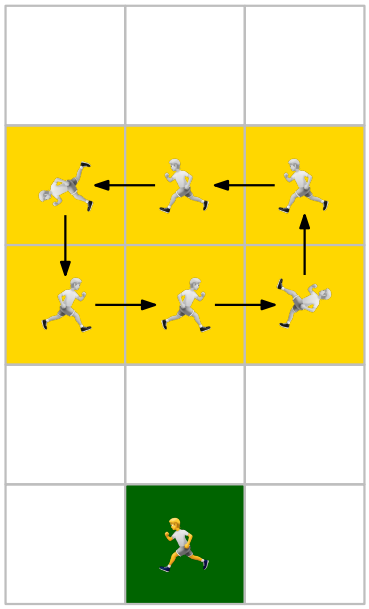

Figure J.1: Illustration of Sample Input 2, where the optimal expected time is 3.25 seconds.

Input

The input consists of:

- One line with three integers x, y, and n ($0 \leq x \leq 10^9$, $0 \leq y \leq 10^9$, $2 \leq n \leq 10^5$), describing your initial position (x, y) and the length n of Jesse's looping route.
- n lines, the ith of which contains two integers x_i and y_i ($0 \leq x_i \leq 10^9$, $0 \leq y_i \leq 10^9$), describing the ith position of Jesse's route.

All neighbouring steps of Jesse are guaranteed to be of distance exactly 1, so Jesse will always be moving one step up, down, left, or right. This guarantee also holds for the last and first position, allowing Jesse to loop their route. Additionally, no two positions in this route are the same. See Figure J.1 for an example.

Output

Output the expected time in seconds to reach Jesse assuming an optimal strategy. Your answer should have an absolute or relative error of at most 10^{-6}.

Sample Input 1	Sample Output 1
2 1 2 4 4 4 5	5.25

Sample Input 2	Sample Output 2
1 0 6 0 2 1 2 2 2 2 3 1 3 0 3	3.25