Problem A. Wowoear

Input file:	standard input
Output file:	standard output
Time limit:	3 seconds
Memory limit:	1024 megabytes

Wowo is a solo adventurer who completed many dangerous journeys on his own foot in forests, deserts and even glaciers. The Shanghai ICPC (Shanghai Invitational Contest on Programmable Cheating) committee invited Wowo as a tester of their new running trial.

The trial can be described as a 2D simple polyline $(p_1, \ldots, p_n)$. In other words, the trial consists of $n-1$ line segments $(p_1, p_2), \ldots, (p_{n-1}, p_n)$. The line segments do not intersect with each other except that two consecutive line segments (p_i, p_{i+1}) and (p_{i+1}, p_{i+2}) intersect at the point p_{i+1}. Any two consecutive segments have different directions. The committee wants Wowo to run from p_1 to p_n along the line segments $(p_1, p_2), \ldots, (p_{n-1}, p_n)$ in order.

However, Wowo has a smart device that can hack the committee's system for an interval of time. Wowo is able to choose 2 points a, b on the trial and run directly from a to b along the line segment (a, b). Each of these a and b can be some p_i $(1 \le i \le n)$ and can be some point on some line segment (p_i, p_{i+1}) $(1 \le i < n)$ as well. Before reaching a and after reaching b, Wowo has to run along the original trial. Wowo does not want to be caught cheating, so he decided that the line segment (a, b) should not intersect or touch any line segment of the trial at any point other than a and b. Help Wowo to choose a and b wisely and output the shortest distance Wowo need to run from p_1 to p_n using his smart cheating device.

Input

The first line includes a single integer n indicating the number of points on the running trial $(2 \le n \le 200)$.

The $i+1$-th line $(1 \le i \le n)$ contains two integers x and y separated by a single space indicating the coordinates of p_i $(-1000 \le x, y \le 1000)$.

It is guaranteed that the line segments do not intersect with each other except that two consecutive line segments (p_i, p_{i+1}) and (p_{i+1}, p_{i+2}) intersect at the point p_{i+1}. In other words, $(p_i, p_{i+1}) \cap (p_j, p_{j+1}) = \begin{cases} \emptyset & i \neq j-1 \\ \{p_j\} & i = j-1 \end{cases}$ holds for any integers i, j satisfying $1 \le i < j < n$. Here (s, t) represents all points on the line segment from s to t including s and t.

It is guaranteed that each line segment has nonzero length. In other words, $p_i \neq p_{i+1}$ for any integer $i \in [1, n)$.

It is guaranteed that adjacent line segments are not collinear. In other words, for any integer $i \in [1, n-2]$ and any real number λ, $p_i - p_{i+1}$ is **not** equal to $\lambda(p_{i+1} - p_{i+2})$.

Output

Output the shortest distance Wowo needs to run. Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}.

Example

standard input	standard output
5 0 0 1 10 2 0 3 10 4 0	22.099751242242