Mountain Is Quiet and Alone

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Slipped, tumbled, Mountain is quiet and alone.

— Santōka Taneda, *Grass Tree Stupa*

Peng is a young climber who enjoys mountaineering really much. One day he was climbing a tall mountain alone when he, unfortunately, slipped. He started tumbling, rolling down the mountain.

The mountain (up to the point where Peng is at) is a monotone slope described by n points $(x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)$ such that $0 < x_1 < x_2 < \ldots < x_n < 1000$ and $0 < y_1 < y_2 < \ldots < y_n < 1000$. The slope contains the following segments: $((-\infty, 0), (0, 0))$, $((0, 0), (x_1, y_1))$, and $((x_i, y_i), (x_{i+1}, y_{i+1}))$ for all $1 \le i \le n - 1$. For simplicity we consider Peng to be a segment $((x_n, y_n), (x_n, y_n + 1))$ of length 1, and we call the $(x_n, y_n + 1)$ end of the segment Peng's "head".

We now describe the rolling process. Peng always rotates counter-clockwise (downhill) around his lowest contact point with the hill. Whenever he has a new (lower) contact point with the hill, he starts rolling from that point. He only stops rolling when his "head" has y-coordinate 0.

Peng would like to know the total length his "head" travels in the rolling process.

Input

The first line contains an integer n ($1 \le n \le 1000$).

For each of the following n lines, the i-th line contains two real numbers x_i and y_i with at most 6 digits of precision.

Output

Output one real number, the total distance.

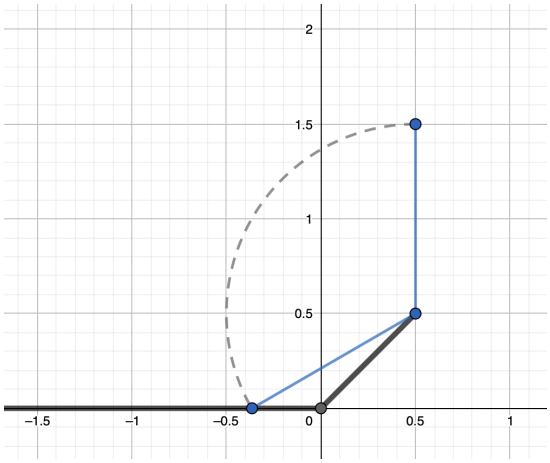
Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}. Formally let your answer be a and jury's answer be b. Your answer will be considered correct if $\frac{|a-b|}{\max(1,|b|)} \le 10^{-6}$.

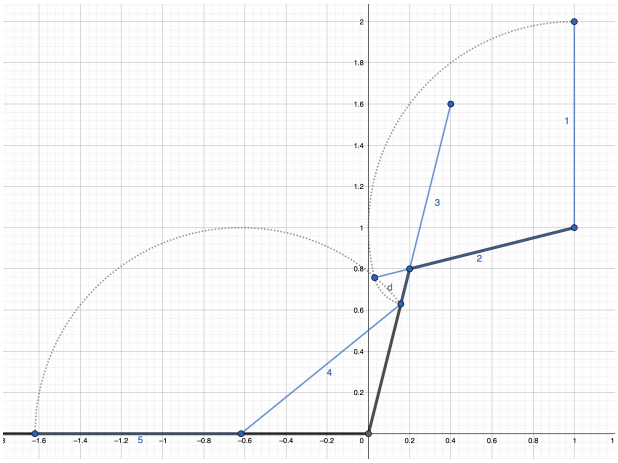
Examples

standard input	standard output
1 0.5 0.5	2.094395102393195
2 0.2 0.8 1 1	4.465554239614399

Note

It is guaranteed that during the rotation, when an **end point** of the segment is in contact with the hill, the point is not within 0.0001 distance of points $(0, 0), (x_1, y_1), \ldots, (x_{n-1}, y_{n-1})$.





Explanation for examples.