Problem D. Rotate Sum 2

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	1024 mebibytes

Grammy loves geometry. Today, she takes out her precious convex polygon and plays with it on a piece of paper. The polygon has n vertices numbered from 1 to n in counterclockwise order. For vertex i, the next vertex in this order is $i^+ = i \bmod n + 1$, and the previous one is $i^- = (i + n - 2) \bmod n + 1$.

Firstly, Grammy draws a horizontal line on the paper. Secondly, she chooses two vertices i and j of the polygon independently and equiprobably. Thirdly, she places the edge between vertex i and vertex i^- on the line, landing all other vertices above the line, and draws a vertical line through vertex j. Next, she rotates the polygon clockwise, taking vertex i as the rotation center, until vertex i^+ hits the line. When vertex i^+ hits the line, she changes the rotation center to vertex i^+ and rotates again until vertex i^{++} (the next after i^+) hits the line. She repeats this operation until vertex i hits the line again. Finally, she draws another vertical line through the vertex j and calculates the area between the trajectory of vertex j and the three lines.

Since you do not know which points Grammy will choose, you want to calculate the expected value of the area.

Input

The first line contains a single integer n ($3 \le n \le 100\,000$), denoting the number of vertices in the polygon.

Each of the following n lines contains two integers x_i and y_i ($-10^9 \le x_i, y_i \le 10^9$), denoting the coordinates of a vertex of the polygon. The vertices are given in counterclockwise order. It is guaranteed that the polygon is strictly convex.

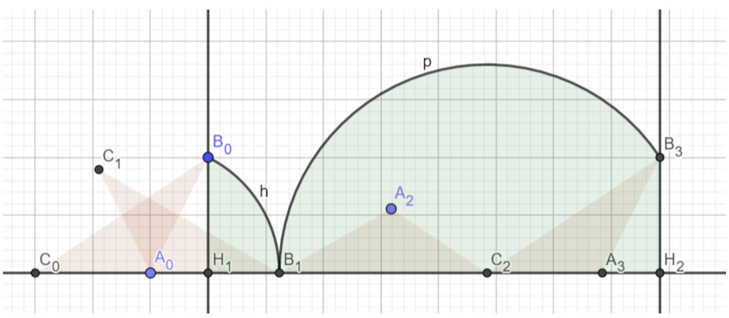
Output

Output a single real number denoting the expected area. The answer is considered correct if its absolute of relative error does not exceed 10^{-4}.

Example

standard input	standard output
3 1 -1 1 1 -1 2	18.763234503173919

Note



For the first example, if the i-th vertex is marked as A_0, and the j-th vertex is marked as B_0, then the polygon will be $A_3B_3C_2$ after 3 rotations, and the trajectory of vertex j is arc h and arc p. The area of the green part is the answer in this case.