Bob's gym routine - Hard

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	256 megabytes

The only difference between the easy and hard version of the problem is the size of the constraints.

Bob has decided to maintain a healthy lifestyle and has started going to the gym. His gym instructor is very strict and makes him do a rigorous workout. There are N poles spread across the gym, where the i^{th} pole is located at coordinate (x_i, y_i). The gym instructor has asked Bob to run around three such poles. Bob is exhausted and wanted to choose a set of three poles with the minimum perimeter.

Could you help Bob find the minimum perimeter?

Input

The first line contains an integer N $(3 \leq N \leq 200000)$ — the number of poles.

This is followed by N lines, each containing two integer x_i and y_i $(-10^9 \leq x_i, y_i \leq 10^9)$ — the coordinates of the i^{th} pole.

You may assume that each point is distinct.

Output

Print a single real number d where d is the minimum perimeter.

Answers within an absolute error of 10^{-6} will be accepted

Note: Degenerate triangles — triangles with zero area — are ok.

Examples

standard input	standard output
4 0 0 0 3 3 0 1 1	6.650281539873
3 0 0 0 1 0 2 1 5	4.000000000000