Problem Geometry

Input file	`stdin`
Output file	`stdout`

Set A contains N points A_i in the plane with known integer coordinates $(A_i.x, A_i.y)$. For a query defined by a point $Q = (Q.x, Q.y)$, you are asked to find the area of the convex hull of the points: $\{Q\} \cup \{A_i \mid A_i.x < Q.x \text{ and } A_i \in A\}$. The convex hull of a set of points is the smallest area convex polygon that contains all the points inside it or on its boundary.

Input Data

The first line of the standard input contains the non-zero natural numbers N and M.

The next N lines each contain two integers $A_i.x$ and $A_i.y$, separated by a space.

The next M lines each contain two integers $Q.x$ and $Q.y$, separated by a space.

In the input file, both the points A_i and the points Q are given in increasing order of their x-coordinates.

Output Data

Print M lines to the standard output with the answers to the queries in order. Display the answer with exactly one decimal place of precision.

Restrictions and Clarifications

- $1 \leq N, M \leq 10^5$.
- $0 \leq A_i.x, A_i.y, Q.x, Q.y \leq 10^9$.
- The points in set A have distinct $A_i.x$ values.
- The convex hull of a set with at most two points has an area equal to zero.

Examples

Input file	Output file	Explanations
3 3 1 3 4 5 5 1 3 3 6 8 8 4	0.0 15.0 14.5	
9 2 1 3 3 5 4 1 6 4 8 6 9 1 10 3 11 5 13 2 4 3 10 4	3.0 32.0	

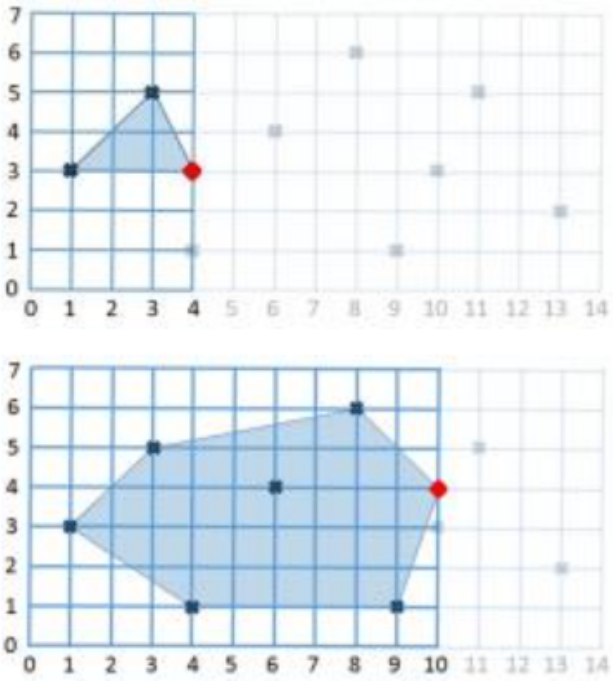

Figure 1: Explanation for second example.