Doors of the Wardrobe

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 mebibytes

There is a picture in the notes, we recommend looking at it often during the reading of the statement.

Rikka bought a new wardrobe. In this wardrobe, the doors are installed in N layers: if we look at the wardrobe, we can see the first door in front of us, the second is hidden behind it, and so on, up to the very last N-th door.

As we all know, Rikka is good in math now, so it's easier for her to think about these doors in such a way as if they lie on the same Euclidean plane.

Each door consists of a pair of sliding parts. Consider a door, we can assume that the door parts are the two half-planes separated by some straight line L. Note that the wardrobe is designed in a way that the line L is **not necessarily** vertical.

Moreover, at some point on the line L the two handles are placed, one handle for each part of the door. Rikka can grab a handle and pull it in the direction perpendicular to L, thus moving the corresponding half of the door in that direction. Rikka can pull two handles on the parts of the same door independently of each other.

To open the wardrobe, Rikka opens all the doors in turn from the 1-st to the N-th. After Rikka begins to open the next door, the sliding parts of all the previous doors can no longer be moved. Rikka can only pull a handle if it is not obstructed by the previous doors during the entire moving process. So if Rikka does not open some door wide enough, it may block the opening of some of the following doors in the future.

Rikka wants to get M small items from her closet. Each item can be represented as a point of the plane with the given coordinates. She wants to open the doors so that none of the objects is blocked by any door.

As a mathematician, Rikka wants to minimize the total distance he has to move the handles. Help him calculate this minimum.

Input

The first line of the input contains two integers, N and M — the number of the doors and the number of the items, respectively ($1 \le N \le 10^5$, $3 \le M \le 10^5$).

Then N lines follow, describing the doors in the order from the first (the door on the surface) to the N-th (the deepest door inside). Each door is described by four real numbers, given with no more than 15 digits after the decimal point. Those numbers are the coordinates x_h and y_h of the point H where both handles are located when the door is closed, and the coordinates x_d and y_d of the vector D, such that the straight line L splitting the door into halves contains the point H and is orthogonal to the vector D.

Then M lines follow, containing the descriptions of the items. Each item is described by its coordinates x and y — two real numbers, given with no more than 15 digits after the decimal point.

The coordinates do not exceed 10 by the absolute value. The length of vector D for each door is not less than $\frac{1}{10}$. You may assume that there are three items that are not collinear.

Note that the tests are generated in such a way that there are no degenerate cases (like all points are too close to be collinear etc), and thus the tests are not intended to create troubles with the numerical stability.

Output

Print the minimal possible sum of the lengths of the handles movement vectors. The answer will be considered correct if the absolute or relative error from the optimal answer does not exceed 10^{-10}.

Example

standard input	standard output
3 4 -3 3 0.6 -0.3 4 -1 1 1 1 -4 1 0 -2 3 2 3 2 -2 -0.5 -2	20.27523290755122432

Note

There are three doors in the example, doors are marked with the red, green and blue colors. For each door the solid line denotes the trajectory of the handles movement, the dotted line denotes the positions of the halves of the door when they are moved. The black crosses denote the items.