Problem C
Frogs
Time Limit: 1 Second

In a hot and dry summer, hungry frogs are headed for "the land of flies" filled with water and foods. They need to cross a river. Normally frogs really swim well, but they are so hungry and tired that they can only walk and jump. There are logs floating on the river and the frogs can a) walk on the logs, or b) jump from one log to another.

As frogs are really hungry and tired, they want to spend as little energy as possible. Walking is free, which means that they spend negligible energy in walking. Jumping is not free: if a frog jumps for a distance x, it spends x^2 units of energy. To reach the land of flies, the total energy spent should be minimized.

Consider the following example. The river and its sides can be represented by a 8×9 grid. Currently, frogs are on the lower side and the land of flies is on the upper side. Note that $(a, b) - (c, d)$ denotes a segment whose endpoints are (a, b) and (c, d). The border of the lower side can be represented by seven segments: $(0,0) - (0,1)$, $(0,1) - (2,1)$, $(2,1) - (2,2)$, $(2,2) - (3,2)$, $(3,2) - (3,1)$, $(3,1) - (7,1)$, and $(7,1) - (7,0)$. The border of the upper side can be represented by eleven segments: $(0,8) - (0,7)$,$(0,7) - (1,7)$, $(1,7) - (1,6)$, $(1,6) - (2,6)$, $(2,6) - (2,7)$, $(2,7) - (4,7)$, $(4,7) - (4,6)$, $(4,6) - (5,6)$, $(5,6) - (5,7)$, $(5,7) - (7,7)$, and $(7,7) - (7,8)$. There are four logs on the river: $(0,3) - (2,3)$, $(6,2) - (4,2)$, $(3,5) - (6,5)$, and $(7,4) - (7,6)$. Assume that all the segments (both for borders and for logs) are parallel either with x-axis or with y-axis. No pair of logs has a common point or a common segment. No log has a common point or a common segment with any border. Again, once a frog lands at one segment, it can move to any point in it freely. Once it arrives at the land of flies, its journey is over.

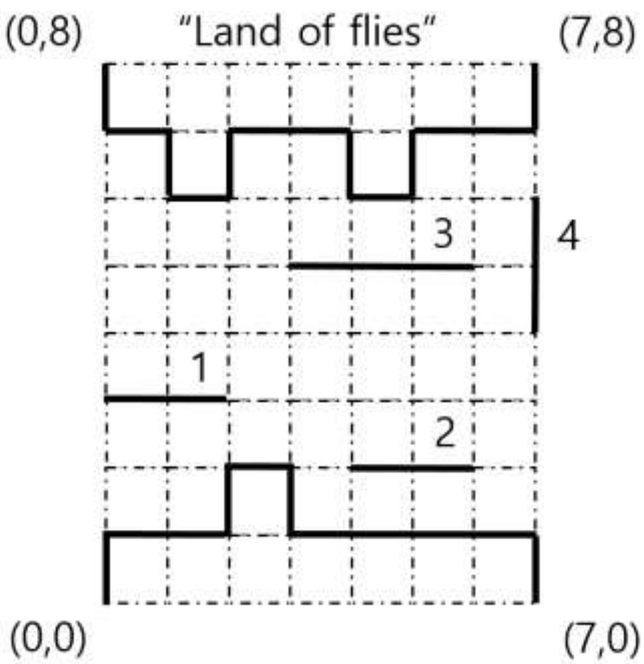

Figure 1. Four logs on the river.

In the example, assume that a frog can jump at most $\sqrt{5}$. One possible path to the land of flies is that a frog first jumps to Log 1, then to Log 3, and to the land of flies. The total energy spent is $1^2 + \sqrt{5}^2 + 1^2 = 7$ and it is easy to show that it is optimal. If a frog can jump at most 2, then it is evident that it cannot reach the land of flies.

You write a program that computes the smallest amount of energy a frog can spend to cross the river.

Input

Your program is to read from standard input. The input consists of several lines. The first line contains two integers n and m which denote the size of grid, $n \times m$ $(3 \leq n, m \leq 5{,}000)$. The next line contains four integers $u, v, w,$ and l $(2 \leq u, v, w \leq 2 * \max(n, m), 1 \leq l \leq \min((n-1)^2, (m-1)^2))$: there are u endpoints on the lower side, and there are v endpoints on the upper side, and there are w logs on the river. Also, a frog can jump at most $\sqrt{l}$. Each of the following u lines contains two integers x and y $(0 \leq x < n,$ $0 \leq y < m)$ representing an endpoint (x, y) of the lower side. These endpoints are given in clockwise order and the bottom left endpoint comes first. Each of the following v lines contains two integers x and y $(0 \leq x < n,$ $0 \leq y < m)$ representing an endpoint (x, y) of the upper side. These endpoints are given in counterclockwise order and the top left endpoint comes first. Each segment linking two neighboring endpoints is parallel either with x-axis or with y-axis. Each of the last w lines contains four integers $x_1, y_1, x_2,$ and y_2 $(0 \leq x_1, x_2 < n,$ $0 \leq y_1, y_2 < m)$ representing a log which is a segment $(x_1, y_1) - (x_2, y_2)$. It is guaranteed that either $x_1 = x_2$ or $y_1 = y_2$. It is also guaranteed that there is no intersection between the lower side and the upper side.

Output

Your program is to write to standard output. Print exactly one line. The line should contain an integer representing the smallest amount of energy required to cross the river. If it is impossible to cross the river, print `-1`.

The following shows sample input and output for two test cases.

Sample Input 1	**Output for the Sample Input 1**
8 9 8 12 4 5 0 0 0 1 2 1 2 2 3 2 3 1 7 1 7 0 0 8 0 7 1 7 1 6 2 6 2 7 4 7 4 6 5 6 5 7 7 7 7 8	7

0 3 2 3 4 2 6 2 3 5 6 5 7 4 7 6	

Sample Input 2	Output for the Sample Input 2
8 9 8 12 4 4 0 0 0 1 2 1 2 2 3 2 3 1 7 1 7 0 0 8 0 7 1 7 1 6 2 6 2 7 4 7 4 6 6 6 6 7 7 7 7 8 0 3 2 3 4 2 6 2 3 5 6 5 7 4 7 6	-1