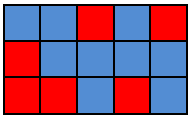
Table Coloring

Sam and his sister Sara have a table of $n \times m$ square cells. They want to color all of the cells in red or blue. Due to personal beliefs, they want every 2×2 square of the table have odd number of red cells (i.e. 1 or 3). For example, a valid coloring of a 3×5 table is drawn in the figure below.



Unfortunately, last night, someone had colored some cells of the table with red and some of the others with blue! Sam and Sara are wondering whether they can color the rest of the table according to their rules or not. If it is possible, they want to know in how many ways can they color the table such that no 2×2 square contain an even number of red cells.

Input

The first line of input contains three integers n, m *and* k, respectively the number of rows and columns of the table andthe number of initially-colored cells. The following k lines contain description of colored cells. The i^{th} line of this section contains three integers x_i, y_i and c_i , where x_i and y_i are the row number and column number of the i^{th} initially-colored cell and $c_i$shows the color of the cell. c_i is equal to 1 if that cell is colored in red and it is equal to 0 if the cell colored in blue. It is guaranteed that these k cells have distinct positions.

Output

In a single line, write number of possible ways of coloring the table (say W) modulo 10^9 (i.e. if W is greater than or equal to 10^9, write its remainder in division by 10^9).

Constraints

- For each description of initially colored cells, it is guaranteed that $1 \leq x_i \leq n$ and $1 \leq y_i \leq m$.
- Consider $2 \leq n, m \leq 10^5$ and $0 \leq k \leq 10^5$ in all of the test cases.
- In 20% of tests $n, m \leq 5$ and $k \leq 5$.
- In 50% of tests $n, m \leq 5000$ and $k \leq 25$.

Sample Input and Output

Sample Input	Sample Output
3 4 3 2 2 1 1 2 0 2 3 1	8

Find the Path

TooDee is the name of a 2-dimensional grid-shaped land, like well-known Cartesian coordinate system, in which cute "Dee"s live! Dees are small creatures like bees, but they are two-dimensional, and very civilized. Hives in TooDee are also different in comparison tonormal beehives – they are rectangular and their edges are parallel to the geographical axes of TooDee, either exactly from east to west or from north to south.

Since Dees are extraordinarily advanced creatures, they have fixed flying paths in the world, which can be assumed to be lines joining coordinates with integer values of longitude or latitude parallel to the axes (i.e. either horizontally or vertically). The flying rules of TooDee respected by all Dees are as follows: (Remember that all points in TooDee have integer longitude and latitude):

- If you are at the point (X_S, Y_S) you can only fly to any of its 4 adjacent neighbor points (i.e. $(X_S + 1, Y_S), (X_S - 1, Y_S), (X_S, Y_S + 1), (X_S, Y_S - 1)$).
- You cannot enter any Deehive.
- You can change your flying direction only when you are on an edge or a corner of a Deehive.
- You can start your flight initially in any direction you wish.

Tonight is the birthday of daughter of *Deeficer* (an officer of Public Wealth Ministry of TooDee) and she wants to go home as fast as possible. Assuming she can fly with the speed of one unit of length per second, help her to find out how many seconds would it take to reach home, flying through the best path and yet, respecting the rules!

Input

The first line of input consists of a single integer T, the number of test scenarios. It is guaranteed that $1 \leq T \leq 20$. The remaining lines of input consist of these T scenarios come afterward. There is a blank line before any scenario of the input.

Each scenario begins with a line consisting of the coordinates of Deeficer's office location and her home. These two points are each described by two integers $X$and Y.The second line of the scenario consists of a single integer N, the number of Deehives. In the remaining N lines, one Deehive is described per line. The description of a Deehive is given by the coordinates of two opposite corners of it. You can assume no two Deehives, overlap or touch, even on corners. You can also assume that home and office are distinct points. The area for each Deehive is at least one square unit.

Output

For each scenario write the number of seconds it would take for Deeficer to reach home through the shortest path, in a single line. If she is unable to reach home obeying the rules, write `"No Path"`.

Constraints

- In all of the test cases, all coordinates are integers in range $[-10^9, 10^9]$ and $0 \leq N \leq 1000$.
- In 20% of tests, $N \leq 10$ in all scenarios and all coordinates are non-negative and less than 100.
- In 60% of tests, all coordinates absolute values are less than 1000 and $0 \leq N \leq 100$.

Sample Input and Output

Sample Input	Sample Output
2 1 7 7 8 2 2 5 3 8 4 10 6 7 2 1 5 4 1 3 1 4 3	9 No Path