5th Asia-Pacific Informatics Olympiad

Hosted by

Iran National Olympiad in Informatics (INOI), Tehran, Iran

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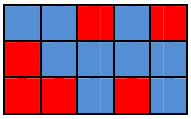
Task Name	Color	Path	Guess
Time Limit	2 sec	2 sec	2 sec
Memory Limit	256 MB	256 MB	256 MB
Points	100	100	100
Input	stdin (keyboard)		
Output	stdout (screen)		

Language	Compiler Version	Compiler Options
C++	g++ version 4.2.4	-m32 -lm
Pascal	fpc version 2.2.0	-Sd –Sh

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

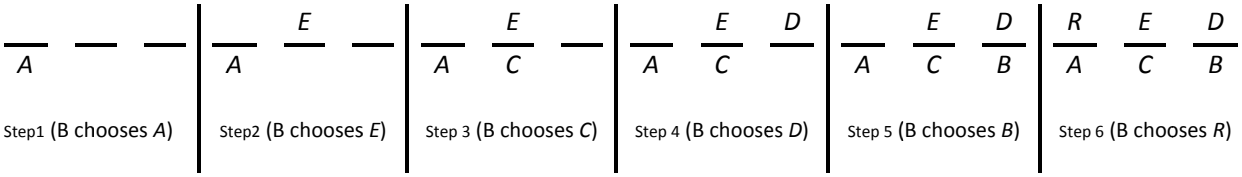
Guess My Word!

"Guess My Word" (or shortly GMW) is a two-player game, which is being played widely among young Iranian students! Naming two players A and B, initially A, the first player, picks a word from a corpus known to both players and keeps it in mind. Then, on a piece of paper visible to B, he draws as many little horizontal line segments as the number of letters in the word (say n) in a row.

Now B tries to guess the word, letter by letter. For each turn, B chooses a single letter and tells A. In response:

- If the letter chosen by B occurs in the word, A writes it in the proper position above the respective line segment. If the word is completed (all of its letters are written), B wins!
- Otherwise, if the letter does not occur in the word, player A writes it below the leftmost line segment that has an empty space below it. If A cannot write the letter because all spaces below the lines are occupied (i.e. B has already told n wrong letters) then B is lost and A is the winner! A has to reveal the chosen word to B in this case, after his win.

As an example consider A has picked the word RED (from the corpus), and B has guessed and told the letters *A, E, C, D, B* and *R* in consecutive turns. The result of each step is illustrated in the following figure. B is the final winner. But if B had guessed *S* instead of *R* in his last turn, he would have lost!



Aidin is a fan of the GMW game! He believes that if the given corpus is large enough and contains *relatively good* words, then player A (the starting player) can perform the unfair action of *changing his Word*! Since player A is just keeping the word in mind and does not write it anywhere, he is able to change it during the game to another word, which is also consistent to all of the responses given to B so far. For example, in the example game above, if the words RED, BED, LED and TED were available in the corpus, then A could guarantee a win after step 4. He would always write B's chosen letter below the line (meaning a wrong letter) and in each subsequent turn he would lose at most one of the words in set {RED, BED, LED, TED}. At the end, he would announce to B: "*the word was, umm…,*" he would just say the remaining word in his virtual set!

Aidin thinks that with a good corpus, player A can sometimes be guaranteed to win from the beginning! For example if they play with 2-letter words and all the words in set {ME, MD, DE, ED, AS, IS, AI, SI} can be found in the corpus, then A can always win. Find the strategy by yourself!

Given the corpus, Aidin wants to know whether player A can be sure to win against any strategy by B.

Input

Input consists of several corpora, which are to be solved independently.

The first line of the input consists of an integer *C,* the number of corpora. Then these *C* corpora come in C blocks below it. You can assume that $1 \leq C \leq 20$.

The first line of each corpus consists of an integer *K*, the number of words in the corpus. The following lines consist of *K* words, separated by spaces, tabs, and/or line-breaks. All the words are written in English uppercase letters and their length is always less than seven. Each word in corpus has unique letters, (i.e. no letter is repeated in a single word more than once).

You can assume input file has less than 500KB size.

Output

For each corpus, write "Yes" if player A has a winning strategy (i.e. can always win regardless of the letters chosen, and strategy decided by B). Otherwise, write "No" in a single line.

Remember that at the end of any game in which player A wins, player B needs to be given a word from the corpus as the Selected word, which is consistent with all responses of player A during the game!

Constraints

- It is guaranteed that no corpus contains less than 1 or more than 1000 words.
- In 20% of the test cases, all of the words in all the given corpora contain at most 3 letters, and each corpus will have at most 100 words.
- In 50% of the tests cases, the words will consist of at most 4 letters, and each corpus will have at most 300 words.

Sample Input and Output

Sample Input	Sample Output
2 12 SI ME AND AI ARE MD AS WHEN ED IS DE HARPY 5 A B AB AC AD	Yes No