Triolandia 2

We are back to Triolandia. Recall that Triolandia is a country divided in triangle-shaped districts defined and controlled by three cities at its corners. Each city controls all the surrounding districts. Since the last time we visited, the people of Triolandia have built roads between each pair of cities that control two common districts, and highways between cities that control exactly one common district. Consequently, Triolandia is now surrounded by a highway. Let's travel once around the country using this highway and visit all the cities along the way.

Input

The first line of input contains two positive numbers, the number of cities, $m \leq 10^5$, and the number of districts, $n \leq 10^5$. Each of the following m lines contains the name of a city, a string C_i consisting of at most 10 capital letters, and its coordinates $-10^6 \leq x_i, y_i \leq 10^6$, for $i = 1, \ldots, m$. The input continues with n lines of district data. For each district D_j, $j = 1, \ldots, n$, the corresponding line contains the indices a_j, b_j, c_j of the three cities that control this district.

Output

The output contains the names of the cities along the highway in the order in which they are traversed when driving once around the country in counterclockwise direction, starting at the city, which ranks first among all these highway cities if sorted in alphabetical order.

Examples

Sample input 1

```
9 9
ALPHA -3 3
BETA 1 4
GAMMA 6 3
DELTA 0 0
EPSILON 4 -1
ZETA 7 0
ETA -4 -3
THETA -1 -4
IOTA 5 -3
4 2 5
2 3 5
3 5 6
1 2 4
7 1 4
4 8 7
8 5 4
5 6 9
8 9 5
```

Sample output 1

```
ALPHA
ETA
THETA
IOTA
ZETA
GAMMA
BETA
```

Limits

Time limit is 1 second.

Memory limit is 256 megabytes.