6041 Retrenchment

ACM Telco is one of the well-known mobile telecommunication services providers in Byte Land. Lately ACM Telco has a hard time maintaining their revenue because of the high operational cost in maintaining their cell towers across the land.

To save their company, the board of directors have a plan to build a new tower and demolishing two existing towers such that they don't sacrifice the signal coverage by much, i.e. by choosing two nearest existing towers from the newly build one to be demolished, but there is one restriction: these two towers to be demolished should be chosen from towers inside a certain region (which resembles a closed simple polygon). Tower which located at the boundary of the region is considered inside the region.

The distance function used in this problem is Euclidean distance. Let there be two points (x_1, y_1) and (x_2, y_2), the distance between them is:

$$D = ((x_1 - x_2)^2 + (y_1 - y_2)^2)^{0.5}$$

You are given the location of all N existing towers (x_i, y_i) in a Cartesian plane and R number of regions. For each region there is M positions in which for each position you should find the two nearest towers in the region.

Input

The first line of input contains an integer T ($T \leq 10$) denoting the number of cases.

The first line of each case contains a positive integer N ($5 \leq N \leq 20,000$) denoting the number of towers in the land. The next N lines each represents the location of a tower given in format of 'x_i y_i' ($0 \leq x_i, y_i \leq 1,000,000$). Each tower has an id from 1 to N given in such order.

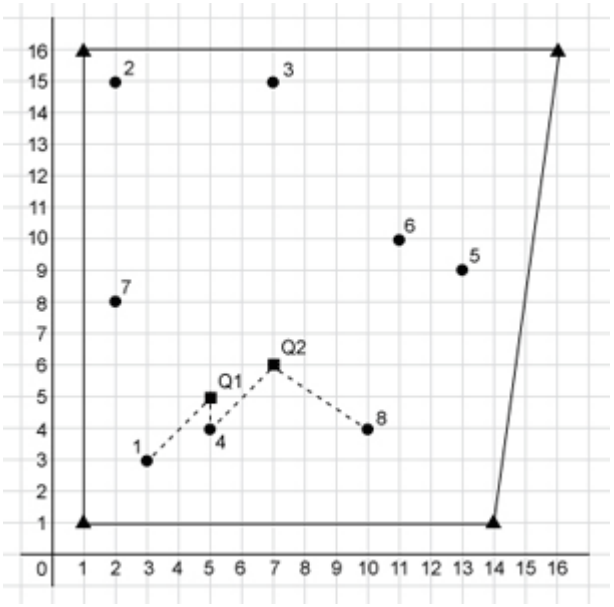
The following line contains an integer R ($1 \leq R \leq 10$) denoting the number of regions. The next R blocks each represents the region boundaries and queries on that region.

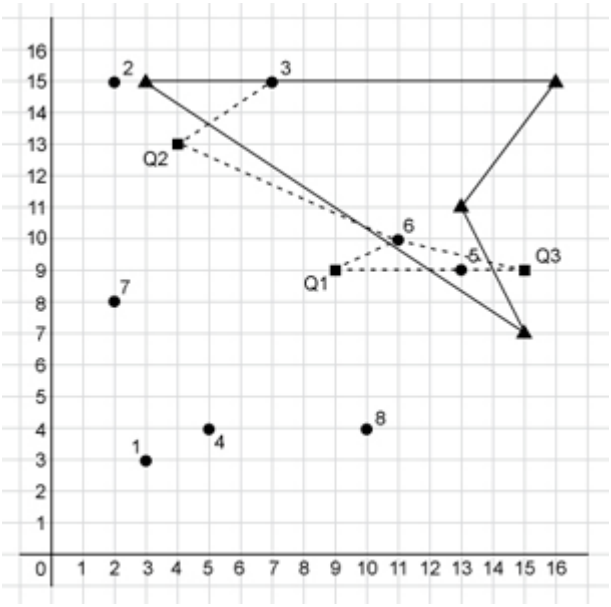
Each block begins with an integer B_k ($3 \leq B_k \leq 20$) denoting the number of corner points of the region boundaries. The points will be given in clockwise order in the next B_k lines with the same format as the tower position. You may assume that the given region will form a closed simple polygon. The next line contains an integer M_k ($1 \leq M_k \leq 5,000$) denoting the number of position queries for that region. The following M_k lines, each contains the query position (the new tower) in the same format as the tower position.

Output

For each case, output '`Case #`X`:`' in a line, where X is case number starts from 1. For each region in the case, output '`Region` K' in a line where K is the region number starts from 1. The next M_k lines for each region contains two integers 'A B' denoting the id of two nearest towers in the region from the query position. A is the id of the nearest tower while B is id for the second nearest tower. In case of tie, prioritize the tower with smaller id. Assume that there are at least two towers in the region.

Explanation for 1st sample input.





The left figure corresponds to query on the 1st region, while the right figure corresponds to query on the 2nd region.

Sample Input

```
1
8
3 3
2 15
7 15
5 4
13 9
11 10
2 8
10 4
2
4
1 1
1 16
16 16
14 1
2
5 5
7 6
4
3 15
16 15
13 11
15 7
3
9 9
4 13
15 9
```

Sample Output

```
Case #1:
Region 1
4 1
4 8
Region 2
6 5
3 6
5 6
```