Meteorite Revisited

Lea has finally fenced in her garden and computed that the meteorite will not hit her house. But then, everything went wrong! The laser that heated up the meteorite had too much power and the meteorite exploded into thousands of shards. These shards came down everywhere in Lea's garden and the surroundings.

Of course, Lea is excited and wants to start looking for meteorite shards right away. To her amazement, she discovers a pattern in the shard distribution: The shards exactly hit every integer coordinate in the area. Lea, quite the archaeologist, wants to rope in the area inside her garden where shards might have landed. Help her by telling her at which integer locations inside her garden she should locate posts such that all shard location (inside the garden) are inside the convex hull of the posts. Furthermore, use the minimal number of posts. Points on the boundary of the garden are considerd to be inside the garden.

Input

The first line of the input contains an integer t. t test cases follow, each of them separated by a blank line.

Each test case starts with an integer n, the number of fence posts that define the border of Lea's garden, n lines follow. The i-th line contains two floating point numbers x_i, y_i, the x- and y-coordinates of the i-th fence post. The fence posts are given in counter clockwise order and form a convex area.

Output

For each test case, output one line containing "Case #i:" where i is its number, starting at 1. In the next line output a single number m, the number of posts Lea has to place inside her garden. She may not use existing fence posts (but may place a post at the same location as an existing fence post). Output m more lines. The j-th line should contain two integers u_j, v_j, the x- and y-coordinates of the j-th post Lea has to place. Each line of the output should end with a line break. Any permutation of the correct post locations will be considered correct.
Should all shard locations lie on a line, give the two end points, should only one shard location be inside the garden, give that point. If no shard location lies inside the garden, Lea will be very sad and will not place any posts.

Constraints

- $1 \leq t \leq 20$
- $3 \leq n \leq 100$
- $0 \leq x_i, y_i \leq 300$ for all $1 \leq i \leq n$
- No two points given will be identical.
- The points are given in counter clockwise order and are the vertices of a convex area.

Sample Input 1

```
4
4
0 0
1 0
1 1
0 1

4
0.5 0.5
2.5 0.5
1.75 1.75
0.5 2.5

3
0.5 0.5
1 0.5
0.5 1

3
0.5 0.5
1.5 0.5
0.5 1.5
```

Sample Output 1

```
Case #1:
4
0 0
1 0
1 1
0 1
Case #2:
3
1 1
2 1
1 2
Case #3:
0
Case #4:
1
1 1
```

Sample Input 2

```
4
4
1.375 7.578125
1.484375 7.046875
9.546875 0.203125
9.4375 0.734375

6
2.15625 5.125
5.375 1.859375
8.109375 2.65625
9.0 4.796875
5.78125 8.0625
3.046875 7.265625

6
2.296875 9.140625
2.5 6.828125
4.875 5.28125
8.34375 3.234375
8.140625 5.546875
5.765625 7.09375

4
1.75 8.875
3.359375 6.609375
9.109375 3.796875
7.5 6.0625
```

Sample Output 2

```
Case #1:
3
2 7
4 5
9 1
Case #2:
6
3 5
5 3
8 3
8 5
6 7
3 7
Case #3:
7
3 7
4 6
8 4
8 5
7 6
4 8
3 8
Case #4:
5
3 8
5 6
7 5
8 5
7 6
```