Cake

Sophie loves to bake cakes and share them with friends. For the wedding of her best friend Bea she made a very special cake using only the best ingredients she could get and added a picture of the engaged couple on top of the cake. To make it even more special she did not make it round or square, but made a custom convex shape for the cake. Sophie decided to send the cake by a specialized carrier to the party. Unfortunately, the cake is a little too heavy for their default cake package and the overweight fees are excessive. Therefore, Sophie decides to remove some parts of the cake to make it a little lighter.

Sophie wants to cut the cake the following way: First, she chooses a real number $s \geq 2$. For each vertex and each incident edge of the cake she marks where $1/s$ of the edge's length is. Afterwards, she makes a direct cut between the two markings for each vertex and removes the vertex that way.
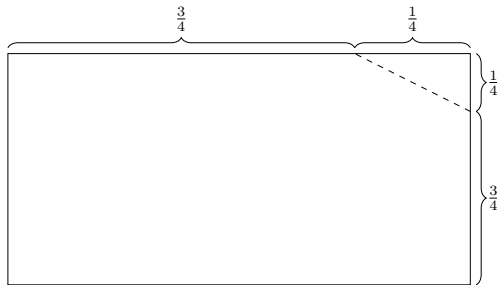

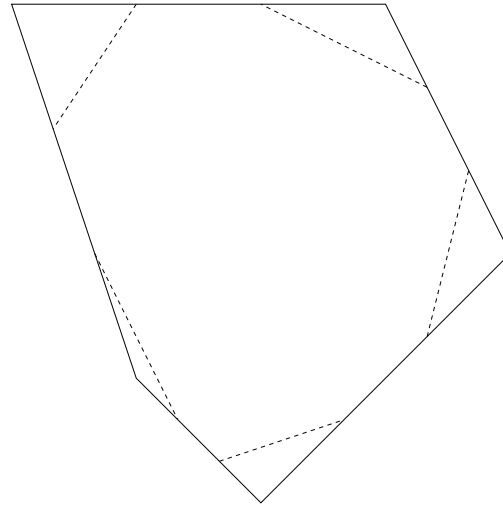Figure 1: Cutting the upper-right corner of a rectangle with $s = 4$

Figure 2: Cutting a cake with $s = 3$

Figure 3: Illustration of the first two Sample Inputs.

Sophie does not want to cut more from the cake than necessary for obvious reasons. Can you tell her how to choose s?

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 a single line containing a floating point number a and an integer n. a is the ratio of the cake's weight allowed by the carrier and n is the number of vertices of the cake. a will be specified with at most 7 digits after the decimal point. The weight is uniformly distributed over the area of the cake. n lines follow describing the cake's vertices. The i-th line contains two space-separated integers x_i and y_i, the coordinates of vertex i. The vertices are given in order in which they form a strictly convex shape.

Output

For each test case, print a line containing "Case #i: s" where i is its number, starting at 1, and s is the biggest value as specified above such that the remaining cake weight is at most the proportion a of its original weight. Each line of the output should end with a line break. Your answer will be considered correct if the absolute error is at most 10^{-4}.

Constraints

- $1 \leq t \leq 20$

- $0.25 \le a \le 1$

- $3 \le n \le 100$

- $0 \le x_i, y_i \le 10^8$ for all $1 \le i \le n$

- The cake will always be convex.

- It will always be possible to cut the cake in the given way.

Sample Input 1

```
3
0.875 4
0 0
8 0
8 4
0 4

0.85 5
6 0
12 6
9 12
0 12
3 3

0.999998 4
20008 10000
15004 15005
10001 20009
15005 15004
```

Sample Output 1

```
Case #1: 4.0
Case #2: 3.0
Case #3: 999.9999999500001
```