

Problem A: Splitting Cake

Filename: `cake`

Time limit: 2 seconds

Since Christian had to rush to New York for a last minute investor meeting, Justin kindly agreed to cover Christian's lecture on trees. Luckily, Christian knew that Justin doesn't like real trees, but prefers cake. To show his gratitude, Christian gifted Justin with a **convex** polygonal cake. Of course, since Justin is generous, instead of eating the cake all by himself, he plans on splitting it with his fellow TA, Brygida.

Since the knife for cutting the cake is already anchored at vertex 0 of the cake, Justin offers Brygida the following offer: Brygida can make a single cut from vertex 0 to any other vertex of the cake, splitting the cake into two pieces. Justin will choose the larger of the two pieces and Brygida will get to keep the smaller of the two pieces. (Of course, in some cases, when Brygida is lucky due to the exact convex polygon in question, the cake could be precisely split in half.) Naturally, Brygida wants to maximize the area of the smaller piece of cake. (Note: The cake is three dimensional, but because the height of the cake is the same everywhere, the surface area of the top of the cake is proportional to the total volume of cake.)

The Problem

Calculate the maximum ratio of the volume of Brygida's piece of cake to the volume of Justin's piece of cake, if Brygida cuts the cake appropriately.

The Input

The first line contains an integer c , the number of test cases. The first line of each test case contains a single positive integer, n , representing the number of vertices in the convex polygon (shape of the cake). The following n lines contain two integers each: x_i and y_i , representing vertex i ($0 \leq i < n$) of the polygon. (The sides of the polygon are (x_0, y_0) to (x_1, y_1) , (x_1, y_1) to (x_2, y_2) , ..., (x_n, y_n) to (x_0, y_0)).

The Output

For each test case, output two space separated integers, p and q , with $\gcd(p, q) = 1$, representing the maximum ratio of the volume of Brygida's piece of cake to the volume of Justin's piece of cake.

Input Bounds and Corresponding Credit

| 20 Points | 80 Points |
|---|---|
| <ul style="list-style-type: none">$1 \leq c \leq 5$$n = 4$$x_i \leq 100, y_i \leq 100$ | <ul style="list-style-type: none">$1 \leq c \leq 15$$4 \leq n \leq 100000$$x_i \leq 10^6, y_i \leq 10^6$ |

Samples

| Input | Output |
|--------|--------|
| 2 | 7 40 |
| 4 | 47 50 |
| 0 0 | |
| 3 5 | |
| 3 12 | |
| -5 20 | |
| 5 | |
| 0 0 | |
| 3 5 | |
| 3 12 | |
| -5 20 | |
| -10 10 | |

Note: The second sample case can not be part of the small data because the polygon has five vertices, not four.