A. Icebergs

time limit per test: 3 seconds

memory limit per test: 256 megabytes

Tania is a marine biologist. Her goal is to measure the impact of climate change on the population of Macaroni penguins. As most species of penguins, Macaroni penguins live in the southern hemisphere, near Antarctica. Tania is primarily focused on the population of Macaroni penguins near the "Îles Nuageuses" (in English, "Cloudy Islands").
During summer, the ice around the islands melt and the islands become too small to host all the birds. Some penguins live on the icebergs floating around. For her study, Tania needs to measure the area of those icebergs.

Using satellite imagery and image recognition, Tania has obtained a map of the icebergs and your goal is to measure their area. The island studied by Tania is quite small and the Earth can locally be approximated as a flat surface. Tania's map thus uses the usual 2D Cartesian coordinate system, and areas are computed in the usual manner. For instance, a rectangle parallel to the axes defined by the equations $x_1 \leq x \leq x_2$ and $y_1 \leq y \leq y_2$ has an area of $(x_2 - x_1) \times (y_2 - y_1)$.

In Tania's representation, an iceberg is a polygon represented by its boundary. For each iceberg, Tania has noted the sequence of points $p_1, \ldots, p_k$ defining the border of the iceberg. The various icebergs never touch each other and they never overlap. Furthermore, the boundary $p_1, \ldots, p_k$ of an iceberg is always a "simple" polygon, i.e. no two segments in $[p_1; p_2], \ldots, [p_k; p_1]$ cross each other.

Input

The input consists of the following lines:

- on the first line, an integer N, describing the number of polygons;
- then N blocks of lines follow, each describing a polygon and composed of:
  - on the first line, an integer P, the number of points defining the polygon border,
  - on the next P lines, two space-separated integers x and y, the coordinates of each border point.

Limits

- The number N of polygons is such that $1 \leq N \leq 1000$.
- Each polygon is described by P points with $3 \leq P \leq 50$.
- All coordinates are such that $0 \leq x, y \leq 10^6$.

Output

The output should contain a single integer: the total area rounded to the nearest integer below. In other words, the output should be a single line containing a single integer I such that the total area A of the polygons described in the input is comprised between I included and $I + 1$ excluded ($I \leq A < I + 1$).

Examples

input	output
1 4 0 0 1 0 1 1 0 1	1

input
2 5 98 35 79 90 21 90 2 36 50 0 3 0 0 20 0 0 20

output
6100

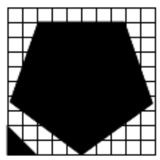
Note

Sample Explanation 1

This sample has a unique iceberg, which is a square of side 1.

Sample Explanation 2

In this sample (depicted below) there are two icebergs, a triangle of area 200 and a pentagon of area 5900.5.



B. Zoo

time limit per test: 2 seconds

memory limit per test: 256 megabytes

The Zoo in the Grid Kingdom is represented by an infinite grid. The Zoo has n observation binoculars located at the OX axis. For each i between 1 and n, inclusive, there exists a single binocular located at the point with coordinates $(i, 0)$. There are m flamingos in the Zoo, located at points with positive coordinates. The flamingos are currently sleeping and you can assume that they don't move.

In order to get a good view over the flamingos, each of the binoculars can be independently rotated to face any angle (not necessarily integer). Then, the binocular can be used to observe all flamingos that is located at the straight line passing through the binocular at the angle it is set. In other words, you can assign each binocular a direction corresponding to any straight line passing through the binocular, and the binocular will be able to see all flamingos located on that line.

Today, some kids from the prestigious Codeforces kindergarten went on a Field Study to the Zoo. Their teacher would like to set each binocular an angle to maximize the number of flamingos that can be seen by the binocular. The teacher is very interested in the sum of these values over all binoculars. Please help him find this sum.

Input

The first line contains two space-separated integers n and m $(1 \le n \le 10^6, 1 \le m \le 250)$, denoting the number of binoculars and the number of flamingos, respectively.

Then m lines follow, the i-th line will contain two space-separated integers x_i and y_i $(1 \le x_i, y_i \le 10^9)$, which means that the i-th flamingo is located at point (x_i, y_i).

All flamingos will be located at distinct points.

Output

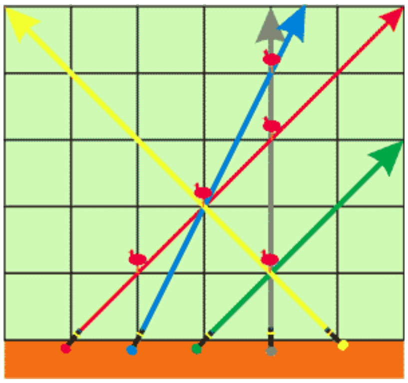
Print a single integer denoting the maximum total number of flamingos that can be seen by all the binoculars.

Examples

input	output
5 5 2 1 4 1 3 2 4 3 4 4	11

Note

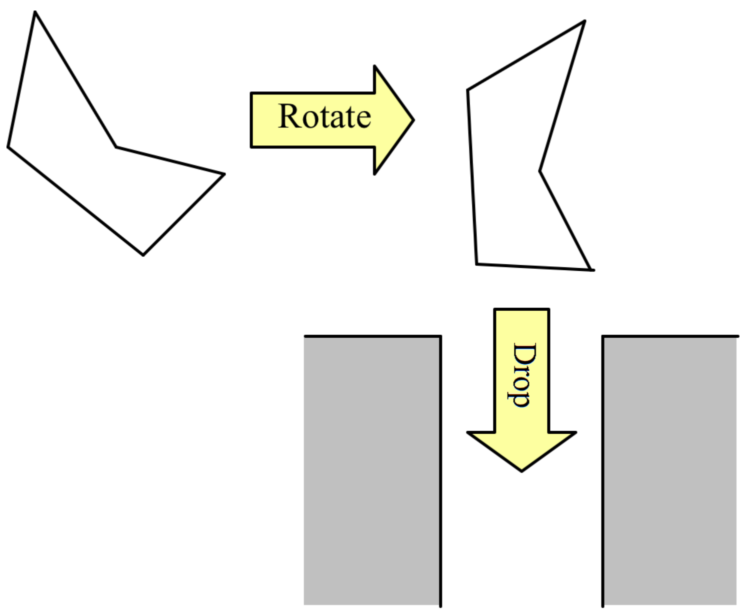
This picture shows the answer to the example test case.



Problem C
Trash Removal

Allied Chute Manufacturers is a company that builds trash chutes. A trash chute is a hollow tube installed in buildings so that trash dropped in at the top will fall down and be collected in the basement. Designing trash chutes is actually highly nontrivial. Depending on what kind of trash people are expected to drop into them, the trash chute needs to have an appropriate size. And since the cost of manufacturing a trash chute is proportional to its size, the company always would like to build a chute that is as small as possible. Choosing the right size can be tough though.

We will consider a 2-dimensional simplification of the chute design problem. A trash chute points straight down and has a constant width. Objects that will be dropped into the trash chute are modeled as polygons. Before an object is dropped into the chute it can be rotated so as to provide an optimal fit. Once dropped, it will travel on a straight path downwards and will not rotate in flight. The following figure shows how an object is first rotated so it fits into the trash chute.



Your task is to compute the smallest chute width that will allow a given polygon to pass through.

Input

The input contains several test cases. Each test case starts with a line containing an integer n ($3 \leq n \leq 100$), the number of points in the polygon that models the trash item.

The next n lines then contain pairs of integers x_i and y_i ($0 \leq x_i, y_i \leq 10^4$), giving the coordinates of the polygon vertices in order. All points in one test case are guaranteed to be mutually distinct and the polygon sides will never intersect. (Technically, there is one inevitable exception of two neighboring sides sharing their common vertex. Of course, this is not considered an intersection.)

The last test case is followed by a line containing a single zero.

Output

For each test case, display its case number followed by the width of the smallest trash chute through which it can be dropped. Display the minimum width with exactly two digits to the right of the decimal point, rounding *up* to the nearest multiple of 1/100. Answers within 1/100 of the correct rounded answer will be accepted.

Follow the format of the sample output.

Sample input	Output for the Sample Input
3 0 0 3 0 0 4 4 0 10 10 0 20 10 10 20 0	Case 1: 2.40 Case 2: 14.15

Problem D The Dragon and the knights

The Dragon of the Wawel Castle, following the conflict with the local Shoemakers' Guild, decided to move its hunting grounds out of Kraków, to a less hostile neighborhood. Now it is bringing havoc and terror to the peaceful and serene Kingdom of Bytes.

In the Kingdom of Bytes there are n rivers and each of them flows along a straight line (that is, you may think of the Kingdom as the Euclidean plane divided by infinite lines). No three rivers have a common point. The rivers divide the Kingdom into some *districts*.

Fortunately, there are m valiant knights in the Kingdom. Each of them has taken his post and swore an oath to protect his district. The Kingdom is thus protected for evermore... or is it?

It is known that Dragon will not attack a district which has at least one knight inside. The knights, however, are famous for their courage in battle, not for their intelligence. They may have forgotten to protect some of the districts.

Given a map of the Kingdom and the knights' positions, determine whether all districts are protected.

Input

The first line of the input contains the number of test cases T. The descriptions of the test cases follow:

Each test case starts with a line containing the number of rivers n ($1 \leqslant n \leqslant 100$) and the number of knights m ($1 \leqslant m \leqslant 50\,000$). Then follow n lines describing rivers. The j-th of them contains three space-separated integers A_j, B_j, C_j of absolute values not exceeding 10 000. These integers are the coefficients of the equation $A_j \cdot x + B_j \cdot y + C_j = 0$ of the line along which the j-th river flows. After that, there are m lines describing the positions of the knights: the i-th of these lines contains two integers X_i, Y_i ($-10^9 \leqslant X_i, Y_i \leqslant 10^9$)—the coordinates of the i-th knight. You may assume that no knight is standing in a river (his shining armour would quickly rust if he did). Two knights may occupy the same post (their coordinates can be equal). No two rivers flow along the same line and no three rivers have a common point.

Output

Print the answers to the test cases in the order in which they appear in the input. For each test case, output a single line containing a single word **PROTECTED** if all districts are safe from the Dragon, and **VULNERABLE** otherwise.

Example

Input	Output
2 3 7 0 1 0 1 0 0 1 1 -3 1 1 5 -1 3 2 2 -2 -2 6 -1 -2 -8 4 1 1 0 1 0 0 1	PROTECTED VULNERABLE

E. Area of Shadow

time limit per test: 1 second

memory limit per test: 256 megabytes

In a three-dimensional space, we are given a point light source p, a convex polyhedron C and a plane L.

Calculate the area of the shadow of C on L.

Input

Each of the first three lines contains three real numbers, which are the coordinates of three distinct points on L. It is also guaranteed that these three points are non-collinear.

The fourth line contains three real numbers, which is the coordinate of p.

The fifth line contains a single integer n ($5 \leq n \leq 100$), which is the number of vertices on C.

Each of the following n lines contains three real numbers, which are coordinates of vertices of C.

It is guaranteed that all input coordinates are in $[-1000, 1000]$. It is also guaranteed that the area of the shadow is neither 0 nor infinitely large.

Output

A single real number which is the area of the shadow. Any solution within 10^{-4} of the correct answer will be considered correct.

Example

input

```
0 0 0
0 1 0
1 0 0
0 0 2
8
0 0 1
0 1 1
1 0 1
1 1 1
0 0 0
0 1 0
1 0 0
1 1 0
```

output

```
4.0000000000
```

Problem F. HHPaint

The famous in the Volga region $H\&H$ company decided to create a very special graphic tool. The head of $H\&H$ believes that it can be used by scientists for numerical experiments. That's why one of the parts of the tool is "triangulating" module. And this module is one you are responsible for.

You are given N points. No three points lay on the same line. Lets consider the convex polygon of minimal area containing all the points. Your task is to split the polygon to the set of not overlapped triangles in such a way, that all the vertices of the triangles are points from the given set. Each point should be used as a vertex of at least one triangle.

Input

The first line of the input file contains number of points N ($3 \le N \le 15000$). Each of the following N lines contains the coordinates of the corresponding point ($-10^6 \le x_i, y_i \le 10^6, 1 \le i \le N$). All coordinates are integers.

Output

Write in the first line of the output file the number of the triangles Q. Each of the following Q lines should contain description of the triangle. The description consists of three integers — numbers of points for each vertex of the triangle. The points are numbered from 1 to N in the order of their appearance in the input file. If there are several solutions, output any of them.

Example

standard input	standard output
6 -10 0 10 0 0 3 -1 4 1 4 0 5	7 1 2 3 1 3 4 1 4 6 2 3 5 2 5 6 6 4 5 3 4 5