Problem A. Postcard and envelope

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

You are given rectangular postcard and envelope. You must decide if you can fit postcard inside envelope or not.

Input

First line contains two numbers — dimensions of the postcard, second line contains dimensions of the envelope in the same format. All dimensions are positive integer numbers not exceeding 100.

Output

if you can fit postcard inside envelope, then output "Possible", otherwise — "Impossible".

Examples

standard input	standard output
10 15 15 10	Possible

Problem B. Integer area

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

You are given N different points on a plane. Count number of ways to select 3 of them in such way that area of this triangle is an integer number. Degenerate triangles have 0 area.

Input

First line contain integer number N ($1 \le N \le 100\,000$). Next N lines contain pairs of integers — coordinates of points. All coordinates don't exceed $1\,000\,000\,000$ by its absolute value.

Output

Output one number — answer for the problem.

Examples

standard input	standard output
4 0 0 0 2 2 2 2 0	4

Problem C. Where are we going with Piglet?

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Tra-la-la, tra-la-la,
Tra-la-la, tra-la-la,
Rum-tum-tiddle-um-tum.
Tiddle-iddle, tiddle-iddle,
Tiddle-iddle, tiddle-iddle,
Rum-tum-tum-tiddle-um.

Winnie-The-Pooh

Piglet and Winnie-The-Pooh are walking every morning to Rabbit to drink tea. Obviously they are using the shortest path.

Unfortunately one day Winnie-The-Pooh and Piglet made a trap in form of a hole for catching Heffalump.

Now every morning they fear that they will fall in it.

Help Winnie-The-Pooh to calculate the shortest safe path to the Rabbit's house.

Trap for Heffalump is a hole in form of an ideal circle. Path is considered safe if it doesn't intersect the hole (but it can go along its circumference).

Input

Input file contains descriptions of Winnie-The-Pooh's home, Rabbits's home, center of a trap and its radius. All coordinates are integer numbers not exceeding 32000 by its absolute value. Radius is positive integer number not exceeding 32000.

Houses can't be strictly inside trap.

Output

Output one number — length of a shortest path. Absolute or relative error of your answer shouldn't exceed 10^{-6}.

Examples

standard input	standard output
0 0 10 0 5 5 1	10.000000000000000
3 4 4 4 0 0 5	1.000000000000000

Problem D. Equilateral triangle approximation

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

You are given three points A, B and C. You must find such equilateral (all its sides are equal) triangle $A_1B_1C_1$, that $r = \max(|AA_1|, |BB_1|, |CC_1|)$ is minimal.

Input

Three lines describe points A, B, C. Each line consists of two real numbers not exceeding 100 by its absolute value.

Output

Output points A_1, B_1, C_1 in the same way as input. Lengths of sides shouldn't differ more than 10^{-6}. $\max(|AA_1|, |BB_1|, |CC_1|)$ shouldn't differ from correct answer more than 10^{-6}.

Examples

standard input	standard output
-4 -6 6 -6 1 2.660254037844386	-4.0000000000000 -6.0000000000000 6.0000000000000 -6.0000000000000 1.0000000000000 2.6602540378444

Problem E. Find a line

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

You have many segments on a plane. You need to find a line that intersects with maximal number of segments.

A line intersects a segment if it has at least one common point with it.

Input

First line contains N — number of segments ($1 \le N \le 1000$). Each of the next N lines contains numbers $X_{i_1}, Y_{i_1}, X_{i_2}, Y_{i_2}$ — coordinates of segment endpoints. All this numbers are integer and don't exceed 10^4 by its absolute value.

Output

Output coordinates of two different points which your line goes through. Coordinates should be integer and shouldn't exceed 10^7 by its absolute value.

Examples

standard input	standard output
3 0 0 1 0 0 1 1 1 0 2 1 2	0 0 1 2
5 -1 0 3 4 2 3 5 6 0 2 2 -2 8 5 9 2 8 5 9 2	-1 0 9 2

Problem F. Triathlon

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Triathlon is an athletic contest consisting of three consecutive sections that should be completed as fast as possible as a whole. The first section is swimming, the second section is riding bicycle and the third one is running. The speed of each contestant in all three sections is known. The judge can choose the length of each section arbitrarily provided that no section has zero length. As a result sometimes she could choose their lengths in such a way that some particular contestant would win the competition.

Input

The first line of the input contains integer number N ($1 \leq N \leq 100$), denoting the number of contestants. Then N lines follow, each line contains three integers V_i, U_i and W_i ($1 \leq V_i, U_i, W_i \leq 10000$), separated by spaces, denoting the speed of i^{th} contestant in each section.

Output

For every contestant write to the output one line, that contains word "Yes" if the judge could choose the lengths of the sections in such a way that this particular contestant would win (i.e. she is the only one who would come first), or word "No" if this is impossible.

Examples

standard input	standard output
9 10 2 6 10 7 3 5 6 7 3 2 7 6 2 6 3 5 7 8 4 6 10 4 2 1 8 7	Yes Yes Yes No No No Yes No Yes

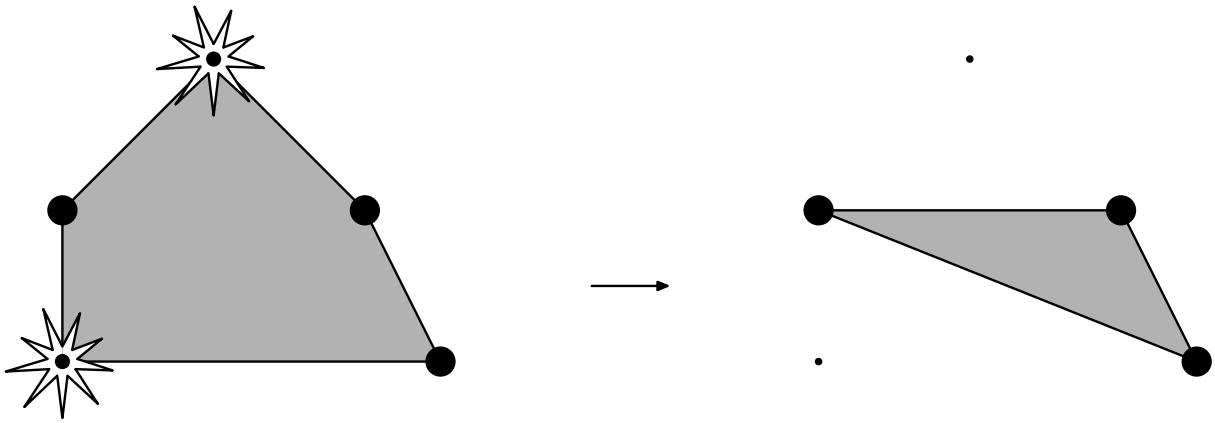
Problem G. Jungle Outpost

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

There is a military base lost deep in the jungle. It is surrounded by n watchtowers with ultrasonic generators. In this problem watchtowers are represented by points on a plane.

Watchtowers generate ultrasonic field and protect all objects that are strictly inside the towers' convex hull. There is no tower strictly inside the convex hull and no three towers are on a straight line.

The enemy can blow up some towers. If this happens, the protected area is reduced to a convex hull of the remaining towers.



The base commander wants to build headquarters inside the protected area. In order to increase its security, he wants to maximize the number of towers that the enemy needs to blow up to make the headquarters unprotected.

Input

The first line of the input file contains a single integer n ($3 \le n \le 50\,000$) — the number of watchtowers. The next n lines of the input file contain the Cartesian coordinates of watchtowers, one pair of coordinates per line. Coordinates are integer and do not exceed 10^6 by absolute value. Towers are listed in the order of traversal of their convex hull in clockwise direction.

Output

Write to the output file the number of watchtowers the enemy has to blow up to compromise headquarters protection if the headquarters are placed optimally.

Example

standard input	standard output
3 0 0 50 50 60 10	1
5 0 0 0 10 10 20 20 10 25 0	2

Problem H. Amber Ball

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	256 mebibytes

Amber ball falls down on the ground facing some obstacles. Introduce standard Cartesian coordinates such that the ground is an Ox axis and the gravity forces the ball to go in negative direction of Oy axis. Obstacles are segments and the ball is a point. If the ball faces an obstacle (even its highest point) it rolls down to the lowest point of an obstacle and then continues to fall down vertically (in other words, the horizontal component of its movement disappears immediately). There are no vertical and no horizontal obstacles, they all are located strictly above the ground and no two obstacles have a common point. Thus, the ball will eventually reach the ground at some point.

The ball is being thrown multiple times from different starting positions. For each starting position you have to determine the x coordinates of the point where the ball will touch the ground.

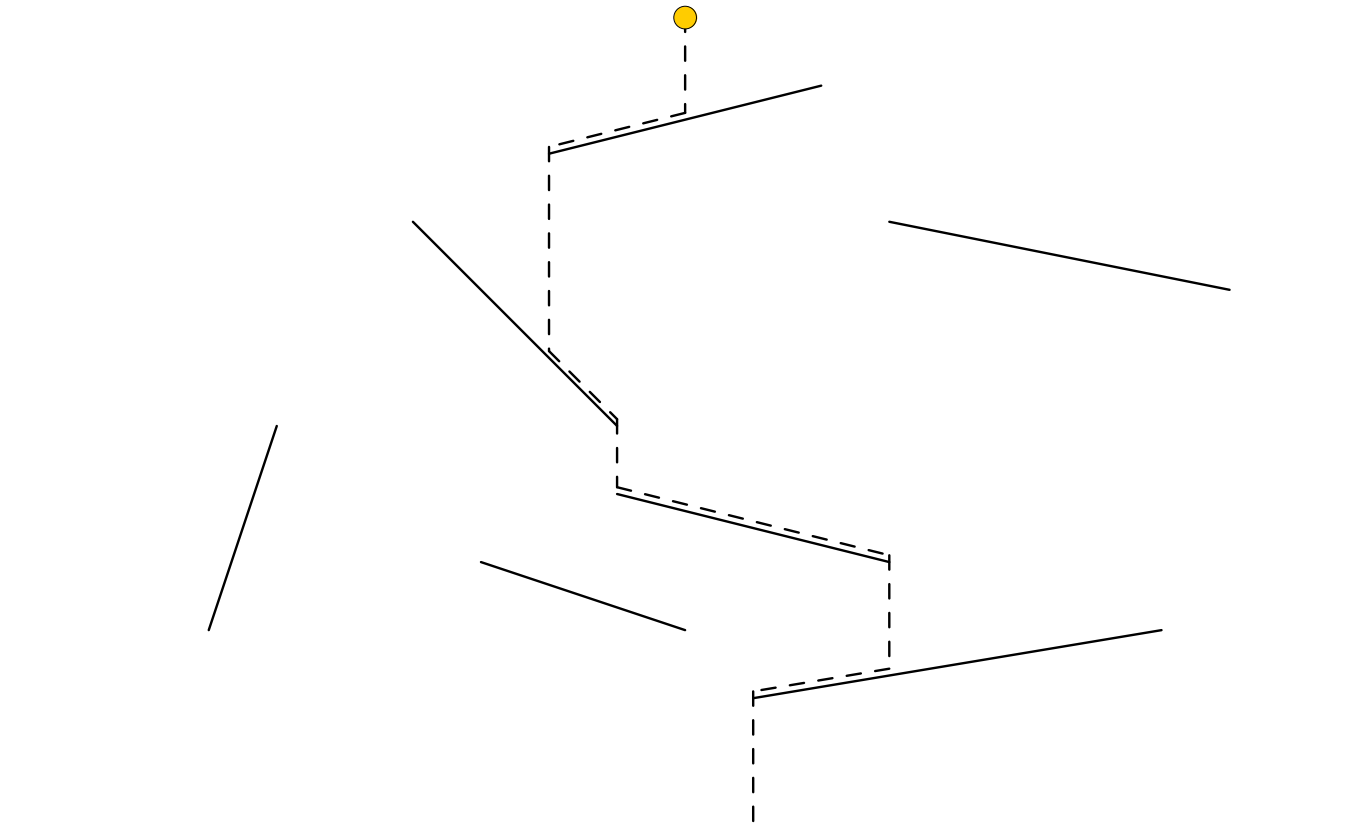


Figure 1: *
Third sample.

Input

The first line of the input contains a single integer n ($0 \le N \le 3 \cdot 10^5$) — the number of obstacles.

Each of the next n lines contains the description of one obstacle — four integers x_1, y_1, x_2, y_2 ($x_1 < x_2$, $y_1 \ne y_2$, $y_1, y_2 > 0$): (x_1, y_1) — coordinates of the left end, (x_2, y_2) — coordinates of the right end.

Next line contains the only integer m ($1 \le m \le 3 \cdot 10^5$) — the number of experiments.

Then follow m lines, each of them contains a single integer — x-coordinate of the starting position. You may assume that the y coordinate of the starting position is bigger than y-coordinate of any point of any obstacle.

All coordinates in the input are integers not exceeding 10^6 by their absolute value. It's guaranteed that there are no vertical or horizontal obstacles and no two obstacles share a common point. The length of each obstacle is positive.

Output

For each starting position print one integer — the x-coordinate of the point where the ball will touch the ground.

Examples

standard input	standard output
2 0 7 1 3 3 3 4 7 2 2 4	2 3
2 -3 5 1 3 -1 1 1 2 3 -3 -4 1	-1 -4 -1
7 -2 10 2 11 -4 9 -1 6 3 9 8 8 -7 3 -6 6 -1 5 3 4 -3 4 0 3 1 2 7 3 1 0	1

Note

The picture above illustrates the third sample.

Problem I. Asteroids

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Association of Collision Management (ACM) is planning to perform the controlled collision of two asteroids. The asteroids will be slowly brought together and collided at negligible speed. ACM expects asteroids to get attached to each other and form a stable object.

Each asteroid has the form of a convex polyhedron. To increase the chances of success of the experiment ACM wants to bring asteroids together in such manner that their centers of mass are as close as possible. To achieve this, ACM operators can rotate the asteroids and move them independently before bringing them together.

Help ACM to find out what minimal distance between centers of mass can be achieved.

For the purpose of calculating center of mass both asteroids are considered to have constant density.

Input

Input file contains two descriptions of convex polyhedra.

The first line of each description contains integer number n — the number of vertices of the polyhedron ($4 \le n \le 60$). The following n lines contain three integer numbers x_i, y_i, z_i each — the coordinates of the polyhedron vertices ($-10^4 \le x_i, y_i, z_i \le 10^4$). It is guaranteed that the given points are vertices of a convex polyhedron, in particular no point belongs to the convex hull of other points. Each polyhedron is non-degenerate.

The two given polyhedra have no common points.

Output

Output one floating point number — the minimal distance between centers of mass of the asteroids that can be achieved. Your answer must be accurate up to 10^{-5}.

Example

standard input	standard output
8 0 0 0 0 0 1 0 1 0 0 1 1 1 0 0 1 0 1 1 1 0 1 1 1 5 0 0 5 1 0 6 -1 0 6 0 1 6 0 -1 6	0.75