Problem A. Triangle Type

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

Given a triangle. Find the triangle type.

Input

There are three lines containing coordinates of three points, one per line. All coordinates are integers, not exceeding 1 000 by absolute value. The points are distinct, do not l

It is guaranteed that all the points are different and do not lie on one line.

Output

If the triangle is acute print «`ACUTE`» (without quotes). If right, print «`RIGHT`» (without quotes). If obtuse, print «`OBTUSE`» (without quotes).

Examples

standard input	standard output

-1 0
0 0
0 1
	RIGHT

5 4
2 3
5 1
	ACUTE

Problem B. Is on Segment?

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

You are given a point and a segment. Check if the point is on the segment.

Input

Given 6 integers from $-10\,000$ to $10\,000$: the point (x, y) and two distinct points (x_1, y_1), (x_2, y_2), endpoints of the segment.

Output

Print "`YES`" (without quotes), if the point is not the segment. Print "`NO`" (without quotes), if the point is not on the segment.

Example

standard input	standard output
`4 0 4 2 4 5`	`NO`

Problem C. Arrangement of Lines

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

Find arrangement type of two given lines and a point of intersection (if exists).

Input

Given 8 integer coordinates from $-32\,000$ to $32\,000$: the first two points (x_1, y_1), (x_2, y_2) (they are distinct) give the first line, the following two points (x_3, y_3), (x_4, y_4) (they are distinct) give the second line.

Output

Print 0 if lines do not intersect, print 1 and coordinates of the intersection if there is exactly one intersection point, print 2 if lines coincide.

Print coordinates with at least 3 digits after a decimal point.

Examples

standard input	standard output
1 2 1 3 1 2 1 3	2
49 -33 28 -15 18 0 42 -33	1 30.4137931034 -17.0689655172

Problem D. Distance from Point to Segment

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

Find the distance from the given point to the given segment.

Input

Given 6 integers from $-10\,000$ to $10\,000$: the point (x, y) and two points (x_1, y_1), (x_2, y_2) — endpoints of the given segment. The endpoints can coincide.

Output

Print the distance with at least 5 digits after a decimal point.

Example

standard input	standard output
`0 0 0 0 4 0`	`0.0000000`

Problem E. Polygon Area

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You are given a polygon by its vertices in clockwise of counterclockwise order. Print its area.

Input

The first line contains N ($3 \leq N \leq 100\,000$), the number of vertices.

The following N lines contain vertices, one per line. Each line contains a pair of integer coordinates. They are between $-10\,000$ and $10\,000$.

Output

Print the single number, the required area with 5 or more digits after a decimal point.

Example

standard input	standard output

4
0 0
0 1
1 1
1 0
	1.0

Problem F. Triangle Perimeter

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

You are given three lines, no two lines are parallel. They intersect in tree points which form a triangle. Return the length of the perimeter of this triangle.

Lines are given by equation $Ax + By = C$. For each line both A and B can't be zero at the same time.

Input

There are three lines in the input. Each line contains A, B and C. All given numbers are integer, do not exceed 100 by absolute value. The answer doesn't exceed 1000.

Output

Print the required length of the perimeter with at least 4 digits after a decimal point.

Example

standard input	standard output

0 1 1
1 0 1
4 3 13
	6.000000

Problem G. Symmetrical Point

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

You are given a line passing through two distinct points (x_1, y_1) and (x_2, y_2). Find the point which is symmetric to the point (x, y) relative to the given line.

Input

In the first line there are two integer numbers x_1 and y_1. In the second line there are two integer numbers x_2 and y_2. The third line contains integers x and y. All the numbers do not exceed 10^9 by absolute value.

Output

Print coordinates of the requited point with at least 8 digits after a decimal point or single integer `-1` if the given point (x, y) is on the given line.

Example

standard input	standard output

`1 1`
`2 2`
`0 1`
	`1.00000000 0.00000000`

Problem H. Intersection

Input file:	`stdin`
Output file:	`stdout`
Time limit:	1 second
Memory limit:	256 megabytes

You are given two set of points. The first set is determined by the equation $A_1x + B_1y + C_1 = 0$, and the second one is determined by the equation $A_2x + B_2y + C_2 = 0$.

Write the program which finds the number of points in the intersection of two given sets.

Input

The first line of the input contains three integer numbers A_1, B_1, C_1 separated by space. The second line contains three integer numbers A_2, B_2, C_2 separated by space. All the numbers are between -100 and 100, inclusive.

Output

Print the number of points in the intersection or `-1` if there are infinite number of points.

Examples

stdin	stdout

`1 1 0`
`2 2 0`
	`-1`

`1 1 0`
`2 -2 0`
	`1`

Problem I. Segments Intersections

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	256 megabytes

You are given n segments in 2D. The segments can degenerate to be points. Find the number of pairs of intersecting segments.

Input

The first line contains integer number n ($1 \leq n \leq 10\,000$). The following n lines contain segments represented as four integers x_1, y_1, x_2, y_2. The coordinates do not exceed $1\,000\,000$ by absolute value.

Output

Print the number of intersecting segments pairs.

Examples

standard input	standard output

3
0 0 1 1
1 1 0 1
0 1 0 3
	2

2
0 0 1 1
1 1 0 1
	1

5
1 1 1 5
1 1 1 1
4 5 2 1
1 1 1 1
5 3 1 2
	5

Problem J. Two Segments

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

Two segments AB and CD in 2D are given as points A, B, C and D.

You are to find their intersection and print:

- number `-1`, if the segments do not intersect;
- coordinates of a single point of intersection, if they intersect by single (exactly one) point;
- coordinates of two points — endpoints of intersection, if intersection of the segments is a segment itself.

Input

The input contains coordinates of the points A, B, C and D — integer numbers not exceeding 1 000 by absolute value. The segments can degenerate to be points.

Output

Print the result. Print coordinates with at least 6 digits after a decimal point.

Examples

standard input	standard output

`0 0`
`9 9`
`9 5`
`0 5`
	`5.000000 5.000000`

`0 0`
`9 9`
`15 15`
`7 7`
	`7.000000 7.000000 9.000000 9.000000`

`0 0`
`9 9`
`10 10`
`10 10`
	`-1`

Problem K. Polygon and Line

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

You are given a convex polygon (i.e. each internal angle is no more than 180 degrees) and a line. The line cuts polygon into two parts (a part can degenerate to be empty). Print areas of two parts.

Input

The first line contains integer N $(3 \le N \le 50)$ — number of vertices in the polygon.

The following N lines contain vertices of the polygon in clockwise of counter clockwise order. It is possible that three or more consecutive vertices are on the same line. Two last lines contain coordinates of two points on the given line.

All coordinates are real numbers not exceeding 10 000 by absolute value. The number of digits after decimal point doesn't exceed 5. It is possible that the line doesn't intersect the polygon.

Output

Print two areas S_1 and S_2 with at least 5 digits after a decimal point, $S_1 \ge S_2$.

Example

standard input	standard output

4
0 0
0 1
1 1
1 0
0.5 0
0.5 1
	0.50000 0.50000

Problem L. Two Circles

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1.5 seconds
Memory limit:	256 megabytes

You are given two circles in 2D. Print all their distinct intersections.

Input

The first line contains integer M ($1 \le M \le 10\,000$), number of test cases.

The following $2 \cdot M$ contain circles. Each circle is given by three integer numbers: coordinates of a center and radius,

All coordinates are between $-1\,000$ and $1\,000$. All radii are positive and do not exceed $1\,000$.

Output

For each test case print:

- if there are no intersections, print `0`,
- if there are infinite number of intersections, print `-1`,
- if there are positive and finite number of intersections, print k — number of intersections, and k lines containing coordinates of intersections (sort them by x and in case of tie sort them by y).

For coordinates absolute or relative error shouldn't exceed 10^{-8}.

Separate outputs for test cases by an empty line.

Example

standard input

```
1
0 0 2
4 0 2
```

standard output

```
1
2.00000000000000000000 0.00000000000000000000
```

Problem M. Area of Triangles Union

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

On a plane there are $N \leq 100$ triangles, given by vertices: $(X_{i1}, Y_{i1}), (X_{i2}, Y_{i2}), (X_{i3}, Y_{i3})$.

All numbers are integer, not exceeding 3 000 by absolute value.

Find total area covered by triangles (i.e. area of their union). All triangles are non-degenerate (i.e. have positive area).

Input

The first line contains N $(1 \leq N \leq 100)$.

The following N lines contain six numbers each: coordinates of vertices of a triangle. Numbers are $X_{i1}, Y_{i1}, X_{i2}, Y_{i2}, X_{i3}, Y_{i3}$. All coordinates are integer, not exceeding 3 000 by absolute value.

Output

Print the required area with at least 4 digits after a decimal point.

Example

standard input	standard output

2
0 0 2 0 1 2
0 0 2 0 1 1
	2.00000

Problem N. Circle-Segment Intersection

Input file:	`stdin`
Output file:	`stdout`
Time limit:	5 seconds
Memory limit:	256 megabytes

Given a circle and a segment. Print all the distinct intersection points. Both the circle and the segment can degenerate to be a point.

Input

The input contains one or more test sets. Each test set is a line containing $x_0, y_0, r, x_1, y_1, x_2, y_2$, where circle center is in (x_0, y_0), radius is r ($0 \le r \le 10^3$), and segment connects (x_1, y_1) and (x_2, y_2).

All coordinates are floating point numbers between -1000 and 1000. Coordinates are given with at most 2 digits after a decimal point.

Number of test sets in the input doesn't exceed 10^5.

Output

For each test set print number of intersection points and coordinates of the points. Print points in order of increasing of x (in case of tie, sort them by y). At most 10^{-6} absolute or relative error in coordinates is allowed.

Examples

stdin	stdout

`0 0 1 0 0 1 1`
`1 0 1 -1 -1 0 0`
`5 3 2 -1 -2 9 8.33`
	`1`
	`0.7071067812 0.7071067812`
	`1`
	`0.0000000000 0.0000000000`
	`2`
	`3.1367208479 2.2732326359`
	`5.6659102918 4.8858853314`

Problem O. See the Sights on the Flights

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	256 mebibytes

Dima is an architect. He is also a photographer. He spends his time on travelling around the world and making photos of cool buildings like Big Ben etc.

This time Dima went to Berland famous with its subway system. It consists of n lines, each of which is represented with a line on the map of the city. For any two lines there is a subway station in their intersection point, those station entrances are considered to be the notable pieces of architecture. Dima decided to take a photo of them.

In order to take the panoramic photo, he is going to use a helicopter flight. Helicopter may use one of the t routes. Each route is also represented with a line on the map of the city. Dima is able to make a photo from an arbitrary point of the route, though the smaller distance from his location to the station means the better photo and the larger number of likes he is going to receive in social networks. That's why Dima needs your help.

You are given n descriptions of the subway lines and t lines defining the helicopter routes. For each of the helicopter routes Dima asks you to find the distance to the closest subway station.

It is guaranteed that no two subway lines coincide, any two subway lines have a common point, any two routes have a common point and each route has exactly one common point with each subway line.

Input

In the first line of the input there are two integers n, t ($2 \le n \le 100\,000$, $1 \le t \le 20$) — the number of subway lines and the number of helicopter routes, respectively.

In each of the following n lines there are three integers a_i, b_i and c_i ($|a_i|, |b_i| \le 10\,000$, $a_i^2 + b_i^2 > 0$, $|c_i| \le 10^8$) defining each of the subway lines. The corresponding line is defined by the equation $a_i \cdot x + b_i \cdot y + c_i = 0$.

In each of the following t lines there are three integers u_i, v_i, w_i ($|u_i|, |v_i| \le 10\,000$, $u_i^2 + v_i^2 > 0$, $|w_i| \le 10^8$) defining each of the helicopter routes. Similarly, each route is defined with the equation $u_i \cdot x + v_i \cdot y + w_i = 0$.

Output

For each route output the only real number — the distance between i-th helicopter route and its most closest subway station. Your answer will be considered correct if the absolute or relative error between your answer and the answer of the jury doesn't exceed 10^{-9}. Namely, $\frac{|p-j|}{\max(1,j)} \le 10^{-9}$ where p is your answer and j is the answer of the jury.

Examples

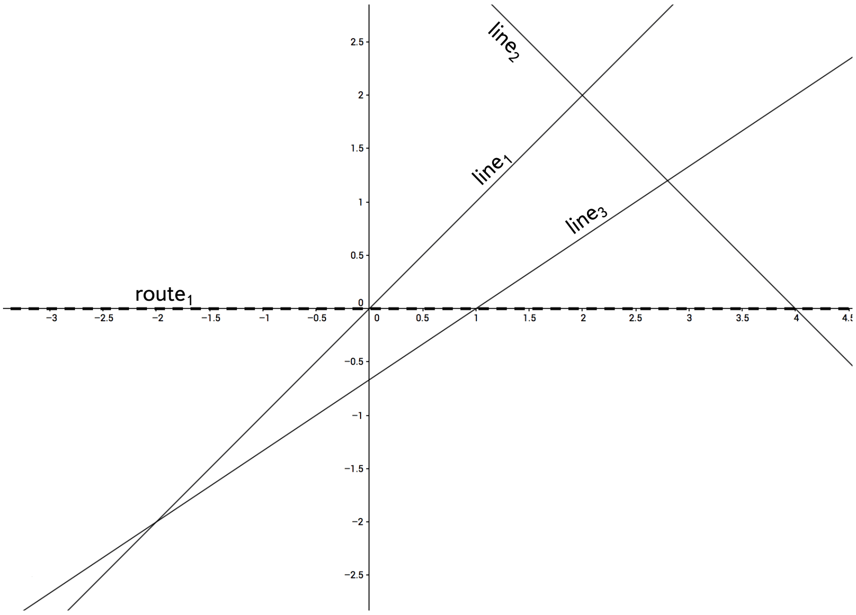
standard input	standard output

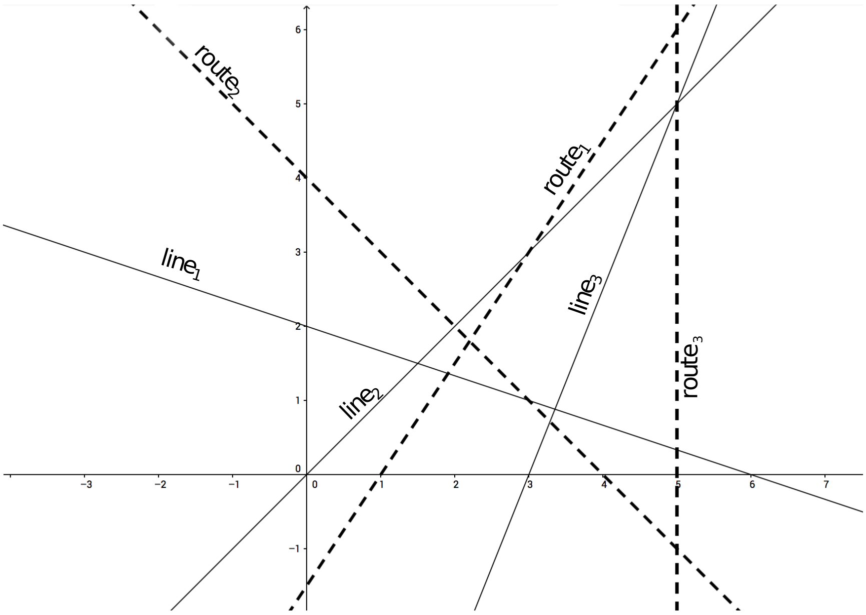
3 1
1 -1 0
1 1 -4
4 -6 -4
0 1 0
	1.2

3 3
1 3 -6
-1 1 0
-5 2 15
3 -2 -3
-1 -1 4
1 0 -5
	0.41602514717
	0.16637806616
	0.0

Note

The pictures for the samples are provided below.




route$_2$
route$_1$
line$_1$
line$_3$
route$_3$
line$_2$
−3
−2
−1
0
1
2
3
4
5
6
7
−1
1
2
3
4
5
6