Problem A. The polar angle of a point

Input file: angle1.in

Output file: angle1.out

Time limit: 1 second

Memory limit: 64 megabytes

Input format

You're given 2 integers which are the coordinates of a point that does not coincide with the origin.

Output Format

One number which is the magnitude of the polar angle in radians from the interval [0, 2π).

Example:

angle1.in	angle1.out
2 3	0.98279

Problem B. The angle between vectors

Input file: angle2.in

Output file: angle2.out

Time limit: 1 second

Memory limit: 64 megabytes

Input format

You're given 4 integers which are the coordinates of two nonzero vectors.

Output Format

One number which is the value of the undirected angle between the two vectors that is within the interval $[0, \pi]$. Output should be precise up to the 5^{th} decimal place.

Example:

angle2.in	angle2.out
2 1 3 5	0.56673

Problem C. Area of the polygon

Input file: area.in

Output file: area.out

Time limit: 1 second

Memory limit: 64 megabytes

Input format

The first line contains one number N ($3 \le N \le 100{,}000$). The next N lines each contain a pair of numbers (x, y) the coordinates of the next vertex of a simple polygon in either clockwise or counterclockwise order. *

All coordinates are integers that do not exceed 10,000 in absolute value.

Output Format

One number which is the area of the given polygon.

Example

area.in	area.out
3 1 0 0 1 1 1	0.5

* The literal phrase Google Translate gave me was “in the order Bypass or counterclockwise. “ I’m just going to assume that Bypass is supposed to mean clockwise since that’s the only thing that really makes sense.

Problem D. Area of the triangle

Input file: area1.in

Output file: area1.out

Time limit: 1 second

Memory limit: 64 megabytes

Input format

You're given 6 integers which are the coordinates of the three vertices of the triangle

(x_1, y_1), (x_2, y_2), (x_3, y_3),

Output Format

One number which is the area of the triangle.

Example

area1.in	area1.out
1 0 2 4 5 2	7.0

Problem E. The bisector

Input file: bisector.in

Output file: bisector.out

Time limit: 1 second

Memory limit: 64 megabytes

Description

Find the line containing the bisector of the angle between the line segments XY and XZ (i.e. the bisector of angle YXZ).

Input format

You're given 6 integers which are the coordinates of X Y and Z respectively.

Output Format

Output A B and C which are the coefficients of the normal bisector of the angle YXZ. This is in the standard form of a line which is Ax + By + C = 0.

Example

bisector.in	bisector.out
1 1 1 0 0 1	-1.0 1.0 0.0

Problem F. Distance from a point to a straight line

Input file: distance1.in

Output file: distance1.out

Time limit: 1 second

Memory limit: 64 megabytes

Description

Find the distance from the given point to the given straight line.

Input Format

You're given 5 integers representing the coordinates of the given point (x, y) and the coefficients A B and C of the normal equation of the line.

Output Format

Output one number which is the distance from a point to a straight line with an accuracy of at least 10^{-6}

distance1.in	distance1.out
1 1 1 1 -1	0.70711

Problem G. Distance from a point to a straight line (Part 2)

Input file: distance2.in

Output file: distance2.out

Time limit: 1 second

Memory limit: 64 megabytes

Description

Find the distance from the given point to the given straight line.

Input Format

You're given 6 integers representing the coordinates of the given point (x, y) and the coordinates of the two points that define the straight line.

Output Format

Output one number which is the distance from a point to a straight line with an accuracy of at least 10^{-6}

distance2.in	distance2.out
1 1 0 0 2 0	1.000000

Problem H. Distance from a point to the ray

Input file: distance3.in

Output file: distance3.out

Time limit: 1 second

Memory limit: 64 megabytes

Description

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

Input Format

You're given 6 integers representing the coordinates of the given point (x, y) and the coordinates of the beginning and end of the vector.

Output Format

Output one number which is distance from a point to a ray, defined by a vector, with an accuracy of at least 10^{-6}

distance3.in	distance3.out
2 1 1 1 0 2	1.0

Problem I. Distance from a point to a segment

Input file: distance4.in

Output file: distance4.out

Time limit: 1 second

Memory limit: 64 megabytes

Description

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

Input Format

You're given 6 integers representing the coordinates of the given point (x, y) and the ends of the line segment.

Output Format

Output one number which is distance the point to the segment with an accuracy of at least 10^{-6}

distance4.in	distance4.out
0 4 2 3 2 5	2.0

Problem J. Distance between segments

Input file: distance5.in

Output file: distance5.out

Time limit: 1 second

Memory limit: 64 megabytes

Description

Find the distance between the two line segments.

Input Format

You're given 8 integers representing the coordinates of the end points of the two line segments.

Output Format

Output one number which is between the two segments with an accuracy of at least 10^{-6}

distance5.in	distance5.out
1 1 2 2 2 1 3 0	0.7071067812

Problem K. The intersection of two lines

Input file: intersec.in

Output file: intersec.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 6 integers A B and C which represent the equation of the normal line of two different non-parallel straight lines (the first three integers define the first line, the last three define the second one).

Output Format

Output two numbers which are the coordinates of the point of their intersection.

distance5.in	distance5.out
1 1 -1 1 -1 0	0.5 0.5

Problem L. Length of the vector

Input file: length.in

Output file: length.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 4 integers which are the coordinates of the beginning and the end of the vector.

Output Format

Output one number which is the length of the given vector with an accuracy to the 6^{th} position after the decimal place (since they didn't mention a tolerance like 10^{-6} in the statement, I assume that means that the output must be rounded and not just printed).

length.in	length.out
1 1 2 2	1.414214

Problem M. The equation of the line 1

Input file: line1.in

Output file: line1.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 4 integers which are the coordinates of two different points on the line.

Output Format

Output three numbers which are the coefficients A B and C of the normal equation of the line.

line1.in	line1.out
1 2 3 1	-1 -2 5

Problem N. The equation of the line 2

Input file: line2.in

Output file: line2.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 4 integers which are the coordinates of the point on the line and the coordinates of the normal vector to this line.

Output Format

Output three numbers which are the coefficients A B and C of the normal equation of the line.

line2.in	line2.out
1 2 3 1	3 1 -5

Problem O. Parallel straight line

Input file: line3.in

Output file: line3.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 4 integers which are the coefficients A B and C of the normal equation of the straight line and a distance value R.

Output Format

Output 6 numbers which are the coefficients A B and C of the normal equation of two different lines that are parallel to the given line and is a distance of R ($R \neq 0$) from the given line. Output must have an accuracy of at least 6 decimal places (10^{-6}). The order of the lines is not important.

line3.in	line3.out
0 -1 1 1	0 -1 2 0 -1 0

Problem P. Is the point on the line? *

Input file: point1.in

Output file: point1.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 5 integers which are the coordinates of the point and the coefficients A B and C of the normal equation of the line.

Output Format

Output "YES" (without quotes) if the given point lies on the given line or "NO" (without quotes) if it does not lie on the line.

point1.in	point1.out
3 7 -2 1 -1	YES

* The translated title to this problem was "The affiliation of the point of the line" but it's basically asking if a point lies on a line, so I figured I'd change the name to make more sense.

Problem Q. Is the point on the ray?

Input file: point2.in

Output file: point2.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 6 integers which are the coordinates of the point and the coordinates of the beginning and the end of the vector.

Output Format

Output "YES" (without quotes) if the given point lies on the ray defined by the vector or "NO" (without quotes) otherwise.

point2.in	point2.out
1 6 3 7 5 8	NO

Problem R. Is the point on the segment?

Input file: point3.in

Output file: point3.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 6 integers which are the coordinates of the point and the coordinates of the ends of the line segment.

Output Format

Output "YES" (without quotes) if the given point lies on the line segment or "NO" (without quotes) otherwise.

point3.in	point3.out
3 3 1 2 5 4	YES

Problem S. The position of points outside the line

Input file: position.in

Output file: position.out

Time limit: 1 second

Memory limit: 64 megabytes

Input Format

You're given 7 integers which are the coordinates of the two points that do not lie on the line and the coefficients A B and C of the normal line.

Output Format

Output "YES" (without quotes) if the two points lie on the same side of the line segment or "NO" (without quotes) otherwise.

position.in	position.out
0 0 2 4 2 -1 -1	YES

Problem T. Distance between beams

Input file: raydist.in

Output file: raydist.out

Time limit: 1 second

Memory limit: 64 megabytes

Description

There are two rays on the plane defined by pairs of points. You want to the find the distance between the two rays.

Input Format

You're given 4 pairs of integers where the first 2 pairs define the first ray and the last 2 define the second ray. Each ray is described the coordinates of its origin and the coordinates of some point on the ray.

Output Format

Output one real number which is the distance between the two rays up to the 5^{th} decimal place.

raydist.in	raydist.out
2 1 1 3 0 1 4 1	0.89443