

# Alternating Cycle

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

You are given  $n$  points in the plane, with no 3 points collinear. You can choose some non-empty subset of the points, and choose an order for this subset. If the points in your chosen ordered subset are  $p_0, p_1, \dots, p_{k-1}$ , we want for  $1 \leq i \leq k + 1$ , that the angles  $\angle p_{i-1}p_i p_{i+1}$  are alternating clockwise and counterclockwise in increasing order of  $i$ . In the labeling of the points in the angle, you should take the indices  $\bmod k$ . Note that  $k$  must be even, otherwise due to parity it is impossible. Such an ordered subset of points is called an *alternating cycle*.

You have to find the *alternating cycle* with the smallest number of points in it, and print it to the output, or report no such cycle exists.

## Input

The first line of input contains a single integer,  $n$  ( $1 \leq n \leq 200\,000$ ) — the number of points in the input.

Each of the next  $n$  lines contains the description of a point. Each line contains two integers  $x$  and  $y$ , ( $0 \leq x, y \leq 10^9$ ) — the coordinates of the point.

It is guaranteed that the points are distinct, and it is also guaranteed no 3 points are collinear.

## Output

Output  $-1$  if there is no alternating cycle. Otherwise, output  $k$ , the number of points in the cycle. On the following lines output the points on the cycle in order.

On each of the following  $k$  lines, print two integers  $x$  and  $y$ , ( $0 \leq x, y \leq 10^9$ ) — the coordinates of a point in the alternating cycle.

The points should be a subset of the input points, and they should form an alternating cycle in the order of the input.

If there are multiple solutions which achieve the minimum  $k$ , any of these solutions is accepted.

## Examples

standard input	standard output
6 10 15 20 15 15 23 0 31 15 0 30 30	6 0 31 10 15 15 0 20 15 30 30 15 23
4 0 0 0 1 1 0 1 1	-1

## Note

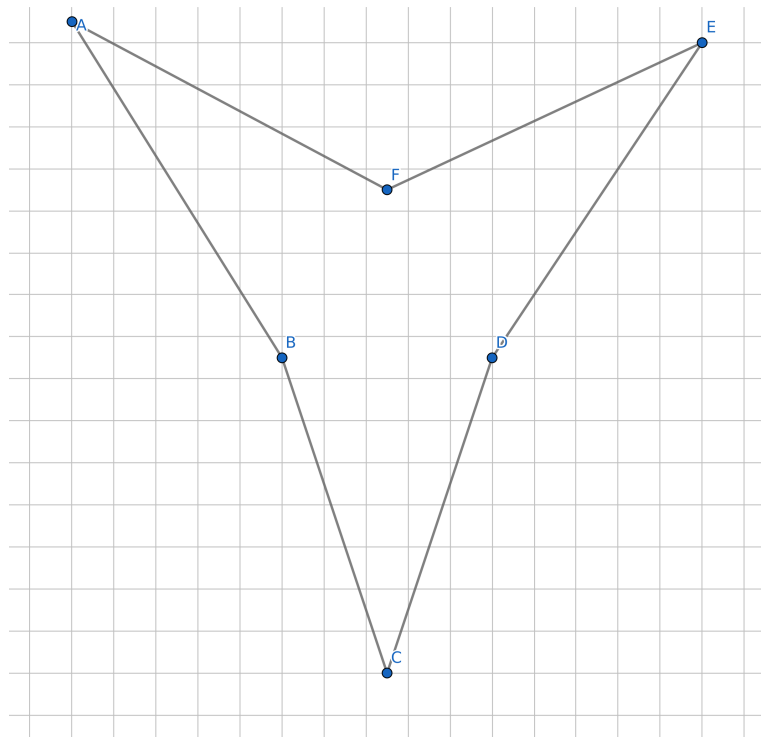


Illustration of sample 1, with a possible alternating cycle of length 6 drawn with straight line segments.