Czech ACM Student Chapter



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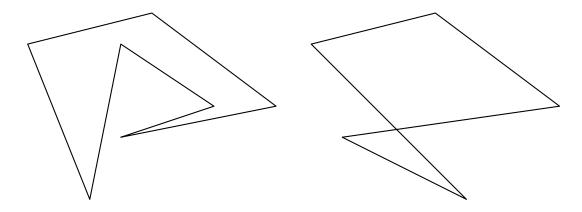
CTU Open Contest 2011

Simple Polygon

polygon.c, polygon.C, polygon.java, polygon.p

A polygon P determined by points p_1, p_2, \ldots, p_n is a closed chain of line segments (called edges) $p_1p_2, p_2p_3, \ldots, p_np_1$ in the plane. Polygon P is simple, if no two edges have any points in common, with the obvious exception of two consecutive segments having one common point (called vertex). Note however, that if a vertex is part of any other (third) edge, the polygon is no longer simple.

Any polygon that is not simple is called *self-intersecting*. In two example figures below, the first polygon is simple, the second one is self-intersecting.



Your task is to determine whether a given polygon is simple or self-intersecting.

Input Specification

The input contains several test cases. Each test case corresponds to one polygon. First line of the test case contains N, the number of points $(1 \le N \le 40\,000)$. Each of the following N lines contains coordinates of point P_i , that is X_i , Y_i separated by space, $1 \le X_i$, $Y_i \le 30\,000$.

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

Output Specification

For each test case output either "YES" (the polygon is simple) or "NO" (the polygon is self-intersecting).

Sample Input

5

1 6

5 7

9 4

2 3

6 1

7

1 6

5 7

9 4

4 3

7 4

4 6

3 1

7

1 1

1 4

1 3

2 2

3 1

3 3

2 2

0

Output for Sample Input

NO

YES

NO