

# Loon Talking

**Purpose: Graphs**

**Due: November 20<sup>th</sup>**



Figure 1: A Project loon balloon.

## Description

Project Loon is a research and development project being developed with the mission of providing Internet access to rural and remote areas. The project uses high-altitude balloons placed in the stratosphere at an altitude of about 18 km (11 mi) to create an aerial wireless network. In order for this to work each balloon stations must be able to communicate with the others. To save batteries, each station is programmed only transmit to its closest two stations. In the case of a tie, the first choice is to choose the westernmost station and in case that is a tie, choose the southernmost station. Given the initial location of the loons, you are to determine if a message can reach all stations.

## Input

The input consists of an integer  $N$ , followed by  $N$  pairs of integers  $X_i, Y_i$ , indicating the  $(x, y)$  coordinates of each station. The first pair of coordinates determines the position of the first transmitting station, while the remaining  $N - 1$  pairs are the coordinates of the other stations. The following constraints are imposed:  $-20 \leq X_i, Y_i \leq 20$ , and  $1 \leq N \leq 1000$ . The input is terminated with  $N = 0$ .

## Output

For each given expression, the output will echo a line with **yes** if all stations can be reached and **no**. otherwise.

## Sample Input

```
4
1 0 0 1 -1 0 0 -1
8
1 0 1 1 0 1 -1 1 -1 0 -1 -1 0 -1 1 -1
6
0 3 0 4 1 3 -1 3 -1 -4 -2 -5
0
```

## Corresponding Sample Output

```
yes
yes
no
```

## How the program will be graded

### Memo

What	pts	November 20 <sup>th</sup>
Name	1	
Justify your choice of data structure	10	
Describe your algorithm	10	

### Source Code Document

What	pts	November 20 <sup>th</sup>
Name	1	
Description	3	
Style	10	
pre/post conditions	10	
Number of test cases passed by the autograder	55	