

# Colony Planning

A large deposit of deep substrate foliated kalkite has been found on the planet Ghorman. Your task, as an employee in the Imperial Bureau of Standards, is to look over blueprints for a new mining colony and determine if they would be valid to construct. Unfortunately, the Empire is very busy with Project Stardust and assigned stormtroopers to create potential plans – and they aren't the best engineers!

Cities planned by the Empire have very strict requirements. Buildings are organized into loops around a singular central armory and cantina. Each loop must have a strictly decreasing number of buildings than the one outside of it – otherwise things could get cramped!

Loops are defined as connections between individual buildings – they must be convex polygons and not necessarily round.

Thus, a valid Imperial colony has the following features:

- There is at least one loop.
- There must be a site for both an armory and cantina, and neither can be part of a loop. These must be in the center of the colony (contained within every loop of the colony).
- Loops are strictly decreasing in the number of buildings they connect from the outermost to the innermost.
- All buildings must be part of a loop. If a building site is provided, there must be a building constructed there, unless one is already built on that site. You can't build on top of an existing building.
- All buildings that fall in a loop or on the loop are part of the loop. If you're running a loop through a building, it must be part of that loop.

The stormtroopers will provide you with a list of valid construction sites for buildings. Your task is to determine if the list provided is a valid site for a colony.

## Input

Each test case will only be comprised of one input. The first value given is the number of building sites  $n$  ( $1 \leq n \leq 1000$ ). Each of the next  $n$  lines contains two spaced-separated integers  $x$  and  $y$  ( $-10000 \leq x, y \leq 10000$ ), representing the location of one building site.

# Output

If a colony is valid, output “valid” followed by the number of loops that comprise the colony (the cantina and armory do not count). If a colony is invalid, output “invalid”.

## Sample Input 1

```
5
0 0
10 0
5 10
4 2
6 2
```

## Sample Output 1

```
valid 1
```

## Sample Input 2

```
5
0 0
10 0
10 10
0 10
5 5
```

## Sample Output 2

```
invalid
```