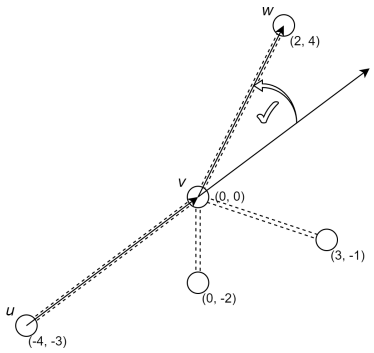
Problem J. Streets of Flatland

Time limit: 2 seconds
Memory limit: 512 megabytes

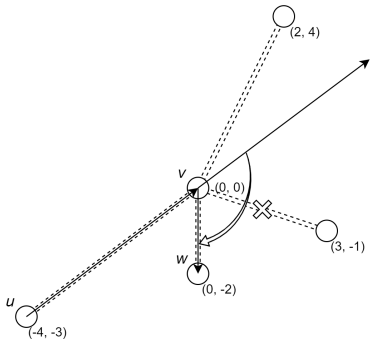
Flatland is a country located on a plane. There are a total of n cities in Flatland, connected by $n - 1$ bidirectional roads in such a way that it is possible to travel from any city to any other. City number i is located at the point with coordinates (x_i, y_i).

Recently, Flatland decided to carry out a road reform and assign a name to each road. However, to save resources it was decided to use as few different names as possible. Several roads can be given the same name if all these roads form a simple path and for any two consecutive roads (u, v) and (v, w) on this path, the pair of directed roads $u \to v$ and $v \to w$ is *compatible* and the pair of directed roads $w \to v$ and $v \to u$ is *compatible*.

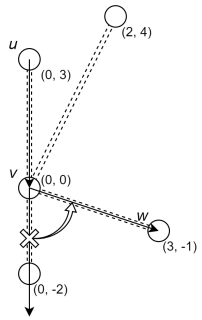
In this case a pair of roads $u \to v$ and $v \to w$ will be called compatible if no other road starting from city v is encountered when rotating the vector $\overrightarrow{uv}$ drawn from point v to the vector $\overrightarrow{vw}$ around the point v.



Compatible pair $u \to v$ and $v \to w$



Incompatible pair $u \to v$ and $v \to w$



Co-directed road

Note that the roads must be compatible in both directions, while the illustration shows compatibility only in one direction. Also, if the vector $\overrightarrow{uv}$ drawn from v turns out to be co-directed with some road, it is considered the only one compatible with the road (u, v).

A path of one or more roads with the same name is called a *highway*. Determine the minimum number of highways with different names into which all the roads of Flatland can be divided.

Input

The first line of input contains a single integer n — the number of cities in Flatland ($1 \le n \le 2 \cdot 10^5$).

In the i-th of the following n lines, there are two integers x_i and y_i — the coordinates of the i-th city ($|x_i|, |y_i| \le 10^9$). It is guaranteed that no two cities are located at the same point on the plane.

The next $n - 1$ lines describe the roads in Flatland — the i-th line contains the numbers of the cities u_i and v_i connected by the i-th road ($1 \le u_i, v_i \le n$). It is guaranteed that there is exactly one path between any two cities.

It is also guaranteed that no two roads emanating from the same city are co-directed. However, it is *not guaranteed* that the segments on the plane corresponding to the roads do not intersect.

Output

Output a single integer — the minimum number of highways after naming all the roads of Flatland.

Examples

standard input	standard output
5 0 0 2 4 3 -1 0 -2 -4 -3 1 2 1 3 1 4 1 5	2
5 0 0 2 4 3 -1 0 -2 0 3 1 2 1 3 1 4 1 5	3

Note

The problem statement includes illustrations for two examples. In the first example, it is possible to combine the paths $(2, 1, 4)$ and $(3, 1, 5)$ into one highway. In the second example, it is not possible to get less than three highways because the roads $(1, 5)$ and $(1, 4)$ are only compatible with each other, while $(1, 2)$ and $(1, 3)$ are not compatible.