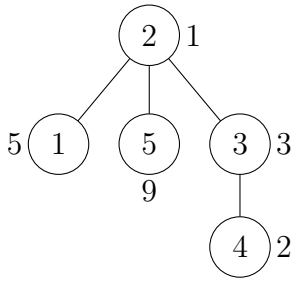
IOI Training Camp 2010 – Final 2, 26 June, 2010

Problem 3 Zorgian Amusement Park

On the northern fringe of the Kingdom of Zorg lies the great Grozian mountains (soon to be renamed as the Greater Zorgian mountains). These mountains form one of the 110293 wonders of the world. The mountain range consists of a set of ridges and peaks. Each ridge runs between a pair of peaks and, following the ridges, there is exactly one path from any peak to another. The locals consider the Zorgian Peak Chinpaolao to be the holiest of peaks.

The somewhat crazy Zorgian inventor RazzyMan has been given the task of building an amusement park with incredible rides on these mountains. True to form, RazzyMan has come up several interesting ideas and the one pertinent to this question is the following: He plans to identify a pair of peaks that are in line of sight—that is, every peak that lies along the unique ridge path between them is strictly lower than both endpoints—and connect them with a cable car. He would like to survey all such pairs to decide on the final location. However, he realises that there are a lot of such pairs. To save himself some work, he has decided to restrict the survey to pairs of peaks a, b where where a lies on the path from Chinpaolao to b. Your task is to write a program to count the number of such pairs.

Here is an example with 5 peaks and 4 ridges connecting them.



The heights of the 5 peaks are written just outside the circle marked with their number. You may assume that Chinpaolao is always assigned the number 1. So, in this example, the height of Chinapaolao is 5. In this case there are six candidates $(1, 2)$, $(1, 5)$, $(1, 3)$, $(2, 5)$, $(2, 3)$ and $(3, 4)$. Notice that $(5, 3)$ is ruled out because of the constraint that one endpoint must lie on the path from Chinpaolao to the other endpoint.

Input format

The first line of input contains a single integer N giving the number of peaks. This is followed by $N-1$ lines, each containing a pair of integers denoting the endpoints of one ridge. This is followed by N lines, each containing one integer, giving the heights of the N peaks, in the sequence $1, 2, \ldots, N$. You may assume that peak 1 is Chinpaolao.

Output format

A single integer on a single line giving the number of pairs of peaks that Razzyman has to survey.

Test Data

You may assume that $2 \leq N \leq 200000$ and that each height is a positive integer and will fit in a 32-bit signed integer.

Sample input

```
5
1 2
3 4
2 3
2 5
5
1
3
2
9
```

Sample output

```
6
```

Time and memory limits

The time limit for this task is 2 seconds. The memory limit is 76 MB (actual limit 64 MB, plus 12 MB buffer for 64-bit compilation).