Every year for your holiday, you take a road trip through the Republic of Treeland. Treeland consists of N towns, with roads connecting them. The people of Treeland are minimalists: for every pair of towns in Treeland, there is exactly one route between them. Also, each town has exactly one airport, and either one museum or one art gallery. Each year you fly into some town, drive to a different town along the unique route, and fly home again. Along the way, you visit every museum and art gallery (including those in the start and end towns).

You get bored with too much of the same thing, so you don't want to visit more than two museums in a row or more than two art galleries in a row.

For example, in Fig. 1 you could make the trip 4–1–2–5, but not 4–1–2–3 because 1–2–3 would be three museums in a row.

You also prefer to drive a different route every year, so you would like to know how many valid routes there are. Driving from A to B and from B to A is considered the same route.

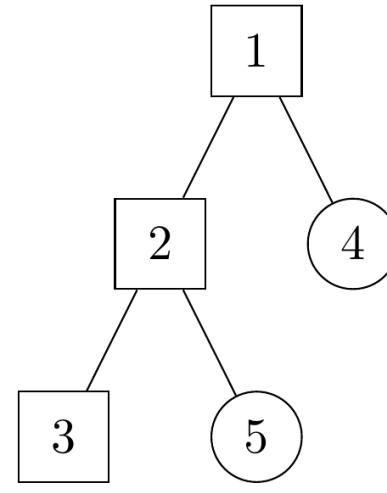

Figure 1: *A possible road map in Treeland, corresponding to the first sample input. Squares represent towns with museums and circles represent towns with art galleries.*

Input

Input consists of an arbitrary number of records, but no more than 20.

The first line of each record contains n ($2 \leq n \leq 100\,000$), the number of towns in Treeland. The towns are numbered from 1 to n. The next line contains n integers, where the i-th integer is 0 if town i has a museum and 1 if it has an art gallery. This is followed by a line containing $n-1$ integers $p_2, p_3, \ldots, p_n$, with $1 \leq p_i < i$. For each i ($1 < i \leq n$) there is a road between towns i and p_i.

The end of input is indicated by a line containing only the value '`-1`'.

Output

For each input record, output a line containing the number of routes that satisfy the conditions.

Sample Input

```
5
0 0
 0 1 1
1 2
 1 2
6
1 1
 0 1 0 1
1 1
 1 1 1
-1
```

Sample Output

```
8
12
```