



Bus Company

Time limit: 6000 ms
Memory limit: 256 MB

Lima is known by its tree-shaped road networks. Thus, there are N cities numbered from 1 to N and there are exactly $N - 1$ bidirectional roads that connect them and there exists a path between any pair of cities. There are two bus companies, A and B, that are being frequently compared by the Ministry of Transportation. Each city has exactly one bus stop, which is owned by one of the two companies.

The Ministry of Transportation may try to compare the two companies, and identify a winner company following these steps:

- Choose two cities u and v and consider the simple path (u, v) between them. A simple path is a path that doesn't visit the same city twice.
- For each company, compute the average length of all the simple paths that start in a city a and end in a city b such that both bus stops at a and b are owned by this company and the path (a, b) contains path (u, v) . That is, all cities in the path from u to v are contained in the path from a to b . If there are no such paths, the value is considered ∞ .
- Declare that the company that has a smaller average length is the winner company.

Additionally, a company can buy the bus stop at some city u , in which case the ownership of the bus stop at city u changes.

You will receive Q events that happen in order, which can be one of the two types:

- Transaction Event: The bus stop in city u was bought by the other company (if it was owned by company A, now belongs to company B, and vice versa).
- Comparison Event: Two cities u and v are chosen to compare the two companies. Check which company wins or if there is a tie.

Standard input

The first line contains a single integer N , indicating the total number of cities.

The second line contains N integers 0 or 1, indicating whether city i initially belongs to company A or B, respectively.

The next $N - 1$ lines each contain 2 integers a and b , indicating there is a bidirectional road between city a and city b .

Line $N + 2$ contains an integer Q , the number of events. The following Q lines contain the events. Each event is either 1 u (transaction event), or 2 u v (comparison event).

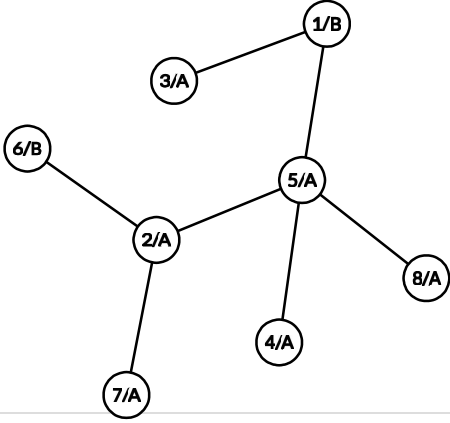
Standard Output

For each comparison event print **A** if company A wins, **B** if company B wins, or **TIE** if there is a tie between both companies.

Constraints and notes

- $N \geq 2$
- $N, Q \leq 2 \cdot 10^5$
- In all events, $1 \leq u, v \leq N, u \neq v$.
- The road network forms a tree.
- There is at least one comparison event.

- For 5% of the test files, $N, Q \leq 10^3$.
- For 10% of the test files, $N, Q \leq 10^4$.
- For 30% of the test files, $N, Q \leq 10^5$.

Input	Output	Explanation
<pre>8 1 0 0 0 0 1 0 0 1 3 5 8 6 2 1 5 5 4 2 7 5 2 6 2 2 6 2 8 7 1 8 1 1 2 8 7 2 2 5</pre>	<pre>B A TIE A</pre>	<p>The road network and the initial ownerships of the bus stops are illustrated below.</p> 
Input	Output	Explanation