STNBD P6 - Terminus Est

Time limit: 2.5s **Memory limit:** 256M

Est is a super cute sword spirit that belongs to Kamito. One day, she goes for a walk with him in a spirit forest in Astral Zero. Est quickly realizes that this forest has many clearings and paths, and the clearings and paths actually form a tree structure.

There are N clearings numbered from 1 to N and $N-1$ paths in the spirit forest, and between every pair of clearings, there is a unique simple path. In every clearing, there may be a demon spirit, which Est will immediately defeat as she is far superior than these lowly demon spirits. Est is eager to defeat some demon spirits, but there is a problem: she doesn't know which clearing she is in right now (although she memorized the layout of the forest). For lack of a better option, Est decides to just keep moving from her current location **without walking over the same path more than once** and fight every demon spirit she meets along the way. Est may decide to stop at a clearing at any time during this journey. The path will visit at least two clearings, including the one Est starts at.

A path between clearings i and j $(i < j)$ is considered **good** if for two parameters a and b $(0 \leq a \leq b \leq N)$ there are at least a demon spirits and at most b demon spirits on the simple path between i and j. Est will enjoy herself the most if the path she chooses is a **good** path. Thus, she has Q questions: given parameters a and b, what is the probability that the path she takes is a good path?

Est is quite kind, and as such, she does not want you to deal with incredibly small real numbers. Therefore, if p is the probability, you should output $p \cdot \frac{N \cdot (N-1)}{2}$. This comes from the fact that the probability of choosing a **good** path is the number of **good** paths divided by the total number of paths. Since Est does not know where she is initially, we should assume each clearing has a $\frac{1}{N}$ chance of being Est's initial clearing. Since Est's will cannot be predicted by mere humans, we should also assume each clearing **that is not the initial clearing** has a $\frac{1}{N-1}$ chance of being chosen as the final clearing where Est stops. In other words, you will just need to output the **number of distinct good paths in the spirit forest** for every a and b Est asks you. In particular, **a path is considered distinct from another path if one path visits a clearing that the other path doesn't**. Therefore, there are $\frac{N \cdot (N-1)}{2}$ distinct paths in total.

Note: Demon spirits don't move from their initial clearings.

Input Specification

The first line of input will have N.

The second line of input will have N space-separated digits, either 0 or 1. If and only if the i^{th} number is 1, the i^{th} clearing has a demon spirit.

The next $N-1$ lines describe the spirit forest. Each line is in the form u v which means that clearings u and v are directly connected.

The $(N+2)^{th}$ line will have Q.

The next Q lines each have a and b, separated by a single space.

Output Specification

There should be Q lines of output, the answers to Est's questions. You should output the answers to Est's questions in the order that they are given.

Constraints

Subtask 1 [1%]

$2 \leq N \leq 50$

$1 \leq Q \leq 100$

Subtask 2 [2%]

$2 \leq N \leq 500$

$1 \leq Q \leq 200\,000$

Subtask 3 [2%]

$2 \leq N \leq 2\,000$

$1 \leq Q \leq 200\,000$

Subtask 4 [10%]

$2 \leq N \leq 100\,000$

$1 \leq Q \leq 200\,000$

$b \leq 2$

Subtask 5 [15%]

$2 \leq N \leq 100\,000$

$1 \leq Q \leq 200\,000$

$b \leq 3$

Subtask 6 [15%]

$2 \leq N \leq 100\,000$

$1 \leq Q \leq 3$

$b - a \leq 10$

Subtask 7 [25%]

$2 \leq N \leq 40\,000$

$1 \leq Q \leq 100\,000$

Subtask 8 [30%]

$2 \leq N \leq 100\,000$

$1 \leq Q \leq 200\,000$

Sample Input

```
8
0 1 1 1 1 0 0 1
2 1
3 1
4 1
5 4
6 5
7 4
8 4
3
0 8
1 2
3 3
```

Sample Output

```
28
20
8
```