

Task Tree

 1.0 sec.  256 MB

Alisa has thought of a tree with N vertices and will turn it into a string of zeros and ones. She will play with Bobi, who will try to reconstruct the tree from that string, having agreed in advance on the strategy they will use. Your goal is to implement a strategy for the two of them which uses strings of minimal length.

Implementation details

You have to implement the following functions, which will be called in **separate** processes:

```
std::string encode(int N, std::vector<std::pair<int, int>> v);
```

This function implements Alisa's strategy. It is called once by the jury and receives as parameters the number of vertices and the bidirectional edges (x, y) describing the tree. It must return a string of zeros and ones of minimal length describing the tree.

```
std::vector<std::pair<int, int>> decode(int N, std::string s);
```

This function implements Bobi's strategy. It is called once by the jury and receives as parameters the number of vertices and Alisa's string. It must return the original tree, described by bidirectional edges (x, y) . The order of the edges, as well as the order of the vertices within them, does not matter.

Constraints

- $3 \leq N \leq 10^5$



 Scoring

Let S be the length of Alisa's string. Then $points = \min((\frac{(N-1)(\lfloor \log_2 N \rfloor + 1)}{S})^2, 1)$.

 Example

Jury	Contestant
<code>encode(3, {{1, 2}, {2, 3}})</code>	<code>"1000011"</code>
<code>decode(3, "1000011")</code>	<code>{{1, 2}, {2, 3}}</code>

This solution gets $(\frac{2.2}{7})^2 \approx 32.7\%$ of the points on the given test.

 Sample grader

The first line contains the number N . The next $N - 1$ lines contain the edges (x, y) .