Lice Hopping

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	256 mebibytes

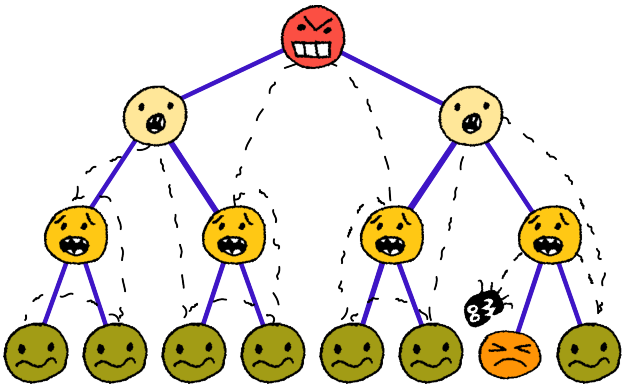


Today you are a lice jumping from head to head to find the best hair for you to live.

The group of people sitting in the room you want to explore can be represented as a tree (connected graph without cycles) of size n, where each head is a vertex, and the edge exists if the two heads are at a jumping distance 1 from one another.

You want to visit the heads of every person in the room. To not make anyone suspicious, you decided to visit each head only once. Before starting your journey, you will train your skill of lice hopping, which will allow you to make longer jumps. If you spent d days on mastering hopping, you are now able to jump a distance no more than d in the tree. Here, the distance $\text{dist}(u, v)$ is defined as the number of edges on the simple path between vertices u and v. A head is considered visited either if it was a starting head or if it was already jumped on. Please note that heads jumped over (between the start and end head of a single jump) are not marked as visited.

What is the minimum number of training days you need to train to be able to visit all the heads? You can choose any starting head you want.



Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 2 \cdot 10^5$). The description of the test cases follows.

The first line of each test case contains one integer n ($2 \le n \le 10^6$), the size of the tree.

Each of the next $n - 1$ lines contains two integers u and v ($1 \le u, v \le n$, $u \ne v$): the vertices connected by an edge of the tree.

The sum of n over all test cases doesn't exceed 10^6.

Output

For each test case, output a line with a single integer: the minimum number of training days needed to be able to jump over the given tree.

Example

standard input	*standard output*
4 3 1 2 1 3 5 1 2 1 3 1 4 1 5 7 1 2 1 3 2 4 2 5 3 6 3 7 15 1 2 1 3 2 4 2 5 3 6 3 7 4 8 4 9 5 10 5 11 6 12 6 13 7 14 7 15	1 2 2 2

Note

For the first test case, you can perform the following sequence of hops: $3 \to 1 \to 2$. For each jump, the distance is 1.

The fourth test case describes the graph from the statement. With $d = 2$, a valid sequence of hops is: $8 \to 9 \to 4 \to 2 \to 10 \to 11 \to 5 \to 1 \to 6 \to 12 \to 13 \to 3 \to 15 \to 7 \to 14$. The distances are: $2, 1, 1, 2, 2, 1, 2, 2, 1, 2, 2, 2, 1, 1$. So 2 training days are enough.