

Contest Duration: 2025-07-12(Sat) 22:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250712T2100&p1=248>) - 2025-07-12(Sat) 23:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250712T2240&p1=248>) (local time) (100 minutes)

[Back to Home \(/home\)](/home)

[🏠 Top \(/contests/abc414\)](/contests/abc414)

[📋 Tasks \(/contests/abc414/tasks\)](/contests/abc414/tasks)

[❓ Clarifications \(/contests/abc414/clarifications\)](/contests/abc414/clarifications)

[📊 Results ▼](#)

[🏆 Standings \(/contests/abc414/standings\)](/contests/abc414/standings)

[🏆 Virtual Standings \(/contests/abc414/standings/virtual\)](/contests/abc414/standings/virtual)

[📖 Editorial \(/contests/abc414/editorial\)](/contests/abc414/editorial)

[💬 Discuss \(https://codeforces.com/blog/entry/144653\)](https://codeforces.com/blog/entry/144653)



F - Jump Traveling

[Editorial \(/contests/abc414/tasks/abc414_f/editorial\)](/contests/abc414/tasks/abc414_f/editorial)



Time Limit: 3 sec / Memory Limit: 1024 MiB

Score : 525 points

Problem Statement

You are given a tree with N vertices numbered from 1 to N and an integer K . The i -th edge bidirectionally connects vertices u_i and v_i .

You are currently at vertex 1. You can repeat the following operation zero or more times:

- Choose a vertex whose distance from the vertex you are currently at is K , and move to that vertex. Here, the distance between two vertices is the number of edges in the simple path connecting the two vertices.

For each $k = 2, \dots, N$, determine whether you can move to vertex k by repeating the operation, and if you can move, find the minimum number of operations.

You have T test cases, so solve each of them.

Constraints

- $1 \leq T \leq 10^5$
- $2 \leq N \leq 2 \times 10^5$
- $1 \leq K \leq 20$
- $1 \leq u_i < v_i \leq N$
- The given graph is a tree.
- The sum of N over all test cases is at most 2×10^5 .
- All input values are integers.

2026-01-02 (Fri)
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Input

The input is given from Standard Input in the following format, where case_i means the i -th test case.

```
 $T$   
 $\text{case}_1$   
 $\text{case}_2$   
 $\vdots$   
 $\text{case}_T$ 
```

Each test case is given in the following format:

```
 $N$   $K$   
 $u_1$   $v_1$   
 $u_2$   $v_2$   
 $\vdots$   
 $u_{N-1}$   $v_{N-1}$ 
```

Output

Output T lines. The i -th line should contain the answer for the i -th test case in the following format:

```
 $\text{ans}_2$   $\text{ans}_3$   $\dots$   $\text{ans}_N$ 
```

ans_i is the answer for $k = i$. If you can move to vertex i by repeating the operation, ans_i is the minimum number of operations; otherwise, ans_i is -1.

Sample Input 1

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```
1  
6 2  
1 2  
2 3  
2 4  
4 5  
5 6
```

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Sample Output 1

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2026-01-02 (Fri)
05:27:03 +11:00

```
-1 1 1 -1 2
```

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This sample input/output consists of one test case.

The vertices whose distance from vertex 1 is 2 are vertices 3 and 4, so you can move to these two vertices with one operation.

Also, by moving from vertex 1 to vertex 4, then moving to vertex 6 whose distance from vertex 4 is 2, you can move to vertex 6 with two operations.

You cannot move to vertices 2 and 5 no matter how you perform the operations.

Sample Input 2

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```
3
2 20
1 2
10 2
1 9
1 8
1 5
6 8
4 5
2 8
5 10
7 9
3 5
10 1
2 6
2 9
8 9
9 10
3 9
4 9
7 9
1 6
3 5
```

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Sample Output 2

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```
-1
1 1 1 -1 1 1 -1 -1 1
2 4 4 5 1 4 4 3 4
```

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