

The 42nd Annual ACM
International Collegiate Programming Contest
Asia Regional – Daejeon
Nationwide Internet Competition



Problem D

Grasshopper Route

Time Limit: 1 Second

A grasshopper is planning to explore a tree, where a *tree* is an undirected graph in which any two vertices are connected by exactly one path. The grasshopper on a vertex of the tree can jump to, and only to, any other vertex within a distance of 3, where the *distance* between two vertices is the number of edges in the path connecting the two. The grasshopper wants to visit every vertex of the tree exactly once, starting at the vertex, s , it is currently on and ending at the vertex, t , it wants.

Given a pair of vertices s and t in a tree with n vertices, your job is to write an efficient program to report an ordering of the vertices of the tree, called a *grasshopper route*, according to which the grasshopper can accomplish what it wants. Specifically, a grasshopper route for s and t in the tree is an ordering $\langle u_1, u_2, \dots, u_n \rangle$ of the vertices of the tree such that $u_1 = s$, $u_n = t$, and the grasshopper can jump and move from u_i to u_{i+1} for every $i \in \{1, 2, \dots, n-1\}$. Fortunately, it was proven early in 1960 that each pair of vertices of a tree are joined by a grasshopper route.

In the tree shown in Figure D.1 below, for example, there is a grasshopper route $\langle 7, 6, 5, 4, 1, 2, 3, 8, 9, 11, 12, 10 \rangle$ for $s = 7$ and $t = 10$. The grasshopper can jump from vertex 5 to vertex 4 because the distance between the two is at most 3; however, it cannot jump from vertex 5 to vertex 3. As you guessed, there may exist more than one grasshopper routes.

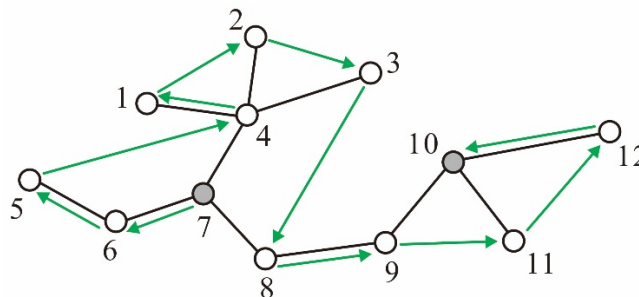


Figure D.1: A grasshopper route from s to t , where $s = 7$ and $t = 10$.

Input

Your program is to read from standard input. The first line contains an integer, n , representing the number of vertices of the input tree, where $2 \leq n \leq 100,000$. It is followed by $n - 1$ lines, each contains two positive integers u and v that represent an edge between vertex u and vertex v of the input tree. It is assumed that the vertices are indexed from 1 to n . The last line contains two distinct integers s and t , where $s, t \in \{1, \dots, n\}$, that respectively represent the start and end vertices of a grasshopper route.

Output

Your program is to write to standard output. Print out a required grasshopper route in n lines, containing, one by one, the vertices encountered when we traverse the route from s to t .

The following shows sample input and output for two test cases.

Sample Input 1	Output for the Sample Input 1
4 1 2 4 3 2 3 4 1	4 2 3 1

Sample Input 2	Output for the Sample Input 2
12 4 1 4 2 4 3 4 7 5 6 6 7 7 8 8 9 9 10 11 10 12 10 7 10	7 6 5 4 1 2 3 8 9 11 12 10