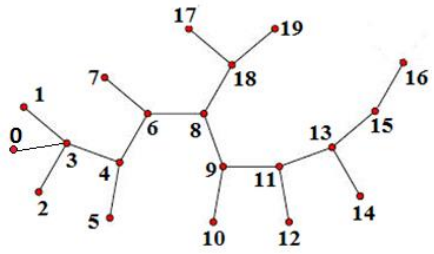
CSCI-550 HW 1

Farmer Jill's farm consists of N facilities (2 <= N <= 100), labeled 0..(N-1). Each facility is connected to another facility via a road. A facility is connected to one or more other facilities. Roads between any two facilities have the same lengths. Facilities are located at the endpoints of roads, and no two roads cross, and there is a unique path (sequence of roads) that connects every pair of facilities.



Jill wants to place a single street light at one facility so that most of the facilities get lighten up. Jill figured that if she chooses the facility whose longest distance to any other facility is the shortest over all the longest distances between any other facility to all the rest of facilities, then most facilities will benefit from the street light. To be specific, let an ***x*** be a facility, and let ***d***(*x*, *v*) be the distance between ***x*** and a facility ***v*** (measured in the number of roads between x and v multiplied by the length of a road). Let *L*(x, v) be the longest distance over all *d*(x, v), where v is a facility other than x. If one calculates L(x, v) for each facility x, then the facility, call it ***u***, whose L(u, v) is the shortest will be the facility next to which Jill will put the light. In case when there are more than one such ***u*** (i.e. when there is a tie among shortest L(u, v)), the facility with the smallest label (0…N-1) will be chosen. Jill named this chosen facility the ***core facility***.

For example, on Figure, facilities labeled 8 and 9 have the longest distance L(8, 16) = L(9, 1) = 5*l*, where *l* is the length of a road. L(8, v) and L(9, v) are the shortest among all L(x, v). For example, L(6, 16) = 6*l*. The facility labeled 8 (smallest label) will be chosen as a core facility.

Input*:* Use ***cin*** to read in the input

Line 1: One integer: N.
Lines 2..N: Each line contains two space-separated integers *u* and *v*, labels of two facilities connected via a road. Note only one of (u, v) and (v, u) is given in the input.

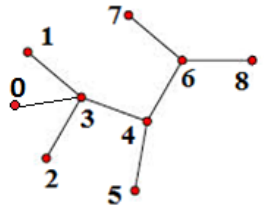
Output: Use ***cout*** to print the output

Lines 1…N-1: Each line contains the labels of facilities on the shortest path from the core facility to a facility *v.* The first line contains the shortest path from the core facility to facility 0, the second line to facility 1, and so on. The only shortest path that is missing is from the core facility to itself.

Output Format:
<label of the core facility><space><label1><space>…<last label><space><endl>
In other words, there is a space after each label on the shortest path including the last label, and at the end of the line there is ***endl***.

Error messages:
If N in the input is less than or equal to 0, use ***cerr*** to output the error message
<ERROR: graph is empty.>

Example of input and output for the Figure below:



Input:
9
0 3
1 3
4 6
2 3
6 7
3 4
4 5
6 8

Output:
4 3 0
4 3 1
4 3 2
4 3
4 5
4 6
4 6 7
4 6 8

Submission:
Submit a single file ***hw1.cpp*** (i.e. this file contains main() function and can contain any classes you want to design) on *turnin* system.