Problem C - Finding connections

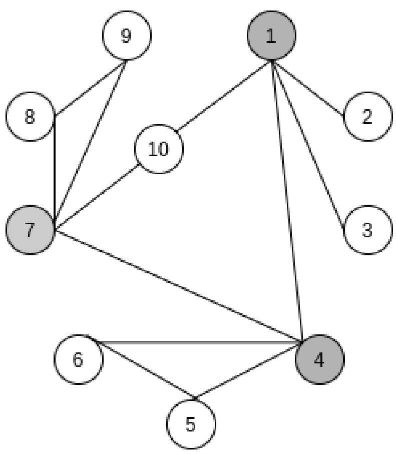
Description

The communication network at a given bank is composed of several departmental networks, each of which connects to the remaining networks only through a server. This network topology was chosen for security reasons. All critical data sent between departmental networks are stored on the hard disk of these servers in order to be analysed by automatic filtering tools. In case of a security breach at a given department, the contents of the server's hard disk are instantaneously moved to another departmental server and the local network becomes disconnected from the remaining networks.

Unfortunately, the current network cables do not support fast copies between servers. In order to improve this situation, the IT department is analysing several possibilities to add a faster cable that only connects these servers. One option is to directly connect all pairs of servers by cable, which is extremely fast, but expensive. The other option is to use a tree topology, which is cheaper but also slower.

This is where you come in. You are doing an intership at the IT department and you have to implement a program that, given a map of the complete communication network at the Bank, it locates all departmental servers and computes the amount of cable that is required for both options. In order to be cost effective, you have to consider the least amount of cable and use the current infrastruture, that is, the new cable will go through the buildings side-by-side with the old cable, possibly passing near other network equipment.

The following figure shows a map of the communication network, where the servers are indentified as circles in gray. The two possiblities to connect these servers with a faster cable are: 1) to do all pairwise connections among servers 1, 4 and 7; 2) for instance, to only connect server 1 to 4 and server 1 to 7. Note that any connection between servers 1 and 7 has to pass close to the network equipment 10.



Since you do not know what to expect from the data, your program should be prepared to handle strange cases: there is no server, or there a single server and therefore, there is no need to buy new cable; some parts of the network may be completely isolated, but they may contain servers, for which the new cable should also be installed among them - to cut expenses, no connection with servers from the main communication network is required.

Report

The maximum grade in mooshak is 550 points. In case you are able to reach the maximum grade, you are allowed to submit a 3-page report (in english or in portuguese) in pdf to describe your implementation. The maximum grade in the report is 100 points. The grade depends of how well you are able to answer the following questions in the report: What is the time complexity of your approach? Which algorithms and data structures were implemented? What is their purpose? Is your approach correct for any input? Prove it, even if informally. (if applicable) Which speed-up tricks did you implement?

Write your report in a clear, concise and objective manner. Use font Arial, size 12, single space between lines. Your report cannot have more than 3 pages. Do not write code in the report, but you are allowed to describe your approach from a high-level perspective using pseudo-code. In that case, use the pseudo-code conventions described in the book Cormen et al, Introduction to Algorithms (Section 2.1).

Input

The first line of each test case gives the amount of network equipment ($n \leq 1000$) at the communication network. Note that some nodes of this network may be servers, but you do not know which ones. Then, the next lines provide information about the network infrastructure. Each line contains a pair of positive integers that correspond to the internal id of the network equipment that is directly connected with the existing cable, followed by the length of this cable, as a positive integer value.

Each test case terminates with number 0. Then, other test cases may follow.

Output

For each test case, print the number of servers, the total amount of cable for the case of a fully connected network and the total amount of cable for a tree topology, as required by the IT department. If there is no server, report "no server".

Example

Example input:

```
3
1 2 3
1 3 4
2 3 5
0
4
1 2 20
1 3 1
2 3 2
3 4 1
0
10
1 2 1
1 3 3
1 4 4
```

```
1 10 2
4 5 6
4 6 7
4 7 8
5 6 9
7 8 10
7 9 11
7 10 3
8 9 12
0
```

Example output:

```
no server
1 0 0
3 17 9
```