Problem D
Routing for Smart Entities
Time Limit: 1 second

One of the essential characteristics of a smart environment is the communication between real physical entities, such as persons, vehicles, TVs, cups, tables, chairs, windows, doors, etc.

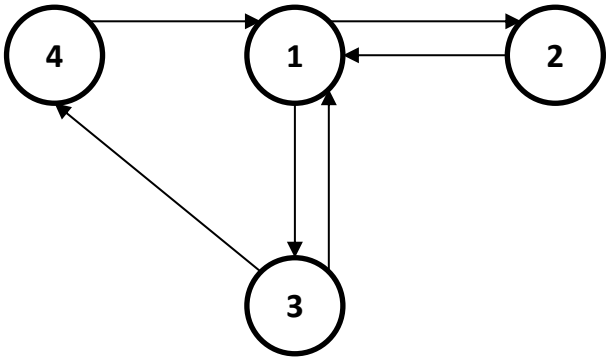
All connected entities form a mesh network. A mesh network is a network topology in which each node relays data for the network. All mesh nodes cooperate in the distribution of data in the network. Mesh networks can relay messages using either a flooding technique or a routing technique.

The topology of a mesh network can be considered as a directed graph with no self-loop. Furthermore, to ensure the connectivity in the network, there is at least one path for data transmission from an entity to any other entity.

The shortest distance from an entity *A* to an entity *B* is determined by the number of hops (number of directed edges) to transmit data from *A* to *B* via the shortest path.

Given the topology of a mesh network of a smart environment, we need to calculate the average shortest distance between any pair of entities.

Example:



- The shortest distance from 1 to 2, 3 and 4 are: 1, 1, and 2, respectively
- The shortest distance from 2 to 1, 3 and 4 are: 1, 2, and 3, respectively
- The shortest distance from 3 to 1, 2 and 4 are: 1, 2, and 1, respectively
- The shortest distance from 4 to 1, 2 and 3 are: 1, 2, and 2, respectively

So the average shortest distance of the whole network is:

$$(1 + 1 + 2 + 1 + 2 + 3 + 1 + 2 + 1 + 1 + 2 + 2) / 12 = 1.583$$

Input

The first line contains a positive integer T ($1 \le T \le 20$) which is number of test cases in the input.

Each test case consists of several pairs of integers in the same line.

- Each pair u, v means that there is a directed edge from u to v ($1 \le u \le v \le 100$)
- 0 0 indicates the end of the test case.

Output

For each test case, display in a line the average shortest distance of the network in the test case. The output must be accurate to an absolute or relative error of at most 10^{-3}.

Sample Input	Sample Output
1 1 2 2 1 1 3 3 1 4 1 3 4 0 0	1.583