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PROBLEMS SUBMIT CODE MY SUBMISSIONS STATUS HACKS ROOM STANDINGS CUSTOM INVOCATION

The problem statement has recently been changed. View the changes.

C. Guess The Tree

time limit per test: 2 seconds memory limit per test: 256 megabytes

This is an interactive problem.

Misuki has chosen a secret tree with n nodes, indexed from 1 to n, and asked you to guess it by using queries of the following type:

• "? a b" — Misuki will tell you which node x minimizes |d(a,x)-d(b,x)|, where d(x,y) is the distance between nodes x and y. If more than one such node exists, Misuki will tell you the one which minimizes d(a,x).

Find out the structure of Misuki's secret tree using at most 15n queries!

Input

Each test consists of multiple test cases. The first line contains a single integer t ($1 \le t \le 200$) — the number of test cases.

Each test case consists of a single line with an integer n ($2 \le n \le 1000$), the number of nodes in the tree.

It is guaranteed that the sum of n across all test cases does not exceed 1000.

Interaction

The interaction begins by reading the integer n.

Then you can make up to 15n queries.

To make a query, output a line in the format "? a b" (without quotes) ($1 \le a, b \le n$). After each query, read an integer — the answer to your query.

To report the answer, output a line in the format "! a_1 b_1 a_2 b_2 ... a_{n-1} b_{n-1} " (without quotes), meaning that there is an edge between nodes a_i and b_i , for each $1 \leq i \leq n-1$. You can print the edges in any order.

After 15n queries have been made, the response to any other query will be -1. Once you receive such a response, terminate the program to receive the Wrong Answer verdict.

After printing each line, do not forget to output the end of line and flush the output buffer. Otherwise, you will receive the Idleness limit exceeded verdict. To flush, use:

- fflush(stdout) or cout.flush() in C++;
- System.out.flush() in Java;
- flush (output) in Pascal;
- stdout.flush() in Python;
- see the documentation for other languages.

Hacks

For hacks, use the following format: The first line contains an integer t ($1 \le t \le 200$) — the number of test cases.

The first line of each test contains an integer n — the number of nodes in the hidden tree.

Then n-1 lines follow. The i-th of them contains two integers a_i and b_i ($1 \le a_i, b_i \le n$), meaning that there is an edge between a_i and b_i in the hidden tree.

The sum of n over all test cases must not exceed 1000.

Example

Codeforces Round 967 (Div. 2)

Finished

Practice



→ Virtual participation

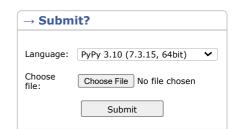
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Start virtual contest

→ Clone Contest to Mashup

You can clone this contest to a mashup.

Clone Contest



→ Last submissions		
Submission	Time	Verdict
277463933	Aug/21/2024 06:20	Accepted
277406594	Aug/20/2024 19:12	Wrong answer on pretest 2
277394979	Aug/20/2024 18:53	Wrong answer on pretest 2







Note

A tree is an undirected acyclic connected graph. A tree with n nodes will always have n-1 edges.

In the example case, the answer to "? 1 2" is 1. This means that there is an edge between nodes 1 and 2.

The answer to "? 1 3" is 1. This means that there is an edge between nodes 1 and 3.

The answer to "? $1\ 4$ " is 3. It can be proven that this can only happen if node 3 is connected to both node 1 and 4.

The edges of the tree are hence (1,2), (1,3) and (3,4).

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