

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  $t$  ( $1 \leq t \leq 200$ ) — the number of test cases.

Each test case consists of a single line with an integer  $n$  ( $2 \leq n \leq 1000$ ), 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) ( $1 \leq a, b \leq n$ ). After each query, read an integer — the answer to your query.

To report the answer, output a line in the format "! a<sub>1</sub> b<sub>1</sub> a<sub>2</sub> b<sub>2</sub> ... a<sub>n-1</sub> b<sub>n-1</sub>" (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  $t$  ( $1 \leq t \leq 200$ ) — 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  $b_i$  ( $1 \leq a_i, b_i \leq n$ ), 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

Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ICPC mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If you just want to solve some problem from a contest, a virtual contest is not for you - solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a virtual contest.

Start virtual contest

### → Clone Contest to Mashup

You can clone this contest to a mashup.

Clone Contest

### → Submit?

Language: PyPy 3.10 (7.3.15, 64bit)

Choose file: Choose File No file chosen

Submit

### → Last submissions

Submission	Time	Verdict
<a href="#">277463933</a>	Aug/21/2024 06:20	Accepted
<a href="#">277406594</a>	Aug/20/2024 19:12	Wrong answer on pretest 2
<a href="#">277394979</a>	Aug/20/2024 18:53	Wrong answer on pretest 2

### → Problem tags

binary search brute force greedy  
interactive trees

No tag edit access

### → Contest materials

- Announcement (en)
- Tutorial (en)

input	Copy
1 4 1 1 3	
output	Copy
? 1 2  ? 1 3  ? 1 4  ! 1 2 1 3 3 4	

**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).

---

[Codeforces](#) (c) Copyright 2010-2024 Mike Mirzayanov  
The only programming contests Web 2.0 platform  
Server time: Aug/21/2024 09:10:13<sup>UTC+5.5</sup> (i2).  
Desktop version, switch to [mobile version](#).  
[Privacy Policy](#)

Supported by

