Colored Complete Graph

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	1024 megabytes

This is an interactive problem, and the judge is adaptive.

There is a complete undirected graph G with N vertices. Each edge is colored either red or blue, but the colors are hidden.

You can ask up to $2N$ questions of the following type:

- Ask the color of the edge (i, j) connecting vertex i and vertex j $(1 \leq i, j \leq N, i \neq j)$.

Output one spanning tree of the graph G where all edges are colored the same. It is guaranteed that such a spanning tree exists under the constraints of the problem.

Note that the output is not counted towards the number of questions.

Interaction Protocol

First, read an integer N from the standard input: the number of vertices in the graph $(2 \leq N \leq 5 \times 10^4)$.

N

After that, you can ask questions. To ask the color of the edge (i, j) connecting vertex i and vertex j $(1 \leq i, j \leq N, i \neq j)$, print a line formatted as follows (with a newline at the end):

`?` i j

If the question is valid, you will receive a response c : the color of the edge (i, j), which will be `R` if the edge is red or `B` if the edge is blue.

c

If the question is invalid due to an incorrect format or exceeding the allowed number of questions, you will receive an `F` instead.

`F`

In this case, your submission will be judged incorrect, and the judging program will terminate.

When you have determined the spanning tree T to output, print the answer in the following format (with a newline at the end). Each edge (u_i, v_i) should be output as follows:

`!`
u_1 v_1
u_2 v_2
$\vdots$
u_{N-1} v_{N-1}

The answer will be considered correct only if all of the following conditions are met:

- $1 \leq u_i, v_i \leq N$, $u_i \neq v_i$
- The graph consisting of the $N - 1$ edges and their vertices is a spanning tree of G.

- All $N-1$ edges are colored the same.

Once the answer is received, the judging program will terminate regardless of whether the answer is correct or incorrect.

Example

standard input	standard output
3 R B R	 ? 1 2 ? 1 3 ? 2 3 ! 1 2 2 3