Decorating Tree
Problem ID: decoratingtree

This is an interactive problem.

Thang and Trang plan to decorate their house with a Christmas tree. They want the tree to be a connected graph consisting of n nodes indexed from 1 to n with $n - 1$ edges.

As always, Trang is very excited for Christmas, she will first create a tree of m nodes indexed from 1 to m with $m - 1$ edges.

After Trang is done, Thang will add $n - m$ remaining nodes and $n - m$ edges, without showing Trang the final tree. It is guaranteed that the final tree is connected.

Thang asks Trang to find the diameter of the tree, i.e. the maximum length of the simple path between any two nodes of the tree.

As a Christmas gift, Thang allows Trang to ask up to `666` questions of the following types:

- `distance u v` - Thang will tell the distance between two vertices u and v on the tree,

- `subtree u v` - Considering the tree rooted at vertex u, Thang will tell the maximum distance from u to any vertex in the subtree of v.

Interaction protocol

- In this problem, your program assumes the role of Trang, and the jury program assumes the role of Thang.

- First, your program must read two integers m and n ($1 \leq m \leq 5 \cdot 10^4, m < n \leq 3 \cdot m$)

- Then, your program must print $m - 1$ lines, each line containing two integers u, v ($1 \leq u, v \leq m$), represents an edge in the tree.

- Then, your program must start asking up to `666` questions as mentioned above

    - `distance u v` ($1 \leq u, v \leq n, u \neq v$)
    - `subtree u v` ($1 \leq u, v \leq n, u \neq v$)

- Finally, your program print out an exclamation mark following with a single integer represents the diameter of the tree.

Sample communication

standard input	standard output
2 5	
	1 2
	distance 1 4
3	
	distance 1 5
3	
	subtree 3 2
2	
	! 3

Note

When you write the solution for the interactive problem it is important to keep in mind that if you output some data it is possible that this data is first placed to some internal buffer and may be not directly transferred to the interactor. In order to avoid such situation **you have to use special 'flush' operation each time you output some data**. There are these 'flush' operations in standard libraries of almost all languages. For example, in C++ you may use 'fflush(stdout)' or 'cout « flush' (it depends on what do you use for output data — 'scanf/printf' or 'cout'). In Java you can use method 'flush' for output stream, for example, 'System.out.flush()'. In Python you can use 'stdout.flush()'.
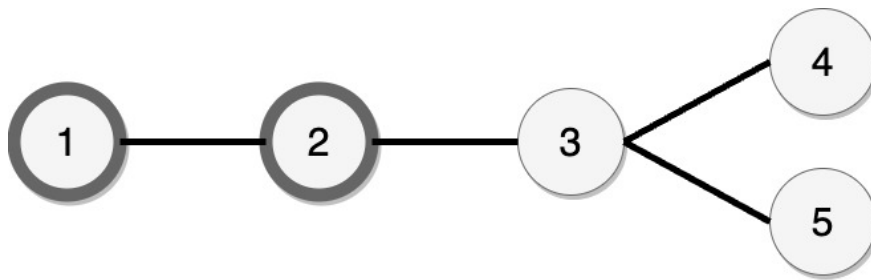
Figure 1: The final tree of n vertices in the sample. The m initial vertices have thicker border.