Time Limits C:5, Cpp:5, C#:6, Java:8, Php:18, Ruby:20, Python:20, Perl:18, Haskell:10, Scala:14, Javascript:20, Pascal:5

Like every IT company, the Uplink Corporation has its own network. But, unlike the rest of the companies around the world, Uplink's network is subject to very specific restrictions:

- Any pair of servers within the network should be directly connected by at most 1 link.
- Each link is controlled by some specific network administrator.
- No server has more than 2 links connected to it, that are controlled by the same administrator.
- For easier management, links controlled by some administrator cannot be redundant (this is, removing any link will disconnect some two previously connected servers)

Notice that 2 connected servers might not have any direct link between them. Furthermore, in order to keep the network in a secured status, Uplink directives periodically try to perform some modifications over the network to mislead hackers. The problem is, having such a huge network, they need a software to efficiently simulate the network status after any of such modifications. You have been assigned to write the core section of that software.

Operations performed by the directives are:

- Change the administrator assigned to some particular link.
- Place some number of security devices along a particular link.

Also, given a network administrator, they would like to know how many devices are in the path created by links controlled by that administrator (if any) between 2 servers.

Input Format
Input begins with a line containing 4 integers S, L, A, T separated by a single whitespace, denoting the number of servers, links, network administrators and transformations, respectively. L lines follow each one with 3 integers x, y $(x < y)$ and a_i $(1 \leq a_i \leq A)$, saying that there is a link between server x and server y, and that link is controlled by administrator a_i. Initially, network topology fulfills the restrictions described above and there is no security device along any link. Remaining T lines in the input follow one the next formats:

- $1\ A\ B\ a_i$

meaning that link between server A and server B $(A < B)$ is requested to be assigned to administrator a_i

- $2\ A\ B\ x$

meaning that the number of security devices along the link between server A and server B $(A < B)$ will be fixed to x, removing any existing devices on this link before the operation. The involved link will always exist.

- $3\ A\ B\ a_i$

meaning that directives want to know the number of security devices placed along the path between server A and server B, just considering links controlled by administrator a_i.

Output Format
For each network transformation in the form $1\ A\ B\ a_i$ you should output:

- "Wrong link" if there is no direct link between server A and server B.
- "Already controlled link" if the requested link does exist, but it is already controlled by administrator a_i.
- "Server overload" if administrator a_i already controls 2 links connected to one of the involved servers.
- "Network redundancy" if the requested assignment creates no new connection considering just the links controlled by a_i.
- "Assignment done" if none of the above conditions holds. In this case, link directly connecting A with B is assigned to a_i.

For each network transformation in the form $3\ A\ B\ a_i$ you should output:

- "No connection" if there is no path between the requested servers considering just the links

controlled by a_i.
- "D security devices placed" where **D** is the number of security devices placed so far on the existing connection between the requested servers considering just the links controlled by a_i.

Constraints

$1 \leq S \leq 10^5$
$1 \leq L \leq 5 \times 10^5$
$1 \leq A \leq 10^2$
$1 \leq T \leq 5 \times 10^5$
$1 \leq x \leq 2000$

Sample Input:

```
4 5 3 15
1 2 1
2 3 1
3 4 2
1 4 2
1 3 3
2 3 4 49
1 1 2 3
2 1 4 64
3 1 4 2
1 1 2 3
3 4 2 3
3 1 3 3
1 1 4 3
3 3 4 2
3 2 4 1
2 1 4 13
2 1 3 21
2 2 3 24
1 2 3 3
1 2 4 3
```

Sample Output:

```
Assignment done
64 security devices placed
Already controlled link
No connection
0 security devices placed
Server overload
49 security devices placed
No connection
Network redundancy
Wrong link
```