Problem A - Apple Orchard

Daniel has gotten sick and tired of dealing with all this pizza nonsense from ACM practice, so he's retired and moved to the Okanagan. Daniel's fulfilling his life long dream of being an apple farmer, so he's bought an apple orchard.

The apple orchard is set up so that there between some pairs of trees there is a gravel road. Furthermore, there is a unique path to the tree right in front of Daniel's house (labeled 0) to every other apple tree (labeled with the numbers from 1 to 2×10^5) via these gravel roads.

Daniel wants to do some renovating of the apple orchard, so he's going to chop some trees down, and plant some new ones. The tree he chops down is guarenteed to not lie on a path to some other tree, and the trees he plants are also guranteed to have a unique path to Daniel's house.

Daniel is interested in asking questions of the following form:

"*If I walk from tree X towards my house, and I walk K gravel roads, what tree would I have gotten to, or would I have gotten to my home already?*"

Daniel needs to answer these questions while he's renovating to figure out how to construct his ideal orchard. Help answer all of Daniel's questions!

Input

The first line contains a single integer T denoting the number of test cases.

In each test case, the first line of each test case contains two integers n ($1 \leq n \leq 10^5$) and q ($1 \leq q \leq 10^5$) denoting the number of trees that Daniel initially has planted and number of operations and questions that Daniel has.

The next $n-1$ lines each contain two space seperated integers a and b ($0 \leq a, b < 10^5$) denoting that the ath tree is connected to the bth tree. It is guarenteed that $a \neq b$ and that there is at most one gravel roads between any a and b, and that a tree with label 0 appears somewhere in the input.

Next follows q lines each with an operation that Daniel performs in his orchard, or a question Daniel has. They are of the following form:

- 0 A B - This means that tree B ($1 \leq B < 2 \times 10^5$) was planted by Daniel and has a gravel road to A ($0 \leq A < 2 \times 10^5$). It is guarenteed that A is in the orchard and B is not in the orchard already.
- 1 B - This means that tree B ($1 \leq B < 2 \times 10^5$) was chopped down by Daniel. It is guarenteed that there was only one gravel road leaving B.
- 2 B K - This means that Daniel is asking about walking K ($0 \leq K \leq 10^8$) gravel roads from tree B ($1 \leq B < 2 \times 10^5$) towards the tree in front of his house (labeled 0).

Output

Output for every query of type 2 the label of the tree Daniel will get to if he walked K gravel roads towards the tree in front of his house (labeled 0) from tree B, or output `HOME` if Daniel will end up at the tree in front of his house (labeled 0) after walking K or fewer gravel roads.

Sample Input

```
1
3 4
0 1
1 2
0 1 4
2 4 1
1 2
2 4 3
```

Sample Output

```
1
HOME
```