Query on a tree II

You are given a tree (an undirected acyclic connected graph) with **N** nodes, and edges numbered 1, 2, 3...**N**-1. Each edge has an integer value assigned to it, representing its length.

We will ask you to perfrom some instructions of the following form:

- **DIST a b** : ask for the distance between node **a** and node **b**
  or
- **KTH a b k** : ask for the **k**-th node on the path from node **a** to node **b**

Example:
N = 6
1 2 1 // edge connects node 1 and node 2 has cost 1
2 4 1
2 5 2
1 3 1
3 6 2

Path from node 4 to node 6 is 4 -> 2 -> 1 -> 3 -> 6
DIST 4 6 : answer is 5 (1 + 1 + 1 + 2 = 5)
KTH 4 6 4 : answer is 3 (the 4-th node on the path from node 4 to node 6 is 3)

Input

The first line of input contains an integer **t**, the number of test cases (**t** <= 25). **t** test cases follow.

For each test case:

- In the first line there is an integer **N** (**N** <= 10000)
- In the next **N**-1 lines, the i-th line describes the i-th edge: a line with three integers **a b c** denotes an edge between **a**, **b** of cost **c** (**c** <= 100000)
- The next lines contain instructions **"DIST a b"** or **"KTH a b k"**
- The end of each test case is signified by the string "**DONE**".

There is one blank line between successive tests.

Output

For each **"DIST"** or **"KTH"** operation, write one integer representing its result.

Print one blank line after each test.

Example

Input:

```
1

6
1 2 1
```

```
2 4 1
2 5 2
1 3 1
3 6 2
DIST 4 6
KTH 4 6 4
DONE
```

Output:

```
5
3
```