Problem Description

You are given a circuit as input, output the truth table for the circuit.

Input Format (Similar as output format for A)

The first line will consist of an integer T, the number of test cases.
T cases follow. For each case:

The first line will consist of two integers M and N separated by a space, the number of logic gates and the number of variables respectively. The gates are numbered from N+1...N+M. The output of the gate numbered N+M is the final output of the circuit.

M lines follow. Each line describes each logic gate. Each logic gate has the following format:

The first token will be either “AND”, “OR”, or “NOT”, depending what is the gate.
If the first token is “NOT”, it will be followed by a single integer representing the input index.
Otherwise, it will be followed by two integers separated by a space representing the input index.
Input index is an integer i represents the value of x_i (if $1 \le I \le N$), or the output of gate i (if $N + 1 \le i \le N + M$)
Input index of gate i must be between 1 and N+i-1 inclusive.

Output Format (Same as output format for B)

For each case, you have to output in the following format:

There will be 2^N lines.
The first line will consist of the value of the formula given that ($x_1 = 0, x_2 = 0, x_3 = 0, \ldots , x_N = 0$).
The second line will consist of the value of the formula given that ($x_1 = 0, x_2 = 0, x_3 = 0, \ldots , x_N = 1$).
The third line will consist of the value of the formula given that ($x_1 = 0, x_2 = 0, x_3 = 0, \ldots , x_{N-1} = 1 , x_N = 0$).
The fourth line will consist of the value of the formula given that ($x_1 = 0, x_2 = 0, x_3 = 0, \ldots , x_{N-1} = 1 , x_N = 1$).
…
The 2^Nth line will consist of the value of the formula given that ($x_1 = 1, x_2 = 1, x_3 = 1, \ldots , x_N = 1$).

If the format above is too complicated to understand, see the I/O sample.

Input Sample

```
1
8 4
OR 1 2
NOT 2
OR 2 3
NOT 4
OR 6 3
OR 7 8
AND 5 9
AND 11 10
```

Output Sample

```
0
0
0
0
0
0
1
1
1
0
1
1
0
0
1
1
```

Explanation

The circuit is the output sample from problem A. Therefore, the circuit

should have the same truth table as the input sample from problem A (which is also the input sample from problem B).

Constraint

Time Limit: 2s
$1 \leq T \leq 15$
$1 \leq N \leq 15$
$1 \leq M \leq 100$

Score – (26 points)

There is only one test file for this problem.

Note

Java version used is "gcj-java-3.2.2".
C++ version used is "g++ 4.4.7".