PROBLEM H: AND/OR GRAPHS

Input file: AOG.IN

Output file: AOG.OUT

Problem

Many complex problems can be broken down into a series of subproblems such that the solution of all or some of them results in the solution of the original problem. These subproblems may be broken down further into subproblems and so on until the only problems remaining are sufficiently primitive as to be trivially solvable. This breaking down of a complex problem into several subproblems can be represented by a directed graph-like structure, called AND/OR graph, in which nodes represent problems and descendants of a node represent the subproblems associated with it. Nodes with no descendants (with zero as their out-degrees) are termed terminal. Terminal nodes represent primitive problems and are marked either solvable (S) or unsolvable (U). Solvable terminal nodes are represented in Figure 1 by rectangles. Internal nodes (with out-degrees greater than zero) of AND/OR graphs are of two types: AND nodes and OR nodes. AND node represents a problem which for its solution requires solutions of all its subproblems. AND nodes are drawn with double circles. OR node represents a problem which can be solved if at least one of its subproblems is solvable. A solution graph is a subgraph consisting of solvable nodes that shows that the initial problem is solved. The solution graph for the graph of Figure 1(a) is shown by heavy edges.

Write a program to determine whether or not given AND/OR graphs represent solvable problems, i.e. whether initial nodes of these graphs are solvable.

Remark

Breaking down a problem into several subproblems is known as problem reduction. AND/OR graphs are often used to represent search spaces in Artificial Intelligence. In practice, the AND/OR graph corresponding to a given problem is usually available only implicitly by a function F that generates all the descendants of a node already generated.

Input

The first line contains N - the number of graphs to examine.
The rest of the input file comprises blocks of lines, each block preceded by an empty line. Each block describes one AND/OR graph.
In the first line of the block there is a number V ($1 \le V \le 30$) which gives the number of nodes in the graph. Nodes are numbered by consecutive integers, starting from 1 for initial node.
The second line of the block starts with three items I D T, where I is the number of the node ($1 \le I \le V$), D is the out-degree of this node ($0 \le D \le V$) and T is one character indicating the type of the node: A for AND, O for OR, U for unsolvable terminal node, S for solvable terminal node. T is separated from D by exactly one space. The rest of this line and the following lines, if necessary, contain D numbers of descendants of I-th node, separated by spaces, tabs or end of lines.

Output

N lines, each containing identification and answer for one graph in the format shown in the example below.

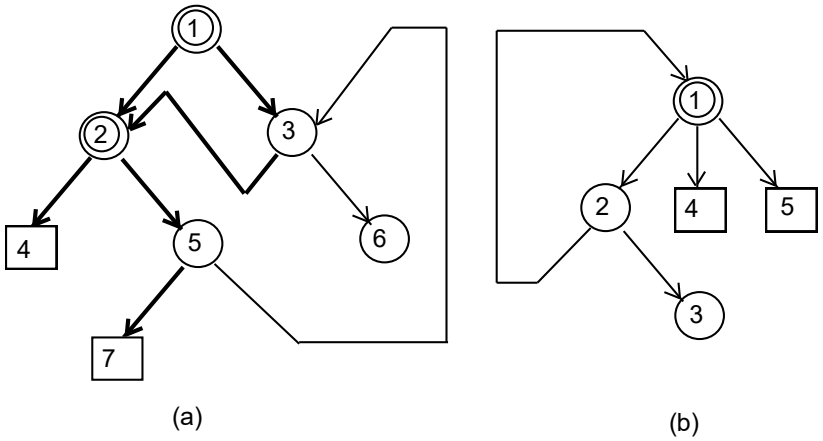

Figure 1. Two AND/OR graphs. (a) solvable (b) unsolvable

Example (for graphs from Figure 1)

Input file

```
2

7
1 2 A  2 3
2 2 A  4 5
3 2 O  2 6
4 0 S
5 2 O  7 3
6 0 U
7 0 S

5
1 3 A  2 4 5
2 2 O  3 1
4 0 S
3 0 U
5 0 S
```

Output file

```
G1: YES
G2: NO
```