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## Algorithms Lab

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### Exercise 1 – False Coin

The “Gold Bar” bank received information from reliable sources that in their last group of  $N$  coins exactly one coin is false and differs in weight from other coins (while all other coins are equal in weight). After the economic crisis they have only a simple balance available. Using this balance, one can only determine if the weight of objects in the left pan is less than, greater than, or equal to the weight of objects in the right pan.



In order to detect the false coin the bank employees numbered all coins by the integers from 1 to  $N$ , thus assigning each coin a unique integer identifier. After that they carried out various weighings, where in each weighing they placed *the same number of coins* in both pans. (Needless to say, a single coin can not appear in both pans at the same time.) The identifiers of coins and the results of the weighings were carefully recorded. You are to write a program that will help the bank employees to determine the identifier of the false coin using the results of these weighings.

**Input** The first line of the input is an integer  $M$  denoting the number of datasets. There is a blank line between datasets, as well as between the first line of the input and the first data set.

The first line of each dataset contains two integers  $N$  and  $K$ , separated by spaces, where  $N$  is the number of coins ( $1 \leq N \leq 100$ ) and  $K$  is the number of weighings carried out ( $1 \leq K \leq 100$ ). The following  $2K$  lines describe all weighings. Each weighing is described by two consecutive lines. The first of these starts with a number  $P_i$  (where  $1 \leq P_i \leq N/2$ ), representing the number of coins placed in each pan, followed by the  $P_i$  identifiers of the coins placed in the left pan, and the  $P_i$  identifiers of the coins placed in the right pan. All numbers are separated by spaces. The second line contains one character describing the outcome of the weighing: '<', '>', or '=' depending on whether the total weight of the coins in the left pan is less than, greater than, or equal to the total weight of the coins in the right pan.

**Output** For each dataset, output the identifier of the false coin in a line of its own. If the given weighings do not determine the false coin uniquely, output a line containing '0'.

#### Sample Input

```
=
1      1 2 5
=
5 3
2 1 2 3 4
<
1 1 4
```

```
=
1 2 5
=
3
3
```

#### Sample Output

(\* Points)100