
Problem 6: Logical Consistency of Liar, Liar Input Data

A recent programming puzzle on Facebook, "Liar, Liar", describes a scenario in which there is a group of people, each of whom is either "unfailingly honest" (i.e., a non-liar) or "compulsively deceptive" (i.e., a liar). Furthermore, each member of the group knows into which of these two categories each of the others belongs. Each member of the group is asked to provide a list of persons who are liars. (Of course, a liar, being such, will place only non-liars on his list! A non-liar's list, on the other hand, will be accurate.)

Facebook invites you to submit a program that, using such lists as input data, reports the sizes of (i.e., number of people in) each of the two categories, but without indicating which size matches which category. (It turns out that, in some cases, there is no way to determine these sizes. However, that is of no concern to us here.)

As an example, suppose that Ann identifies Bill and Carol as liars. If Ann is a non-liar, then, indeed, Bill and Carol must be liars. On the other hand, if Ann is a liar, then neither Bill nor Carol is one! At this point, all we can conclude is that, among the three persons mentioned, one of them (Ann) is in one category and two of them (Bill and Carol) are in the other.

If, in addition to Ann claiming that Bill and Carol are liars, Bill (and/or Carol) identifies Ann as a liar, that doesn't really give us any new information, as it is simply consistent with Ann being in one category and both Bill and Carol being in the other.

Suppose, however, that (in addition to Ann's claims) Bill identifies Carol as a liar (or vice versa). Then we have a logical inconsistency, because Ann's claims imply that Bill and Carol are in the same category whereas Bill's claim implies that Bill and Carol are in different categories.

To analyze it in a slightly different way, suppose that Ann is a non-liar. She names Bill as a liar, so he must be one. Therefore, Bill's claim that Carol is a liar is false, making her a non-liar. But Ann mis-identifies Carol as a liar, making Ann a liar, which contradicts our assumption! Had we instead assumed Ann to be a liar, a similar analysis would have led us to the contradictory conclusion that she is a non-liar.

In our example above, an inconsistency arises as a result of the interaction of three people's claims. In a more complicated case, it may be necessary to take into account the claims of five, or seven, or more people in order to ascertain that an inconsistency is present.

Develop a program that, given as input the "liar list" of each member of a group, reports whether the given data are logically consistent.

Input: The first line contains a positive integer m indicating how many instances of the problem are described thereafter. Each instance of the problem is described using $n + 1$ lines, where n, which indicates the number of people in the group, is the positive integer appearing on the first such line. (For the programmer's convenience, the people are identified not by names but rather by the nonnegative integers 0 through $n - 1$.) On the n lines that follow are the

"liar lists" of the group members, one list per line, with the first list being that of person 0, the next being that of person 1, etc., etc. Each list begins with a nonnegative integer k indicating the length of the list followed by k nonnegative integers in increasing order, each in the range $0..n-1$. Of course, each value in a list identifies a person who is claimed (by the "author" of the list) to be a liar.

Output: For each instance of the problem, the output generated should be a one-line message indicating whether or not the input data is logically consistent. See sample output below for the exact forms of the two possible messages.

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Sample Input:       Explanation:
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3                   three instances of the problem are described
4                   first instance has a group of four persons
2 1 2               person 0 claims that persons 1 and 2 are liars
0                   person 1 makes no claims about liars
1 0                 person 2 claims that person 0 is a liar
0                   person 3 makes no claims about liars
5                   second instance has a group of five persons
1 1                 person 0 claims that person 1 is a liar
2 0 1               person 1 claims that persons 0 and 1 are liars
3 1 3 4             person 2 claims that persons 1, 3, and 4 are liars
0                   person 3 makes no claims about liars
1 2                 person 4 claims that person 2 is a liar
7                   third instance has a group of seven persons
1 5                 person 0 claims that person 5 is a liar
1 6                 person 1 claims that person 6 is a liar
2 1 4               person 2 claims that persons 1 and 4 are liars
2 0 6               person 3 claims that persons 0 and 6 are liars
2 2 5               person 4 claims that persons 2 and 5 are liars
0                   person 5 makes no claims about liars
2 1 5               person 6 claims that persons 1 and 5 are liars


Resultant output:
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Consistent
Not consistent
Not consistent
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