Arrow Signs

Mouse Stofl is making the last preparations for the final round of the SOI. Now, he only needs to put up the signs to guide the participants to the contest room. However, Stofl discovers that there are only signs pointing to the left! It's too late to make more signs, so Stofl needs to mark the way using only these signs.

There are N rooms in the building. Each room is rectangular and can have up to four doors, one on each wall. Stofl must decide whether or not to place a sign at each entrance of the room.

The participants will walk as follows:

- If there is a sign, they follow that sign.

- If there is only one *other* door, they go through that door.

- If there is no sign and multiple other doors, they will go straight.

If the directions are not clear, for instance if

- a sign points to a wall

- there is no other door than the one they came through

- there is no sign and the opposing wall is blocked

they will go home and complain about the SOI on Facebook.

The particpants enter room number 0 from the north side and need to get room number $N-1$.

Output a possible labeling of the room entrances. The length of the path the participants take does not matter.

Note that doors are bidirectional and even though the participants enter room 0 from the north, it will appear that there is no room north of 0.

Input

The first line contains the integer N, the number of rooms. N lines follow. The i-th line describes room i using four integers: n_i, e_i, s_i and w_i, the numbers of the rooms to the north, east, south or west respectively, or -1 if there is no room in that direction.

Output

On the first line, output 'POSSIBLE' or 'IMPOSSIBLE', saying whether a labeling exists or not. If a labeling exists, output N more lines. The i-th of these lines should describe the entrances in room i and should contain four integers - each either a one if Stofl should place a sign at the door or a zero otherwise. The order of the entrances has to be the same: north, east, south and west.

Limits

There are 6 test groups, each is which different amounts of points.

- In test group 1, worth 10 points, we have $N \leq 4$ and you don't need to output a labeling.

- In test group 2, worth 10 points, we have $N \leq 4$.

- In test group 3, worth 20 points, we have $N \leq 100$ and you don't need to output a labeling.

- In test group 4, worth 20 points, we have $N \leq 100$.

- In test group 5, worth 20 points, we have $N \leq 100\,000$ and you don't need to output a labeling.

- In test group 6, worth 20 points, we have $N \leq 100\,000$.

If you don't need to output a labeling, you can only to output "POSSIBLE" or "IMPOSSIBLE". The output after "POSSIBLE" won't be checked.

Examples

Input	Output
7 -1 1 5 -1 4 2 6 0 3 -1 -1 1 -1 -1 2 4 -1 3 1 -1 0 -1 -1 -1 1 -1 -1 -1	POSSIBLE 1 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Stofl guides the particpants to the east, then makes them walk in a loop to enter the same room from the east side again. The participants will visit the rooms 0, 1, 4, 3, 2, 1, 6 in that order. Alternatively, he could have arranged the loop the other way around.
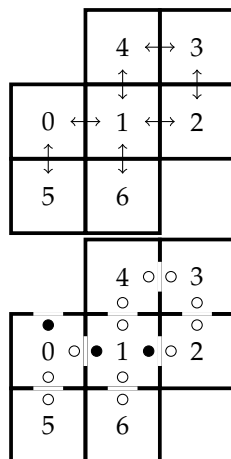
Input	Output
3 -1 -1 1 2 0 -1 -1 -1 -1 0 -1 -1	IMPOSSIBLE

Stofl can't label the first room: if he puts a sign there it points to a wall, if he does not there are two possible exits, so the participants will walk straight into room 1 which is a dead end.

2 ↔→	0
	↕↑↓
	1