Sudoku

Sudoku is a very popular puzzle that involves numbers. It is very good for your brain and an excellent game to play while you are waiting for something (e.g. in a hospital waiting for your turn or waiting for the bus). Just make sure you don't miss the bus, though. The specifications of a Sudoku puzzle are as follows:

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

1. You have a grid of size N^2 x N^2 and you have to fill it using the numbers 1 … N^2.
2. Each row must contain all numbers between 1 to N^2 (both inclusive) with each number appearing exactly once.
3. Each column must contain all numbers between 1 to N^2 (both inclusive) with each number appearing exactly once.
4. There are N^2 non-overlapping N x N submatrices (defined by the bolded black lines in the diagram). Each of them must contain all numbers between 1 to N^2 (both inclusive) with each number appearing exactly once.
5. The left diagram represents an empty Sudoku puzzle, while a valid solution to the given puzzle is given on the right diagram, given N = 3.

You are to write an automated checker to check whether the given input is a valid solution to the Sudoku puzzle. Good luck!

Input

The input consists of a single number **N** (2 <= N <= 14). **N^2** rows follow. Each row represents the i^{th} row of the Sudoku puzzle. In each row, there are N^2 distinct numbers from 1 to N^2 (inclusive), each occupying a cell in the Sudoku puzzle. There is a single space separating each number.

Output

If the given input is a valid solution to the Sudoku puzzle, print "VALID". Otherwise, print "INVALID".

Sample Input 1

```
3
5 3 4 6 7 8 9 1 2
6 7 2 1 9 5 3 4 8
1 9 8 3 4 2 5 6 7
8 5 9 7 6 1 4 2 3
4 2 6 8 5 3 7 9 1
7 1 3 9 2 4 8 5 6
9 6 1 5 3 7 2 8 4
2 8 7 4 1 9 6 3 5
3 4 5 2 8 6 1 7 9
```

Sample Output 1

```
VALID
```

Sample Input 2

```
3
7 9 2 1 3 5 4 6 8
5 4 6 8 7 9 2 1 3
3 8 1 6 2 4 9 5 7
1 3 5 4 6 8 7 9 2
8 7 9 2 1 3 5 4 6
6 2 4 9 5 7 3 8 1
4 6 8 7 9 2 1 3 5
2 1 3 5 4 6 8 7 9
9 5 7 3 8 1 6 2 5
```

Sample Output 2

```
INVALID
```

Explanation

Sample input 1 is illustrated in the Sudoku puzzle example. It is clear that sample input 1 provides a valid solution as illustrated in the example, whereas sample input 2 is not a valid solution. If you look at the last column of sample input 2, there are two 5s in that column (row 7 and 9). It already violates one of the requirements of a valid Sudoku solution. Therefore, it is not a valid solution.

Note

This is a special practice as an extension to CS1020 Soap Opera episode 8 entitled “Sudoku Verifier”. Treat it as a good practice for you in addition to the take-home labs. This is not part of the take-home labs and all discussions on this problem are welcome on the Soap Opera forum under Episode 8: Sudoku Verifier. If you are up for a little bit of challenge, do attempt this challenging exercise. The test-cases have been mounted on CodeCrunch and you can upload your code to CodeCrunch to check whether it passes all test-cases. Have fun!