

Ada and Cycle

Ada the Ladybug is on a trip in Bugindia. There are many cities and some uni-directional roads connecting them. Ada is wondering about the shortest path, which begins in a city and ends in the same city. Since Ada likes short trips, she asked you to find the length of such path for each city in Bugindia.

Input

The first line will contain $0 < N \leq 2000$, the number of cities.

Then N lines follow, each containing N integers $0 \leq H_{ij} \leq 1$. One means, that there is a road between i and j (zero means there isn't a road).

Output

Print N lines, the length of shortest path which begins in city i and ends in city i . If the path doesn't exist, print "NO WAY" instead.

Example Input

```
5
0 1 1 1 1
1 0 0 0 1
0 0 1 1 0
0 0 1 0 0
0 0 0 1 0
```

Example Output

```
2
2
1
2
NO WAY
```

Example Input

```
5
0 1 0 0 1
0 0 1 0 0
0 0 0 1 0
0 0 0 0 1
1 0 0 0 0
```

Example Output

```
2
5
5
5
2
```

