A Math Contest P15 - Matrix Fixed Point

Time limit: 1.0s **Memory limit:** 512M

You are given the $N \times N$ transition matrix for a regular Markov chain, and you need to find its steady state vector. Formally, given an $N \times N$ matrix P, you need to find the unique vector v such that

- $Pv = v$
- $0 \leq v_1, \ldots, v_N \leq 1$
- $\sum_{i=1}^{N} v_i = 1$

For this problem, input and output will be done modulo $10^9 + 7$. This means that if P_{ij} is some fraction A/B where $0 < A \leq B$, then you're given the integer $A \cdot B^{-1}$ modulo $10^9 + 7$ (and the same is true for output).

Constraints

$1 \leq N \leq 500$

$0 < P_{ij} \leq 1$

Each column of P sums to exactly 1.

Input Specification

The first line contains an integer, N, the number of possible events to consider.

The next N lines contain N space-separated numbers, representing the matrix P (as defined above). The j-th integer on the i-th row contains P_{ij}.

Output Specification

Output N space-separated numbers, the entries of the unique vector v.

Sample Input

```
2
900000007 500000004
100000001 500000004
```

Sample Output

```
625000005 375000003
```

Explanation for Sample

We are given the transition matrix of

$$P = \begin{bmatrix} 7/10 & 1/2 \\ 3/10 & 1/2 \end{bmatrix}$$

and find that its steady-state vector is $v = \langle 5/8, 3/8 \rangle$.