Gerrymandering

2022/2023 SEASON – THIRD ROUND

"Gerrymandering is the political manipulation of electoral district boundaries with the intent to create undue advantage for a party, group, or socioeconomic class within the constituency."

In one square country, it is time for another elections and the parties are meeting to determine how to divide the districts. They only have a map of the results by counties from the previous elections, where in each county one party won the most votes. A district is formed by merging several counties. The winner of a district is the party that has won the most counties in the district, and if there is a tie, there is no winner and it goes to a runoff.

Each party wants to make the division in such a way that if the election results are repeated, it wins as many districts as possible in the first round without a runoff. For each of the parties, find a division by districts that gives as many first-round wins as possible for that party.

Input

The first line of the **gerrymandering.in** file contains the numbers n, d and p - size of the state, number of districts and number of parties. It is guaranteed that d divides n^2 without a remainder. The next n lines contain n numbers each - the winners by counties of the previous elections. Each $1x1$ square symbolizes a different county, so there are n^2 counties in total. The party that won the most counties in the last elections is denoted by 1, 2 denotes the next one, and so on - p denotes the party that won the fewest counties.

Output

For each party in the file **gerrymandering.out**, print a map of n lines of n numbers from 1 to d inclusive - the districts themselves. Equal numbers symbolize the same district. **Each district must consist of $\frac{n^2}{d}$ counties and be continuous (one can go from any cell in the district to any other by moving up/down/left/right without leaving the district).**

Scoring

For each map, it is counted in how many of the districts the current party wins and how many counties it had won (the numbers r and s). *yourScore* will be the sum of $r * \frac{n^2}{s}$ over all parties. For each test, let *maxScore* be the highest score among all participants' scores and *yourScore* be your score. You will be awarded $1 - \sqrt{1 - \frac{yourScore+1}{maxScore+1}}$ multiplied by the amount of points for the test.

Constraints

$n = 300$

$d \in \{25, 50, 120, 240, 500\}$

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$2 \leq p \leq 8$

Time limit: 5 sec.
Memory limit: 256 MB.
Tests generation

The tests will be of 3 types:

(1) The largest party wins by more than 20% over the second largest
(2) The two largest parties each have more than 40%
(3) None of the above

The percentages of the parties will be taken from actual elections, with the percentages of parties with less than 4% being redistributed proportionally to the other parties. Having the party percentages, they will be randomly generated on the map with the results of the previous elections.

The tests are distributed as follows:

$d\backslash type$	1	2	3
25	5%	5%	10%
50	5%	5%	10%
120	5%	5%	10%
240	5%	5%	10%
500	5%	5%	10%

Sample test

Input (gerrymandering.in)	Output (gerrymandering.out)
5 5 2 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 1 2 4 4

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	1 2 2 4 4 1 1 2 4 5 3 3 2 5 5 3 3 3 5 5

Example explanation

The sample test is for an explanation only, in all real tests $n = 300$ and $d \in \{25, 50, 120, 240, 500\}$.

On the first map, party 1 wins in all districts and on the second map party 2 wins 3 districts - 1, 2 and 4.

The total score is $5 * \frac{5*5}{15} + 3 * \frac{5*5}{10} \approx 15.8333333333333$