There are 1 questions for a total of 100 points.

(100)   1. <u>Matrix construction</u>: Given integers $R_1, ..., R_n$ and $C_1, ..., C_n$, implement an algorithm that determines if there exists an $n \times n$ 0/1 matrix A such that:

(a) For all i, $\sum_{j=1}^{n} A[i, j] = R_i$, and

(b) For all j, $\sum_{i=1}^{n} A[i, j] = C_j$.

Your algorithm should also output such a matrix A in case it exists. Your program should take input from a file named `input.txt` and should write the output in a file named `output.txt`. Your program should produce an output within 5 seconds for this assignment. The format for input and output files are as follows.

<u>INPUT</u>: The first line of the input file gives the value of n (assume $n \leq 1000$). The next line gives the value of $R_1, R_2, ..., R_n$ separated by commas. The final line gives the value of $C_1, C_2, ..., C_n$ separated by commas. Below is an example of an input file.

```
3
2,1,1
1,1,2
```

<u>OUTPUT</u>: The first line of the output should indicate whether such a matrix A exists. This is a 0/1 value. In case, this line contains 0, then the subsequent lines should be empty (since your algorithm thinks that no such matrix can exist). In case the first line is 1, then the subsequent lines should give the matrix. More specifically, the second line of the `output.txt` file should give the first row of the matrix (entries separated by commas), the third line should give the second row of the matrix and so on. Note that the matrix may not be unique and in that case *any one* correct matrix is acceptable. Consider a valid output file corresponding to the input file above:

```
1
1,0,1
0,1,0
0,0,1
```

Evaluation: Evaluation of this homework will be completely automated. There will be no labs held for evaluation of this assignment. Labs may be held before the deadline for helping you in case you are facing any problems in programming. So, please make sure you follow the instructions:

- There will be serious consequences if you try to copy code or cheat in any manner in this assignment.

- Any code submitted after the deadline will not be evaluated.

- Please follow input/output instructions carefully since your code will be checked using scripts. Please name the java file containing the main method as `matrix.java`.