

There are 1 questions for a total of 25 points.

- (25) 1. Matrix construction: Given integers R_1, \dots, R_n and C_1, \dots, 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 15 seconds for this assignment. The format for input and output files are as follows.

INPUT: 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, \dots, R_n separated by commas. The final line gives the value of C_1, C_2, \dots, C_n separated by commas. Below is an example of an input file.

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

OUTPUT: The first line of the output should indicate whether such a graph 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. The second line 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. For example, consider the output file corresponding to the input file above:

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

SUBMISSION INSTRUCTIONS: All your program files should be in a directory named `<Your ID>`. You will be asked to create a zip of this directory and submit this zip file. In this directory, there should be a makefile that will compile your code (read about makefile on the net in case you do not know what it is). After running `make`, the directory should have an executable called `checkmatrix`. This when executed, should read the input file (`input.txt`) and write the answer in the output file (`output.txt`).