Practice Problem Set 5

1. Write a C program that finds the maximum element of the input 2D array.
   Examples

Input	Output
4 5 1 2 3 4 5 4 5 6 7 8 5 6 7 8 9 1 2 4 5 7	Max Element: 9

2. Write a C program that finds the row-wise maximum element of the input 2D array.
   Examples

Input	Output
4 5 1 2 3 4 5 4 5 6 7 8 5 6 7 8 9 1 2 4 5 7	Max element of row 0: 5 Max element of row 1: 8 Max element of row 2: 9 Max element of row 3: 5

3. Write a C program that finds the column-wise maximum element of the input 2D array.
   Examples

Input	Output
4 5 1 2 3 4 5 4 5 6 7 8 5 6 7 8 9 1 2 4 5 7	Max element of column 0: 5 Max element of column 1: 6 Max element of column 2: 8 Max element of column 3: 9

4. Write a C program that asks the user to enter m (number of rows) and n (number of columns) and creates a new array with the first m rows and n columns of the input array.
   Examples

Input	Output
4 5 1 2 3 4 5 4 5 6 7 8 5 6 7 8 9 1 2 4 5 7 3 3	3 3 1 2 3 4 5 5 5 6 7

5. Write a C program that calculates the sparsity and density of a matrix.
   Hints: A sparse matrix is a matrix where most of the elements are zero and a dense matrix is a matrix where most of the elements are non-zero.
   Sparsity = number of zero elements / total elements
   Density = number of non-zero elements / total elements
   Examples

Input	Output
5 5 0 0 0 0 1 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0	Sparsity = 0.76 Density = 0.24

6. Write a C program that checks if the input matrix is an identity matrix or not.

Examples

Input	Output
3 3 1 0 0 0 1 0 0 0 1	Yes

Input	Output
3 3 1 0 1 0 1 0 1 0 1	No

7. Write a C program that stacks the 2 input arrays horizontally and prints the output array.
   Hints: The number of rows of the input arrays must be equal to horizontally stack them.
   Examples

Input	Output
4 5 1 2 3 4 5 4 5 6 7 8 5 6 7 8 9 1 2 4 5 7 4 3 1 2 3 5 6 7 1 3 6 2 4 7	4 8 1 2 3 4 5 1 2 3 4 5 6 7 8 5 6 7 5 6 7 8 9 1 3 6 1 2 4 5 7 2 4 7

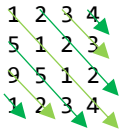
   Examples

Input	Output
4 5 1 2 3 4 5 4 5 6 7 8 5 6 7 8 9 1 2 4 5 7 3 4 1 2 3 5 6 7 1 3 6 2 4 7	Not possible to horizontally stack the two arrays

8. Write a C program that flips a binary matrix horizontally, then inverts it, and returns the resulting matrix.
   Hints: To flip a matrix horizontally means that each row of the matrix is reversed.
   For example, flipping [1, 1, 0] horizontally results in [0, 1, 1].
   To invert a matrix means that each 0 is replaced by 1, and each 1 is replaced by 0.
   For example, inverting [0, 1, 1] results in [1, 0, 0]
   Examples

Input	Output
3 4 1 0 0 1 0 0 0 1 1 1 0 0	After flipping: 1 0 0 1 1 0 0 0 0 0 1 1 After inverting: 0 1 1 0 0 1 1 1 1 1 0 0

9. Write a C program that prints all the diagonals left to right of the input array.
   Hints:



Examples

Input	Output
4 4 1 2 3 4 5 1 2 3 9 5 1 2 1 2 3 4	1 9 2 5 5 3 1 1 1 4 2 2 2 3 3 4

10. Write a C program that asks the user to enter `r` and `c` and reshapes the input matrix to a `rxc` matrix if possible.
    Hints: Create a 1d array with `mxn` elements and populate the 1d array with the elements of input 2d array.
    Then populate the `rxc` matrix from the 1d array.
    Examples

Input	Output
4 4 1 2 3 4 5 1 2 3 9 5 1 2 2 6	2 6 1 2 3 4 5 1 2 3 9 5 1 2

Input	Output
4 4 1 2 3 4 5 1 2 3 9 5 1 2 2 3	Not possible