

Matrices - Exercises

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1. Compare Matrices

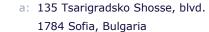
Write a program that reads two integer matrices (2D arrays) from the console and compares them element by element.

Each matrix contain a line with a positive integer number \mathbf{R} – the number of rows in the matrix and \mathbf{C} – the number of columns – followed by \mathbf{R} lines containing the \mathbf{C} numbers, separated by spaces (each line will have an equal amount of numbers).

Print "equal" if the matrices match and "not equal" if they don't match.

Input	Output
23 123 213	equal







2 3	
123	
213	
2 3	not equal
123	·
456	
2 2	
13	
4 5	
2 3	not equal
123	
213	
2 3	
123	
214	

2. Matrix Addition

Given two matrices of the same size, write a program to add them together.

First read 2 integers separated by whitespace (rows and cols of the matrices), next read the matrices.

Print new matrix with the sum of the sum of the same indices from the two matrices.

Input	Output
2 2	3 4
1 2	5 6
3 4	
2 2	
2 2	
2 3	2 4 6
123	8 5 3
431	
123	
422	

3. Intersection of Two Matrices

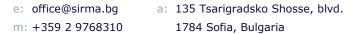
Write a program that reads two char matrices (A[][] and B[][]) of the same order M * N and prints the third matrix C[][], which is filled with the intersecting elements of A and B, otherwise set the element to '*'. On the first two lines, you receive M and N, then on 2 * M lines N characters – the matrices elements.

The matrix elements may be any ASCII char **except '*'.**

Examples

Input	Output







3	* b c *
4	a b * d
a b c d	a * c d
a b c d	
a b c d	
k b c k	
a b g d	
akcd	
5	* 2
2	3 *
1 2	* 6
3 4	7 *
5 6	* 1
78	
9 1	
0 2	
3 1	
16	
7 4	

4. Sum Matrix Elements

Write a program that **reads a matrix** from the console and prints:

- The count of **rows**
- The count of **columns**
- The sum of all matrix's elements

On the first line, you will get the matrix dimensions in the format "**{rows, columns}**". On the next lines, you will get the elements for each **row** separated by a comma.

Examples

11

Input	Output







3 6	3
713321	6
139856 467910	76
2 4	2
10 11 12 13	4
14 15 16 17	108

5. Maximum Sum of 2X2 Submatrix

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Write a program that **reads a matrix** from the console. Then find the biggest sum of a **2x2 submatrix**. Print the submatrix and its sum.

On the first line, you will get the matrix dimensions in the format "**{rows, columns}**". On the next lines, you will get the elements for each **row** separated by a comma.

Input	Output
3 6	33
713321	9 8
139856 467910	7 9
2 4	58
10 11 12 13	12 13
14 15 16 17	16 17

6. Print Diagonals of Square Matrix

Write a program that **reads a matrix** from the console. Then print the diagonals. The matrix will always be square. On the first line, you read a single integer **N** the matrix size. Then on each line N elements. The first diagonal should always start with the element at the **first row and col**. The second diagonal should start with the element at the **last row and first col**.

Input	Output
3 123 123 123	1 2 3 1 2 3
4 1 2 3 2	1 1 1 1 2 2 2 2





7. Matrix Diagonal Sum

Write a program to find the sum of both diagonals in a square matrix.

Input	Output
3 3	30
1 2 3 4 5 6 7 8 9	
2 2	50
10 11	
14 15	

8. Fill the Matrix

Write two **methods** that **fill** a **size N x N matrix** in **two** different **patterns**. Both patterns are described below:

Patte	ern A			Patte	rn B		
1	5	9	13	1	8	9	16
2	6	10	14	2	7	10	15
3	7	11	15	3	6	11	14
4	8	12	16	4	5	12	13

Input	Output
3 A	1 4 7
	2 5 8
	3 6 9
4 B	1 8 9 16
	2 7 10 15
	3 6 11 14
	4 5 12 13



9. Row Sum and Column Sum

Given a matrix, calculate the sum of each row and each column.

Input	Output
3 2	Row Sums: 3, 7, 11
1 2	Column Sums: 9, 12
3 4	
5 6	
3 3	Row Sums: 6, 15, 24 Column Sums: 12, 15, 18
123	Column 3ums. 12, 13, 16
4 5 6	
789	

10. Zero Matrix

If an element in a matrix is 0, set its entire row and column to 0.

Input	Output
3 3	103
123	0 0 0
406	7 0 9
789	
4 4	0 0 0 0
1230	0 5 6 0
4567	0 0 0 0
0891	

11. Matrix Boundary Sum

Write a program that calculates the sum of the boundary elements of a matrix.





Input	Output
3 3	28
123	// 1 + 2 + 4 + 6 + 9 + 8 + 7 + 4
4 5 6	
789	
4 4	35
1230	
4567	
0891	

12. Rotate Matrix 90 Degrees

Rotate the given matrix 90 degrees to the right (or clockwise).

Input	Output
3 3	7 4 1
1 2 3	8 5 2
4 5 6	9 6 3
789	
4 4	12 8 4 0
0 1 2 3	13 9 5 1
4 5 6 7	14 10 6 2
8 9 10 11	15 11 7 3
12 13 14 15	

13. Excel Column Name to Number

In Excel, columns are represented by letters, starting from A for the 1st column, B for the 2nd, and so on. After Z, the columns are represented by two letters, like AA, AB, etc. Write a program that converts an Excel column name to its corresponding column number.





Input	Output
AB	28
A	1
С	3
CZ	104
ММ	351

14. Chessboard Checker

Given a chessboard representation where empty squares are 0 and queens are 1, determine if either two queens threaten each other.

Input	Output
4 4 0 1 0 0 0 0 0 1 1 0 0 0 0 0 1 0	No
4 4 0 1 0 0 0 0 0 1 1 0 0 0 0 1 0 0	Yes
4 4 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0	No
3 3 0 1 0 0 0 1 0 0 0	Yes

15. Excel Sum Formula

Imagine an Excel sheet where each cell contains a number. Write a program that calculates the **sum of a given range**.

Input	Output	
-------	--------	--





3 3 1 2 3 4 5 6 7 8 9 A1:C2	21
4 4 0 1 0 0 0 0 0 1 1 0 0 0 0 1 0 0 A1:B4	3
4 4 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 A1:C4	2

16. Matrix Border Flip

Given a matrix, flip its border elements in a clockwise direction.

Input	Output
3 3 1 2 3	4 1 2
456	7 5 3
789	8 9 6
4 4	0 0 1 0
0100	1000
0001	0 0 0 1
1000	1000
0100	

17. Magic Square Checker

Determine if a matrix is a magic square (a matrix in which the sums of every row, every column, and both main diagonals are the same).

Input	Output
3 3 1 2 3 4 5 6	False





789	
44 1000 0001 0100 0010	True
3 3 8 1 6 3 5 7 4 9 2	True

18. Spiral Matrix Traversal

Print the elements of a matrix in spiral order.

Input	Output
3 3 1 2 3 4 5 6 7 8 9	123698745
4 4 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	True 1 2 3 4 8 12 16 15 14 13 9 5 6 7 11 10
2 2 1 2 3 4	1 2 4 3

19. Checkerboard Pattern

Given an $n \times n$ size, generate a matrix with a checkerboard pattern using 0s (for white squares) and 1s (for black squares).

Input	Output
3	0 1 0
	101
	0 1 0
4	0 1 0 1
	1010





0 1 0 1
1010

20. Maximal Sum

Write a program that reads a rectangular integer matrix of size $\bf N$ $\bf x$ $\bf M$ and finds the square $\bf 3$ $\bf x$ $\bf 3$ with a maximal sum of its elements.

- On the first line, you will receive the rows N and columns M.
- On the next **N lines,** you will receive **each row with its elements**.

Print the **elements** of the 3 x 3 square as a matrix, along with their **sum**. See the format of the output below.

Input	Output
4 5	Sum = 75
15524	1 4 14
2 1 4 14 3	7 11 2
3 7 11 2 8	8 12 16
4 8 12 16 4	
5 6	Sum = 34
104311	2 5 6
131304	5 4 1
641256	6 0 5
221541	
3 3 3 6 0 5	

21. Snowflakes*

Generate every state of a given matrix, where "*" represents a **snowflake**, falling on the ground. "0" is empty space and the "#" is a barrier, which cannot move.

Print every state until all flakes cannot fall anymore.

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Input	Output
3 3 * 0 *	0 0 0 * 0 *





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0 0 0	0 0 0
0 0 0	===
	0 0 0
	0 0 0
	* 0 *
4 4	0 0 * 0
* 0 * *	* 0 # *
0 0 # 0	# 0 # 0
# 0 # 0	# 0 # #
# 0 # #	====
	0 0 * 0
	* 0 # 0
	# 0 # *
	# 0 # #

