

Matrices - Exercises

1.	Compare Matrices	1
2.	Matrix Addition	2
3.	Intersection of Two Matrices	2
4.	Sum Matrix Elements.....	3
5.	Maximum Sum of 2X2 Submatrix.....	3
6.	Print Diagonals of Square Matrix.....	4
7.	Matrix Diagonal Sum	4
8.	Fill the Matrix	4
9.	Row Sum and Column Sum	5
10.	Zero Matrix	5
11.	Matrix Boundary Sum	6
12.	Rotate Matrix 90 Degrees.....	6
13.	Excel Column Name to Number	7
14.	Chessboard Checker	7
15.	Excel Sum Formula	8
16.	Matrix Border Flip	8
17.	Magic Square Checker	8
18.	Spiral Matrix Traversal	9
19.	Checkerboard Pattern	9
20.	Maximal Sum	10

1. Compare Matrices

Write a program that receives two integer matrices (2D arrays) and compares them element by element.

Each matrix contain a line with a positive integer number **R** – the number of rows in the matrix and **C** – the number of columns – followed by **R** lines containing the **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
[[1,2,3], [2,1,3]], [[1,2,3], [2,1,3]]	equal



[[1,2,3], [4,5,6]], [[1,3], [4,5]]	not equal
---	-----------

2. Matrix Addition

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

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

Input	Output
[[1,2],[3,4]], [[2,2],[2,2]]	3 4 5 6
[[1,2,3],[4,3,1]], [[1,2,3],[4,2,2]]	2 4 6 8 5 3

3. Intersection of Two Matrices

Write a program that receives 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 '*'. 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
["a b c d", "a b c d", "a b c d"], ["k b c k", "a b g d", "a k c d"]	* b c * a b * d a * c d
["1 2", "3 4", "5 6", "7 8", "9 1"], ["0 2",	* 2 3 * * 6 7 * * 1



"3 1", "1 6", "7 4", "1 1"]	
--------------------------------------	--

4. Sum Matrix Elements

Write a program that **receive a matrix** and prints:

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

Examples

Input	Output
[[7, 1, 3, 3, 2, 1], [1, 3, 9, 8, 5, 6], [4, 6, 7, 9, 1, 0]]	3 6 76
[[10, 11, 12, 13], [14, 15, 16, 17]]	2 4 108

5. Maximum Sum of 2X2 Submatrix

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

Input	Output
["7 1 3 3 2 1", "1 3 9 8 5 6", "4 6 7 9 1 0"]	33 9 8 7 9
["10 11 12 13", "14 15 16 17"]	58 12 13



	16 17
--	-------

6. Print Diagonals of Square Matrix

Write a program that receives **a matrix**. Then print the diagonals. The matrix will always be square. 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
["1 2 3", "1 2 3", "1 2 3"]	1 2 3 1 2 3
["1 2 3 2", "1 1 2 4", "1 2 1 4", "2 2 3 1"]	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
["1 2 3", "4 5 6", "7 8 9"]	30
["10 11", "14 15"]	50

8. Fill the Matrix

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

Pattern A	Pattern 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
3 B	1 6 7 2 5 8 3 4 9

9. Row Sum and Column Sum

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

Input	Output
["1 2", "3 4" "5 6"]	Row Sums: 3, 7, 11 Column Sums: 9, 12
["1 2 3", "4 5 6", "7 8 9"]	Row Sums: 6, 15, 24 Column Sums: 12, 15, 18

10. Zero Matrix

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

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



["1 2 3", "4 0 6", "7 8 9"]	1 0 3 0 0 0 7 0 9
["1 2 3 0", "4 5 6 7", "0 8 9 1"]	0 0 0 0 0 5 6 0 0 0 0 0

11. Matrix Boundary Sum

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

Input	Output
["1 2 3", "4 5 6", "7 8 9"]	28 // 1 + 2 + 4 + 6 + 9 + 8 + 7 + 4
["1 2 3 0", "4 5 6 7", "0 8 9 1"]	35

12. Rotate Matrix 90 Degrees

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

Input	Output
["1 2 3", "4 5 6", "7 8 9"]	7 4 1 8 5 2 9 6 3
["0 1 2 3", "4 5 6 7", "8 9 10 11"]	12 8 4 0 13 9 5 1 14 10 6 2



"12 13 14 15"]	15 11 7 3
----------------	-----------

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
C	3
CZ	104
MM	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
["0 1 0 0", "0 0 0 1", "1 0 0 0", "0 0 1 0"]	No
["0 1 0 0", "0 0 0 1", "1 0 0 0", "0 1 0 0"]	Yes
["0 1 0 0", "0 0 0 0", "1 0 0 0", "0 0 0 0"]	No



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
[[1, 2, 3], [4, 5, 6], [7, 8, 9]], "A1:C2"	21
[[0, 1, 0, 0], [0, 0, 0, 1] [1, 0, 0, 0] [0, 1, 0, 0]], "A1:B4"	3
[[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
["1 2 3", "4 5 6", "7 8 9"]	4 1 2 7 5 3 8 9 6
["0 1 0 0", "0 0 0 1", "1 0 0 0", "0 1 0 0"]	0 0 1 0 1 0 0 0 0 0 0 1 1 0 0 0

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
-------	--------



["1 2 3", "4 5 6", "7 8 9"]	False
["1 0 0 0", "0 0 0 1", "0 1 0 0", "0 0 1 0"]	True
["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
["1 2 3", "4 5 6", "7 8 9"]	1 2 3 6 9 8 7 4 5
["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
["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 1 0 1 0 1 0
4	0 1 0 1 1 0 1 0 0 1 0 1 1 0 1 0



20. Maximal Sum

Write a program that receives a rectangular integer matrix and finds the square **3 x 3** with **a maximal sum of 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
<code>["1 5 5 2 4", "2 1 4 14 3", "3 7 11 2 8", "4 8 12 16 4"]</code>	Sum = 75 1 4 14 7 11 2 8 12 16
<code>["1 0 4 3 1 1", "1 3 1 3 0 4", "6 4 1 2 5 6", "2 2 1 5 4 1", "3 3 3 6 0 5"]</code>	Sum = 34 2 5 6 5 4 1 6 0 5