

# 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

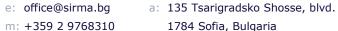
Write a program that receives two integer matrices (2D arrays) and compares them element by element.

Each matrix contain a line with a positive integer number  $\mathbf{R}$  – 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		
[[1,2,3], [2,1,3]], [[1,2,3], [2,1,3]	equal		







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

#### 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]],	3 4
[[2,2],[2,2]]	5 6
[[1,2,3],[4,3,1]],	2 4 6
[[1,2,3],[4,2,2]]	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",	* b c *
"a b c d",	a b * d
"a b c d"],	a * c d
["k b c k",	
"a b g d",	
"a k c d"]	
["1 2",	* 2
"3 4",	3 *
"5 6",	* 6
"7 8",	7 *
"9 1"],	* 1
["0 2",	





"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],	3
[1, 3, 9, 8, 5, 6], [4, 6, 7, 9, 1, 0]]	6
	76
[[10, 11, 12, 13],	2
[14, 15, 16, 17]]	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",	33		
"1 3 9 8 5 6",	9 8		
"4 6 7 9 1 0"]	7 9		
["10 11 12 13",	58		
"14 15 16 17"]	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",	1111
"1 1 2 4",	2 2 2 2
"1 2 1 4",	
"2 2 3 1"]	

# 7. Matrix Diagonal Sum

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

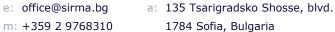
Input	Output
["1 2 3", "4 5 6", "7 8 9"]	30
["10 11",	50
"14 15"]	

#### 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







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10

11

12

16

15

14

13

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

Input	Output
3 A	1 4 7
	2 5 8
	3 6 9
3 B	167
	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
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["1 2 3",	103
[ 123 /	103
"4 0 6",	0 0 0
"7 8 9"]	7 0 9
-	
["1 2 3 0",	0 0 0 0
"4 5 6 7",	0 5 6 0
"0 8 9 1"]	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",	28
"4 5 6",	// 1 + 2 + 4 + 6 + 9 + 8 + 7 + 4
"7 8 9"]	
["1 2 3 0",	35
"4 5 6 7",	
"0 8 9 1"]	

# 12. Rotate Matrix 90 Degrees

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

Input	Output
["1 2 3",	7 4 1
"4 5 6",	8 5 2
"7 8 9"]	9 6 3
["0 1 2 3",	12 8 4 0
"4 5 6 7",	13 9 5 1
"8 9 10 11",	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
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
["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",	4 1 2
"7 8 9"]	7 5 3
	8 9 6
["0 1 0 0", "0 0 0 1", "1 0 0 0",	0 0 1 0 1 0 0 0 0 0 0 1 1 0 0 0
"0 1 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"]	123698745
["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
	1010
	0 1 0 1
	1010





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#### 20. Maximal Sum

Write a program that receives a rectangular integer matrix and finds the square  $\bf 3 \ x$ 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
["1 5 5 2 4",	Sum = 75
"2 1 4 14 3",	1 4 14
"3 7 11 2 8",	7 11 2
"4 8 12 16 4"]	8 12 16
["1 0 4 3 1 1",	Sum = 34
"1 3 1 3 0 4",	2 5 6
"6 4 1 2 5 6",	5 4 1
"2 2 1 5 4 1",	6 0 5
"3 3 3 6 0 5"]	

