C++-A06: 2D Array

1. Spiral Traversal of a 2D Array

- Write a program to traverse a 2D array in a spiral order starting from the top-left corner.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
1 2 3 6 9 8 7 4 5
```

---

2. Wave Traversal of a 2D Array

- Traverse the matrix in a column-wise wave pattern (top to bottom in odd columns, bottom to top in even columns).

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
1 4 7 8 5 2 3 6 9
```

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3. Diagonal Traversal (Top-Left to Bottom-Right)

- Print diagonals of a given 2D matrix from top-left to bottom-right.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
1
2 4
3 5 7
6 8
9
```

---

4. Boundary Traversal of a 2D Array

- Print the boundary elements of the matrix in clockwise order.

Input:

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

Output:

```
1 2 3 4 8 12 16 15 14 13 9 5
```

---

5. Rotate a 2D Matrix by 90 Degrees Clockwise

- Rotate the matrix by 90 degrees without using extra space.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
7 4 1
8 5 2
9 6 3
```

---

6. Find Saddle Point in a Matrix

- A saddle point is an element that is the minimum in its row but the maximum in its column. Find such an element, if it exists.

Input:

```
3 3
1 10 4
5 3 8
7 6 9
```

Output:

```
Saddle Point: 5
```

---

7. Find the Row with Maximum Sum

- Find the row index with the maximum sum of its elements.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
Row with maximum sum: 3
```

---

8. Transpose of a Matrix

- Find the transpose of a given 2D matrix.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
1 4 7
2 5 8
3 6 9
```

---

9. Check if a Matrix is Symmetric

- A matrix is symmetric if it is equal to its transpose.

Input:

```
3 3
1 2 3
2 5 6
3 6 9
```

Output:

```
The matrix is symmetric
```

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10. Zigzag Traversal of a Matrix

- Traverse the matrix in a zigzag fashion.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
1 2 3 6 5 4 7 8 9
```

---

11. Find the First Non-Repeating Element in a 2D Matrix

- Given an `N x M` matrix, find the first element that does not repeat.

Input:

```
3 3
1 2 3
4 5 6
3 2 1
```

Output:

```
First non-repeating element: 4
```

---

12. Find the Maximum Element in Each Row

- Find the largest element in each row and print it.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
Max in row 1: 3
Max in row 2: 6
Max in row 3: 9
```

---

13. Find the Sum of Each Column in a Matrix

- Print the sum of elements in each column.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
Sum of column 1: 12
Sum of column 2: 15
Sum of column 3: 18
```

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14. Rotate a Matrix by 180 Degrees

- Rotate a given `N x N` matrix by **180 degrees**.

Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Output:

```
9 8 7
6 5 4
3 2 1
```

Happy Coding!