جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم

قسم الانظمة الطبية الذكية

Lecture: (4)

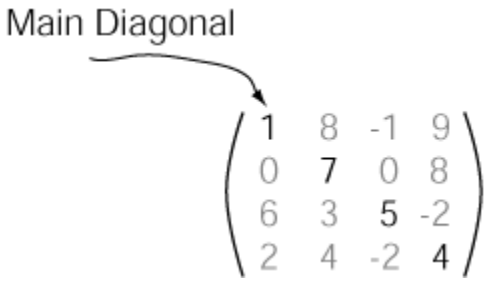
Arrays Part IV

Subject: Computer Programming II
Level: First
Lecturer: Dr. Maytham N. Meqdad

Main Diagonal

The **main diagonal** of a matrix consists of those elements that lie on the diagonal that runs from top left to bottom right.

If the matrix is **A**, then its main diagonal are the elements who's row number and column number are equal, $\mathbf{a_{jj}}$.



$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Main Diagonal

- Given a 2D square matrix, print the Principal and Secondary diagonals.

Examples :

Input:

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

Output:

```
Principal Diagonal: 1, 3, 9, 3
Secondary Diagonal: 4, 2, 8, 6
```

Input:

```
1 1 1
1 1 1
1 1 1
```

Output:

```
Principal Diagonal: 1, 1, 1
Secondary Diagonal: 1, 1, 1
```

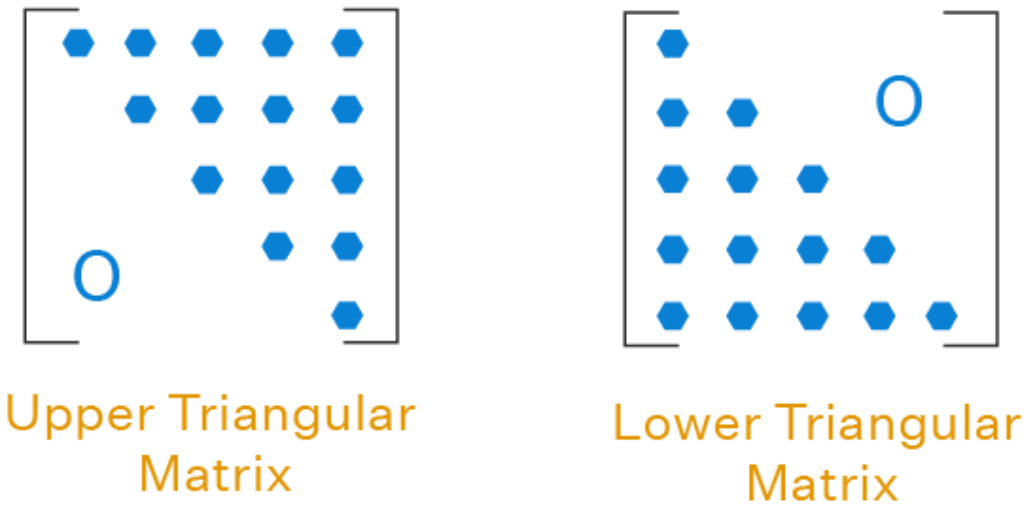
```
/ Java Program to print the Diagonals of a Matrix
class GFG {
    static int MAX = 100;

    // Function to print the Principal Diagonal
    static void printPrincipalDiagonal(int mat[][], int n)
    {
        System.out.print("Principal Diagonal: ");

        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++) {

                // Condition for principal diagonal
                if (i == j) {
                    System.out.print(mat[i][j] + ", ");
                }
            }
        }
        System.out.println("");
    }

    // Function to print the Secondary Diagonal
    static void printSecondaryDiagonal(int mat[][], int n)
    {
        System.out.print("Secondary Diagonal: ");

        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++) {

                // Condition for secondary diagonal
                if ((i + j) == (n - 1)) {
                    System.out.print(mat[i][j] + ", ");
                }
            }
        }
        System.out.println("");
    }

    // Driver code
    public static void main(String args[])
    {
        int n = 4;
        int a[][] = { { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 },
                      { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 } };
```

```
        printPrincipalDiagonal(a, n);
        printSecondaryDiagonal(a, n);
    }
}
// This code is contributed by Rajput-Ji
```

Output

```
Principal Diagonal: 1, 6, 3, 8,
Secondary Diagonal: 4, 7, 2, 5,
```

Above and below the main diagonal java



-To print the elements above the main diagonal of a matrix

```
class GFG {
    static int MAX = 100;

    // Function to print the elements above the main diagonal
    static void printElementsAboveMainDiagonal(int mat[][], int n) {
        System.out.println("Elements above the main diagonal:");
        for (int i = 0; i < n; i++) {
            for (int j = i + 1; j < n; j++) {
                System.out.print(mat[i][j] + " ");
            }
            System.out.println();
```

```
        }
    }

    // Driver code
    public static void main(String args[]) {
        int n = 4;
        int a[][] = { { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 },
                      { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 } };

        printElementsAboveMainDiagonal(a, n);
    }
}
```

Out put

Elements above the main diagonal:

2 3 4

7 8

4

-

- To print the elements below the main diagonal of a matrix in Java

```
class GFG {
    static int MAX = 100;

    // Function to print the elements below the main diagonal
    static void printElementsBelowMainDiagonal(int mat[][], int n) {
        System.out.println("Elements below the main diagonal:");
        for (int i = 1; i < n; i++) {
            for (int j = 0; j < i; j++) {
                System.out.print(mat[i][j] + " ");
            }
            System.out.println();
        }
    }

    // Driver code
    public static void main(String args[]) {
        int n = 4;
        int a[][] = { { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 },
                      { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 } };

        printElementsBelowMainDiagonal(a, n);
    }
}
```

Output

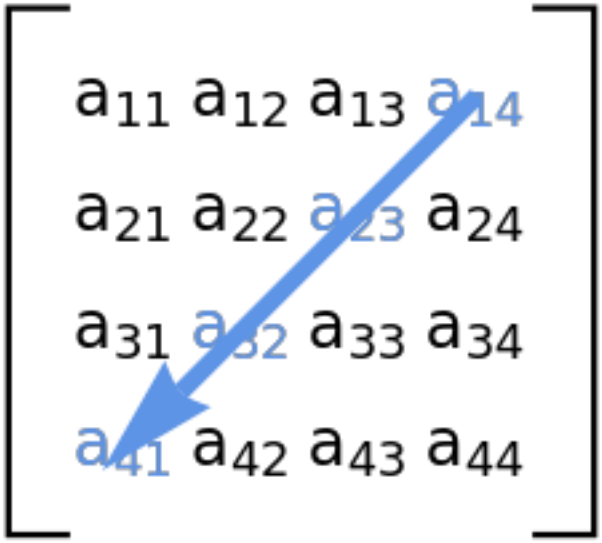
Elements below the main diagonal:

5

1 2

5 6 7

Anti-diagonal



-To print the elements along the anti-diagonal of a matrix in Java, you can modify the code as follows:

```
class GFG {
    static int MAX = 100;

    // Function to print the elements along the anti-diagonal
    static void printAntiDiagonal(int mat[][], int n) {
        System.out.println("Elements along the anti-diagonal:");
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++) {
                // Condition to check if the element is on the anti-diagonal
                if ((i + j) == (n - 1)) {
                    System.out.print(mat[i][j] + " ");
                }
            }
        }
        System.out.println();
    }

    // Driver code
    public static void main(String args[]) {
        int n = 4;
        int a[][] = { { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 },
                      { 1, 2, 3, 4 },
                      { 5, 6, 7, 8 } };
```

```
        printAntiDiagonal(a, n);
    }
}
```

Output

Elements along the anti-diagonal:

4 7 2 5