Assignment 1

Finding transpose and determinant of a matrix using 2-D array.

Submitted by:
IEC2021046
IEC2021047
IEC2021048
IEC2021049

Contents :-

Problem Statement :-

Write a C program to find transpose and determinant of a matrix.

Introduction :-

In the given task, in order to find the transpose and determinant of a given matrix, first we need to make a 2-D array. Which is later followed by a function which would find the transpose of the given matrix and a function to determine the value of the determinant of the matrix.

Procedure:-

- First we have to form 2d array in which we input the entries of matrix and print the given matrix.
- Code a function that transpose a given matrix and then print it.
- Now if matrix is an square matrix then determinant is feasible otherwise determinant not feasible, therefore need to check whether matrices square matrix or not.
- Code the function for finding determinant and print it .

Algorithms :-

Step 1 :- First we need to assign the number of rows and columns of the matrix using do while loop.

```
int Matrix_Rows, Matrix_Columns;
//Code to Assign the number of Rows in the matrix.
do
{
    printf("Enter the number of Rows of the Matrix\n");
    scanf("%d", &Matrix_Rows);
} while (Matrix_Rows<1 || Matrix_Rows > 100);
//Code to Assign the number of Columns in the matrix.
do
{

    printf("Enter the number of Columns of the Matrix\n");
    scanf("%d", &Matrix_Columns);
} while (Matrix_Columns < 1 || Matrix_Columns > 100);
```

Step2 :-Now we form the matrix with the help of 2D array and take the elements of the matrix as input.

```
18      // Intializing the 2D array to store the values in the matrix.
19      int Matrix[100][100];
20
21      // Taking the values of the matrix as input.
22
23      for (int i = 0; i < Matrix_Rows; i++)
24      {
25          for (int j = 0; j < Matrix_Columns; j++)
26          {
27              printf("Enter the value for the %dth row and %dth column: ", i + 1, j + 1);
28              scanf("%d", &Matrix[i][j]);
29          }
30      }
```

Step 3 :- Printing the given matrix.

```
31      // Printing the matrix for the end user.
32      printf("Given matrix is:\n");
33      for (int i = 0; i < Matrix_Rows; i++)
34      {
35          for (int j = 0; j < Matrix_Columns; j++)
36          {
37              printf("%d ", Matrix[i][j]);
38          }
39          printf("\n");
40      }
41
```

Step 4 :- Now we print the transpose of the given matrix.

```
41
42      // Function for printing the Transpose of the given matrix.
43      printf("Transposed matrix is:\n");
44      for (int j = 0; j < Matrix_Columns; j++)
45      {
46          for (int i = 0; i < Matrix_Rows; i++)
47          {
48              printf("%d ", Matrix[i][j]);
49          }
50          printf("\n");
51      }
52
```

Step 5 :- Now we find the matrix is square or not and if it is a square of order 2*2 or 3*3 then finding its determinant.

```
53      long determinant;
54      if (Matrix_Columns == 2 && Matrix_Rows == 2)
55      {
56          determinant = Matrix[0][0] * Matrix[1][1] - Matrix[1][0] * Matrix[0][1];
57          printf("\nThe value of the 2x2 Determinant is : %ld\n", determinant);
58      }
59      else if (Matrix_Columns == 3 && Matrix_Rows == 3)
60      {
61          determinant = Matrix[0][0] * ((Matrix[1][1] * Matrix[2][2]) - (Matrix[2][1] * Matrix[1][2])) -
62                        Matrix[0][1] * ((Matrix[1][0] * Matrix[2][2] - Matrix[2][0] * Matrix[1][2])) +
63                        Matrix[0][2] * ((Matrix[1][0] * Matrix[2][1] - Matrix[2][0] * Matrix[1][1]));
64          printf("\nThe value of the 3x3 Determinant is : %ld\n", determinant);
65      }
66      else if (Matrix_Rows != Matrix_Columns)
67      {
68          printf("Since the matrix is not a square matrix, We cannot find the value of the determinant.\n");
69      }
70      else if (Matrix_Columns > 3 && Matrix_Rows == Matrix_Columns)
71      {
72          printf("The value of determinant can not be calculated by the given code.\n");
73      }
74      return 0;
75  }
76
```

Problems faced :-

The above programme is good for finding transpose of any matrix ,for checking whether matrix is square or not and finding the determinant of any 2*2 and 3*3 matrix. But we also face a problem, we cannot obtain higher order determinants using this algorithm.

Time Complexity For each Steps:-

1) For declaring the number of rows and columns : O(1)

2) For inputting variables : O(m*n)

3) For Outputting Matrix : O(m*n)

4) Printing Transpose : O(m*n)

5) Determinant : O(1)

-> Final Time Complexity : O(m*n)

Conclusion:-

```
Enter the number of Rows of the Matrix row
3
Enter the number of Columns of the Matrix
3
Enter the value for the 1th row and 1th column: 3
Enter the value for the 1th row and 2th column: 151
Enter the value for the 1th row and 3th column: 51
Enter the value for the 2th row and 1th column: 53
Enter the value for the 2th row and 2th column: 3
Enter the value for the 2th row and 3th column: 52
Enter the value for the 3th row and 1th column: 23
Enter the value for the 3th row and 2th column: 34
Enter the value for the 3th row and 3th column: 12
Given matrix is:
3 151 51
53 3 52
23 34 12
Transposed matrix is:
3 53 23
151 3 34
51 52 12

The value of the 3x3 Determinant is : 167747
```

```
Enter the number of Rows of the Matrix row
3
Enter the number of Columns of the Matrix
3
Enter the value for the 1th row and 1th column: 1
Enter the value for the 1th row and 2th column: 2
Enter the value for the 1th row and 3th column: 3
Enter the value for the 2th row and 1th column: 4
Enter the value for the 2th row and 2th column: 5
Enter the value for the 2th row and 3th column: 6
Enter the value for the 3th row and 1th column: 7
Enter the value for the 3th row and 2th column: 8
Enter the value for the 3th row and 3th column: 9
Given matrix is:
1 2 3
4 5 6
7 8 9
Transposed matrix is:
1 4 7
2 5 8
3 6 9

The value of the 3x3 Determinant is : 0
```

Thank You