



Assignment 1

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

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Problem Statement :-

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



Introduction :-

As we need to obtain the transpose and Determinant of a matrix, first we need to form a matrix. After writing code for forming a matrix we need to write the code for the program which will find the transpose of a matrix and then print it.

After that we would have to write a program which would obtain the determinant of the matrix and later print it if and only if matrix is of order 3×3 or 2×2 .



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.

```
1  #include <stdio.h>
2  int main()
3  {
4      int Matrix_Rows, Matrix_Columns;
5      // Code to Assign the number of Rows in the matrix.
6      do
7      {
8          printf("Enter the number of Rows of the Matrix row \n");
9          scanf("%d", &Matrix_Rows);
10     } while (Matrix_Rows < 1);
11     // Code to Assign the number of Columns in the matrix.
12     do
13     {
14         printf("Enter the number of Columns of the Matrix\n");
15         scanf("%d", &Matrix_Columns);
16     } while (Matrix_Columns < 1);
```



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