ASSIGNMENT 2 – 2D ARRAY

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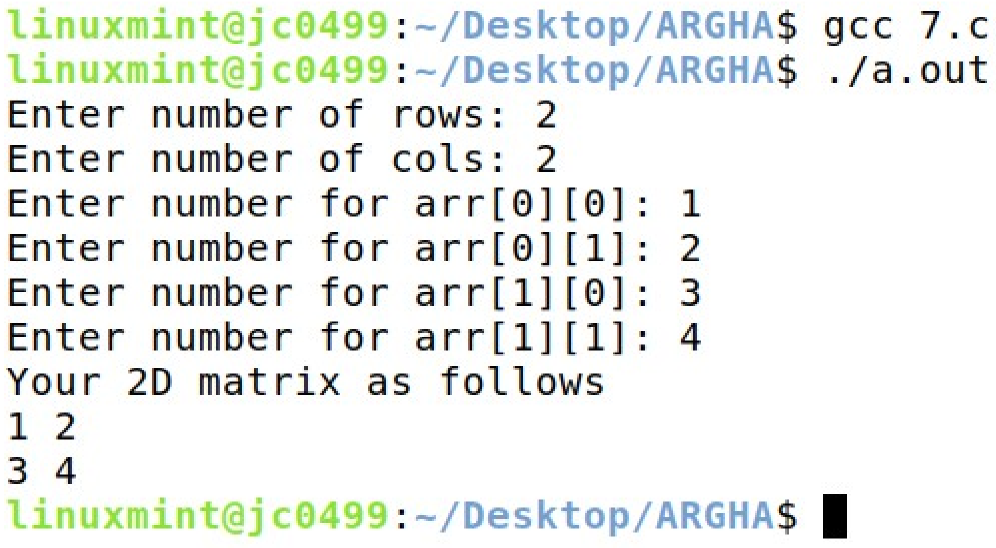
Q7. Write a C program to store the elements in a 2D array and display it & represent it in row major order.

Source Code:

```
#include<stdio.h>
int main(){
	int m, n;
	printf("Enter number of rows: ");
	scanf("%d",&m);
	printf("Enter number of cols: ");
	scanf("%d", &n);
	int arr[m][n];
	for(int i=0; i<m; i++) {
		for(int j=0; j<n; j++){
			printf("Enter number for arr[%d][%d]: ",i,j);
			scanf("%d", &arr[i][j]);
		}
	}
	printf("Your 2D matrix as follows\n");
	for(int i=0; i<m; i++) {
		for(int j=0; j<n; j++){
			printf("%d ", arr[i][j]);
		}
		printf("\n");
	}
}
```

Output:



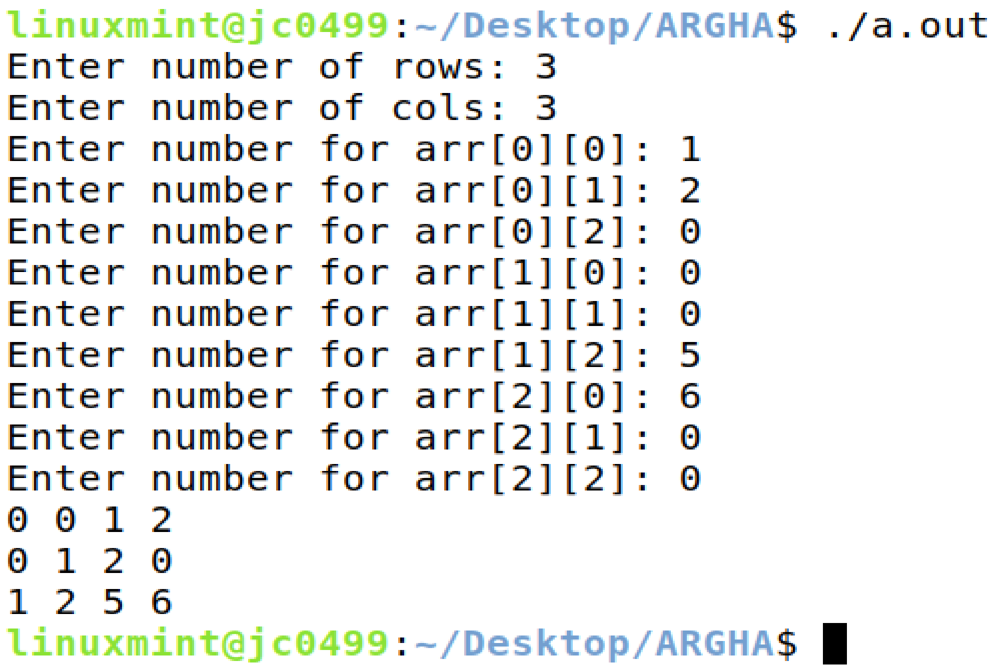
```
linuxmint@jc0499:~/Desktop/ARGHA$ gcc 7.c
linuxmint@jc0499:~/Desktop/ARGHA$ ./a.out
Enter number of rows: 2
Enter number of cols: 2
Enter number for arr[0][0]: 1
Enter number for arr[0][1]: 2
Enter number for arr[1][0]: 3
Enter number for arr[1][1]: 4
Your 2D matrix as follows
1 2
3 4
linuxmint@jc0499:~/Desktop/ARGHA$ 
```

Q8. Write a program to test a given matrix is parse or not. If it is parse then represent it in 3-tuple format.

Source Code:

```
#include<stdio.h>
int main(){
    int m, n;
    printf("Enter number of rows: ");
    scanf("%d",&m);
    printf("Enter number of cols: ");
    scanf("%d", &n);
    int arr[m][n];
    for(int i=0; i<m; i++) {
        for(int j=0; j<n; j++){
            printf("Enter number for arr[%d][%d]: ",i,j);
            scanf("%d", &arr[i][j]);
        }
    }

    int isSparse = 0, nonZeroCount = 0, zeroCount = 0;
    for(int i=0; i<m; i++) {
        for(int j=0; j<n; j++){
            if(arr[i][j] != 0) nonZeroCount++;
            else zeroCount++;
        }
    }
    if(zeroCount > nonZeroCount) {
        isSparse = 1;
    }

    if(isSparse == 1) {
    // represent it as 3 - tuple format
    int sparse[3][nonZeroCount], k = 0;
    for(int i=0; i<m; i++) {
        for(int j=0; j<n; j++){
            if(arr[i][j] != 0) {
                sparse[0][k] = i;
                sparse[1][k] = j;
                sparse[2][k] = arr[i][j];
                k++;
            }
        }
    }
    for(int i=0; i<3; i++) {
        for(int j=0; j<nonZeroCount; j++){
            printf("%d ", sparse[i][j]);
        }
        printf("\n");
    }
}

}
```

Output:



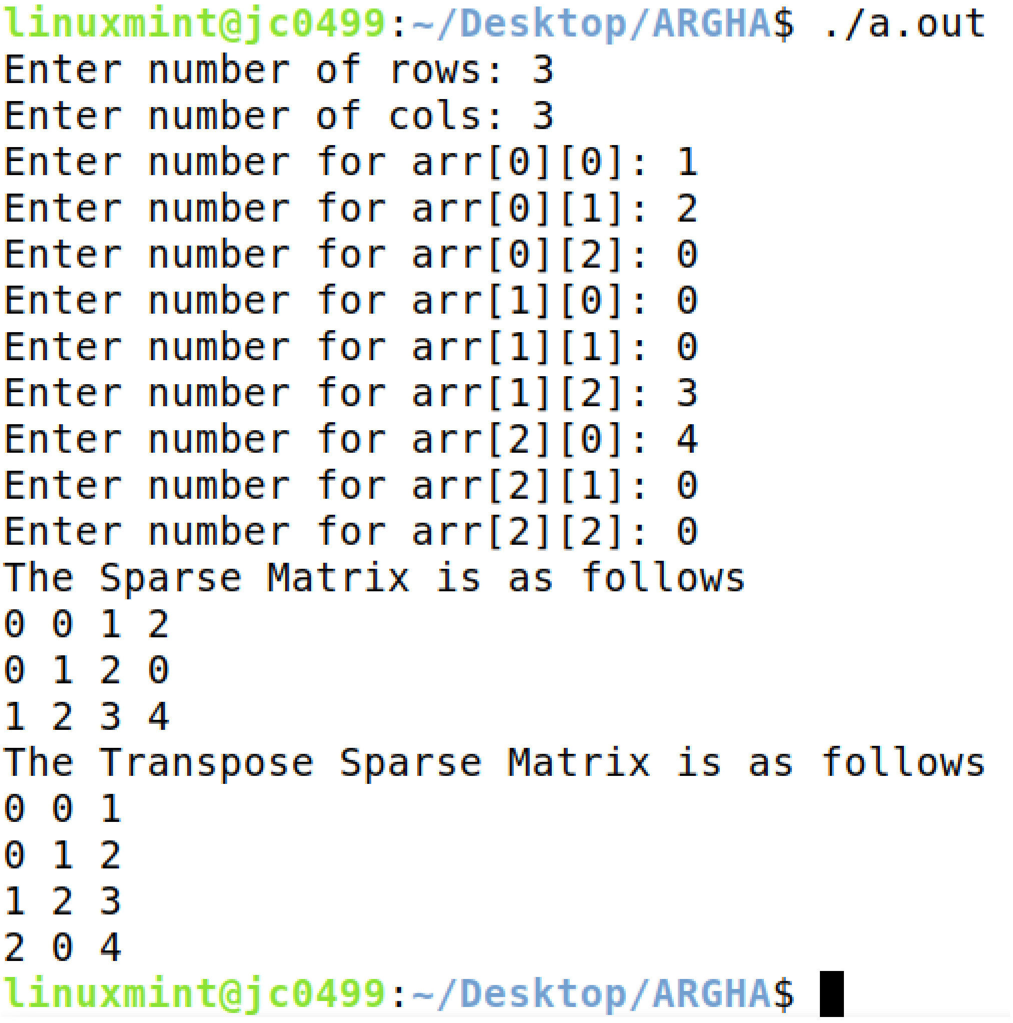
```
linuxmint@jc0499:~/Desktop/ARGHA$ ./a.out
Enter number of rows: 3
Enter number of cols: 3
Enter number for arr[0][0]: 1
Enter number for arr[0][1]: 2
Enter number for arr[0][2]: 0
Enter number for arr[1][0]: 0
Enter number for arr[1][1]: 0
Enter number for arr[1][2]: 5
Enter number for arr[2][0]: 6
Enter number for arr[2][1]: 0
Enter number for arr[2][2]: 0
0 0 1 2
0 1 2 0
1 2 5 6
linuxmint@jc0499:~/Desktop/ARGHA$ 
```

Q9. Write a C program to find the Tranpose the given matrix.

Source Code:

```
#include <stdio.h>
int main() {
  int m, n;
  printf("Enter number of rows: ");
  scanf("%d", &m);
  printf("Enter number of cols: ");
  scanf("%d", &n);
  int arr[m][n];
  for (int i = 0; i < m; i++) {
    for (int j = 0; j < n; j++) {
      printf("Enter number for arr[%d][%d]: ", i, j);
      scanf("%d", &arr[i][j]);
    }
  }

  int isSparse = 0, nonZeroCount = 0, zeroCount = 0;
  for (int i = 0; i < m; i++) {
    for (int j = 0; j < n; j++) {
      if (arr[i][j] != 0)
        nonZeroCount++;
      else
        zeroCount++;
    }
  }
  if (zeroCount > nonZeroCount) {
    isSparse = 1;
  }

  if (isSparse == 1) {
    // convert to 3 - tuple format
    int sparse[3][nonZeroCount], k = 0;
    int transposeSparse[nonZeroCount][3];
    for (int i = 0; i < m; i++) {
      for (int j = 0; j < n; j++) {
        if (arr[i][j] != 0) {
          sparse[0][k] = i;
          sparse[1][k] = j;
          sparse[2][k] = arr[i][j];
          k++;
        }
      }
    }

    // print the sparse matrix
    printf("The Sparse Matrix is as follows\n");
    for (int i = 0; i < 3; i++) {
      for (int j = 0; j < nonZeroCount; j++) {
        printf("%d ", sparse[i][j]);
      }
      printf("\n");
    }

    // find the transpose of the sparse matrix
    for (int i = 0; i < 3; i++) {
      for (int j = 0; j < nonZeroCount; j++) {
        transposeSparse[j][i] = sparse[i][j];
      }
    }

    // print the transpose of the sparse matrix
    printf("The Transpose Sparse Matrix is as follows\n");
    for (int i = 0; i < nonZeroCount; i++) {
      for (int j = 0; j < 3; j++) {
        printf("%d ", transposeSparse[i][j]);
      }
      printf("\n");
    }
  } else {
    printf("This is not a Sparse Matrix.\n");
  }
}
```

Output:



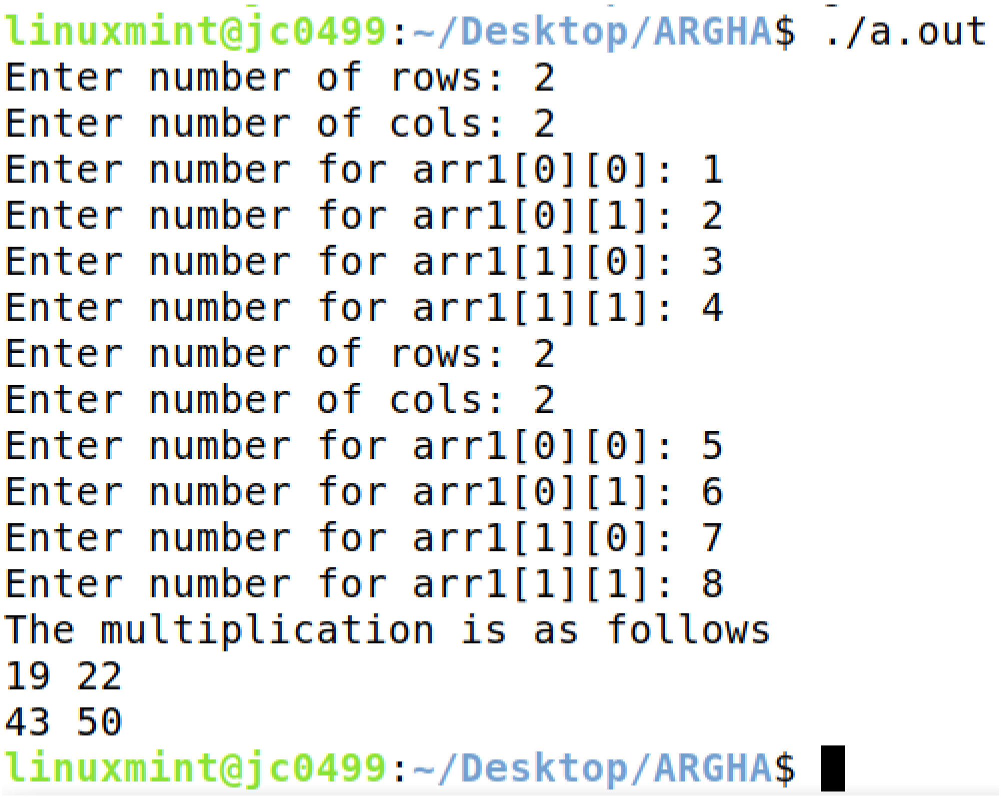
```
linuxmint@jc0499:~/Desktop/ARGHA$ ./a.out
Enter number of rows: 3
Enter number of cols: 3
Enter number for arr[0][0]: 1
Enter number for arr[0][1]: 2
Enter number for arr[0][2]: 0
Enter number for arr[1][0]: 0
Enter number for arr[1][1]: 0
Enter number for arr[1][2]: 3
Enter number for arr[2][0]: 4
Enter number for arr[2][1]: 0
Enter number for arr[2][2]: 0
The Sparse Matrix is as follows
0 0 1 2
0 1 2 0
1 2 3 4
The Transpose Sparse Matrix is as follows
0 0 1
0 1 2
1 2 3
2 0 4
linuxmint@jc0499:~/Desktop/ARGHA$ 
```

Q10. Write a C program to find the matrix multiplication of two given matrix.

Source Code:

```
#include <stdio.h>
int main() {
  // input first matrix
  int m1, n1;
  printf("Enter number of rows: ");
  scanf("%d", &m1);
  printf("Enter number of cols: ");
  scanf("%d", &n1);
  int arr1[m1][n1];
  for (int i = 0; i < m1; i++) {
    for (int j = 0; j < n1; j++) {
      printf("Enter number for arr1[%d][%d]: ", i, j);
      scanf("%d", &arr1[i][j]);
    }
  }

  // input second matrix
  int m2, n2;
  printf("Enter number of rows: ");
  scanf("%d", &m2);
  printf("Enter number of cols: ");
  scanf("%d", &n2);
  int arr2[m2][n2];
  for (int i = 0; i < m2; i++) {
    for (int j = 0; j < n2; j++) {
      printf("Enter number for arr1[%d][%d]: ", i, j);
      scanf("%d", &arr2[i][j]);
    }
  }

  if (n2 == m1) {
    // do multiplication
    int mulArr[m1][n2];
    for (int i = 0; i < m1; i++) {
      for (int j = 0; j < n2; j++) {
        mulArr[i][j] = 0;
        for (int k = 0; k < m1; k++) {
          mulArr[i][j] += arr1[i][k] * arr2[k][j];
        }
      }
    }

    // print the matrix
    printf("The multiplication is as follows\n");
    for (int i = 0; i < m1; i++) {
      for (int j = 0; j < n2; j++) {
        printf("%d ", mulArr[i][j]);
      }
      printf("\n");
    }
  } else {
    printf("Multiplication Not Possible.\n");
  }
}
```

Output:



```
linuxmint@jc0499:~/Desktop/ARGHA$ ./a.out
Enter number of rows: 2
Enter number of cols: 2
Enter number for arr1[0][0]: 1
Enter number for arr1[0][1]: 2
Enter number for arr1[1][0]: 3
Enter number for arr1[1][1]: 4
Enter number of rows: 2
Enter number of cols: 2
Enter number for arr1[0][0]: 5
Enter number for arr1[0][1]: 6
Enter number for arr1[1][0]: 7
Enter number for arr1[1][1]: 8
The multiplication is as follows
19 22
43 50
linuxmint@jc0499:~/Desktop/ARGHA$
```