

## Evaluation 3

### 1D ARRAYS - Lab 5

1. Find the largest and smallest element in a 1D array.

**Program:**

```
#include <stdio.h>
```

```
int main()
{
    int a[100],n;
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the size of array\n");
    scanf("%d",&n);
    printf("Enter the %d array elements\n",n);
    for(int i=0; i<n; i++)
    {
        scanf("%d",&a[i]);
    }
    int large, small;
    large=a[0];
    small=a[0];
    for(int i=1; i<n; i++)
    {
        if(a[i]>large)
        {
            large=a[i];
        }
        if(a[i]<small)
        {
            small=a[i];
        }
    }
    printf("The largest number in the 1D array is %d\n",large);
    printf("The smallest number in the 1D array is %d\n",small);

    return 0;
}
```

**Output:**

```
"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab5\LargestSmallestArray\LargestSmallestArray.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the size of array
6
Enter the 6 array elements
1 3 7 2 8 4
The largest number in the 1D array is 8
The smallest number in the 1D array is 1

Process returned 0 (0x0)   execution time : 9.217 s
Press any key to continue.
```

2. *Print all the prime numbers in a given 1D array.*

**Program:**

```
#include <stdio.h>
```

```
#include <math.h>
```

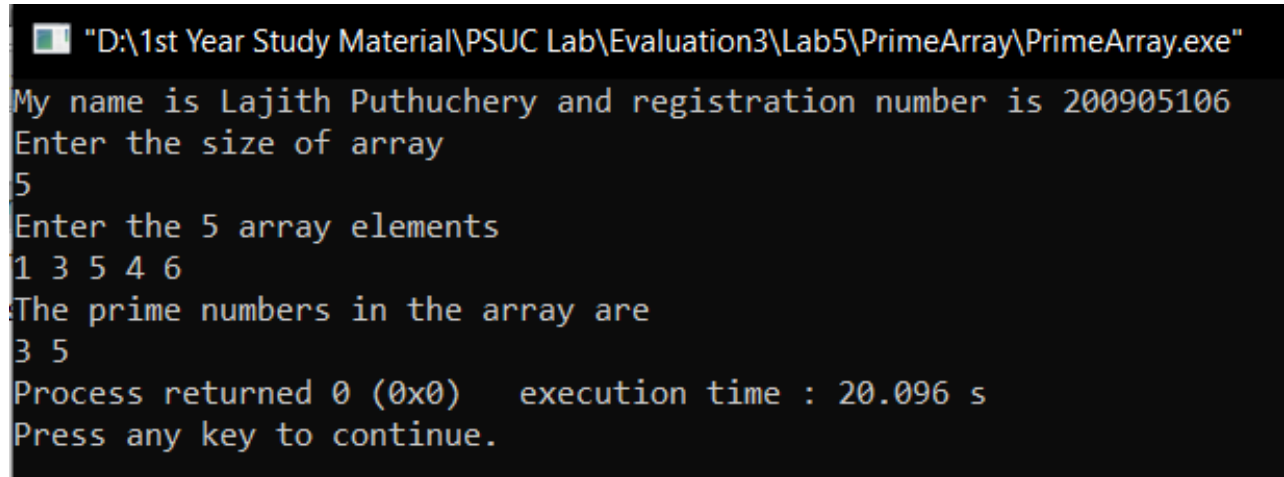
```
int main()
{
    int a[100],n;
    int flag=0;
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the size of array\n");
    scanf("%d",&n);
    printf("Enter the %d array elements\n",n);
    for(int i=0; i<n; i++)
    {
        scanf("%d",&a[i]);
    }
    printf("The prime numbers in the array are\n");
    for(int i=0; i<n; i++)    //Check prime condition
    {
        if(a[i]==1)
        {
            continue;
        }
        flag=0;
        for(int j=2; j<(a[i]); j++)
        {
            if(a[i]%j==0)
            {
                flag=1;
                break;
            }
        }
        if(flag==0)
        {
            printf("%d ",a[i]);
        }
    }
}
```

```

    }
}
return 0;
}

```

**Output:**



```

"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab5\PrimeArray\PrimeArray.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the size of array
5
Enter the 5 array elements
1 3 5 4 6
The prime numbers in the array are
3 5
Process returned 0 (0x0)   execution time : 20.096 s
Press any key to continue.

```

3. Arrange the given elements in a 1D array in ascending and descending order using bubble sort method. [Hint: use switch case (as case 'a' and case 'd') to specify the order].

**Program:**

```
#include <stdio.h>
```

```

int main()
{
    int a[100],n;
    int i,j;
    int temp;
    char x;
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the size of array\n");
    scanf("%d",&n);
    printf("Enter the %d array elements\n",n);
    for(int i=0; i<n; i++)
    {
        scanf("%d",&a[i]);
    }
    printf("Enter 'a' to arrange the array in ascending order and 'd' to arrange in descending
order\n");
    scanf(" %c",&x);
    for (i=0; i<n-1; i++)
    {
        for (j=0; j<n-i-1; j++)
        {
            if (a[j] > a[j+1])
            {
                temp=a[j];
                a[j]=a[j+1];

```

```

        a[j+1]=temp;
    }
}
switch(x)
{
    case 'a':
        printf("The array in ascending order is:\n");
        for(int i=0; i<n; i++)
        {
            printf("%d ",a[i]);
        }
        break;
    case 'd':
        printf("The array in descending order is:\n");
        for(int i=n-1; i>0; i--)
        {
            printf("%d ",a[i]);
        }
        break;
    default:
        break;
}
return 0;
}

```

#### Output:

```

"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab5\Buuble Sort\Bubble Sort.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the size of array
6
Enter the 6 array elements
8 7 3 4 6 3
Enter 'a' to arrange the array in ascending order and 'd' to arrange in descending order
a
The array in ascending order is:
3 3 4 6 7 8
Process returned 0 (0x0)   execution time : 10.401 s
Press any key to continue.

```

4. Insert an element into a 1D array by getting an element and the position from the user.

#### Program:

```

#include <stdio.h>
#include <math.h>

```

```

int main()
{
    int a[100],n;
    int ele,pos;
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the size of array\n");
}

```

```

scanf("%d",&n);
printf("Enter the %d array elements\n",n);
for(int i=0; i<n; i++)
{
    scanf("%d",&a[i]);
}
printf("Enter the element to be inserted\n");
scanf("%d",&ele);
printf("Enter the position where %d is to be inserted\n",ele);
scanf("%d",&pos);
for(int i=n-1; i>=pos; i--)
{
    a[i+1] = a[i];
}
a[pos]=ele;
n=n+1;
printf("The newly formed array after insertion of %d is\n",ele);
for(int i=0; i<n; i++)
{
    printf("%d ",a[i]);
}
return 0;
}

```

**Output:**

```

D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab5\Insert Element\Insert Element.exe
My name is Lajith Puthuchery and registration number is 200905106
Enter the size of array
6
Enter the 6 array elements
1 4 2 5 6 3
Enter the element to be inserted
8
Enter the position where 8 is to be inserted
2
The newly formed array after insertion of 8 is
1 4 8 2 5 6 3
Process returned 0 (0x0)   execution time : 17.413 s
Press any key to continue.

```

5. Search the position of the number that is entered by the user and delete that number from the array and display the resultant array elements.

**Program:**

```
#include <stdio.h>
```

```

int main()
{

```

```

int a[20],n;
int num,pos=-1;
printf("My name is Lajith Puthuchery and registration number is 200905106\n");
printf("Enter the size of the array\n");
scanf("%d",&n);
printf("Enter the %d array elements\n",n);
for(int i=0; i<n; i++)
{
    scanf("%d",&a[i]);
}
printf("Enter the number that you want to delete\n");
scanf("%d",&num);
//Linear Search
for(int i=0; i<n; i++)
{
    if(num==a[i])
    {
        pos=i;
        break;
    }
}
if(pos==-1)
{
    printf("The element does not exist in the array and hence the array stays as it is\n");
    for(int i=0; i<n; i++)
    {
        printf("%d ",a[i]);
    }
}
else
{
    for(int i=pos; i<n; i++)
    {
        a[i]=a[i+1];
    }
    n=n-1;
    printf("The array after deletion of %d is\n",num);
    for(int i=0; i<n; i++)
    {
        printf("%d ",a[i]);
    }
}
}

```

**Output:**

```

"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab5\Delete Element\Delete Element.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the size of the array
6
Enter the 6 array elements
1 9 8 2 5 3
Enter the number that you want to delete
2
The array after deletion of 2 is
1 9 8 5 3
Process returned 0 (0x0)   execution time : 29.466 s
Press any key to continue.

```

## 2D ARRAYS – Lab 6

1. Find whether a given matrix is symmetric or not. [Hint:  $A = A^T$ ]

**Program:**

```
#include <stdio.h>
```

```

int main()
{
    int a[20][20], transpose[20][20];
    int m, n;
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the dimensions of the matrix\n");
    scanf("%d %d", &m, &n);
    printf("Enter the %d matrix elements\n", m*n);
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)
        {
            scanf("%d", &a[i][j]);
        }
    }
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)
        {
            transpose[j][i]=a[i][j];
        }
    }

    printf("The original matrix is\n");
    for(int i=0; i<m; i++)

```

```

{
    for(int j=0; j<n; j++)
    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}

printf("The transpose matrix is\n");
for(int i=0; i<n; i++)
{
    for(int j=0; j<m; j++)
    {
        printf("%d ",transpose[i][j]);
    }
    printf("\n");
}

if(m==n)
{
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)
        {
            if(a[i][j]!=transpose[i][j])
            {
                printf("The matrix is not symmetric\n");
                exit(0);
            }
        }
    }
    printf("The matrix is symmetric");
}
else
{
    printf("The matrix is not symmetric");
}
return 0;
}

```

**Output:**



```
"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab6\Symmetric\Symmetric.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the dimensions of the matrix
3 3
Enter the 9 matrix elements
1 3 4 3 5 6 4 7 6
The original matrix is
1 3 4
3 5 6
4 7 6
The transpose matrix is
1 3 4
3 5 7
4 6 6
The matrix is not symmetric

Process returned 0 (0x0)   execution time : 46.716 s
Press any key to continue.
```

2. Find the trace and norm of a given square matrix. [Hint: Trace= sum of principal diagonal elements Norm= SQRT (sum of squares of the individual elements of an array)]

**Program:**

```
#include <stdio.h>
```

```
#include <math.h>
```

```
int main()
```

```
{
```

```
    int a[20][20];
```

```
    int m,n;
```

```
    int trace=0;
```

```
    float norm=0;
```

```
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
```

```
    printf("Enter the dimensions of the matrix\n");
```

```
    scanf("%d %d",&m,&n);
```

```
    printf("Enter the %d matrix elements\n",n*n);
```

```
    for(int i=0; i<m; i++)
```

```
    {
```

```
        for(int j=0; j<n; j++)
```

```
        {
```

```
            scanf("%d",&a[i][j]);
```

```
        }
```

```
    }
```

```
    printf("The entered matrix is\n");
```

```

//Display the matrix
for(int i=0; i<m; i++)
{
    for(int j=0; j<n; j++)
    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}
//TraceNorm
if(m==n)
{
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)
        {
            if(i==j)
            {
                trace+=a[i][j];
            }
            norm+=pow(a[i][j],2);
        }
    }
    norm=sqrt(norm);
    printf("The trace of the matrix is %d\n",trace);
    printf("The norm of the matrix is %f",norm);
}
else
{
    printf("Trace exists only for a square matrix\n");
}
return 0;
}

```

**Output:**

```

D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab6\TraceNorm\TraceNorm.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the dimensions of the matrix
3 3
Enter the 9 matrix elements
1 9 2 8 3 7 4 6 5
The entered matrix is
1 9 2
8 3 7
4 6 5
The trace of the matrix is 9
The norm of the matrix is 16.881943
Process returned 0 (0x0)   execution time : 10.144 s
Press any key to continue.

```

3. Perform matrix multiplication.

**Program:**

```
#include <stdio.h>
```

```
#include <math.h>
```

```
int main()
```

```
{
```

```
    int a[20][20],b[20][20],c[20][20];
```

```
    int m,n,p,q;
```

```
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
```

```
    printf("Enter the dimensions of the first matrix\n");
```

```
    scanf("%d %d",&m,&n);
```

```
    printf("Enter the %d matrix elements\n",m*n);
```

```
    for(int i=0; i<m; i++)
```

```
    {
```

```
        for(int j=0; j<n; j++)
```

```
        {
```

```
            scanf("%d",&a[i][j]);
```

```
        }
```

```
    }
```

```
    printf("Enter the dimensions of the second matrix\n");
```

```
    scanf("%d %d",&p,&q);
```

```
    printf("Enter the %d matrix elements\n",p*q);
```

```
    for(int i=0; i<p; i++)
```

```
    {
```

```
        for(int j=0; j<q; j++)
```

```
        {
```

```

        scanf("%d",&b[i][j]);
    }
}

//Display the matrix
printf("The first matrix is\n");
for(int i=0; i<m; i++)
{
    for(int j=0; j<n; j++)
    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}

printf("The second matrix is\n");
for(int i=0; i<p; i++)
{
    for(int j=0; j<q; j++)
    {
        printf("%d ",b[i][j]);
    }
    printf("\n");
}

//Matrix Multiplication
if(n==p)
{
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<q; j++)
        {
            c[i][j]=0;
            for(int k=0; k<p; k++)
            {
                c[i][j]+=a[i][k]*b[k][j];
            }
        }
    }
}
//Display the product
printf("The product matrix is\n");
for(int i=0; i<m; i++)
{
    for(int j=0; j<q; j++)
    {
        printf("%d ",c[i][j]);
    }
}

```

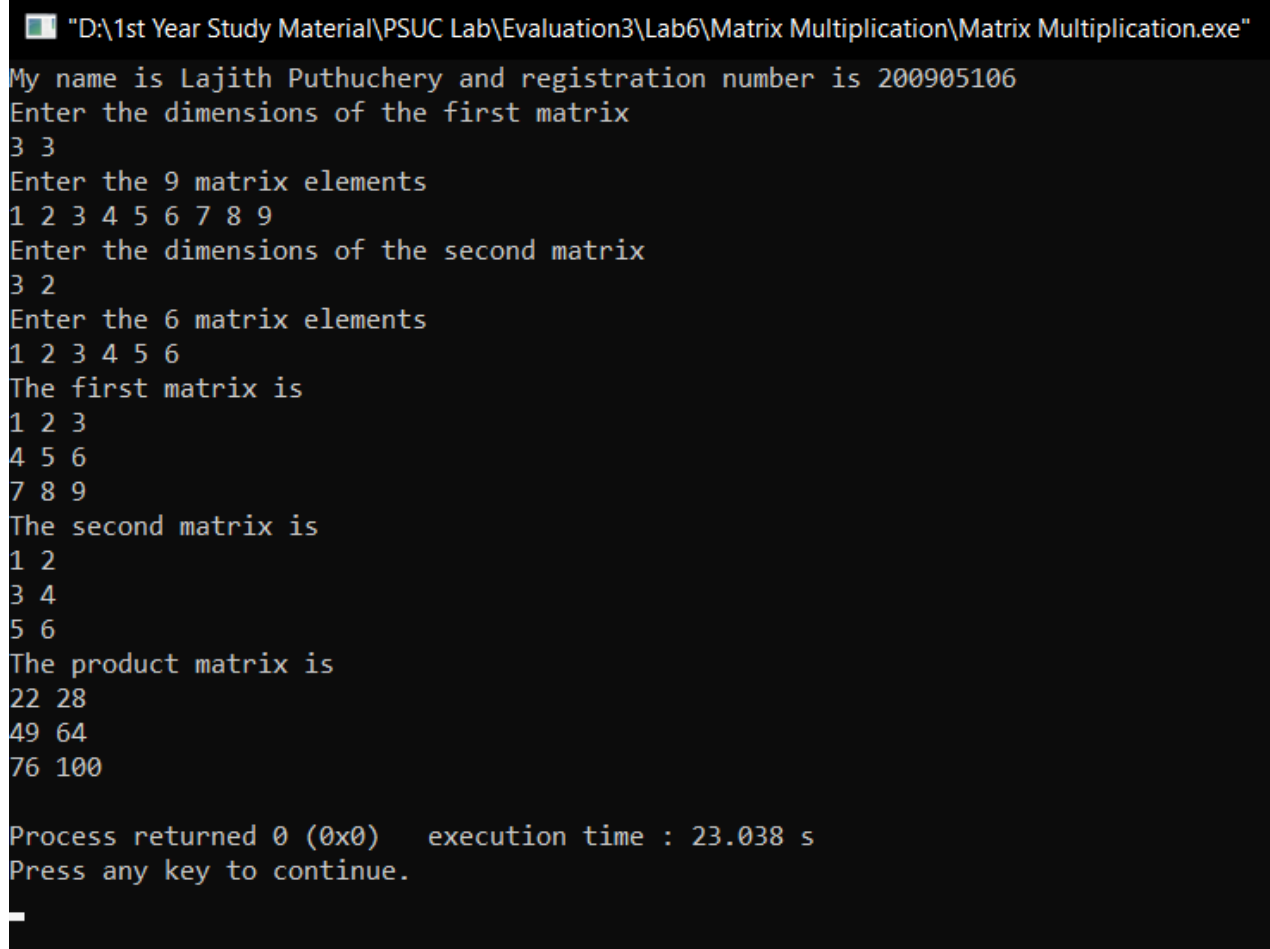
```

        printf("\n");
    }
}
else
{
    printf("Matrix multiplication is not compatible with the above matrices");
}

return 0;
}

```

**Output:**



```

"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab6\Matrix Multiplication\Matrix Multiplication.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the dimensions of the first matrix
3 3
Enter the 9 matrix elements
1 2 3 4 5 6 7 8 9
Enter the dimensions of the second matrix
3 2
Enter the 6 matrix elements
1 2 3 4 5 6
The first matrix is
1 2 3
4 5 6
7 8 9
The second matrix is
1 2
3 4
5 6
The product matrix is
22 28
49 64
76 100

Process returned 0 (0x0)   execution time : 23.038 s
Press any key to continue.

```

4. To interchange the primary and secondary diagonal elements in the given Matrix.

**Program:**

```
#include <stdio.h>
```

```

int main()
{
    int a[20][20],n,p,q,x,y,temp;
    printf("M name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the number of rows/columns of the square matrix\n");
    scanf("%d",&n);
    printf("Enter the %d matrix elements\n",n*n);
    for(int i=0; i<n; i++)

```

```

{
    for(int j=0; j<n; j++)
    {
        scanf("%d",&a[i][j]);
    }
}
printf("The original matrix is\n");
for(int i=0; i<n; i++)
{
    for(int j=0; j<n; j++)
    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}

//Interchange of diagonals
for(int i=0; i<n; i++)
{
    for(int j=0; j<n; j++)
    {
        if(i==j)
        {
            temp=a[i][j];
            a[i][j]=a[i][n-1-j];
            a[i][n-1-j]=temp;
        }
    }
}
printf("The matrix after interchanging of primary and secondary diagonals is\n",x,y);
for(int i=0; i<n; i++)
{
    for(int j=0; j<n; j++)
    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}
return 0;
}

```

**Output:**

```
"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab6\Interchange Diagonals\Interchange Diagonals.exe"
M name is Lajith Puthuchery and registration number is 200905106
Enter the number of rows/columns of the square matrix
3
Enter the 9 matrix elements
1 2 3 4 5 6 7 8 9
The original matrix is
1 2 3
4 5 6
7 8 9
The matrix after interchanging of primary and secondary diagonals is
3 2 1
4 5 6
9 8 7

Process returned 0 (0x0)   execution time : 23.533 s
Press any key to continue.
_
```

5. Interchange any two Rows & Columns in the given Matrix.

**Program:**

```
#include <stdio.h>
```

```
int main()
{
    int a[20][20],m,n,p,q,x,y,temp;
    printf("M name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the dimensions of the matrix");
    scanf("%d %d",&m,&n);
    printf("Enter the %d matrix elements",m*n);
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    printf("The original matrix is\n");
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)
        {
            printf("%d ",a[i][j]);
        }
        printf("\n");
    }
    printf("\nEnter row number to be exchanged : ");
    scanf("%d", &p);
    printf("\nEnter other row number to be exchanged with : ");
```

```

scanf("%d",&q);

//Row Exchange
for(int i=0; i<n; i++)
{
    temp=a[p-1][i];
    a[p-1][i]=a[q-1][i];
    a[q-1][i]=temp;
}

printf("The matrix after exchange of rows %d and %d is\n",p,q);
for(int i=0; i<m; i++)
{
    for(int j=0; j<n; j++)
    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}

printf("\nEnter column number to be exchanged : ");
scanf("%d", &x);
printf("\nEnter other column number to be exchanged with : ");
scanf("%d",&y);

//Column Exchange
for(int i=0; i<m; i++)
{
    temp=a[i][x-1];
    a[i][x-1]=a[i][y-1];
    a[i][y-1]=temp;
}

printf("The matrix after exchange of columns %d and %d is\n",x,y);
for(int i=0; i<m; i++)
{
    for(int j=0; j<n; j++)
    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}
return 0;
}

```

**Output:**



```

"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab6\Interchange Row&Column\InterchangeRowColumn.exe"
M name is Lajith Puthuchery and registration number is 200905106
Enter the dimensions of the matrix
3 4
Enter the 12 matrix elements
5 4 3 2 1 6 7 8 9 8 7 6
The original matrix is
5 4 3 2
1 6 7 8
9 8 7 6

Enter row number to be exchanged : 1

Enter other row number to be exchanged with : 3
The matrix after exchange of rows 1 and 3 is
9 8 7 6
1 6 7 8
5 4 3 2

Enter column number to be exchanged : 1

Enter other column number to be exchanged with : 4
The matrix after exchange of columns 1 and 4 is
2 4 3 5
8 6 7 1
6 8 7 9

Process returned 0 (0x0)   execution time : 25.781 s
Press any key to continue.

```

6. Search for an element in a given matrix and count the number of its occurrences.

**Program:**

```

#include <stdio.h>
int main()
{
    int a[20][20];
    int m,n,num,count=0;
    printf("My name is Lajith Puthuchery and registration number is 200905106\n");
    printf("Enter the dimensions of the matrix\n");
    scanf("%d %d",&m,&n);
    printf("Enter the %d matrix elements\n",m*n);
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)
        {
            scanf("%d",&a[i][j]);
        }
    }

    //Display the matrix
    for(int i=0; i<m; i++)
    {
        for(int j=0; j<n; j++)

```

```

    {
        printf("%d ",a[i][j]);
    }
    printf("\n");
}

printf("Enter the element to be searched and counted\n");
scanf("%d",&num);

for(int i=0; i<m; i++)
{
    for(int j=0; j<n; j++)
    {
        if(num==a[i][j])
        {
            count++;
        }
    }
}

printf("The frequency of the element %d in the matrix is %d",num,count);
return 0;
}

```

**Output:**

```

"D:\1st Year Study Material\PSUC Lab\Evaluation3\Lab6\Frequency\Frequency.exe"
My name is Lajith Puthuchery and registration number is 200905106
Enter the dimensions of the matrix
3 4
Enter the 12 matrix elements
8 2 2 1 5 8 4 3 7 6 8 1
Enter the element to be searched and counted
8
The frequency of the element 8 in the matrix is 3
Process returned 0 (0x0)   execution time : 18.762 s
Press any key to continue.

```