LAB SESSION 5

Question: Find the sum of all elements in a 2D array.

Code:

```cpp
#include <iostream>
using namespace std;

int startlab5()
{
    cout << "Name: Saad Ali Khan(SE-23083)" << endl;
    cout << "Start of Lab 05" << endl;
    return 0;
}

int l5q1()
{
    int matrix[3][3] = {
        {1, 2, 3},
        {4, 5, 6},
        {7, 8, 9}};

    int sum = 0;
    for (int i = 0; i < 3; ++i)
    {
        for (int j = 0; j < 3; ++j)
        {
            sum += matrix[i][j];
        }
    }

    cout << "Sum of all elements: " << sum << endl;
    return 0;
}

int main()
{
    startlab5();
    l5q1();
    return 0;
}
```

OUTPUT:

```
Name: Saad Ali Khan(SE-23083)
Start of Lab 05
Sum of all elements: 45
PS D:\SE\oops_labs>
```

Question: Calculate the transpose of a given matrix.

Code:

```cpp
#include <iostream>
using namespace std;

int startlab5()
{
    cout << "Name: Saad Ali Khan(SE-23083)" << endl;
    cout << "Lab 05" << endl;
    return 0;
}

int l5q2()
{
    int matrix[3][3] = {
        {1, 2, 3},
        {4, 5, 6},
        {7, 8, 9}};

    int transpose[3][3];

    for (int i = 0; i < 3; ++i)
    {
        for (int j = 0; j < 3; ++j)
        {
            transpose[j][i] = matrix[i][j];
        }
    }

    cout << "Transpose of the matrix:" << endl;
    for (int i = 0; i < 3; ++i)
    {
        for (int j = 0; j < 3; ++j)
        {
            cout << transpose[i][j] << " ";
        }
        cout << endl;
```

```
    }

    return 0;
}


int main()
{
    startlab5();
    l5q2();
    return 0;
}
```

Output:

```
Name: Saad Ali Khan(SE-23083)
Lab 05
Transpose of the matrix:
1 4 7
2 5 8
3 6 9
PS D:\SE\oops_labs>
```

Question: Check if a matrix is symmetric or not.

Code:

```
#include <iostream>
using namespace std;

int startlab5()
{
    cout << "Name: Saad Ali Khan(SE-23083)" << endl;
    cout << "Lab 05" << endl;
    return 0;
}

bool isSymmetric(int matrix[3][3])
{
    for (int i = 0; i < 3; ++i)
    {
        for (int j = 0; j < 3; ++j)
```

```cpp
        {
            if (matrix[i][j] != matrix[j][i])
            {
                return false;
            }
        }
    }
    return true;
}

int l5q3()
{
    int matrix[3][3] = {
        {1, 2, 3},
        {2, 5, 6},
        {3, 6, 9}};

    if (isSymmetric(matrix))
    {
        cout << "The matrix is symmetric." << endl;
    }
    else
    {
        cout << "The matrix is not symmetric." << endl;
    }

    return 0;
}

int main()
{
    startlab5();
    l5q3();
    return 0;
}
```

Output:

```
Name: Saad Ali Khan(SE-23083)
Lab 05
The matrix is symmetric.
PS D:\SE\oops_labs>
```

Question: Multiply two matrices and print the result.

Code:

```cpp
#include <iostream>
using namespace std;

int startlab5()
{
    cout << "Name: Saad Ali Khan(SE-23083)" << endl;
    cout << "Lab 05" << endl;
    return 0;
}

int l5q4()
{
    int matrix1[2][3] = {
        {1, 2, 3},
        {4, 5, 6}};

    int matrix2[3][2] = {
        {7, 8},
        {9, 10},
        {11, 12}};

    int result[2][2] = {0};

    for (int i = 0; i < 2; ++i)
    {
        for (int j = 0; j < 2; ++j)
        {
            for (int k = 0; k < 3; ++k)
            {
                result[i][j] += matrix1[i][k] * matrix2[k][j];
            }
        }
    }

    cout << "Resultant matrix after multiplication:" << endl;
    for (int i = 0; i < 2; ++i)
    {
        for (int j = 0; j < 2; ++j)
        {
            cout << result[i][j] << " ";
        }
```

```
        cout << endl;
    }

    return 0;
}

int main()
{
    startlab5();
    l5q4();
    return 0;
}
```

Output:

```
Name: Saad Ali Khan(SE-23083)
Lab 05
Resultant matrix after multiplication:
58 64
139 154
PS D:\SE\oops_labs>
```

Question: Find the largest element in each row of a matrix.

Code:

```cpp
#include <iostream>
#include <algorithm>
using namespace std;

int startlab5()
{
    cout << "Name: Saad Ali Khan(SE-23083)" << endl;
    cout << "Lab 05" << endl;
    return 0;
}

int l5q5()
{
    int matrix[3][3] = {
        {1, 2, 3},
        {4, 5, 6},
        {7, 8, 9}};
```

```cpp
    for (int i = 0; i < 3; ++i)
    {
        int maxElement = *max_element(matrix[i], matrix[i] + 3);
        cout << "Largest element in row " << i + 1 << ": " << maxElement << endl;
    }

    return 0;
}

int main()
{
    startlab5();
    l5q5();
    return 0;
}
```

Output:

```
Name: Saad Ali Khan(SE-23083)
Lab 05
Largest element in row 1: 3
Largest element in row 2: 6
Largest element in row 3: 9
PS D:\SE\oops_labs>
```