C++ - LAB-4

Name: Vivaan Shiromani

Reg.No: 201900189

Date: 8/02/2021

Lab Guided By: Prof. Ashis Datta Sir.

Q-12: Write a C++ Program to for matrix operation using switch-case.
(a) add two matrix
(b) subtract two matrix
(c) multiply two matrix
(d) transpose of a matrix

Ans: Source code

```
#include <bits/stdc++.h>
using namespace std;

void add(int m, int n, int **a, int **b)
{
    int i,j, sum[m][n];
    cout << "You are in addition function\n";
    for(i=0; i<m; i++)
    {
        for(j=0; j<n; j++)
        sum[i][j]=a[i][j] + b[i][j];
    }
    cout << "The elements after addition are:\n";
    for(i=0; i<m; i++)
    {
        cout << "\n";
        for(j=0; j<n; j++)
        cout << "\t" << " " <<   sum[i][j];
    }

}
void sub(int **a, int **b, int m , int n)
{
    int i,j, s[m][n];
    cout << "You are in substraction function\n";
```

```
    for(i=0; i<m; i++)
    {
        for(j=0; j<n; j++)
        s[i][j]=a[i][j] - b[i][j];
    }
    cout << "The elements after substraction are:\n";
    for(i=0; i<m; i++)
    {
        cout << "\n";
        for(j=0; j<n; j++)
        cout << "\t" << " " <<   s[i][j];
    }
}
void mul(int **a, int **b, int m, int n, int m1, int n1)
{
    int mal[m][n1], i, j, k;  // rows of first matrix and cols of secon
d matrix
    for(i=0; i<m; i++)
    {
        for(j=0; j<n1; j++)
        {
            mal[i][j]=0;
            for(k=0; k<n1; j++)
                mal[i][j] += a[i][k] * b[k][j];
        }
    }
    cout << "The elements after matrix multiplication are:\n";

    for(i=0; i<m; i++)
    {
        cout << "\n";
        for(j=0; j<n1; j++)
        {
            cout << "\t" << " " << mal[i][j];
        }
    }

}
void trans(int **a, int **b, int m, int n, int m1, int n1)
{
    int i, j, transmata[m][n], transmatb[m1][n1];

    // transpose of mat a
    cout << "transpose of mat a\n";
    for(i=0; i<m; i++)
    {
```

```
        for(j=0; j<n; j++)
        transmata[i][j]=a[j][i];
    }

    for(i=0; i<m; i++)
    {
        cout << "\n";
        for(j=0; j<n; j++)
        {
            cout << "\t" << " " << transmata[i][j];
        }
    }

    cout << "\n";
    // transpose of mat b
    cout << "transpose of mat b\n";
    for(i=0; i<m1; i++)
    {
        for(j=0; j<n1; j++)
        transmatb[i][j]=b[j][i];
    }

    for(i=0; i<m1; i++)
    {
        cout << "\n";
        for(j=0; j<n1; j++)
        {
            cout << "\t" << " " << transmatb[i][j];
        }
    }
}

int main()
{
    int n, m, **a, **b , i, j, m1, n1, e;
    cout << "Enter rows and cols of 1st matrix resp.: ";
    cin >> m >> n;

    a=new int*[m]; // array of pointers of size rows

    for(i=0; i<m; i++)
    {
        a[i]=new int[n]; // memory allo of cols using array of pointers
    }

    // insert values
```

```
    for(i=0; i<m; i++)
    {
        for(j=0; j<n; j++)
        {
            cout << "\na" << "[" << i << "]" <<  "[" << j << "]" << " =
 ";
            cin >> a[i][j];
        }
    }

    cout << "Enter rows and cols of 2nd matrix resp.: ";
    cin >> m1 >> n1;

    b=new int*[m1]; // array of pointers of size rows

    for(i=0; i<m1; i++)
    {
        b[i]=new int[n1]; // memory allo of cols using array of pointer
s
    }

    // insert values
    for(i=0; i<m1; i++)
    {
        for(j=0; j<n1; j++)
        {
            cout << "\nb" << "[" << i << "]" <<  "[" << j << "]" << " =
 ";
            cin >> b[i][j];
        }
    }


        e=1;
        while(e)
    {
        cout << "\nPress 1 for add, 2 for sub, 3 for mul, 4 for transpo
se, 0 to terminate: ";
        cin >> e;
        switch (e)
        {
        case 1:
        {
            if(m != m1 || n != n1)
            {
                cout << "The rows or cols are not equal to matrix 1\n";
```

```
            e=0;
            break;
        }
        else
        {
            add(m,n,a,b);
            break;
        }
    }
    case 2:
    {
        if(m != m1 || n != n1)
        {
            cout << "The rows or cols are not equal to matrix 1\n";
            e=0;
            break;
        }
        else
        {
            sub(a, b, m, n);
            break;
        }
    }
    case 3:
    {
        if(n != m1)
        {
            cout << "Mul cannot happen\n";
            e=0;
            break;
        }
        else
        {
        mul(a, b, m, n, m1, n1);
        break;
        }
    }
    case 4:
    {
        trans(a, b, m, n, m1, n1);
        break;
    }
    case 5:
    {
        cout << "EXIT\n";
        break;
```

```
        }
        default:
        {
            e=0;
            break;
        }
        }
    }

    return 0;
}
```

Output:

Enter rows and cols of 1st matrix resp.: 2 2

a[0][0] = 1

a[0][1] = 2

a[1][0] = 3

a[1][1] = 4

Enter rows and cols of 2nd matrix resp.: 2 2

b[0][0] = 3

b[0][1] = 4

b[1][0] = 5

b[1][1] = 6

Press 1 for add, 2 for sub, 3 for mul, 4 for transpose, 0 to terminate: 1

You are in addition function

The elements after addition are:

4 6

8 10

Press 1 for add, 2 for sub, 3 for mul, 4 for transpose, 0 to terminate: 2

You are in substraction function

The elements after substraction are:

-2 -2

-2 -2

Press 1 for add, 2 for sub, 3 for mul, 4 for transpose, 0 to terminate: 3

The elements after matrix multiplication are:

3 4

9 12

Press 1 for add, 2 for sub, 3 for mul, 4 for transpose, 0 to terminate: 4

transpose of mat a

1 3

2 4

transpose of mat b

3 5

4 6

Press 1 for add, 2 for sub, 3 for mul, 4 for transpose, 0 to terminate: 0

Q-13: Write a C++ Program to Sort the Array in an Ascending Order

Ans: Source Code:

```
#include <bits/stdc++.h>
using namespace std;
int main()
{
    int n, i, temp, j;
    cout << "Enter the size of array: ";
    cin >> n;
    int a[n];

    cout << "Enter the elements in the array:\n";

    for(i=0; i<n; i++)
    {
        cout << "\na" << "[" << i << "]" << " = ";
        cin >> a[i];
    }

    // now to sort the array

    for(i=0; i<n; 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;
            }
        }
    }

    cout << "The array in sorted order is:\n";

    for(i=0; i<n; i++)
    {
        cout << a[i] << " ";
    }

    return 0;
}
```

Output:

Enter the size of array: 5

Enter the elements in the array:

a[0] = 12

a[1] = 19

a[2] = 10

a[3] = 3

a[4] = 6

The array in sorted order is:

3 6 10 12 19

Q-14: Write a C++ Program to print the array index and array element using pointer

Ans: Source Code:

```
#include <bits/stdc++.h>
using namespace std;
int main()
{
    int n, i;
    cout << "enter the size of array: ";
    cin >> n;
    int a[n], *ptr;
    ptr=a;

    for(i=0; i<n; i++)
```

```
    {
    cout << "\na" << "[" << i << "]" << " = ";
    cin >> a[i];
    }

    cout << "The values of array are:\n";
    for(i=0; i<n; i++)
    {
        cout << *(ptr+i) << "\n";
    }

    cout << "The indexes of array are:\n";
    for(i=0; i<n; i++)
    {
        cout << i << "\n";
    }

    return 0;
}
```

Output:

enter the size of array: 5

a[0] = 1

a[1] = 2

a[2] = 3

a[3] = 45

a[4] = 12

The values of array are:

1

2

3

45

12

The indexes of array are:

0

1

2

3

4

Q-15: Write a C++ Program to swap two numbers using call by pointer variables

Ans: Source Code:

```
#include <bits/stdc++.h>
using namespace std;

int main()
{
    int a, *ptra, b, *ptrb, temp;

    ptra=&a;
    ptrb=&b;
    cout << "Enter two values:\n";
    cin >> a >> b;
    cout << "Values before swap: a=" << *ptra << " , b=" << *ptrb << "\
n";

    temp=*ptrb;
    *ptrb=*ptra;
    *ptra=temp;
```

```
    cout << "Values after swap: a=" << *ptra << " , b=" << *ptrb;


    return 0;
}
```

Output:

Enter two values:

2 3

Values before swap: a=2 , b=3

Values after swap: a=3 , b=2

Q-16: Create a structure Student with data members name, roll_no & marks. Implement the functions getdata(), showdata() for input and display the details of a student. Using switch case write a menu driven main function for the following tasks:
(a) Take input for 5 students
(b) Display all the student's information in details in tabular form.
(c) Sort the student list w.r.t. roll_no and display all in tabular form.
(d) Sort the student list w.r.t. marks and display all in tabular form.
(e) Sort the student list w.r.t. name and display all in tabular form.

Ans:
```
#include <bits/stdc++.h>

using namespace std;
struct student
    {
        int roll_number[5];
        string name[6];
        float marks[5];
    };
```

```
    student a;

void getdata(void)
{
    int i;

    cout << "Enter student roll number\n";
    for(i=0; i<5; i++)
    {
        cout << "\nStudent: " << i+1 << "-";
        cin >> a.roll_number[i];
    }

    cout << "Enter student name\n";
    for(i=0; i<6; i++)
    {
        //cout << "\nStudent: " << i+1 << "-";
        getline(cin, a.name[i]);
    }

    cout << "Enter student marks\n";
    for(i=0; i<5; i++)
    {
        cout << "\nStudent: " << i+1 << "-";
        cin >> a.marks[i];
    }
}
void displaydata(void)
{
    // display in sorted order
    int i, j, temp;
    string temp1;

    // for roll number
    for(i=0; i<5; i++)
    {
        for(j=0; j<5-i-1; j++)
        {
            if(a.roll_number[j] > a.roll_number[j+1])
            {
                temp=a.roll_number[j];
                a.roll_number[j]=a.roll_number[j+1];
                a.roll_number[j+1]=temp;
            }
        }
    }
```

```
    cout << "Sorted order of roll numbers:\n";
    for(i=0; i<5; i++)
    {
        cout << a.roll_number[i] << "\n";
    }

    // for marks
    for(i=0; i<5; i++)
    {
        for(j=0; j<5-i-1; j++)
        {
            if(a.marks[j] > a.marks[j+1])
            {
                temp=a.marks[j];
                a.marks[j]=a.marks[j+1];
                a.marks[j+1]=temp;
            }
        }
    }
    cout << "Sorted order of marks:\n";
    for(i=0; i<5; i++)
    {
        cout << a.marks[i] << "\n";
    }

    // for names

    for(i=0; i<5; i++)
    {
        for(j=0; j<5-i; j++)
        {
            if(a.name[j] > a.name[j+1])
            {
                temp1=a.name[j];
                a.name[j]=a.name[j+1];
                a.name[j+1]=temp1;
            }
        }
    }
    cout << "Sorted order of names:\n";

    for(i=0; i<6; i++)
    {
        cout << a.name[i] << "\n";
    }
```

```
}

int main()
{
    int n, e;

    e=1;
    while(e)
    {
    cout << "Press 1 to input user details, 2 to display all details in
 sorted order, 3 to terminate\n";
    cout << "Enter your option: ";
    cin >> n;
        switch(n)
        {
            case 1:
            {
                getdata();
                break;
            }
            case 2:
            {
                displaydata();
                break;
            }
            case 3:
            {
                e=0;
                break;
            }
        }
    }

    return 0;
}
```

Output:

Press 1 to input user details, 2 to display all details in sorted order, 3 to terminate

Enter your option: 1

Enter student roll number

Student: 1-20

Student: 2-19

Student: 3-12

Student: 4-13

Student: 5-14

Enter student name

ram

abhishek

rohan

rahul

yash

Enter student marks

Student: 1-12

Student: 2-13

Student: 3-19

Student: 4-20

Student: 5-11

Press 1 to input user details, 2 to display all details in sorted order, 3 to terminate

Enter your option: 2

Sorted order of roll numbers:

12

13

14

19

20

Sorted order of marks:

11

12

13

19

20

Sorted order of names:

abhishek

rahul

ram

rohan

yash