# Practical-8

## Q. Program to create a matrix class and perform basic matrix functions .

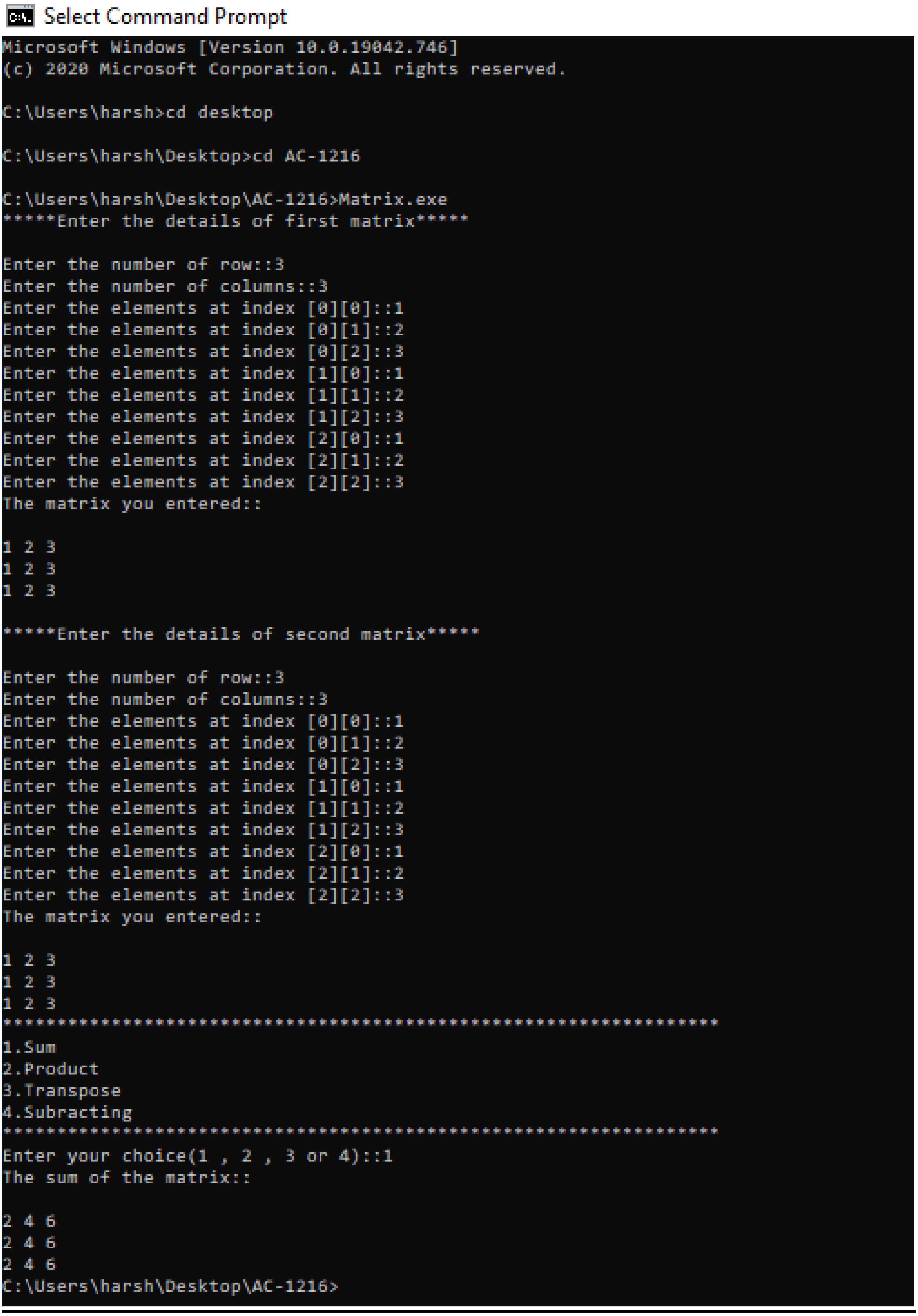
## Code:-

```
//Harsh Bamotra AC-1216
//Program to perform matrix function using matrix class

#include <iostream>
using namespace std;

//************************* Defining matrix class ************************//

class matrix
  {
        private:
        int row , col;                          //defining private members

        public:
        int arr[10][10];                          //defining public members
        void setData(int n1 , int n2)             //defining function to take input in the private members
              {
                    row=n1;                 //initializing private members
                    col=n2;
              }

        void create_arr()                                 //defining function to create a matrix by taking matrix elements
              {
                    for(int i=0 ; i<row ; i++)
                          {
                                for(int j=0 ; j<col ; j++)
                                      {
                                            cout << "Enter the elements at index [" << i << "][" << j << "]::";
                                            cin >> arr[i][j];
                                      }
                          }
              }

        void display_arr()                              //defining function to print the elements of the matrix
              {
                    for(int i=0 ; i<row ; i++)
                          {
                                cout << endl;
                                for(int j=0 ; j<col ; j++)
                                      {
                                            cout << arr[i][j] << " ";
                                      }
                          }
              }
```

```
    void trans();                              //defining function trans() for transpose of the matrix

//*********************overloading operators to perform basic matrix functions *********************//

    matrix operator +(matrix m)                              //overloading + operator to perform sum of matrix
        {
            matrix temp;                    //defining a matrix class object for storing the result
            temp.row=m.row;                 //initializing the private members of temp
            temp.col=m.col;
            if(row==m.row && col==m.col)                     //checking the order of the two matrix
                {                                           //if they are equal or not
                for(int i=0 ; i<row ; i++)
                    {
                        for(int j=0 ; j<col ; j++)              //adding the elements
                            {                                   // and initializing them in arr of temp
                                temp.arr[i][j]=arr[i][j]+m.arr[i][j];
                            }
                    }
                }
            else
                {
                    cout << "Error !! The order of the matrix are not same. ";
                }                                                   //handling exception

            return temp;                    //returning the temp
        }



    matrix operator -(matrix m)                      //overloading – operator for subtracting two matrix
        {
            matrix temp;                        //defining a matrix class object for storing the result
            temp.row=m.row;                     //initializing the private members of temp
            temp.col=m.col;
            if(row==m.row && col==m.col)             //checking if the order of the matrix is same or not
                {
                for(int i=0 ; i<row ; i++)
                    {
                        for(int j=0 ; j<col ; j++)          //subtracting the elements and
                            {                               //initializing them in the arr of temp
                                temp.arr[i][j]=arr[i][j]-m.arr[i][j];
                            }
                    }
                }
            else
                {
                    cout << "Error !! The order of the matrix are not same. ";
                }                                                           //handling exeption

            return temp;                        //returning temp
        }
        matrix operator *(matrix m)                     //overloading * operator for multiplying two matrix
                {
                        matrix temp;                    //defining a matrix class object for storing the result
                        temp.row=row;                   //initializing the private members of temp
                        temp.col=m.col;
                        for(int i=0 ; i<row ; i++)
                                {
                                        for(int j=0 ; j<col ; j++)
                                                {                       // initializing the whole matrix to 0
                                                        temp.arr[i][j]=0;
                                                }
                                }
                        if(col==m.row)          //checking is the col of first matrix is equal to the row of the second matrix
                                {
                                        for(int i=0 ; i<row ; i++)                     //multiplying the elements and
                                                {                               //initializing them in arr of temp
                                                        for(int j=0 ; j<m.col ; j++)
                                                                {
                                                                        for(int k=0 ; k<col ; k++)
                                                                                {
                                                                                     temp.arr[i][j]+=arr[i][k]*m.arr[k][j];
                                                                                }
                                                                }
                                                }
                                }
                        else
                                {
                                        cout << "Error !! the column of the fisrt matrix not equal to the row of second.";
                                }                            //handling exception
                        return temp;
                }                            //returning temp

  };

void matrix :: trans()                          //defining the logic for transpose function
        {
                int arr1[10][10];            //defining a matrix
                for(int i=0 ; i<row ; i++)
                        {
                                for(int j=0 ; j<col ; j++)
                                        {
                                                arr1[i][j]=arr[j][i];   //transposing the elements and initializing
                                        }                              // in the arr1
                        }

                cout << "The matrix after transpose::";
                for(int i=0 ; i<row ; i++)
                        {
                                cout << endl;
                                for(int j=0 ; j<col ; j++)
                                        {
                                                cout << arr1[i][j] << " ";    //printing the transposed matrix
                                        }
                                }
                }


int main()
  {
        int r1 , r2 , c1 , c2 , x , y;                                  //defining variables
        matrix m1 , m2 , m3 ;                                           //defining matrix class objects
        cout << "*****Enter the details of first matrix*****" << endl << endl;
        cout << "Enter the number of row::";
        cin >> r1;                                                      //taking number of rows from the user
        cout << "Enter the number of columns::";
        cin >> c1;                                                      //taking number of columns from the user
        m1.setData(r1 , c1);
        m1.create_arr();                                                //taking elements of the matrix from the user
        cout << "The matrix you entered::" << endl;
        m1.display_arr();                                               //printing the matrix

        cout << endl << endl << "*****Enter the details of second matrix*****" << endl << endl;
        cout << "Enter the number of row::";
        cin >> r2;                                                              //taking number of rows  from the user
        cout << "Enter the number of columns::";
        cin >> c2;                                                              //taking number of columns from the user
        m2.setData(r2 , c2);
        m2.create_arr();                                                        //taking elements of the matrix from the user
        cout << "The matrix you entered::" << endl;
        m2.display_arr();                                                       //printing the matrix

        //**********************Printing the menu to the user**********************************//

        cout << endl << "*******************************************************************" << endl;
        cout << "1.Sum" << endl << "2.Product" << endl << "3.Transpose" << endl << "4.Subracting" << endl ;
        cout << "*******************************************************************" << endl;
        cout << "Enter your choice(1 , 2 , 3 or 4)::";
        cin >> x;                                                               //taking users choice
        if(x==1)
                {
                        m3=m1+m2;                                               //adding the matrix
                        if(r1==r2 && c1==c2)
                                {
                                        cout << "The sum of the matrix::" << endl;
                                        m3.display_arr();                               //printing the result
                                }
                }
        else if(x==2)
                {
                        m3=m1*m2;                                               //multiplying the matrix
                        if(c1==r2)
                                {
                                        cout << "The product of the matrix::" << endl;
                                        m3.display_arr();                               //printing the result
                                }
                }
        else if(x==3)
            {
                cout << "******************************************************************" << endl;
                cout << "Which matrix you want to transpose (1 or 2)::";
                cin >> y;                                               //taking users choice
                if(y==1)
                     {
                        m1.trans();                             //transposing the first matrix
                     }
                else if(y==2)
                    {
                        m2.trans();                             //transposing the second  matrix
                    }
                else
                    {
                        cout << "Wrong Input!!" << endl ;               //handling exception
                    }
            }
        else if(x==4)
            {
                m3=m1-m2;                                       //subtracting the matrix
                if(r1==r2 && c1==c2)
                    {
                        cout << "The subtraction of the matrix::";
                        m3.display_arr();                                       //printing the result
                    }
            }
        else
            {
                cout << "Wrong input !!!";                              //handling exception
            }


        return 0 ;
}
```

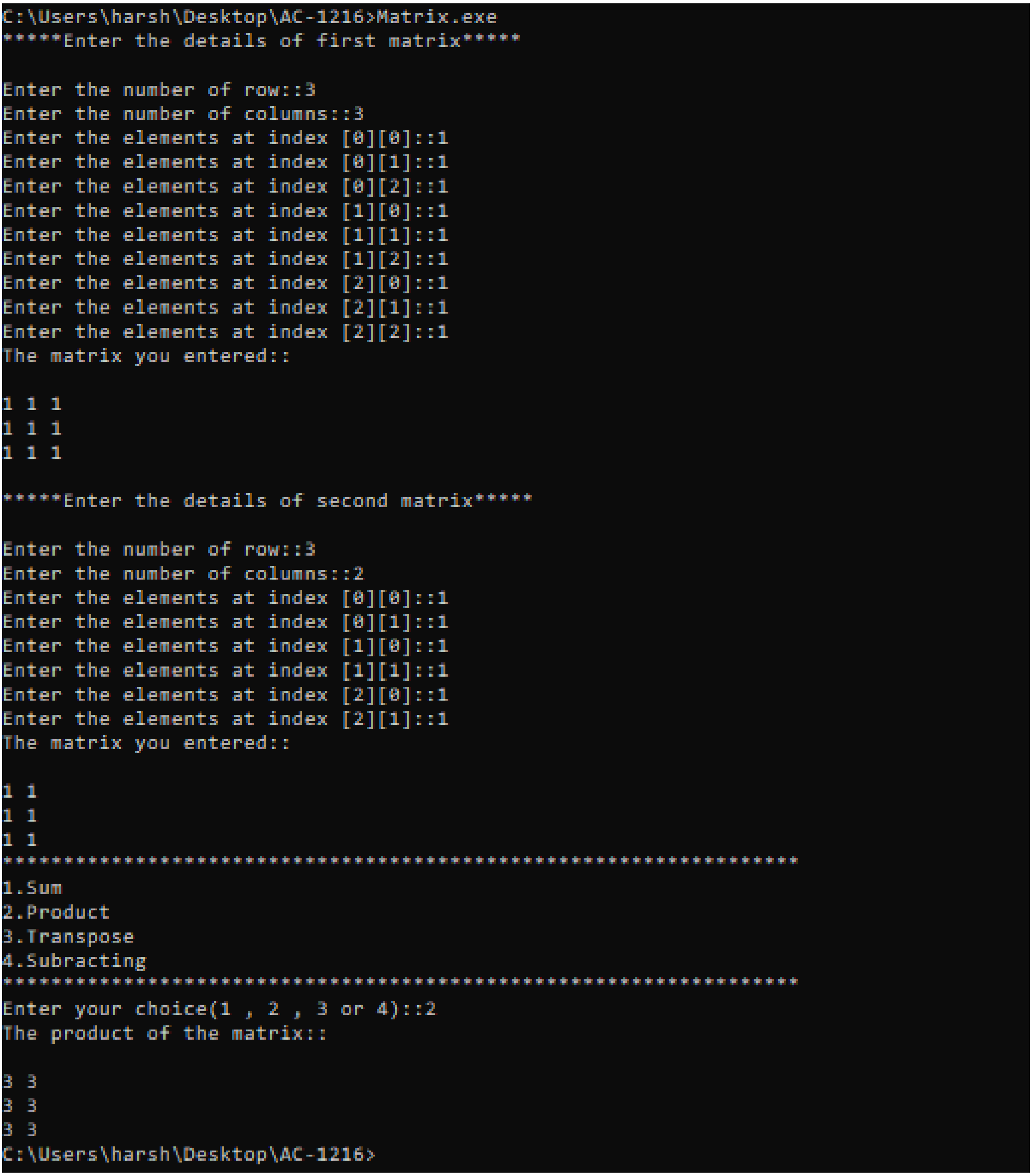
## Output:-

### 1. Sum of two matrix



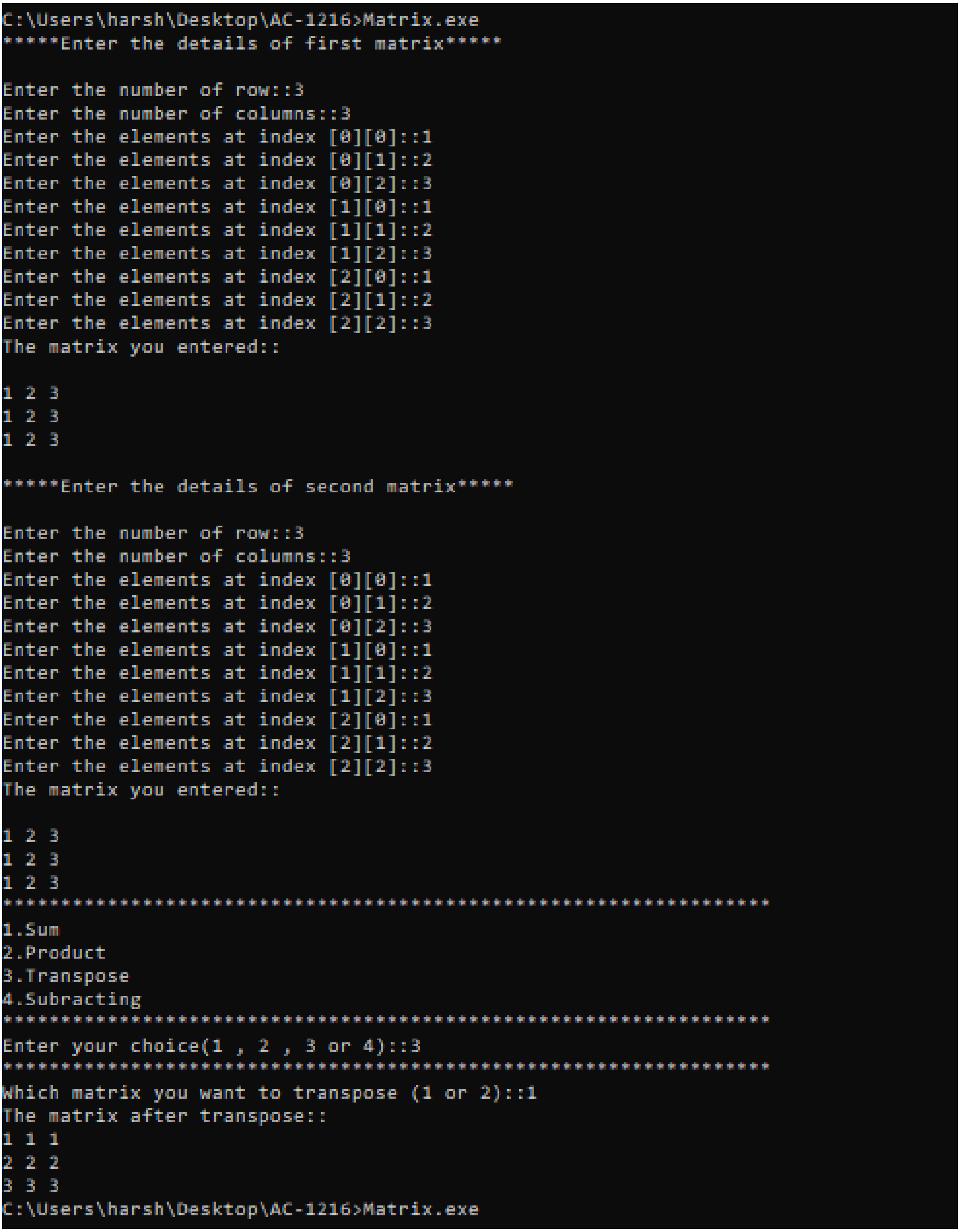
```
Microsoft Windows [Version 10.0.19042.746]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd AC-1216

C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3
*****************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*****************************************************************
Enter your choice(1 , 2 , 3 or 4)::1
The sum of the matrix::

2 4 6
2 4 6
2 4 6
C:\Users\harsh\Desktop\AC-1216>
```

## 2. Multiplying the matrix



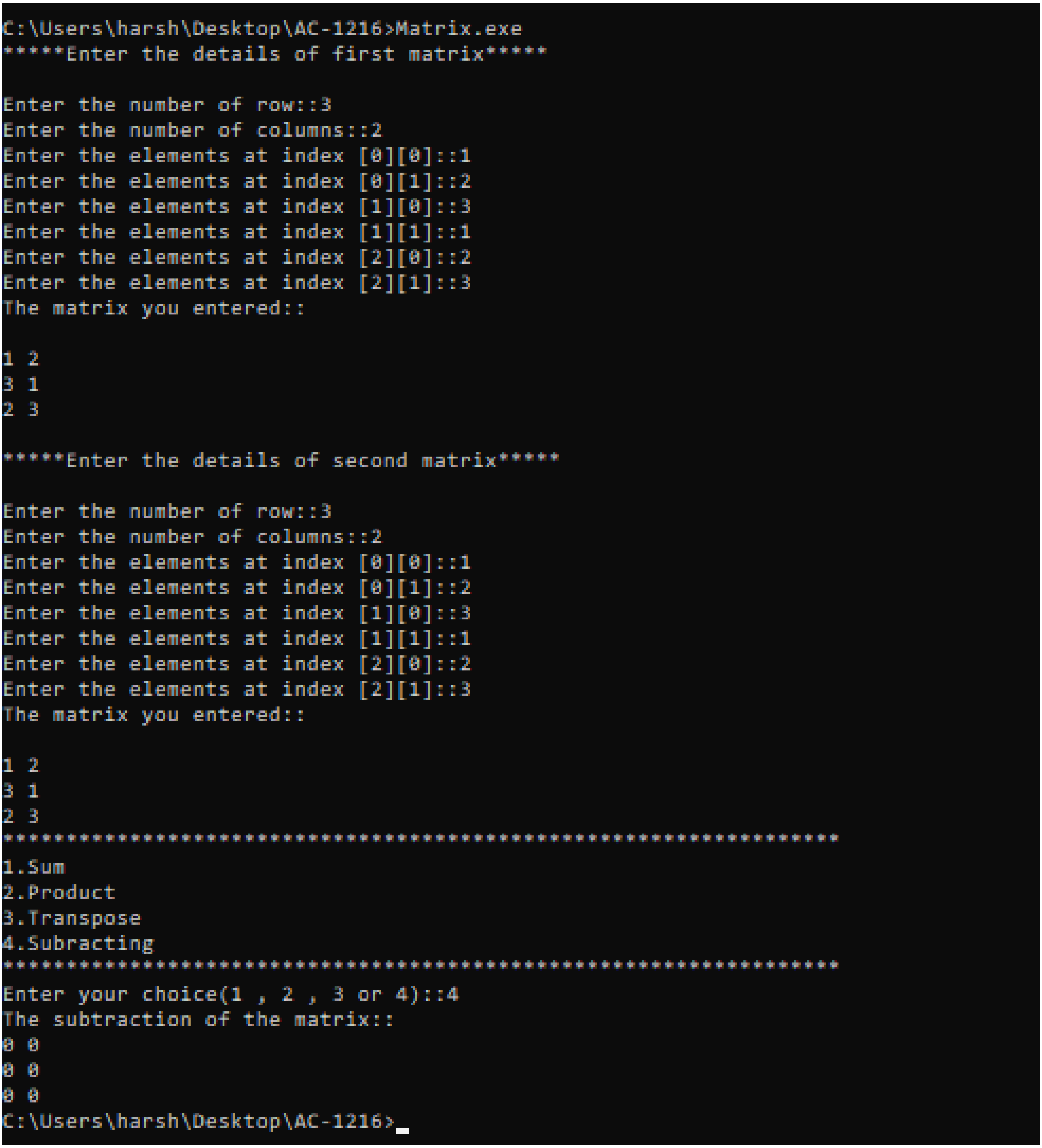
```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [0][2]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
Enter the elements at index [1][2]::1
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::1
Enter the elements at index [2][2]::1
The matrix you entered::

1 1 1
1 1 1
1 1 1

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::1
The matrix you entered::

1 1
1 1
1 1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::2
The product of the matrix::

3 3
3 3
3 3
C:\Users\harsh\Desktop\AC-1216>
```

## 3. Transpose of the matrix



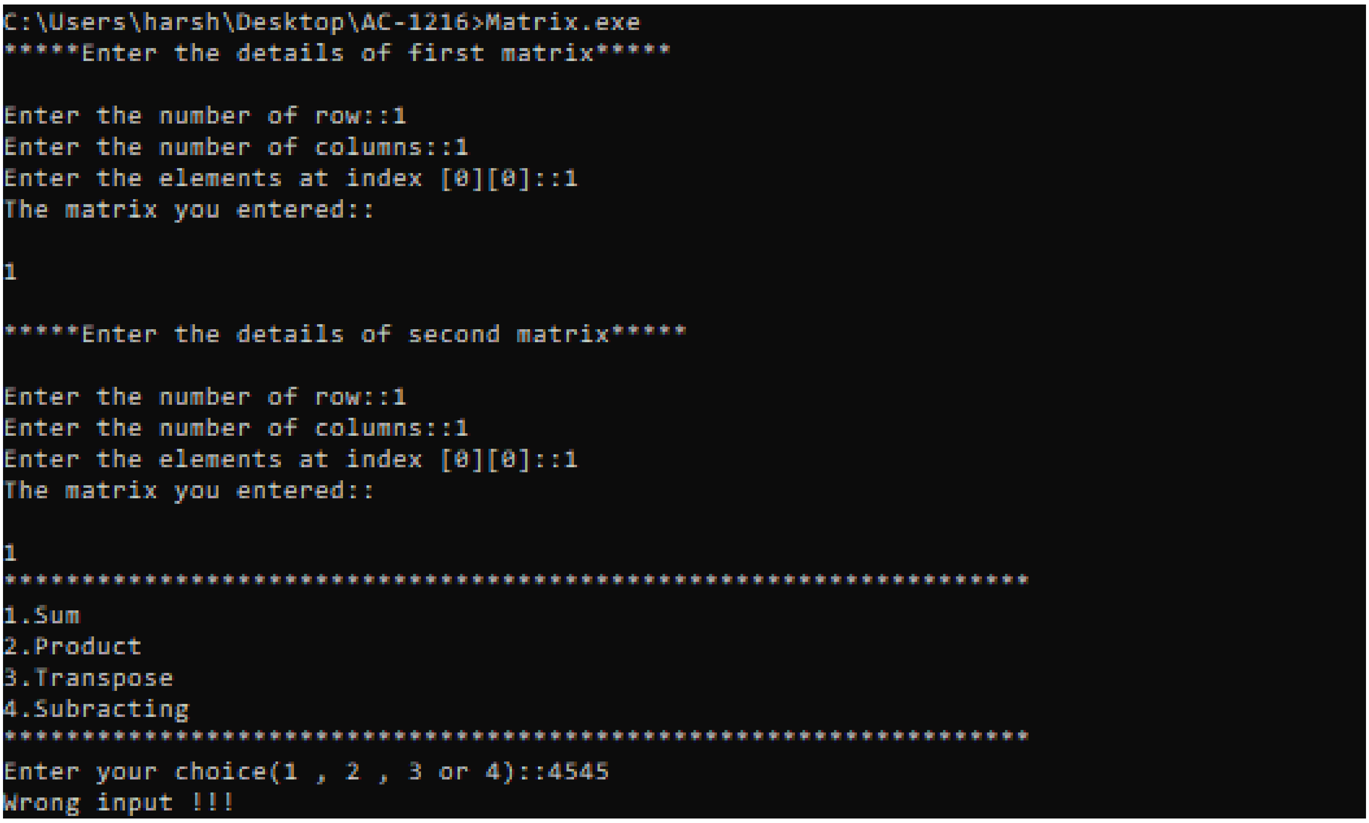
```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::3
******************************************************************
Which matrix you want to transpose (1 or 2)::1
The matrix after transpose::
1 1 1
2 2 2
3 3 3
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
```

## 4. Subtraction of two matrix

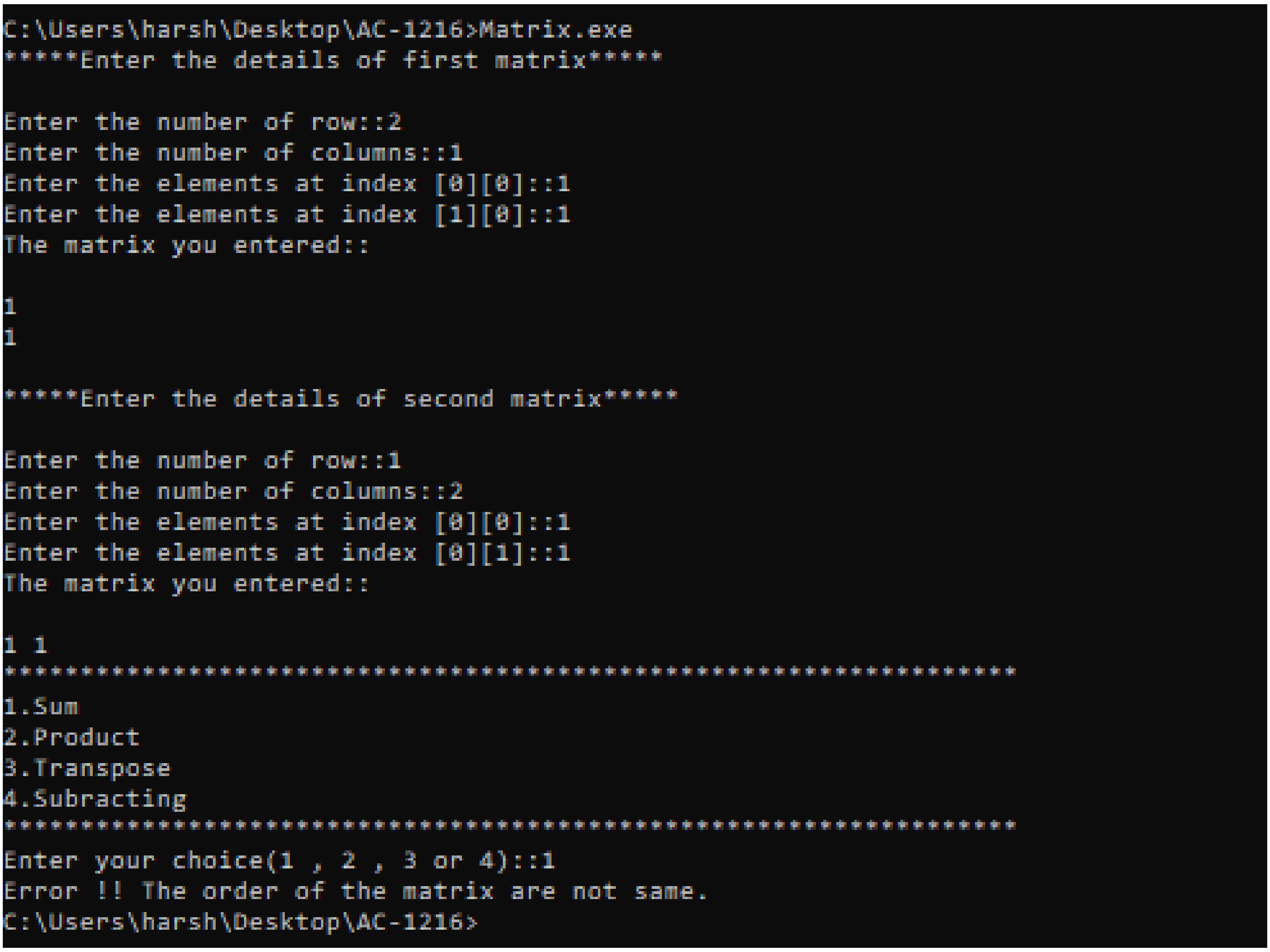


```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::3
Enter the elements at index [1][1]::1
Enter the elements at index [2][0]::2
Enter the elements at index [2][1]::3
The matrix you entered::

1 2
3 1
2 3

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::3
Enter the elements at index [1][1]::1
Enter the elements at index [2][0]::2
Enter the elements at index [2][1]::3
The matrix you entered::

1 2
3 1
2 3
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::4
The subtraction of the matrix::
0 0
0 0
0 0
C:\Users\harsh\Desktop\AC-1216>_
```

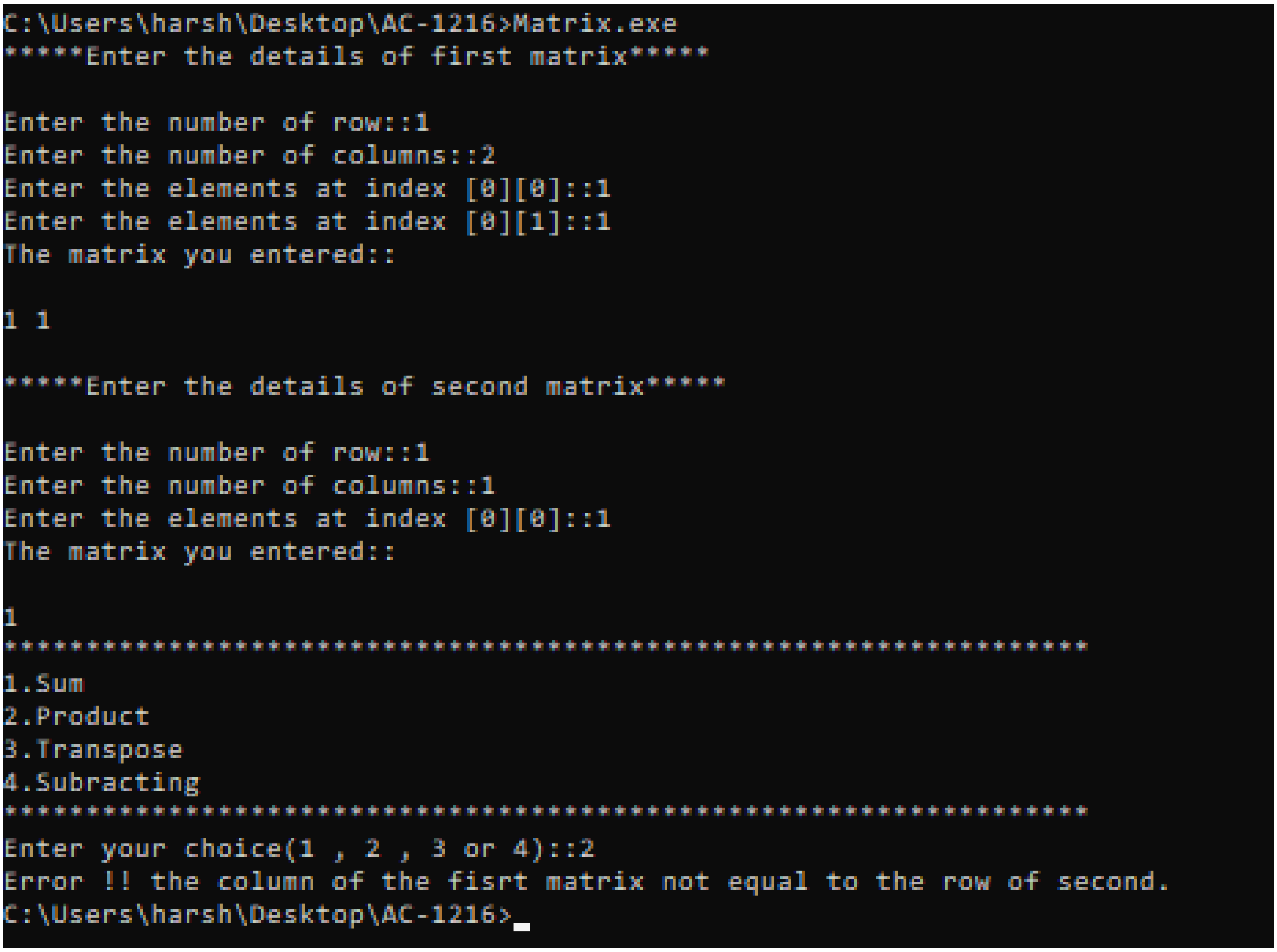
## 5. Handling different exceptions



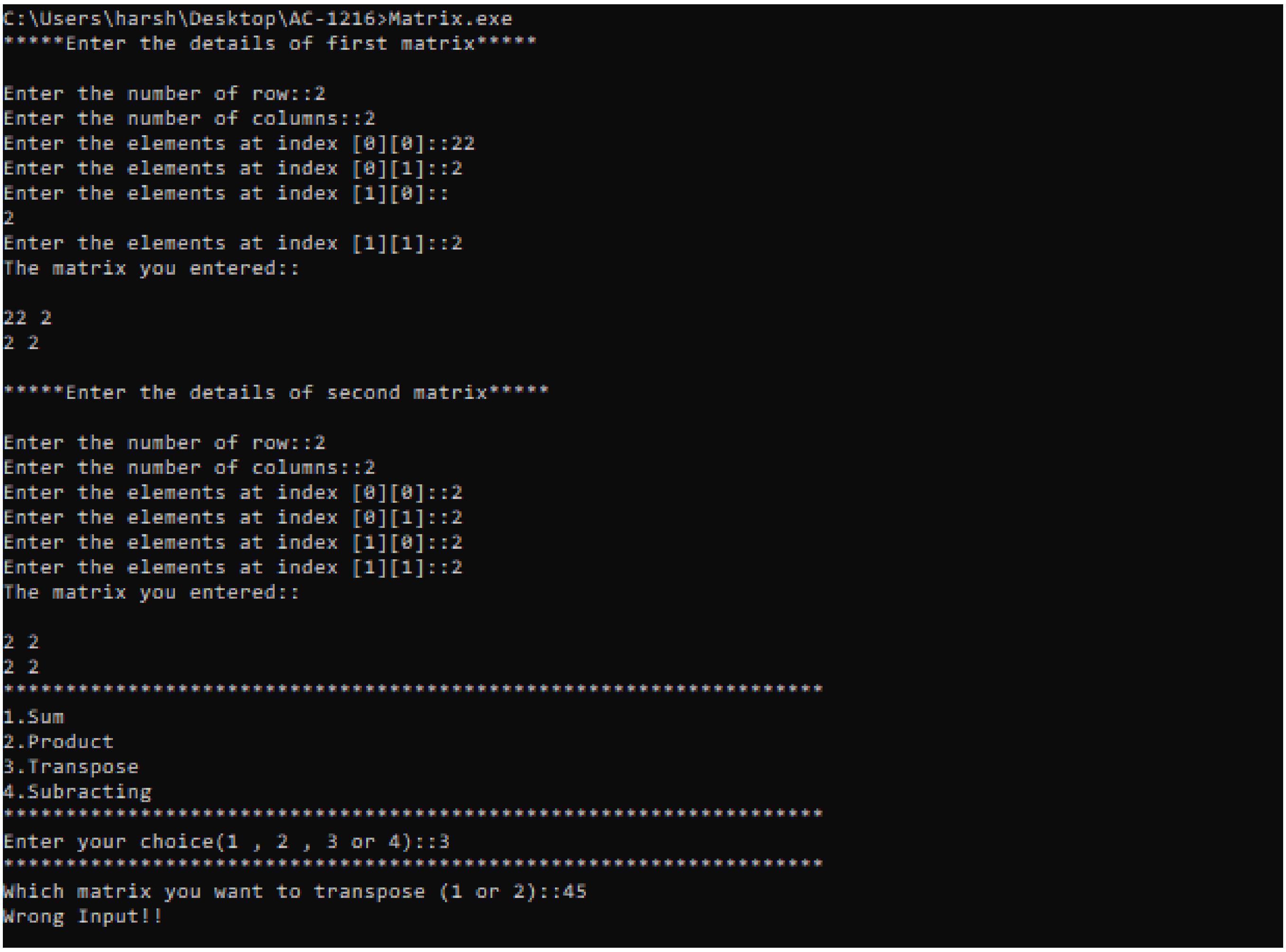
```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::4545
Wrong input !!!
```



```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::1
Enter the elements at index [0][0]::1
Enter the elements at index [1][0]::1
The matrix you entered::

1
1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
The matrix you entered::

1 1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::1
Error !! The order of the matrix are not same.
C:\Users\harsh\Desktop\AC-1216>
```



```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::1
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
The matrix you entered::

1 1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::2
Error !! the column of the fisrt matrix not equal to the row of second.
C:\Users\harsh\Desktop\AC-1216>_
```



```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::22
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::
2
Enter the elements at index [1][1]::2
The matrix you entered::

22 2
2 2

*****Enter the details of second matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::2
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::2
Enter the elements at index [1][1]::2
The matrix you entered::

2 2
2 2
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::3
******************************************************************
Which matrix you want to transpose (1 or 2)::45
Wrong Input!!
```