```
#include <iostream.h>


struct data
{
        int a[5][5] , b[5][5] , difference[5][5] , sum[5][5] , trans[5][5] ;
        int r , c ; // r is the no. of rows ,c is the no. of columns
        int i , j ; // i is the index of row ,j is the index of column
        int r1 , c1 , r2 , c2 , q , e[5][5] ;
};

void transpose()
{
        data T ;
    cout << "Enter no. of rows then no. of columns of matrix: \n";
    cin >> T.r >> T.c;

    // Storing element of matrix entered by user in array T.a[][].
    cout << endl << "Enter elements of matrix: " << endl;
    for(T.i = 0; T.i < T.r; ++T.i)
    for(T.j = 0; T.j < T.c; ++T.j)
    {
        cout << "Enter elements T.a" <<" row no.: "<< T.i <<" column no.: "<< T.j << ": ";
        cin >> T.a[T.i][T.j];
    }

    // Displaying the matrix T.a[][]
    cout << endl << "Entered Matrix: " << endl;
    for(T.i = 0; T.i < T.r; ++T.i)
    for(T.j = 0; T.j < T.c; ++T.j)
    {
       cout << " " << T.a[T.i][T.j];
       if(T.j == T.c - 1)
       cout << endl << endl;
    }

    // Finding transpose of matrix T.a[][] and storing it in array T.trans[][].
    for(T.i = 0; T.i < T.r; ++T.i)
    for(T.j = 0; T.j < T.c; ++T.j)
    {
        T.trans[T.j][T.i]=T.a[T.i][T.j];
        // T.j in T.trans mean row and T.i in T.trans mean column
        // T.c++ make T.a T.trans. to metrics T.a[][] and save this until I ask this

        /**
                 |  0  |  1
        ---------|-----|-----
               0 |  1  |  4
               1 |  2  |  5
               2 |  3  |  6
        */
    }

    // Displaying the transpose,T.i.e, Displaying array T.trans[][].
    cout << endl << "Transpose of Matrix: " << endl;
    for(T.i = 0; T.i < T.c; ++T.i)
    for(T.j = 0; T.j < T.r; ++T.j)
    {
       cout << " " << T.trans[T.i][T.j];
       if(T.j == T.r - 1)
       cout << endl << endl;
    }

}

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void sum()
{
        data S ;

    cout << "Enter no. of rows then no. of columns of matrix: \n";
    cin >> S.r >> S.c;

    cout << endl << "Enter elements of 1st matrix: " << endl;

    // Storing elements of first matrix entered by user.
    for(S.i = 0; S.i < S.r; ++S.i)
    for(S.j = 0; S.j < S.c; ++S.j)
    {
        cout << "Enter elements T.a" <<" row no.: "<< S.i <<" column no.: "<< S.j << ": ";
         cin >> S.a[S.i][S.j];
    }

    // Storing elements of second matrix entered by user.
    cout << endl << "Enter elements of 2nd matrix: " << endl;
    for(S.i = 0; S.i < S.r; ++S.i)
    for(S.j = 0; S.j < S.c; ++S.j)
    {
        cout << "Enter elements b" <<" row no.: "<< S.i <<" column no.: "<< S.j << ": ";
         cin >> S.b[S.i][S.j];
    }

    // Adding Two matrices
    for(S.i = 0; S.i < S.r; ++S.i)
    for(S.j = 0; S.j < S.c; ++S.j)
        S.sum[S.i][S.j] = S.a[S.i][S.j] + S.b[S.i][S.j];

    // Displaying the resultant T.sum matrix.
    cout << endl << "Sum of two matrix is: " << endl;
//    for(i = 0; i < r; ++i)
//        for(j = 0; j < c; ++j)
//        {
//            cout << sum[i][j] << "  ";
//            if(j == c - 1)
//                cout << endl;
//        }

       for ( S.i = 0 ; S.i < S.r ; S.i++ )
       {
          for (S.j = 0 ; S.j < S.c ; S.j++ )
             cout << S.sum[S.i][S.j] << "\t";

          cout << endl;
       }


}

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void difference()
{
        data D ;

    cout << "Enter no. of rows then no. of columns of matrix: \n";
    cin >> D.r >> D.c;

    cout << endl << "Enter elements of 1st matrix: " << endl;
```

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    // Storing elements of first matrix entered by user.
    for(D.i = 0; D.i < D.r; ++D.i)
    for(D.j = 0; D.j < D.c; ++D.j)
    {
        cout << "Enter elements T.a" <<" row no.: "<< D.i <<" column no.: "<< D.j << ": ";
         cin >> D.a[D.i][D.j];
    }

    // Storing elements of second matrix entered by user.
    cout << endl << "Enter elements of 2nd matrix: " << endl;
    for(D.i = 0; D.i < D.r; ++D.i)
    for(D.j = 0; D.j < D.c; ++D.j)
    {
        cout << "Enter elements b" <<" row no.: "<< D.i <<" column no.: "<< D.j << ": ";
         cin >> D.b[D.i][D.j];
    }

    // difference Two matrices
    for(D.i = 0; D.i < D.r; ++D.i)
    for(D.j = 0; D.j < D.c; ++D.j)
          D.sum[D.i][D.j] = D.a[D.i][D.j] + D.b[D.i][D.j];

    // Displaying the resultant T.difference matrix.
    cout << endl << "difference of two matrix is: " << endl;
//    for(i = 0; i < r; ++i)
//        for(j = 0; j < c; ++j)
//        {
//            cout << difference[i][j] << "  ";
//            if(j == c - 1)
//                cout << endl;
//        }

       for ( D.i = 0 ; D.i < D.r ; D.i++ )
       {
          for (D.j = 0 ; D.j < D.c ; D.j++ )
             cout << D.difference[D.i][D.j] << "\t";

          cout << endl;
       }


}

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void multiplication()
{
        data M ;

    A:
        cout <<"If you want make multiplication to two matrices you must know that: \n
    the no. of columns of the 1st matrix must equal to no. of rows of the 2nd matrix "<<endl<<endl;

         cout << "For 1st matrix ,Enter no. of rows then no. of columns of matrix: \n";
         cin >> M.r1 >> M.c1;
         cout<<endl<<endl;

         cout << "For 2nd matrix ,Enter no. of rows then no. of columns of matrix: \n";
         cin >> M.r2 >> M.c2;
         cout<<endl<<endl;

        if(M.c1!=M.r2)
        {       cout<<"I am sorry I can't do this ,because:\n"
                                "the no. of columns of the 1st matrix not equal to no. of rows of the 2nd matrix .\n
\n";
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goto A ;}

else
{
    cout << endl << "Enter elements of 1st matrix: "<<endl<<endl;
    for(M.i = 0; M.i < M.r1; ++M.i)
    for(M.j = 0; M.j < M.c1; ++M.j)
    {
        cout << "Enter elements T.a" <<" row no.: "<< M.i <<" column no.: "<< M.j << ": ";
        cin >> M.a[M.i][M.j];
    }

    cout << endl << "Entered Matrix: " << endl;
    for(M.i = 0; M.i < M.r1; ++M.i)
    for(M.j = 0; M.j < M.c1; ++M.j)
    {
       cout << " " << M.a[M.i][M.j];
       if(M.j == M.c1 - 1)
       cout << endl << endl;
    }

    cout << endl << "Enter elements of 2nd matrix: "<<endl<<endl;
    for(M.i = 0; M.i < M.r2; ++M.i)
    for(M.j = 0; M.j < M.c2; ++M.j)
    {
        cout << "Enter elements T.a" <<" row no.: "<< M.i <<" column no.: "<< M.j << ": ";
        cin >> M.b[M.i][M.j];
    }

    cout << endl << "Entered Matrix: " << endl;
    for(M.i = 0; M.i < M.r2; ++M.i)
        for(M.j = 0; M.j < M.c2; ++M.j)
    {
       cout << " " << M.b[M.i][M.j];
       if(M.j == M.c2 - 1)
       cout << endl << endl;
    }

    for(M.i = 0; M.i < M.r1; ++M.i)
        for(M.j = 0; M.j < M.c2; ++M.j)
        {

                M.e[M.i][M.j] = M.a[M.i][0]*M.b[0][M.j] ;

    if(M.c1 > 1)
                {
        for(M.q=1 ; M.q<M.c1 ; M.q++)
                  {
                    M.e[M.i][M.j]+=M.a[M.i][M.q]*M.b[M.q][M.j] ;
                  }
                }

        }

    cout<<"The multiplication of tow metrics\n" ;
    cout<<"==================================\n" ;

    for(M.i = 0; M.i < M.r1; ++M.i)
    for(M.j = 0; M.j < M.c2; ++M.j)
    {
          cout << M.e[M.i][M.j] << "  ";
          if(M.j == M.c2 - 1)
          cout << endl;
    }


}
```

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}

//================================================================================================
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int main()
{
        char data , ans ;

        cout<<"=============================================================================\n";
        cout<<"=============================================================================\n";
        cout<<"Hello I am c++ ,I will make transpose or sum or difference or
    multiplication to matrix ,as your request sir .\n\n";
        A :
        cout<<"enter (T) if you want transpose or (S) if you want sum or (D)
    if you want difference or (M) if you want multiplication : \n";
        cin>> data;

        switch(data)
        {
        case 'T' :cout<<"I am under your service .\n\n" ; transpose(); break;
        case 'S' :cout<<"I am under your service .\n\n" ; sum(); break;
        case 'D' :cout<<"I am under your service .\n\n" ; difference(); break;
        case 'M' :cout<<"I am under your service .\n\n" ; multiplication(); break;
        default:cout<<"There is something wrong ,please try again \n"; goto A ;
        }

   E :
        cout<<"Are you want make it again ?\n";
        cout<<"Choice Y to yes and N to no .\n";
        cin>>ans;
        switch(ans)
        {
        case 'Y' :cout<<"I am under your service .\n" ; goto A; break;
        case 'N' :cout<<"Good by .\n" ;  break;

        default:cout<<"There is something wrong ,please try again \n"; goto E ;
        }

//      if(data==1)
//      transpose();
//      if(data==2)
//      sum() ;
//      if(data==3)
//      difference();
//      else
//              goto Y ;

        return 0 ;
}
```