## 1. Transpose of a m x n Matrix.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[10][10],b[10][10], i, j, m,n;
    clrscr();
    printf("Enter matrix dimensions :");
    scanf("%d%d", &m, &n );
    printf("Enter Matrix values\n");
    for( i=0; i<m; i++ )
    {
        for( j=0; j<n; j++)
            scanf("%d", &a[i][j] );
    }
    // Store transpose in b .. store every A(i,j) element as B(j,i)
    for(i=0; i<m; i++ )
    {
        for( j=0; j<n; j++ )
            b[j][i] = a[i][j];
    }
    printf("\nTranspose Matrix\n");
    for( i=0; i<n; i++ )  //display  n x m Matrix
    {
        for( j=0; j<m; j++)
            printf("%d\t", b[i][j] );
        printf("\n");
    }
    getch();
}
```

**Example Output :**

```
Enter matrix dimensions : 2  3
Enter Matrix values
2  3  4
5  6  7

Transpose Matrix
2    5
3    6
4    7
```

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## 2. Transpose of a Square matrix. Use Only one 2-Dim. array.

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

void main()
{
    int a[10][10], i, j, t, s;
    clrscr();
    printf("Enter matrix size :");
    scanf("%d", &s );
    printf("Enter Matrix values\n");
    for( i=0; i<s; i++ )
    {
        for( j=0; j<s; j++)
            scanf("%d", &a[i][j] );
    }
    // Store transpose in same array by swapping Aij with Aji
    for(i=0; i<s; i++ )
    {
        for( j=i+1; j<s; j++ )
        {
            t = a[i][j];
            a[i][j] = a[j][i];
```

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```
            a[j][i] = t;
        }
    }
    printf("\nTranspose Matrix\n");
    for( i=0; i<s; i++ )  // s x s Matrix
    {
        for( j=0; j<s; j++)
            printf("%d\t", a[i][j] );
        printf("\n");
    }
    getch();

}
```

**Example Output :**

```
Enter matrix size : 4
Enter Matrix values
2 3 4 5
5 6 7 8
1 2 3 4
4 5 6 7

Transpose Matrix
2   5   1   4
3   6   2   5
4   7   3   6
5   8   4   7
```

## 3. Checking for a given square matrix is Symmetric or Not.

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

void main()
{
    int a[10][10], i, j, s;
    int f = 1;  // flag variable
    clrscr();
    printf("Enter matrix size :");
    scanf("%d", &s );
    printf("Enter Matrix values\n");
    for( i=0; i<s; i++ )
    {
        for( j=0; j<s; j++)
            scanf("%d", &a[i][j] );
    }
    // checking for Symmetric matrix.
    for(i=0; i<s; i++ )
    {
        for( j=0; j<s; j++ )  // we can set j=i+1 also
        {
            if( a[i][j]  !=  a[j][i] ) // any i,j value not matching with j,i value
            {
                f = 0;  // change flag value
                break;  // stop this loop
            }
        }
        if( f == 0 ) // if mismatch found, stop this loop, too
            break;
    }
    if( f == 1 )
        printf("Its a Symmetric Matrix\n");
    else
        printf("Not a symmetric matrix");
    getch();

}
```

**Example Output :**

```
Enter matrix size : 3
Enter Matrix values
2 3 4
3 6 7
1 7 5

Not a symmetric matrix
```

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## 4. Find sum of main diagonal elements of a square matrix.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[10][10], i, j, s;
    int sum =0;  // for sum
    clrscr();
    printf("Enter matrix size :");

    printf("Enter Matrix values\n");
    for( i=0; i<s; i++ )
    {
        for( j=0; j<s; j++)
            scanf("%d", &a[i][j] );
    }
    for(i=0; i<s; i++ )
    {
        sum = sum + a[i][i];
    }
    printf("Sum = %d" , sum );
    getch();
}
```

**Example Output :**

```
Enter matrix size : 3
Enter Matrix values
2  3  4
3  6  7
1  7  5

Sum = 13
```

## 5. Addition of two m x n Matrices.

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```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[10][10], b[10][10], c[10][10], i, j, m, n;
    clrscr();
    printf("Enter matrix dimensions :");
    scanf("%d%d", &m, &n );

    printf("Enter Matrix a \n");
    for( i=0; i<m; i++ )     // input 1st matrix
    {
        for( j=0; j<n; j++)
            scanf("%d", &a[i][j] );
    }

    printf("Enter Matrix b \n");
    for( i=0; i<m; i++ ) // input 2nd matrix
    {
        for( j=0; j<n; j++)
            scanf("%d", &b[i][j] );
    }

    // Add and display Resultant matrix
    printf("Matrix Addition\n");
    for(i=0; i<m; i++ )
    {
        for(j=0; j<n; j++ )
        {
            c[i][j] = a[i][j] + b[i][j];
```

**Example Output :**

```
Enter matrix dimensions : 2  3
Enter Matrix a
2  3  4
1  2  3
Enter Matrix b
3  4  5
3  3  3
Matrix Addition
5    7    9
4    5    6
```

```
            printf("%d\t", c[i][j] );
        }
        printf("\n");
    }
    getch();
}
```

## 6. Addition of two m x n Matrices. Define functions to input and output matrices.

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

// function to input r x c Matrix
void input( int m[10][10], int r, int c )
{
    int i, j;
    for( i=0; i<r; i++ )
    {
        for( j=0; j<c; j++)
            scanf("%d", &m[i][j] );
    }
}
// function to output r x c Matrix
void output( int m[10][10], int r, int c )
{
    int i, j;
    for( i=0; i<r; i++ )
    {
        for( j=0; j<c; j++)
            printf("%d\t", m[i][j] );
        printf("\n");
    }
}

void main()
{
    int a[10][10], b[10][10], c[10][10], i, j, m, n;
    clrscr();
    printf("Enter matrix dimensions :");
    scanf("%d%d", &m, &n );
    printf("Enter Matrix a \n");
    input( a, m, n );
    printf("Enter Matrix b \n");
    input( b, m, n );
    // Add Matrices
    for(i=0; i<m; i++ )
    {
        for(j=0; j<n; j++ )
        {
            c[i][j] = a[i][j] + b[i][j];
        }
    }
    printf("Matrix a\n");
    output( a, m, n);
    printf( "Matrix b\n");
    output( b, m, n);
```

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**Example Output :**

```
Enter matrix dimensions : 2  3
Enter Matrix a
2  3  4
1  2  3
Enter Matrix b
3  4  5
3  3  3
Matrix a
2    3    4
1    2    3
Matrix b
3    4    5
3    3    3
Resultant Matrix
5    7    9
4    5    6
```

```
    printf("Resultant Matrix\n");
    output( c, m, n);
    getch();
}
```

## 7. Multiplication of two m x n Matrices. Check for valid dimensions.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[10][10], b[10][10], c[10][10], i, j, k;
    int r1, c1, r2, c2;
    clrscr();
    printf("Enter dimensions for a :");
    scanf("%d%d", &r1, &c1 );
    printf("Enter dimensions for b :");
    scanf("%d%d", &r2, &c2 );
    if( r2 == c1 )
    {
        printf("Enter Matrix a \n");
        for( i=0; i<r1; i++ )
        {
            for( j=0; j<c1; j++)
                scanf("%d", &a[i][j] );
        }

        printf("Enter Matrix b \n");
        for( i=0; i<r2; i++ )
        {
            for( j=0; j<c2; j++)
                scanf("%d", &b[i][j] );
        }

        // Multiply and print each element of resultant matrix
        printf("\nResultant Matrix\n");
        for( i=0; i<r1; i++ )
        {
            for( j=0; j<c2; j++)
            {
                c[i][j] = 0;
                for( k=0; k<c1; k++ )
                {
                    c[i][j] =c[i][j] + a[i][k] * b[k][j] ;
                }
                printf("%d\t", c[i][j] );
            }
            printf("\n");
        }
    }
    else
        printf("Invalid dimensions\n");

    getch();
}
```

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**Example Outputs :**

1.
Enter dimensions for a : 2 3
Enter dimensions for a : 4 4
Invalid dimensions

2.
Enter dimensions for a : 2 3
Enter dimensions for a : 3 3

Enter Matrix a
1 2 2
2 2 1
Enter Matrix b
2 2 1
1 2 2
1 1 2

Resultant Matrix
6 8 9
7 9 8

**8. Multiplication of two m x n Matrices. Define functions to input, output and multiply matrices.**

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

// function to input r x c Matrix
void input( int m[10][10], int r, int c )
{
    int i, j;
    for( i=0; i<r; i++ )
    {
        for( j=0; j<c; j++)
            scanf("%d", &m[i][j] );
    }
}
// function to output r x c Matrix
void output( int m[10][10], int r, int c )
{
    int i, j;
    for( i=0; i<r; i++ )
    {
        for( j=0; j<c; j++)
            printf("%d\t", m[i][j] );
        printf("\n");
    }
}
// function to multiply two Matrices
void multiply( int a[10][10], int b[10][10], int m[10][10], int r1, int c1, int c2 )
{
    int i, j, k;
    for( i=0; i<r1; i++ )
    {
        for( j=0; j<c2; j++)
        {
            m[i][j] = 0;
            for( k=0; k<c1; k++ )
            {
                m[i][j] = m[i][j] + a[i][k] * b[k][j] ;
            }
        }
    }
}

void main()
{
    int a[10][10], b[10][10], c[10][10];
    int r1, c1, r2, c2;
    clrscr();
    printf("Enter dimensions for a :");
    scanf("%d%d", &r1, &c1 );
    printf("Enter dimensions for b :");
    scanf("%d%d", &r2, &c2 );

    printf("Enter Matrix a \n");
    input( a, r1, c1 );
    printf("Enter Matrix b \n");
    input( b, r2, c2 );
```

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op. Kasturi Plaza,
Manpada Road,
Dombivali(East)
889 828 7767

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**Example Outputs :**

```
Enter dimensions for a : 2  2
Enter dimensions for a : 2  2

Enter Matrix a
1  2
2  2
Enter Matrix b
2  2
1  2
Matrix  a
1    2
2    2
Matrix  b
2    2
1    2
Resultant Matrix
4     6
6     8
```

```
    multiply( a, b, c, r1, c1, c2 );
    printf("Matrix a\n");
    output( a, r1, c1 );
    printf( "Matrix b\n");
    output( b, r2, c2 );
    printf("Resultant Matrix\n");
    output( c, r1, c2 );

    getch();
}
```

**9. Write a program to find and display sum of each row in 2-dim array. Input dimensions from user.**

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[10][10], i, j;
    int m, n , sum;
    clrscr();
    printf("Enter no of Rows and Cols :");
    scanf("%d%d", &m, &n );
    printf("Enter Array values\n");
    for( i=0; i<m; i++ )
    {
        for( j=0; j<n; j++)
            scanf("%d", &a[i][j] );
    }
    printf("\nSum of Rows\n");
    for( i=0; i<m; i++ ) //
    {
        sum = 0;   // set sum=0 for the ith row
        for( j=0; j<n; j++) // move through ith row
        {
            sum = sum + a[i][j];  // get sum of elements
        }
        printf("Row %d , Sum=%d\n", i, sum ); // print row index and sum
    }
    getch();
}
```

**Example Output :**

```
Enter matrix dimensions : 2  3
Enter Matrix values
2  3  4
5  6  7

Sum of Rows
Row 0, Sum = 9
Row 1, Sum = 18
```

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======

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& Maths-3
100 % Results !!!