PROGRAM:

```
import java.util.Scanner;

public class MatrixSymmetry
{
   public static void main(String[] args)
   {
      Scanner sc = new Scanner(System.in);

      System.out.println("Enter the no. of rows : ");

      int rows = sc.nextInt();

      System.out.println("Enter the no. of columns : ");

      int cols = sc.nextInt();

      int matrix[][] = new int[rows][cols];

      System.out.println("Enter the elements :");

      for (int i = 0; i < rows; i++)
      {
         for (int j = 0; j < cols; j++)
         {
            matrix[i][j] = sc.nextInt();
         }
      }

      System.out.println("Printing the input matrix :");
```

```
for (int i = 0; i < rows; i++)
{
   for (int j = 0; j < cols; j++)
   {
      System.out.print(matrix[i][j]+"\t");
   }

   System.out.println();
}

//Checking the input matrix for symmetric

if(rows != cols)
{
   System.out.println("The given matrix is not a square matrix, so it can't be symmetric.");
}
else
{
   boolean symmetric = true;

   for (int i = 0; i < rows; i++)
   {
      for (int j = 0; j < cols; j++)
      {
         if(matrix[i][j] != matrix[j][i])
         {
            symmetric = false;
            break;
         }
      }
```

```
        }

        if(symmetric)
        {
           System.out.println("The given matrix is symmetric...");
        }
        else
        {
           System.out.println("The given matrix is not symmetric...");
        }
      }

      sc.close();
   }
}
```

OUTPUT:

```
D:\Aniket JAVA>javac MatrixSymmetry.java
D:\Aniket JAVA>java MatrixSymmetry
Enter the no. of rows :
3
Enter the no. of columns :
3
Enter the elements :
2
112
3
1
4
5
22
15
```

6

Printing the input matrix :

2 12 3

1 4 5

22 15 6

The given matrix is not symmetric.

PROGRAM:

```
import java.util.Scanner;


public class MatrixMul {


  public static void main(String[] args) {
     Scanner s = new Scanner(System.in);
     System.out.print("Enter number of rows in A: ");
     int rowsInA = s.nextInt();
     System.out.print("Enter number of columns in A / rows in B: ");
     int columnsInA = s.nextInt();
     System.out.print("Enter number of columns in B: ");
     int columnsInB = s.nextInt();
     int[][] a = new int[rowsInA][columnsInA];
     int[][] b = new int[columnsInA][columnsInB];
     System.out.println("Enter matrix A");
     for (int i = 0; i < a.length; i++) {
        for (int j = 0; j < a[0].length; j++) {
           a[i][j] = s.nextInt();
        }
     }
     System.out.println("Enter matrix B");
     for (int i = 0; i < b.length; i++) {
        for (int j = 0; j < b[0].length; j++) {
           b[i][j] = s.nextInt();
        }
     }
     int[][] c = multiply(a, b);
     System.out.println("Product of A and B is");
     for (int i = 0; i < c.length; i++) {
        for (int j = 0; j < c[0].length; j++) {
```

```
            System.out.print(c[i][j] + " ");
        }
        System.out.println();
    }
  }

  public static int[][] multiply(int[][] a, int[][] b) {
    int rowsInA = a.length;
    int columnsInA = a[0].length; // same as rows in B
    int columnsInB = b[0].length;
    int[][] c = new int[rowsInA][columnsInB];
    for (int i = 0; i < rowsInA; i++) {
      for (int j = 0; j < columnsInB; j++) {
        for (int k = 0; k < columnsInA; k++) {
          c[i][j] = c[i][j] + a[i][k] * b[k][j];
        }
      }
    }
    return c;
  }
}
```

OUTPUT:

```
D:\Aniket JAVA>javac MatrixMul.java
D:\Aniket JAVA>java MatrixMul
Enter number of rows in A: 2
Enter number of columns in A / rows in B: 2
Enter number of columns in B: 2
Enter matrix A
1 2 4 5
Enter matrix B
22 35 41 16
```

Product of A and B is

104 67

293 220

PROGRAM:

```
import java.util.*;
public class Trace
{
   public static void main(String args[])
   {
      int array[][]=new int[10][10];
      int i, j;
      double sum = 0, square = 0, result = 0;
           System.out.println("Enter total rows and columns: ");
           Scanner s = new Scanner(System.in);
           int row = s.nextInt();
           int column = s.nextInt();
           System.out.println("Enter matrix:");
           for(i = 0; i < row; i++)
           {
              for(j = 0; j < column; j++)
              {
                 array[i][j] = s.nextInt();
            System.out.print(" ");
              }
      }
           System.out.println("The entered Matrix is :");
           for(i = 0; i < row; i++)
      {
              for(j = 0; j < column; j++)
         {
           System.out.print(array[i][j]+" ");
         }
         System.out.println(" ");
           }
```

```
        System.out.println("The Trace of the above matrix is ");
            for(i = 0; i < row; i++)
            {
               for(j = 0; j < column; j++)
               {
             if(i == j)
             {
                        sum = sum + (array[i][j]);
                    }
           }
        }
        System.out.println(sum);
        System.out.println("The Normal of the above matrix is ");
            for(i = 0; i < row; i++)
            {
               for(j = 0; j < column; j++)
               {
                  square = square + (array[i][j])*(array[i][j]);
           }
            }
        result = Math.sqrt(square);
        System.out.println(result);
    }
}
```

OUTPUT:

```
D:\Aniket JAVA>javac Trace.java
D:\Aniket JAVA>java Trace
Enter total rows and columns:
2
2
Enter matrix:
```

1 3 5 2

The entered Matrix is :

1 3

5 2

The Trace of the above matrix is

3.0

The Normal of the above matrix is

6.244997998398398