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AIM: To perform array implementation in java.

THEORY:

- Arrays:

An array is a group of like-typed variables that are refered to by a common name. Arrays of any data type can be created and may have one or more dimensions. A specific element in an array is accessed by its index. Arrays in java follows ~~zero~~ indexing that is first element is at index zero. Arrays offer a convenient means of grouping related information.

- 1D Array

Syntax: type var-name[]; or
type []var-name;

where type declares the base type of array.

Declaration: int a[];

Creation: a = new int[size];
The new keyword is used dy for dynamic memory allocation

Intialization: int a[] = new int[size];
~~int~~ a[0] = 38;
a[1] = 45;
int a[] = {38, 55, 57};
The number of comma seperated values determine the size of array i.e in this case size of array is 3.

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- 2D Array

Syntax: type var-name[][]; or
type [][] var-name;
where type declares base type of array

Declaration: int b[][];
Creation : b = new int[size1][size2];
size 1 represents rows of matrix
size 2 represents columns of matrix
Intialization: int b[][] = new int [size 1][size 2]
b[0][1] = 18
b[1][2] = 36
Here the array is storing 18 in 0th row and 1st column

When you allocate memory for a 2D array, you need only specify the memory for first (leftmost) dimension. You can allocate the remaining dimensions separately. For eg

```
int a[][] = new int[3][];
a[0] = new int[5];
a[1] = new int[3];
a[2] = new int[1];
```

Here the first row gets five columns, the second row three columns and last row only one column.

(0,0) (0,1) (0,2) (0,3) (0,4)
(1,0) (1,1) (1,2)
(2,0)

- length attribute.

In java, the array length is number of elements that an array can holds. There is no predefined method to obtain the length of an array. We can find the array length in java by using the array attribute 'length'.

The length attribute can be invoked by using dot (.) operator followed by the array name. We can find the length of int[], double[], char[], String[] etc. For eg.

```
int [] a = new int[5];
int a_length = a.length;
```

The variable a_length will store value 5.

- Difference between array in java and in C.

Arrays in Java	Arrays in C
1) Declaration and creation can take place seperately. Eg: int a[]; a = new int[5]	1) Declaration and creation happen at same time. Eg int a[5];
2) It gives exception of ArrayIndexOutOfBoundsException when we try accessing or storing element at an index greater than size of array	2) It does not give error while storing element at an index greater than size of array.
3) length attribute is used to give number of elements of array.	3) sizeof is used to get the size of array.

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CONCLUSION:

Errors encountered

1) Array Index Out Of Bounds Exception

```
for (int i=0 ; i<=n; i++)
{ for (int j=0; j<=n; j++)
    { a[i][j]= s.nextInt();} }
```

Solution

```
for (int i=0 ; i<n ; i++)
{ for (int j=0; j<n ;j++)
    { a[i][j]= s.nextInt(); }}
```

2) method length() used

```
for (int i=0 ; i<a.length(); i++)
{   a[i] = s.nextInt();}
```

Solution Using the length without '()' as it makes the attribute a function

```
for (int=0 ; i<a.length ; i++)
  { a[i] = s.nextInt();}
```

LAB 3: ARRAY IMPLEMENTATION IN JAVA

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1-D Array

Q1. Write a program
i) To print the array in reverse order

CODE:

*RevArray - Notepad

File Edit Format View Help

```
import java.util.*;
class RevArray
{ public static void main(String args[])
        { Scanner s=new Scanner(System.in);
          System.out.println("Enter size of array");
          int n=s.nextInt();
          int a[]=new int[n];
          System.out.println("Enter elements of array");
          for(int i=0;i<n;i++)
            a[i]=s.nextInt();


          System.out.println("Elements in reverse order");
          for(int i=n-1;i>-1;i--)
            System.out.print(a[i]+" ");
          System.out.println();
        }
}
```

OUTPUT:

C:\Windows\System32\cmd.exe

```
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac RevArray.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java RevArray
Enter size of array
5
Enter elements of array
48
67
51
23
95
Elements in reverse order
95 23 51 67 48

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java RevArray
Enter size of array
1
Enter elements of array
5
Elements in reverse order
5

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>
```

ii) To reverse the array

CODE:

ArrayRev - Notepad

File Edit Format View Help

```
import java.util.*;
class ArrayRev
{ public static void main(String args[])
        { Scanner s=new Scanner(System.in);
          System.out.println("Enter size of array");
          int n=s.nextInt();
          int a[]=new int[n];int temp;
          System.out.println("Enter elements of array");
          for(int i=0;i<a.length;i++)
            a[i]=s.nextInt();
          for(int i=0;i<n/2;i++)
           { temp=a[i];
            a[i]=a[n-1-i];
            a[n-1-i]=temp;}
          System.out.println("Elements in reverse order");
          for(int i=0;i<n;i++)
            System.out.print(a[i]+" ");
          System.out.println();
        }
}
```

OUTPUT:

C:\Windows\System32\cmd.exe

```
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac ArrayRev.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java ArrayRev
Enter size of array
5
Enter elements of array
6
5
4
8
7
Elements in reverse order
7 8 4 5 6

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java ArrayRev
Enter size of array
9
Enter elements of array
54
78
65
12
48
35
79
46
12
Elements in reverse order
12 46 79 35 48 12 65 78 54

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>
```

Q.2 Write a program to print the sum of the elements in an array of length n.

CODE:

ArraySum - Notepad

File Edit Format View Help

```
import java.util.*;
public class ArraySum
{ public static void main(String args[])
        { Scanner s=new Scanner(System.in);
          System.out.println("Enter size of array");
          int n=s.nextInt();
          int a[]=new int[n];
          System.out.println("Enter elements of array");
          for(int i=0;i<a.length;i++)
          { a[i]=s.nextInt();
          }
          int sum=0;
          System.out.print("Sum of elements of array: ");
          for(int i=0;i<a.length;i++)
          { sum+=a[i];
          }
          System.out.println(sum);
         }
}
```

OUTPUT:

C:\Windows\System32\cmd.exe

```
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac ArraySum.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java ArraySum
Enter size of array
5
Enter elements of array
65
45
78
12
32
Sum of elements of array: 232

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java ArraySum
Enter size of array
8
Enter elements of array
45
1234
65
1
7
0
96
58
Sum of elements of array: 1506

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>
```

Q.3 Write a program to search an element entered by the user in an array.

CODE:

ArraySearch - Notepad

File Edit Format View Help

```
import java.util.*;
public class ArraySearch
{ public static void main(String args[])
        { Scanner s=new Scanner(System.in);
          System.out.println("Enter size of array");
          int n=s.nextInt();
          int a[]=new int[n];
          System.out.println("Enter elements of array");
          for(int i=0;i<a.length;i++)
          { a[i]=s.nextInt();
          }
          System.out.println("Enter element to be searched");
          int f=s.nextInt();int k=0;
          for(int i=0;i<a.length;i++)
          { if(f==a[i])
             {k++;break;}
          }
          if(k==0)
           System.out.println("Not found");
          else
           System.out.println("Found");
        }
}
```

OUTPUT:

C:\Windows\System32\cmd.exe

```
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac ArraySearch.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java ArraySearch
Enter size of array
5
Enter elements of array
89
45
67
12
325
Enter element to be searched
67
Found

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java ArraySearch
Enter size of array
4
Enter elements of array
45
78
69
12
Enter element to be searched
56
Not found

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>
```

Q.4 Write a program to find duplicates in a given array

CODE:

MultiEntry - Notepad

File Edit Format View Help

```
import java.util.Scanner;
class MultiEntry
{ public static void main(String args[])
        { Scanner s=new Scanner(System.in);
          System.out.println("Enter size of array and enter the elements: ");
          int n=s.nextInt();int i,j,k;
          int a[]=new int[n];
          System.out.println("Enter the elements: ");
          for(i=0;i<n;i++)
                a[i]=s.nextInt();

          for(i=0;i<n;i++)
        {         for(j=i+1; j<n; j++)
                        { if(a[i] == a[j])
                                { for(k=j; k < n - 1; k++)
                                        { a[k] = a[k + 1];
                                        }
                                n--;
                                j--;
                                }
                        }
        }
System.out.print("Array without duplicates: ");
 for(i=0; i<n; i++)
 { System.out.print(a[i]+" ");
 }
}
}
```

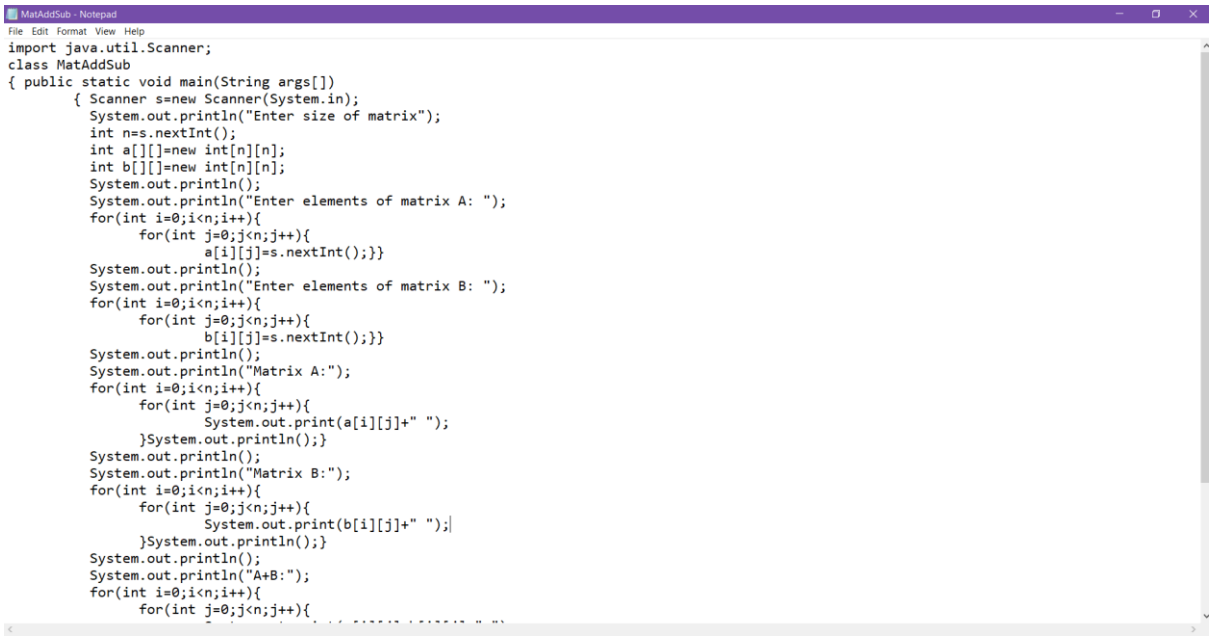
OUTPUT:

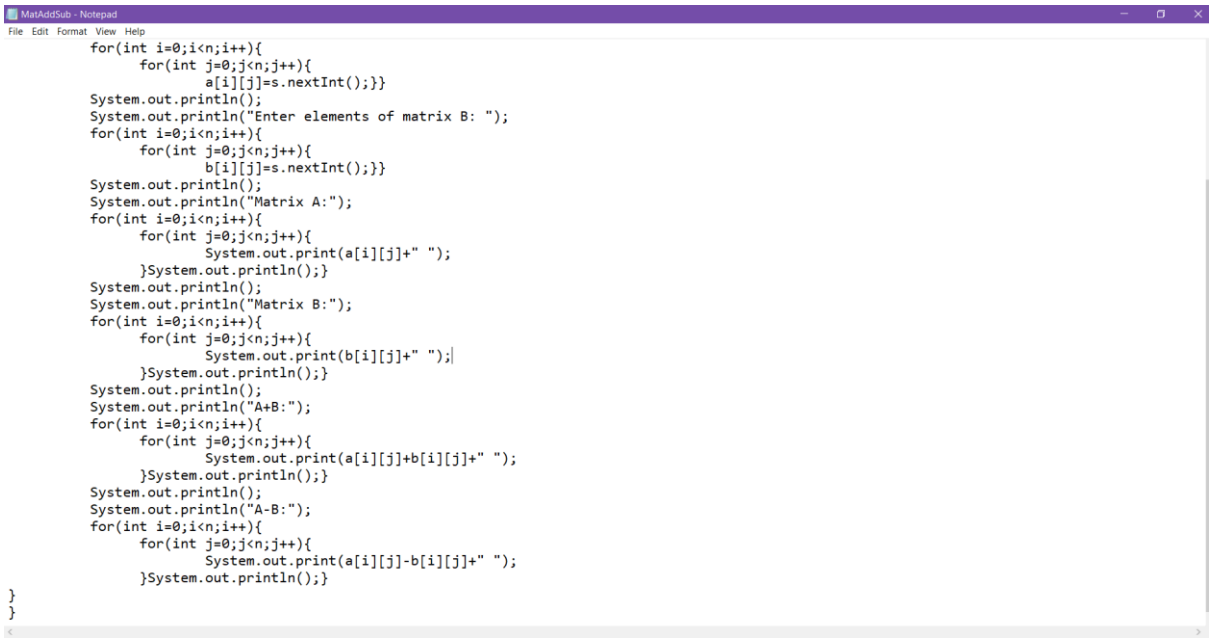
C:\Windows\System32\cmd.exe

```
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac MultiEntry.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java MultiEntry
Enter size of array:
5
Enter the elements:
65
54
12
03
84
Array without duplicates: 65 54 12 3 84
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java MultiEntry
Enter size of array:
6
Enter the elements:
4
4
5
8
4
12
Array without duplicates: 4 5 8 12
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>
```

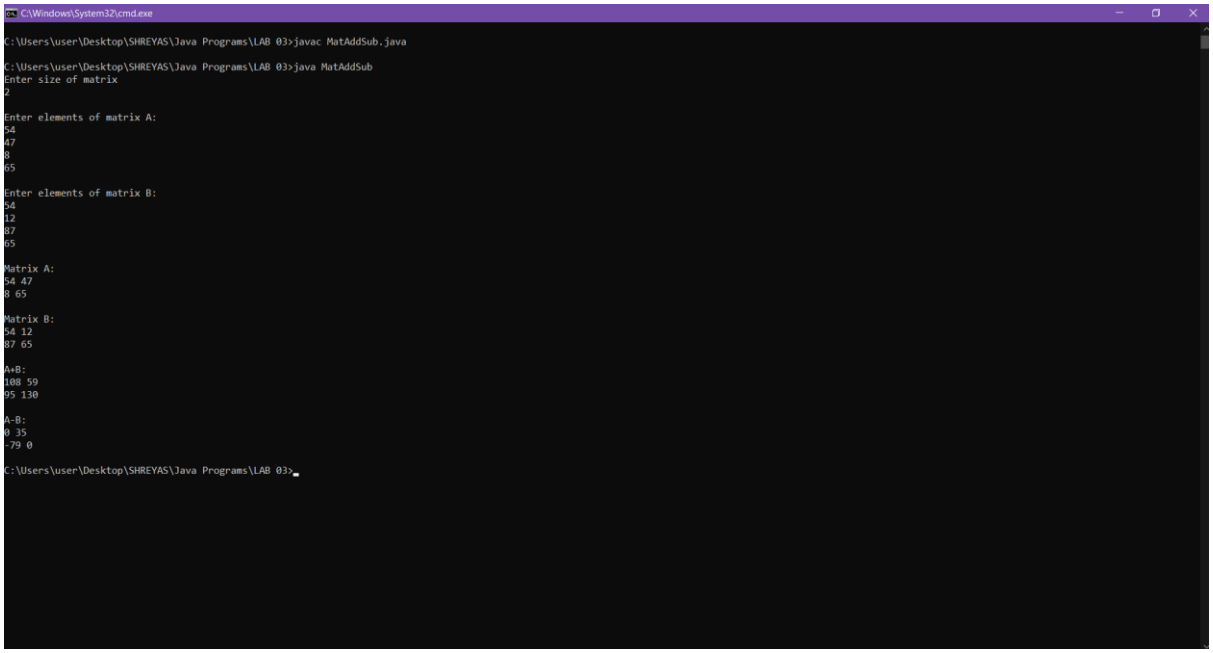
2-D Array

Q.1 Write a program to perform Matrix addition and subtraction
CODE:





OUTPUT:


C:\Windows\System32\cmd.exe
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac MatAddSub.java
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java MatAddSub
Enter size of matrix
2
Enter elements of matrix A:
54
47
8
65
Enter elements of matrix B:
54
12
87
65
Matrix A:
54 47
8 65
Matrix B:
54 12
87 65
A+B:
108 59
95 130
A-B:
0 35
-79 0
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>

Q.2. Write a program to perform Matrix multiplication

CODE:

MatMulti - Notepad

File Edit Format View Help

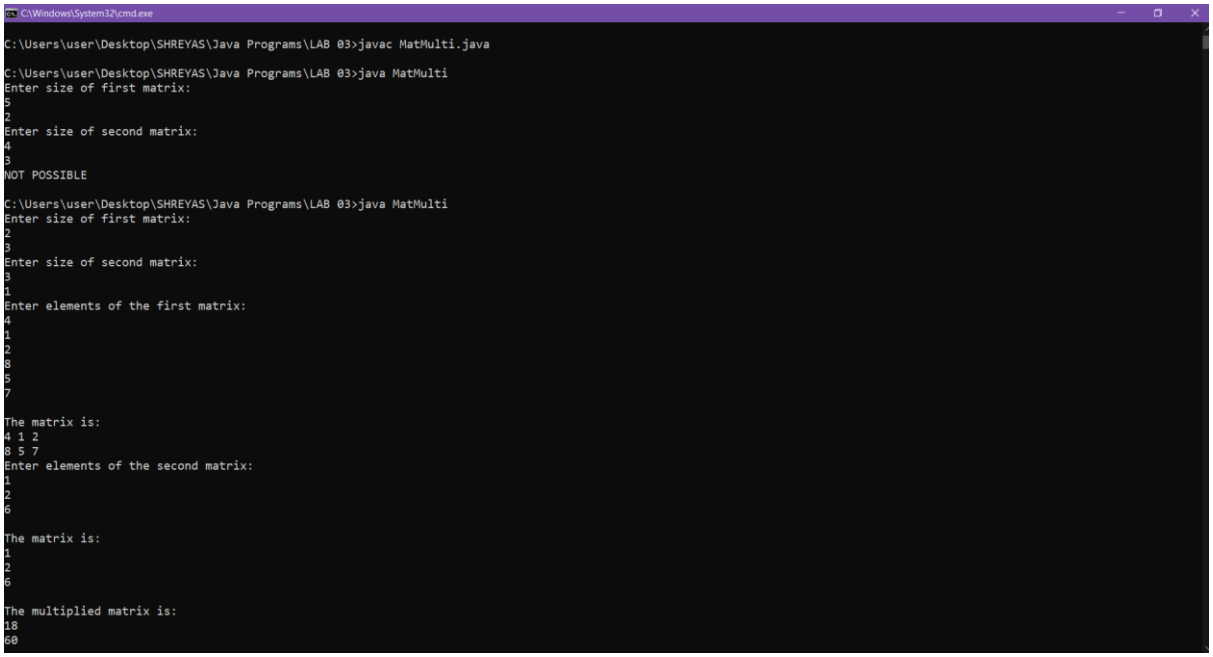
```
import java.util.Scanner;
class MatMulti
{ public static void main(String args[])
{ Scanner s=new Scanner(System.in);
System.out.println("Enter size of first matrix: ");
int m1=s.nextInt();
int n1=s.nextInt();
int a[][]=new int[m1][n1];

System.out.println("Enter size of second matrix: ");
int m2=s.nextInt();
int n2=s.nextInt();
int b[][]=new int[m2][n2];

if(n1==m2)
{}
else
{System.out.println("NOT POSSIBLE");
return;}


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

for(int i=0;i<m1;i++){
         for(int j=0;j<n1;j++){
                  a[i][j]=s.nextInt();}}
System.out.println("\nThe matrix is: ");
for(int i=0;i<m1;i++){
         for(int j=0;j<n1;j++){
                  System.out.print(a[i][j]+" ");}
System.out.println();}
```

MatMulti - Notepad

File Edit Format View Help

```
         for(int j=0;j<n1;j++){
                  System.out.print(a[i][j]+" ");}
System.out.println();}



System.out.println("Enter elements of the second matrix: ");
for(int i=0;i<m2;i++)
         for(int j=0;j<n2;j++)
                  b[i][j]=s.nextInt();
System.out.println("\nThe matrix is: ");
for(int i=0;i<m2;i++){
         for(int j=0;j<n2;j++){
                  System.out.print(b[i][j]+" ");}
System.out.println();}



int c[][]=new int[m1][n2];

 for (int i = 0; i < m1; i++) {
            for (int j = 0; j < n2; j++) {
                for (int k = 0; k < m2; k++)
                    c[i][j] += a[i][k] * b[k][j];
            }
        }
System.out.println("\nThe multiplied matrix is: ");
for(int i=0;i<m1;i++){
         for(int j=0;j<n2;j++){
                  System.out.print(c[i][j]+" ");}
System.out.println();}

}
}
```

OUTPUT:


C:\Windows\System32\cmd.exe
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac MatMulti.java
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java MatMulti
Enter size of first matrix:
5
2
Enter size of second matrix:
4
3
NOT POSSIBLE
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java MatMulti
Enter size of first matrix:
2
3
Enter size of second matrix:
3
1
Enter elements of the first matrix:
4
1
2
8
5
7
The matrix is:
4 1 2
8 5 7
Enter elements of the second matrix:
1
2
6
The matrix is:
1
2
6
The multiplied matrix is:
18
60

Q.3. Write a program to check if the given Matrix is symmetric or not
CODE:

SymMat - Notepad

File Edit Format View Help

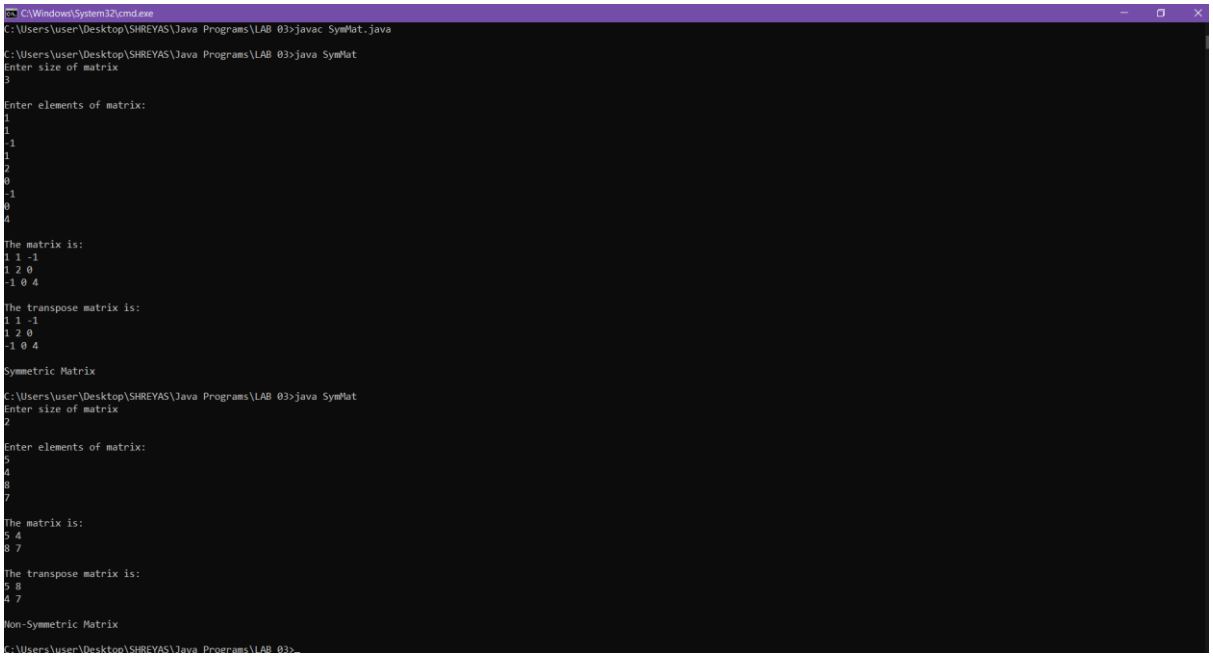
```
import java.util.Scanner;
class SymMat
{ public static void main(String args[])
        { Scanner s=new Scanner(System.in);
          System.out.println("Enter size of matrix");
          int m=s.nextInt();

          int a[][]=new int[m][m];
          System.out.println("\nEnter elements of matrix: ");
          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        a[i][j]=s.nextInt();}}

          System.out.println("\nThe matrix is: ");
          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        System.out.print(a[i][j]+" ");
                }System.out.println();}

          int b[][]=new int[m][m];
          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        b[i][j]=a[j][i];
                }}
          int k=0;

          System.out.println("\nThe transpose matrix is: ");
          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        System.out.print(b[i][j]+" ");
                }System.out.println();}


          for(int i=0;i<m;i++){
```

SymMat - Notepad

File Edit Format View Help

```
          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        System.out.print(a[i][j]+" ");
                }System.out.println();}

          int b[][]=new int[m][m];
          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        b[i][j]=a[j][i];
                }}
          int k=0;

          System.out.println("\nThe transpose matrix is: ");
          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        System.out.print(b[i][j]+" ");
                }System.out.println();}


          for(int i=0;i<m;i++){
                for(int j=0;j<m;j++){
                        if(a[i][j]==a[j][i])
                          k=1;
                        else
                        {k=0;break;} }}
          if (k==1)
          System.out.println("\nSymmetric Matrix");
          else
          System.out.println("\nNon-Symmetric Matrix");
}}
```

OUTPUT:


C:\Windows\System32\cmd.exe
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac SymMat.java
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java SymMat
Enter size of matrix
3
Enter elements of matrix:
1
1
-1
1
2
0
-1
0
4
The matrix is:
1 1 -1
1 2 0
-1 0 4
The transpose matrix is:
1 1 -1
1 2 0
-1 0 4
Symmetric Matrix
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java SymMat
Enter size of matrix
2
Enter elements of matrix:
5
4
8
7
The matrix is:
5 4
8 7
The transpose matrix is:
5 8
4 7
Non-Symmetric Matrix
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>

Q.4. Write a program to find the transpose of a given Matrix

CODE:

TransposeMat - Notepad

File Edit Format View Help

```
import java.util.Scanner;
class TransposeMat
{ public static void main(String args[])
        { Scanner s=new Scanner(System.in);
          System.out.println("Enter size of matrix");
          int m=s.nextInt();
          int n=s.nextInt();
          int a[][]=new int[m][n];
          System.out.println("\nEnter elements of matrix: ");
          for(int i=0;i<m;i++){
                for(int j=0;j<n;j++){
                        a[i][j]=s.nextInt();}}

          System.out.println("\nThe matrix is: ");
          for(int i=0;i<m;i++){
                for(int j=0;j<n;j++){
                        System.out.print(a[i][j]+" ");
                }System.out.println();}

          int b[][]=new int[n][m];
          for(int i=0;i<n;i++){
                for(int j=0;j<m;j++){
                        b[i][j]=a[j][i];
                }}

          System.out.println("\nThe transpose matrix is: ");
          for(int i=0;i<n;i++){
                for(int j=0;j<m;j++){
                        System.out.print(b[i][j]+" ");
                }System.out.println();}
}
}
```

OUTPUT:

C:\Windows\System32\cmd.exe

```
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>javac TransposeMat.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>java TransposeMat
Enter size of matrix
2
3

Enter elements of matrix:
5
4
8
7
6
9

The matrix is:
5 4 8
7 6 9

The transpose matrix is:
5 7
4 6
8 9

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 03>
```