**Matrix**

**1.Print Matrix Element**

**package** Demo;

**import** java.util.\*;

**public** **class** MatrixExample {

**public** **static** **void** main(String[] args) {

**int**[][] a = {

{ 1, 2, 3 },

{ 6, 2, 3 },

{ 1, 8, 7 },

{ 5, 2, 9 },

{ 1, 0, 3 },

};

System.***out***.println(a[2][2]);

}

}

**output:** 7

**2.Print matrix**

**package** Demo;

**import** java.util.\*;

**public** **class** MatrixExample {

**public** **static** **void** main(String[] args) {

**int**[][] a = {

{ 1, 2, 3 },

{ 6, 2, 3 },

{ 1, 8, 7 },

{ 5, 2, 9 },

{ 1, 0, 3 },

};

System.***out***.println("Enter matrix :");

**for** (**int** i = 0; i < 5; i++) {

**for** (**int** j = 0; j < 3; j++) {

System.***out***.print(a[i][j] + " ");

}

System.***out***.println();

}

}

}

**output:**

Enter matrix :

1 2 3

6 2 3

1 8 7

5 2 9

1 0 3

**3.Addition**

**package** Demo;

**import** java.util.\*;

**public** **class** MatrixExample {

**public** **static** **void** main(String[] args) {

**int**[][] a = {

{ 1, 2, 3 },

{ 0, 2, 3 },

{ 1, 0, 1 },

{ 1, 2, 1 },

{ 1, 0, 3 },

};

**int**[][] b = {

{ 0, 1, 1 },

{ 3, 2, 5 },

{ 1, 7, 2 },

{ 2, 2, 1 },

{ 1, 3, 3 },

};

System.***out***.println("Addition of matrix :");

**for** (**int** i = 0; i < 5; i++) {

**for** (**int** j = 0; j < 3; j++) {

System.***out***.print(a[i][j] + b[i][j] + " ");

}

System.***out***.println();

}

}

}

**output:**

Addition of matrix :

1 3 4

3 4 8

2 7 3

3 4 2

2 3 6

**4.Addition of two matrices**

**package** Demo;

**import** java.util.Scanner;

**public** **class** AddMatrix {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

**int**[][] b = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

System.***out***.println("Enter Elements of matrix b:");

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

**for** (**int** j = 0; j < n; j++) {

b[i][j] = sc.nextInt();

}

}

System.***out***.println("Addition:");

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

**for** (**int** j = 0; j < n; j++) {

System.***out***.print((a[i][j] + b[i][j]) + " ");

}

System.***out***.println();

}

}

}

**output:**

Enter Elements of matrix a:

2 8 3

1 0 5

6 2 4

Enter Elements of matrix b:

0 0 0

1 3 2

2 5 1

Addition:

2 8 3

2 3 7

8 7 5

**5.Subtraction of two matrices**

**package** Demo;

**import** java.util.Scanner;

**public** **class** SubMatrix2 {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

**int**[][] b = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

System.***out***.println("Enter Elements of matrix b:");

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

**for** (**int** j = 0; j < n; j++) {

b[i][j] = sc.nextInt();

}

}

System.***out***.println("Subtraction:");

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

**for** (**int** j = 0; j < n; j++) {

System.***out***.print((a[i][j] - b[i][j]) + " ");

}

System.***out***.println();

}

}

}

**output:**

Enter Elements of matrix a:

8 9 4

6 6 8

5 7 3

Enter Elements of matrix b:

4 2 1

1 1 1

0 0 2

Subtraction:

4 7 3

5 5 7

5 7 1

**6.Subtraction of three matrices**

**package** Demo;

**import** java.util.\*;

**public** **class** SubMatrix {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

**int**[][] b = **new** **int**[m][n];

**int**[][] c = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

System.***out***.println("Enter Elements of matrix b:");

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

**for** (**int** j = 0; j < n; j++) {

b[i][j] = sc.nextInt();

}

}

System.***out***.println("Enter Elements of matrix c:");

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

**for** (**int** j = 0; j < n; j++) {

c[i][j] = sc.nextInt();

}

}

System.***out***.println("Subtraction:");

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

**for** (**int** j = 0; j < n; j++) {

System.***out***.print((a[i][j] - b[i][j] - c[i][j]) + " ");

}

System.***out***.println();

}

}

}

**output:**

Enter Elements of matrix a:

9 8 7

7 6 5

9 7 8

Enter Elements of matrix b:

5 4 3

2 1 0

0 0 0

Enter Elements of matrix c:

1 3 1

2 1 0

2 1 2

Subtraction:

3 1 3

3 4 5

7 6 6

**7. Sum of matrix**

**package** Demo;

**import** java.util.\*;

**public** **class** SumMatrix {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3;

**int** sum = 0;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

sum = sum + a[i][j];

}

}

System.***out***.println("Sum = " + sum);

}

}

**output:**

Enter Elements of matrix a:

2 3 6

4 6 8

3 4 6

Sum = 42

**8.Two matrices are equal or not.**

**package** Demo;

**import** java.util.\*;

**public** **class** EqualNotEqual {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 2;

**int** flag=1;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

**int**[][] b = **new** **int**[m][n];

System.***out***.println("Enter elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

System.***out***.println("Enter elements of matrix b:");

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

**for** (**int** j = 0; j < n; j++) {

b[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

**if** (a[i][j] != b[i][j]) {

flag=0;

System.***out***.println("The matrices are not equal");

**break**;

}

}

}

**if** (flag==1) {

System.***out***.println("The matrices are equal");

}

}

}

**output:**

Enter elements of matrix a:

1 2

3 4

5 6

Enter elements of matrix b:

1 2

3 4

5 6

The matrices are equal

**9.Transpose of matrix**

**package** Demo;

**import** java.util.\*;

**public** **class** TransposeMatrix {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

**int**[][] t = **new** **int**[n][m];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

t[j][i] = a[i][j];

}

}

System.***out***.println("Transpose of matrix a:");

**for** (**int** i = 0; i < n; i++) {

**for** (**int** j = 0; j < m; j++) {

System.***out***.print(t[i][j] + " ");

}

System.***out***.println();

}

}

}

**output:**

Enter Elements of matrix a:

7 6 5

1 9 3

2 1 8

Transpose of matrix a:

7 1 2

6 9 1

5 3 8

**10.Sum of Diagonal of matrix**

**package** Demo;

**import** java.util.\*;

**public** **class** InverseMatrix {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3 ,sum = 0;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

**if**(i==j)

{

sum=sum+a[i][j];

}

}

}

System.***out***.println("Sum of Diagonal of matrix : " + sum);

}

}

**output:**

Enter Elements of matrix a:

2 6 4

3 7 6

1 6 2

Sum of Diagonal of matrix : 11

**11.Sum of non-diagonal Elements**

**package** Demo;

**import** java.util.\*;

**public** **class** MatrixExample {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3 ,sum = 0;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

**if**(i!=j)

{

sum=sum+a[i][j];

}

}

}

System.***out***.println("Sum of non-diagonal elements : " + sum);

}

}

**output:**

Enter Elements of matrix a:

2 6 3

1 3 1

2 2 1

Sum of non-diagonal elements : 15

**12.Sum of upper triangular Elements**

**package** Demo;

**import** java.util.\*;

**public** **class** MatrixExample {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3 ,sum = 0;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

**if**(i<=j)

{

sum=sum+a[i][j];

}

}

}

System.***out***.println("Sum of Upper Triangular Elements: : " + sum);

}

}

**output:**

Enter Elements of matrix a:

1 2 3

4 5 6

7 8 9

Sum of Upper Triangular Elements: : 26

**13.Sum of lower triangular Elements**

**package** Demo;

**import** java.util.\*;

**public** **class** InverseMatrix {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3 ,sum = 0;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

System.***out***.println("Enter Elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

**if**(i>=j)

{

sum=sum+a[i][j];

}

}

}

System.***out***.println("Sum of Lower Triangular Elements: : " + sum);

}

}

**output:**

Enter Elements of matrix a:

1 2 3

4 5 6

7 8 9

Sum of Lower Triangular Elements: : 34

**14.Check given number is orthogonal or not**

**package** demo;

**import** java.util.\*;

**public** **class** Quick\_sort {

**public** **static** **void** main(String[] args) {

Scanner sc = **new** Scanner(System.***in***);

System.***out***.println("Enter the elements of the 2x2 matrix:");

**double**[][] matrix = **new** **double**[2][2];

**for** (**int** i = 0; i < 2; i++) {

**for** (**int** j = 0; j < 2; j++) {

matrix[i][j] = sc.nextDouble();

}

}

**double**[][] transpose = **new** **double**[2][2];

transpose[0][0] = matrix[0][0];

transpose[0][1] = matrix[1][0];

transpose[1][0] = matrix[0][1];

transpose[1][1] = matrix[1][1];

**double**[][] product = **new** **double**[2][2];

**for** (**int** i = 0; i < 2; i++) {

**for** (**int** j = 0; j < 2; j++) {

product[i][j] = 0;

**for** (**int** k = 0; k < 2; k++) {

product[i][j] =product[i][j] + matrix[i][k] \* transpose[k][j];

}

}

}

**double**[][] identity = {{1, 0}, {0, 1}};

**int** flag = 0;

**for** (**int** i = 0; i < 2; i++) {

**for** (**int** j = 0; j < 2; j++) {

**if** (Math.*abs*(product[i][j] - identity[i][j]) > 1e-10) {

flag = 0;

**break**;

} **else** {

flag = 1;

}

}

**if** (flag == 0) **break**;

}

**if** (flag == 1) {

System.***out***.println("The matrix is orthogonal.");

} **else** {

System.***out***.println("The matrix is not orthogonal.");

}

}

}

**output:**

Enter the elements of the 2x2 matrix:

0 1

1 0

The matrix is orthogonal.

**15.Find inverse of given matrix**

**package** demo;

**import** java.util.\*;

**public** **class** Inverse{

**public** **static** **void** main(String[] args) {

Scanner sc = **new** Scanner(System.***in***);

System.***out***.println("Enter the elements of the 2x2 matrix:");

**double**[][] matrix = **new** **double**[2][2];

**for** (**int** i = 0; i < 2; i++) {

**for** (**int** j = 0; j < 2; j++) {

matrix[i][j] = sc.nextDouble();

}

}

**double** determinant = matrix[0][0] \* matrix[1][1] - matrix[0][1] \* matrix[1][0];

**if** (determinant == 0) {

System.***out***.println("Matrix is singular and cannot be inverted.");

} **else** {

**double**[][] inverse = **new** **double**[2][2];

inverse[0][0] = matrix[1][1] / determinant;

inverse[0][1] = -matrix[0][1] / determinant;

inverse[1][0] = -matrix[1][0] / determinant;

inverse[1][1] = matrix[0][0] / determinant;

System.***out***.println("Inverse of the matrix:");

**for** (**int** i = 0; i < 2; i++) {

**for** (**int** j = 0; j < 2; j++) {

System.***out***.printf("%.2f ", inverse[i][j]);

}

System.***out***.println();

}

}

}

}

**16.Create a new 4x4 matrix and fill it with the original values and the calculated sums**

**package** Demo;

**import** java.util.\*;

**public** **class** MatrixExample2 {

**public** **static** **void** main(String[] args) {

**int** m = 3, n = 3 ,totalSum = 0;

Scanner sc = **new** Scanner(System.***in***);

**int**[][] a = **new** **int**[m][n];

**int**[] rowSum = **new** **int**[m];

**int**[] colSum = **new** **int**[n];

System.***out***.println("Enter elements of matrix a:");

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

**for** (**int** j = 0; j < n; j++) {

a[i][j] = sc.nextInt();

}

}

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

**for** (**int** j = 0; j < n; j++) {

rowSum[i] = rowSum[i] + a[i][j];

colSum[j] = colSum[j] +a[i][j];

}

}

**int**[][] b = **new** **int**[m+1][n+1];

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

**for** (**int** j = 0; j < n; j++) {

b[i][j] = a[i][j];

}

}

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

b[i][n] = rowSum[i];

}

**for** (**int** j = 0; j < n; j++) {

b[m][j] = colSum[j];

}

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

totalSum =totalSum + rowSum[i];

}

b[m][n] = totalSum;

System.***out***.println("4x4 matrix with sum:");

**for** (**int** i = 0; i < m+1; i++) {

**for** (**int** j = 0; j < n+1; j++) {

System.***out***.print(b[i][j] + " ");

}

System.***out***.println();

}

}

}

**output:**

Enter elements of matrix a:

1 2 3

4 5 6

7 8 9

4x4 matrix with sum:

1 2 3 6

4 5 6 15

7 8 9 24

12 15 18 45