```
#include <stdio.h>

#define MAX_SIZE 10

void printMatrix(int matrix[][MAX_SIZE], int size) {
    for (int i = 0; i < size; i++) {
        for (int j = 0; j < size; j++) {
            printf("%d ", matrix[i][j]);
        }
        printf("\n");
    }
}

void addMatrices(int matrix1[][MAX_SIZE], int matrix2[][MAX_SIZE], int result[][MAX_SIZE], int size) {
    for (int i = 0; i < size; i++) {
        for (int j = 0; j < size; j++) {
            result[i][j] = matrix1[i][j] + matrix2[i][j];
        }
    }
}

void subtractMatrices(int matrix1[][MAX_SIZE], int matrix2[][MAX_SIZE], int result[][MAX_SIZE], int
size) {
    for (int i = 0; i < size; i++) {
        for (int j = 0; j < size; j++) {
            result[i][j] = matrix1[i][j] - matrix2[i][j];
        }
    }
}

void multiplyMatrices(int matrix1[][MAX_SIZE], int matrix2[][MAX_SIZE], int result[][MAX_SIZE], int
size) {
```

```
    for (int i = 0; i < size; i++) {
        for (int j = 0; j < size; j++) {
            result[i][j] = 0;
            for (int k = 0; k < size; k++) {
                result[i][j] += matrix1[i][k] * matrix2[k][j];
            }
        }
    }
}

int sumPrincipalDiagonal(int matrix[][MAX_SIZE], int size) {
    int sum = 0;
    for (int i = 0; i < size; i++) {
        sum += matrix[i][i];
    }
    return sum;
}

int sumNonPrincipalDiagonal(int matrix[][MAX_SIZE], int size) {
    int sum = 0;
    for (int i = 0; i < size; i++) {
        sum += matrix[i][size - i - 1];
    }
    return sum;
}

void sumRows(int matrix[][MAX_SIZE], int size) {
    for (int i = 0; i < size; i++) {
        int sum = 0;
        for (int j = 0; j < size; j++) {
            sum += matrix[i][j];
```

```
        }
        printf("Sum of elements in row %d: %d\n", i + 1, sum);
    }
}

void sumColumns(int matrix[][MAX_SIZE], int size) {
    for (int i = 0; i < size; i++) {
        int sum = 0;
        for (int j = 0; j < size; j++) {
            sum += matrix[j][i];
        }
        printf("Sum of elements in column %d: %d\n", i + 1, sum);
    }
}

void transposeMatrix(int matrix[][MAX_SIZE], int size) {
    int temp;
    for (int i = 0; i < size; i++) {
        for (int j = i + 1; j < size; j++) {
            temp = matrix[i][j];
            matrix[i][j] = matrix[j][i];
            matrix[j][i] = temp;
        }
    }
}

int isSymmetric(int matrix[][MAX_SIZE], int size) {
    for (int i = 0; i < size; i++) {
        for (int j = i + 1; j < size; j++) {
            if (matrix[i][j] != matrix[j][i]) {
                return 0;
```

```
            }
        }
    }
    return 1;
}

int main() {
    int matrix1[MAX_SIZE][MAX_SIZE];
    int matrix2[MAX_SIZE][MAX_SIZE];
    int result[MAX_SIZE][MAX_SIZE];

    int size;
    printf("Enter the size of the square matrices: ");
    scanf("%d", &size);

    printf("Enter the elements of Matrix 1:\n");
    for (int i = 0; i < size; i++) {
        for (int j = 0; j < size; j++) {
            scanf("%d", &matrix1[i][j]);
        }
    }

    printf("Enter the elements of Matrix 2:\n");
    for (int i = 0; i < size; i++) {
        for (int j = 0; j < size; j++) {
            scanf("%d", &matrix2[i][j]);
        }
    }

    int choice;
    int exitFlag = 0;
```

```
while (!exitFlag) {
    printf("\nMatrix Operations\n");
    printf("1. Add Matrices\n");
    printf("2. Subtract Matrices\n");
    printf("3. Multiply Matrices\n");
    printf("4. Sum of Principal Diagonal\n");
    printf("5. Sum of Non-Principal Diagonal\n");
    printf("6. Sum of Rows\n");
    printf("7. Sum of Columns\n");
    printf("8. Print Transpose\n");
    printf("9. Check Symmetry\n");
    printf("0. Exit\n");
    printf("Enter your choice: ");
    scanf("%d", &choice);

    switch (choice) {
        case 0:
            exitFlag = 1;
            break;
        case 1:
            printf("Matrix 1:\n");
            printMatrix(matrix1, size);

            printf("\nMatrix 2:\n");
            printMatrix(matrix2, size);

            printf("\nAdding matrices:\n");
            addMatrices(matrix1, matrix2, result, size);
            printMatrix(result, size);
            break;
```

```
case 2:
    printf("Matrix 1:\n");
    printMatrix(matrix1, size);

    printf("\nMatrix 2:\n");
    printMatrix(matrix2, size);

    printf("\nSubtracting matrices:\n");
    subtractMatrices(matrix1, matrix2, result, size);
    printMatrix(result, size);
    break;
case 3:
    printf("Matrix 1:\n");
    printMatrix(matrix1, size);

    printf("\nMatrix 2:\n");
    printMatrix(matrix2, size);

    printf("\nMultiplying matrices:\n");
    multiplyMatrices(matrix1, matrix2, result, size);
    printMatrix(result, size);
    break;
case 4:
    printf("Matrix:\n");
    printMatrix(matrix1, size);

    printf("\nSum of Principal Diagonal: %d\n", sumPrincipalDiagonal(matrix1, size));
    break;
case 5:
    printf("Matrix:\n");
    printMatrix(matrix1, size);
```

```
    printf("\nSum of Non-Principal Diagonal: %d\n", sumNonPrincipalDiagonal(matrix1, size));
    break;
case 6:
    printf("Matrix:\n");
    printMatrix(matrix1, size);

    printf("\nSum of Rows:\n");
    sumRows(matrix1, size);
    break;
case 7:
    printf("Matrix:\n");
    printMatrix(matrix1, size);

    printf("\nSum of Columns:\n");
    sumColumns(matrix1, size);
    break;
case 8:
    printf("Matrix:\n");
    printMatrix(matrix1, size);

    printf("\nTranspose of Matrix:\n");
    transposeMatrix(matrix1, size);
    printMatrix(matrix1, size);
    break;
case 9:
    printf("Matrix:\n");
    printMatrix(matrix1, size);

    if (isSymmetric(matrix1, size)) {
        printf("\nThe matrix is symmetric.\n");
```

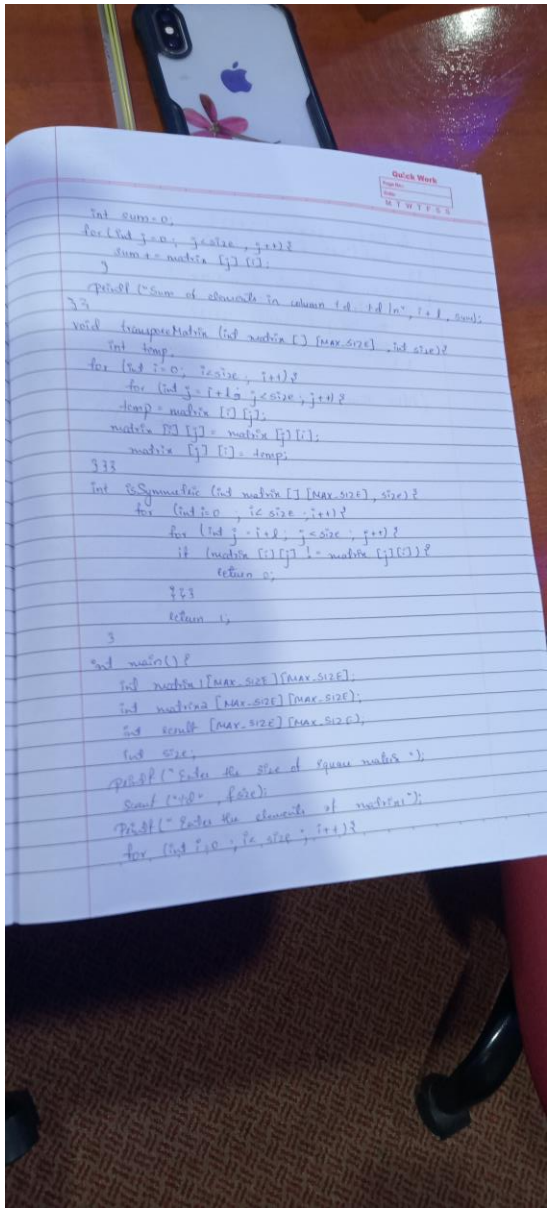
```
            } else {
                printf("\nThe matrix is not symmetric.\n");
            }
            break;
        default:
            printf("Invalid choice.\n");
            break;
      }
   }

   return 0;
}
```

Output

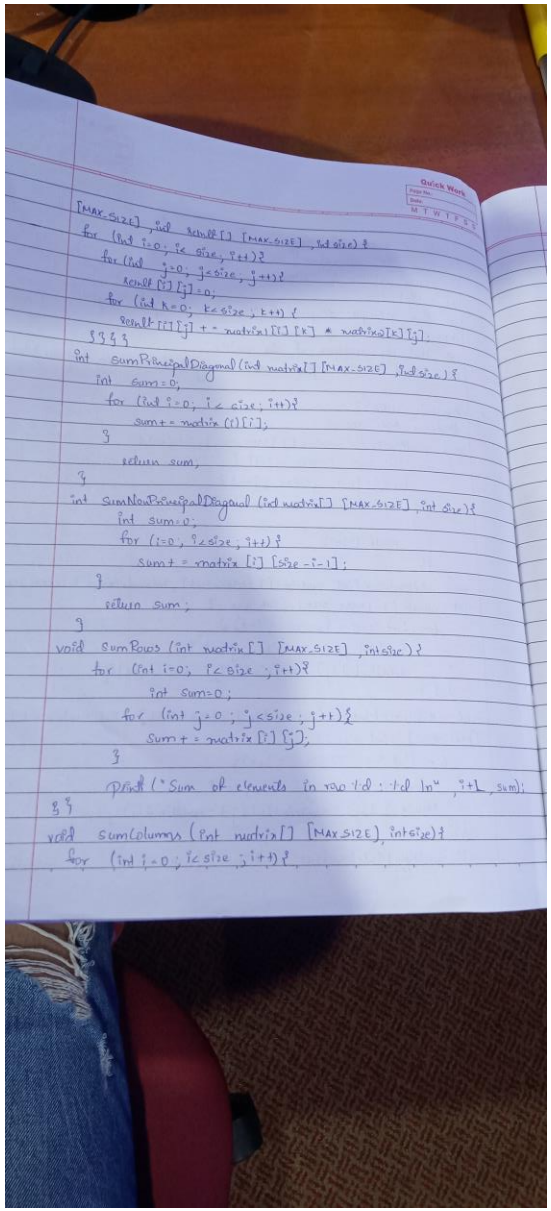
```
7. Sum of Columns
8. Print Transpose
9. Check Symmetry
0. Exit
Enter your choice: 7
Matrix:
1 2
3 4

Sum of Columns:
Sum of elements in column 1: 4
Sum of elements in column 2: 6

Matrix Operations
1. Add Matrices
2. Subtract Matrices
3. Multiply Matrices
4. Sum of Principal Diagonal
5. Sum of Non-Principal Diagonal
6. Sum of Rows
7. Sum of Columns
8. Print Transpose
9. Check Symmetry
0. Exit
Enter your choice: 8
Matrix:
1 2
3 4

Transpose of Matrix:
1 3
2 4

Matrix Operations
1. Add Matrices
2. Subtract Matrices
3. Multiply Matrices
4. Sum of Principal Diagonal
5. Sum of Non-Principal Diagonal
6. Sum of Rows
7. Sum of Columns
8. Print Transpose
9. Check Symmetry
0. Exit
Enter your choice: 9
Matrix:
1 3
2 4

The matrix is not symmetric.

Matrix Operations
1. Add Matrices
2. Subtract Matrices
3. Multiply Matrices
4. Sum of Principal Diagonal
5. Sum of Non-Principal Diagonal
6. Sum of Rows
7. Sum of Columns
8. Print Transpose
9. Check Symmetry
0. Exit
Enter your choice: 9
```

1. Write a C (or) C++ program to do the following pass the matrices as parameter as all this programs.
(1) Matrix Addition & Subtraction
(2) Multiplication
(3) Sum principle diagonal & Non Sum principal diagonal
(4) Sum of rows & columns
(5) Print the transpose of the matrix
(6) Check if the given matrix is symmetric or not. (square Matrix)

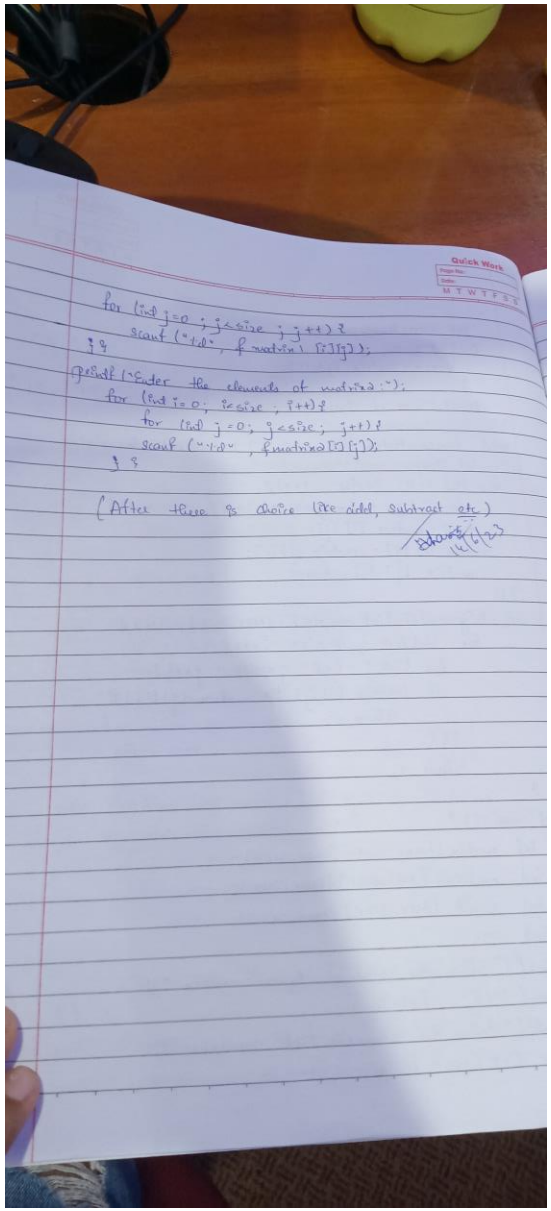
⇒
```
#include <stdio.h>
#define MAX_SIZE 10
void printMatrix(int matrix[][MAX_SIZE], int size){
    for (int i=0 ; i<size ; i++) {
        for (int j=0; j<size ;j++) {
            printf("%d", matrix[i][j]);
        }
        printf("\n");
    }}
void addMatrices(int matrix1[][MAX_SIZE], int matrix2[][MAX_SIZE],
int result[][MAX_SIZE], int size){
    for (int i=0 ; i<size ; i++){
        for(int j=0; j<size ;j++) {
            result[i][j] = matrix1[i][j] + matrix2[i][j];
    }}}
void subtractMatrices(int matrix[][MAX_SIZE], int matrix2[]
[MAX_SIZE], int size){
    for (int i=0; i<size ; i++){
        for (int j=0; j<size; j++){
        result[i][j] = matrix1[i][j] - matrix2[i][j];
    }}
void multiplyMatrices(int matrix1[][MAX_SIZE], int matrix2[]
```



```
int sum=0;
for(int j=0; j<size, j++){
    sum += matrix[j][i];
}
printf("Sum of elements in column %d: %d\n", i+1, sum);
}
void transposeMatrix(int matrix[][MAX_SIZE], int size){
    int temp;
    for(int i=0; i<size; i++){
        for(int j=i+1; j<size; j++){
        temp = matrix[i][j];
        matrix[i][j] = matrix[j][i];
        matrix[j][i] = temp;
}}}
int isSymmetric(int matrix[][MAX_SIZE], size){
    for(int i=0; i<size; i++){
        for(int j=i+1; j<size; j++){
        if(matrix[i][j] != matrix[j][i]){
            return 0;
        }}}
        return 1;
}
int main(){
    int matrix1[MAX_SIZE][MAX_SIZE];
    int matrix2[MAX_SIZE][MAX_SIZE];
    int result[MAX_SIZE][MAX_SIZE];
    int size;
    printf("Enter the size of square matrix:");
    scanf("%d", &size);
    printf("Enter the elements of matrix1:");
    for(int i=0; i<size; i++){
```



```
[MAX_SIZE], int result[][MAX_SIZE], int size){
for(int i=0; i<size; i++){
    for(int j=0; j<size; j++){
        result[i][j]=0;
        for(int k=0; k<size; k++){
        result[i][j] += matrix1[i][k] * matrix2[k][j];
}}}
int sumPrimaryDiagonal(int matrix[][MAX_SIZE], int size){
    int sum=0;
    for(int i=0; i<size; i++){
        sum += matrix[i][i];
    }
    return sum;
}
int sumNonPrimaryDiagonal(int matrix[][MAX_SIZE], int size){
    int sum=0;
    for(i=0; i<size; i++){
        sum += matrix[i][size-i-1];
    }
    return sum;
}
void sumRows(int matrix[][MAX_SIZE], int size){
    for(int i=0; i<size; i++){
        int sum=0;
        for(int j=0; j<size; j++){
            sum += matrix[i][j];
        }
        printf("Sum of elements in row %d: %d\n", i+1, sum);
}}
void sumColumns(int matrix[][MAX_SIZE], int size){
    for(int i=0; i<size; i++){
```



```
    for(int j=0; j<size; j++){
        scanf("%d", &matrix1[i][j]);
}}
printf("Enter the elements of matrix2:");
    for(int i=0; i<size; i++){
        for(int j=0; j<size; j++){
        scanf("%d", &matrix2[i][j]);
}}

(After these is choice like add, subtract etc.)
```