Tridiagonal Matrix 2 X24792_en

A *tridiagonal matrix* is a square sparse matrix that has nonzero elements only on the main diagonal, the subdiagonal (first diagonal below this) and the superdiagonal (first diagonal above the main diagonal).
An *ascending tridiagonal matrix* is a tridiagonal matrix such that all the elements in the main, sub and super diagonals are in ascending order from the upper left corner to the low rigth corner of the matrix.
For example, the matrix A is an ascending tridiagonal while B and C are not because they have nonzero elements outside the diagonals and/or there are non-ordered diagonals, respectively.

```
A
 3  -4   0   0  0
-6   5   3   0  0
 0   1   7   7  0
 0   0   2   8  7
 0   0   0   4  9

B
 5  -4   0   7   1
 7   6   3   0   0
 0   1  -3   7   0
 0   0   2   9  -1
 0   7   0  -6   5

C
 3  -4   0   0   0
-6   5   3   0   0
 0   1   7   7   0
 0   0   2   8   1
 0   0   0   4   9
```

Write a function

```
bool is_asc_tridiagonal(const Matrix& mat);
```

You MUST use the following program, implementing ONLY the code for the `is_asc_tridiagonal` function. Modifying any other part of the code will render your solution INVALID.

```
#include <iostream>
#include <vector>
using namespace std;

typedef vector<int> Row;
typedef vector<Row> Matrix;

// Pre: mat is an n*n square matrix, where n >= 2
```

```
// Post: returns true if mat is an ascending tridiagonal matrix,
// false otherwise
bool is_asc_tridiagonal(const Matrix& mat){
      //  ADD YOUR CODE HERE
}

Matrix read_matrix(int n) {
    Matrix m(n, Row(n));
    for (int i = 0; i < n; ++i)
          for (int j = 0; j < n; ++j)
               cin >> m[i][j];
    return m;
}

int main() {
    int n;    // dimension of the matrix
    while (cin >> n) {
          Matrix a = read_matrix(n);
          if (is_asc_tridiagonal(a)) cout << "TRUE" << endl;
          else cout << "FALSE" << endl;
     }
}
```

Exam score: 3.500000 **Automatic part:** 50.000000%

Input

The input is a sequence of cases where each case consists of an integer $n \geq 2$ followed by n rows of a $n \times n$ square matrix..

Output

For each case in the input, the output must be `TRUE` if the given matrix is *ascending tridiagonal* and `FALSE` otherwise.

Sample input

```
3
1 3 0
5 1 9
0 7 6

5
3 -4 0 0 0
-6 5 3 0 0
0 1 7 5 0
0 0 2 8 7
0 0 0 4 9

5
4 1 0 0 1
1 5 3 0 0
0 2 6 4 0
0 0 6 7 7
0 0 0 7 9

5
3 2 0 0 0
1 5 3 0 0
0 2 7 7 0
0 0 3 8 1
0 0 0 4 9

2
1 3
2 5
```

Sample output

```
TRUE
TRUE
```

```
FALSE
FALSE
TRUE
```

Problem information

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