Tridiagonal matrix 1 X58537_en

A *tridiagonal matrix* is a square sparse matrix that has nonzero elements only on the main diagonal, the subdiagonal (first diagonal below the main diagonal) and the superdiagonal (first diagonal above the main diagonal).

A *zero-sum tridiagonal matrix* is a tridiagonal matrix such that the sum of the elements in the sub and super diagonal equals the sum of the elements in the main diagonal.

For example, matrix *A* is a zero-sum tridiagonal matrix while *B* and *C* are not because *B* has nonzero elements outside the diagonals and *C* does not satisfy the zero-sum requirement.

A

```
40 −4   0   0   0
 2   3   4   0   0
 0   6   7   7   0
 0   0  10   5  13
 0   0   0  12  −5
```

B

```
40 −4   0   2   0
 2   3   4   0   0
 0   6   7   7   0
 4   0  10   5  13
 0   0   0  12  −5
```

C

```
40 −4   0   0   0
 2   3   4   0   0
 0   6   7   7   0
 0   0  10   5  13
 0   0   0  12  −2
```

Write the function:

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

that given a square matrix *mat* returns `true` if *mat* is a zero-sum tridiagonal matrix and `false` otherwise.

You MUST use the following program, implementing ONLY the code for the `is_zerosum_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: it returns true if mat is a zero-sum tridiagonal matrix,
//          false otherwise
bool is_zerosum_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;
    while (cin >> n) {
          Matrix a = read_matrix(n);
          if (is_zerosum_tridiagonal(a)) cout << "TRUE" << endl;
          else cout << "FALSE" << endl;
    }
}
```

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

Input

Input consists of several cases. Each case begins with the dimension of the matrix followed by its elements.

Output

For each matrix, the program writes TRUE if the matrix is zero-sum tridiagonal, and FALSE otherwise.

Sample input

```
5
40 -4   0   0   0
 2   3   4   0   0
 0   6   7   7   0
 0   0 10   5 13
 0   0   0 12 -5

5
40 -4   0   2   0
 2   3   4   0   0
 0   6   7   7   0
 4   0 10   5 13
 0   0   0 12 -5

5
40 -4   0   0   0
```

```
 2   3   4   0   0
 0   6   7   7   0
 0   0 10   5 13
 0   0   0 12 -2

5
40 -4   1   0   0
 2   3   4   0   0
 0   6   7   7   0
 0   0 10   5 13
 0   0  -1 12 -2

5
40 -4   0   0   0
 2   0   4   0   0
 0   6   0   7   0
 0   0   0   5 13
```

```
    0   0   0 12 -5

2
1 1
0 0
```

```
TRUE
FALSE
FALSE
FALSE
TRUE
TRUE
```

Problem information

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