#include <bits/stdc++.h>

using namespace std;

bool searchMatrix(vector<vector<int>>& matrix, int target) {

int n = matrix.size();

int m = matrix[0].size();

//apply binary search:

int low = 0, high = n \* m - 1;

while (low <= high) {

int mid = (low + high) / 2;

int row = mid / m, col = mid % m;

if (matrix[row][col] == target) return true;

else if (matrix[row][col] < target) low = mid + 1;

else high = mid - 1;

}

return false;

}

int main()

{

vector<vector<int>> matrix = {{1, 2, 3, 4}, {5, 6, 7, 8}, {9, 10, 11, 12}};

searchMatrix(matrix, 8) == true ? cout << "true\n" : cout << "false\n";

}