Matrix Median

Using the Matrix class you created in previous problem as base class, create a derived class RowSortedMatrix. RowSortedMatrix class has the property that the rows of the attribute matrix inherited from Matrix class are sorted in ascending order, i.e., for a Matrix A of size $n \times m$:

$$A_{i,j} \leq A_{i,j+1};\ \forall j \in [0, n-1), i \in [0, n-1]$$

Your task is to implement a find_median() function for RowSortedMatrix class, which finds and returns the overall median of the elements in the Matrix.

Expected time and space complexity for your implementation is $\mathcal{O}(\min\{m\log(n), n\log(m)\})$ and $\mathcal{O}(1)$ respectively.

Input Format

First line of the input contains two space-separated integers, n and m, denoting the number of rows and the number of columns respectively of the input matrix A.

Following n lines contain m space-separated integers each, describing the rows of the matrix.

Constraints

$1 \leq n, m \leq 10^6$

$-2^{31} \leq A_{i,j} \leq 2^{31} - 1$

n, m are odd integers.

Output Format

Print the median of the elements in A.

Sample Input

3 3 1 3 5 2 6 9 3 6 9

Sample Output

5

Explanation

All elements of the matrix in sorted order are: $[1, 2, 3, 3, 5, 6, 6, 9, 9]$. Thus median of the elements in the matrix is 5.