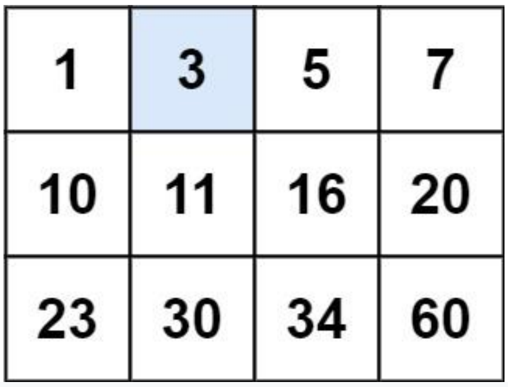
Search a 2D Matrix

Write an efficient algorithm that searches for a value `target` in an `m x n` integer matrix `matrix`. This matrix has the following properties:

- Integers in each row are sorted from left to right.
- The first integer of each row is greater than the last integer of the previous row.

Example 1:

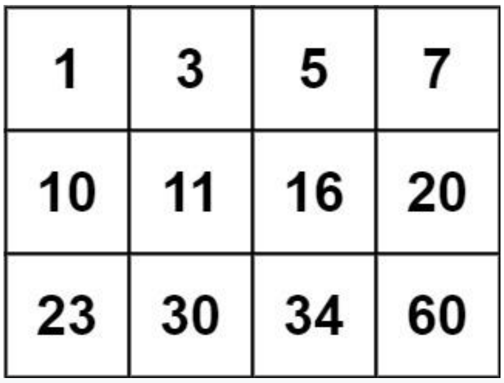


1	3	5	7
10	11	16	20
23	30	34	60

```
Input: matrix = [[1,3,5,7],[10,11,16,20],[23,30,34,60]], target = 3

Output: true
```

Example 2:



1	3	5	7
10	11	16	20
23	30	34	60

```
Input: matrix = [[1,3,5,7],[10,11,16,20],[23,30,34,60]], target = 13

Output: false
```

Constraints:

- `m == matrix.length`
- `n == matrix[i].length`
- `1 <= m, n <= 100`
- -10^4 `<= matrix[i][j], target <=` 10^4

```
public class Solution {
    public bool SearchMatrix(int[][] matrix, int target) {
       int rowVal = BSearchRow(matrix, target, 0, matrix.Length-1);
       return BSearchValue(matrix[rowVal],target,0,matrix[rowVal].Length-1);
    }

    //Binary search for identifying the row :  row[0] <= target <= row[length-1]
   int BSearchRow(int[][] matrix, int target, int lowIndex, int highIndex)
   {
        int midIndex = (highIndex + lowIndex)/2;
        int retVal = 0;

        if(midIndex == lowIndex || midIndex == highIndex)
        {
            retVal = highIndex;
            if(matrix[lowIndex][0] <= target && target <=matrix[midIndex][matrix[midIndex].Length-1])
            {
                retVal = lowIndex;
            }
        }
        else if(target < matrix[midIndex][0])
        {
            retVal = BSearchRow(matrix, target, lowIndex, midIndex);
        }
        else if(target > matrix[midIndex][matrix[midIndex].Length-1])
        {
           retVal = BSearchRow(matrix, target, midIndex, highIndex);
        }
        else
        {
           retVal = midIndex;
        }
        return retVal;
   }

    //Binary search for identifying element in a single dimention array
    bool BSearchValue(int[] matrix, int target, int lowIndex, int highIndex)
    {
        int midIndex = (highIndex + lowIndex)/2;
        bool retVal = false;

        if(matrix[midIndex] == target)
        {
           retVal = true;
        }
        else if(midIndex == lowIndex || midIndex == highIndex)
        {
            if(matrix[lowIndex] == target || matrix[highIndex] == target)
            {
               retVal = true;
            }
            else
            {
                retVal = false;
            }
        }
        else if(matrix[midIndex] < target)
        {
           retVal = BSearchValue(matrix, target, midIndex, highIndex);
        }
        else if(matrix[midIndex] > target)
        {
           retVal = BSearchValue(matrix, target, lowIndex, midIndex);
        }
        else
        {
           retVal = false;
        }
       return retVal;
    }
}
```