

Advanced Coding Practice

Coding Problem #2

2023 Fall, CSE4152
Sogang University



Largest N numbers

Let M be an $N \times N$ integer matrix, where each element in M is distinct, ensuring that no two elements are equal. Propose an algorithm that efficiently identifies the N largest elements among the elements of M . Furthermore, provide a proof of the correctness of this algorithm. Note that the algorithm does not need to preserve M 's initial state.

Example

Input

5

// N

1 5 9 13 25

// NXN matrix

2 6 11 16 27

3 7 14 18 28

4 8 15 21 30

10 11 20 23 50

Output

50 30 28 27 25

Position of k

Consider an $N \times N$ matrix of integers where both its rows and columns are arranged in non-decreasing order. Propose an algorithm that, given such a matrix and an integer k , efficiently determines the position of k within the matrix. In cases where there are multiple occurrences of k in the matrix, the algorithm will identify one of them.

Example

Input

5 // N

1 5 9 13 25

2 6 11 16 27

3 7 14 18 28

4 8 15 21 30

10 11 20 23 50

8 // K

Output

4 2