
Lab 01

Sorting

CSE 4404
ALGORITHMS LAB

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Problem Statement

Let's say you have an array of n integers a_1, a_2, \dots, a_n . You need to make pairs from these numbers (a_i, a_j) such that $(1 \leq i, j \leq n)$ and sort them lexicographically in non-decreasing order. A pair (p_1, q_1) is lexicographically less than the pair (p_2, q_2) if either $p_1 < p_2$, or $p_1 = p_2$ and $q_1 < q_2$. As there are n integers in the array, you will have a total of n^2 pairs. Let's number them from 1 to n^2 . Your task is to find the k -th pair from the lexicographically sorted list of pairs.

Input

The first line contains two integers n and k ($1 \leq n \leq 10^5, 1 \leq k \leq n^2$). The second line contains the array containing n integers a_1, a_2, \dots, a_n ($-10^5 \leq a_i \leq 10^5$). The numbers in the array might not be distinct.

Output

In the single line print two numbers of the k -th pair.

Example

Sample Input 1	Sample Output 1
3 2 3 1 5	1 3

Sample Input 2	Sample Output 2
4 11 1 1 3 3	3 1

Explanation

In the first sample, the list of pairs will be $(3, 3), (3, 1), (3, 5), (1, 3), (1, 1), (1, 5), (5, 3), (5, 1), (5, 5)$. After you sort these pairs, the list becomes $(1, 1), (1, 3), (1, 5), (3, 1), (3, 3), (3, 5), (5, 1), (5, 3), (5, 5)$. So, the 2-nd pair is $(1, 3)$ which is the same as the given output.

Task 1.1

Find a $O(n^2)$ solution of the given problem. you are not allowed to use any kinds of built in sorting library. If you need to perform any kinds of sorting, write a custom function for that.

Task 1.2

Find a $O(n \log n)$ solution of the given problem. you are not allowed to use any kinds of built in sorting library. If you need to perform any kinds of sorting, write a custom function for that.

Find The Median

Median plays an important role in the world of statistics. By definition, it is a value which divides an array into two equal parts. In this problem you are to determine the current median of some long integers. Suppose, we have five numbers 1, 3, 6, 2, 7. In this case, 3 is the median as it has exactly two numbers on its each side. 1, 2 and 6, 7. If there are even number of values like 1, 3, 6, 2, 7, 8, only one value cannot split this array into equal two parts, so we consider the average of the middle values 3, 6. Thus, the median will be $(3 + 6)/2 = 4.5$. In this problem, you have to print only the integer part, not the fractional. As a result, according to this problem, the median will be 4 !

Input

The input consists of a series of integers $X(0 < X < 10^9)$. You may safely assume that the total number of integers will be less than 1000.

Output

For each input print the current value of the median.

Example

Sample Input 1	Sample Output 1
1	1
3	2
4	3
60	3
70	4
50	27
2	4

Task 2.1

Find a suitable solution of the given problem. Write your own sorting function.