Lab Task 1: Sorting and Binary Search

#Problem 1: Height of the students

Description:
You will be dealing with the heights of the students here. First, you will be given an integer value N denoting the number of students in the class. Then you will be given N numbers (can be floating point numbers) denoting the *height* of each student in some unit. The i^{th} number will denote the *height* of the i^{th} student. After that you will be given a value K.

In the assembly students are arranged from the smallest to largest height. You have to print the roll which will be standing in the K^{th} position in such an arrangement. The rolls follow 1 based indexing. In the case of repeating heights, you need to print the student with a lesser roll.

Limits:
1<=N<=100000
1<=k<=100000
100 <= height <= 5000

Test Cases:

Input	Output

5
100 105.3 500.7 200.3 161
3
	5

4
205.1 181.2 173.7 181.2
2
	2

#Problem 2: Min Distance between the points of 1D coordinates

Description:
You will be given N, 1D co-ordinates lying in the number line. You have to print the absolute minimum distance found between two given coordinates.

Limits:
1<=N<=100000

Test Cases:

Input	Output
5 7 10 9 -5 5	1
5 10 -15 15 12 3	2

#Problem 3: Finding Majority Element - 1

Description:
In this problem, you will be given N numbers. You need to find the element which occurred the maximum number of times. If there are ties in frequencies, return the element which is comparatively greater.
In the first line, you will be given an integer N. In the following line, you will be given N integer values A_i (1<=i<=N).
For each input there will be a single line of output. Printing the element with the maximum number of occurrences. For ties in occurrences, print the element with the maximum value.

Limits:
$1<=N<=100000, -10^5 <= A_i <= 10^5$

Test Cases:

Input	Output
6 5 3 2 3 2 1	3
7 5 1 2 3 3 2 2	2

#Problem 4: Upper and Lower Bound

Description:
Given a sorted array A of size N and a search value S, you have to find the upper and lower bound value for S.
In the first line, you will be given N and S. In the second line, you will be given N values denoting the sorted array.
You have to print the upper and lower bound respectively with a single blank space. Keep a new line character after each output. Print the answer using 0 based indexing.

Upper Bound: The index of the smallest value in the sorted array which is greater than S. For repeating such values consider the largest or the right-most index. If the largest value in the array is smaller than S. Then the upper bound is the size of the array.

Lower Bound: The index of the largest value in the sorted array which is smaller or equal to S. For repeating such values consider the smallest or the left-most index. If S is smaller than the smallest value in the array, consider the lower bound as 0.

Limits:
1<=|A|<=100000

Test Cases:

Input	Output
5 3 1 2 3 7 8	3 2
5 4 1 2 3 7 8	3 2
8 6 1 3 5 5 5 7 9 10	5 2
8 12 1 3 5 5 5 7 9 10	8 7
8 0 1 3 5 5 5 7 9 10	0 0
6 3 1 2 2 4 4 7	4 1
6 2 1 2 2 4 4 7	4 1

- First solve for non repeating elements
- Then consider the solution for repeating elements
- Try to write code using separate functions

#Problem 5: Finding Square Root

Description:

You will be given an integer number. You need to calculate the square root of that number up to three decimal places. So, your precision should match three places after the decimal. You can not use the built-in function sqrt here.

Test Cases:

Input	Output
4	2.000
10	3.162
15	3.873