

DSA Tutorial:

Searching and Hashing

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1. Frequency in sorted array (warm-up)

You are given a sorted array of n integers and an integer x . You need to tell the frequency(number of occurrences) of x in the array.

Input

The first line contains two integers n, x — the number of elements in the array and the element whose frequency you need to find out.

The second line contains n integers in sorted order:

a_1, a_2, \dots, a_n ($-10^9 \leq a_i \leq 10^9$) and $a_i \leq a_{i+1}$.

Output

Print a single integer — the frequency of x .

Sample input 1:

10 5

-10 -4 -4 0 1 5 5 5 19 3456

Sample output 1:

3

2. Maximum Median

You are given an array a of n integers, where n is odd. You can make the following operation with it:

- Choose one of the elements of the array (for example a_i) and increase it by 1 (that is, replace it with $a_i + 1$).

You want to make the median of the array the largest possible using at most k operations.

The median of the odd-sized array is the middle element after the array is sorted in non-decreasing order. For example, the median of the array $[1, 5, 2, 3, 5]$ is 3.

Input

The first line contains two integers n, k ($1 \leq n \leq 2 \cdot 10^5$, n is odd, $1 \leq k \leq 10^9$) — the number of elements in the array and the largest number of operations you can make.

The second line contains n integers a_1, a_2, \dots, a_n ($1 \leq a_i \leq 10^9$).

Output

Print a single integer — the maximum possible median after the operations.

Sample input 1:

3 2

1 3 5

Sample output 1:

5

Sample input 2:

5 5

1 2 1 1 1

Sample output 2:

3

Sample input 3:

7 7

4 1 2 4 3 4 4

Sample output 3:

5

3. Zero Quantity Maximization

You are given two arrays a and b , each contains n integers.

You want to create a new array c as follows: choose some real (i.e. not necessarily integer) number d , and then for every $i \in [1, n]$ let $c_i = d * a_i + b_i$.

Your goal is to maximize the number of zeroes in array c . What is the largest possible answer, if you choose d optimally?

Input

The first line contains one integer n ($1 \leq n \leq 2 * 10^5$) — the number of elements in both arrays.

The second line contains n integers a_1, a_2, \dots, a_n ($-10^9 \leq a_i \leq 10^9$).

The third line contains n integers b_1, b_2, \dots, b_n ($-10^9 \leq b_i \leq 10^9$).

Output

Print one integer — the maximum number of zeroes in array c , if you choose d optimally.

Sample input 1:

5

1 2 3 4 5

2 4 7 11 3

Sample output 1:

2

Sample input 2:

3

13 37 39

1 2 3

Sample output 2:

2

Sample input 3:

4

0 0 0 0

1 2 3 4

Sample output 3:

0

Sample input 4:

3

1 2 -1

-6 -12 6

Sample output 4:

3

Practice Problems:

- Divisible Subset (www.codechef.com/problems/DIVSUBS)
- PIE (www.spoj.com/problems/PIE/)
- Stealing Gulab Jamun
(www.hackerrank.com/contests/dsa-searching-practice/challenges/stealing-gulab-jamun/problem)
- Maximum points on the same line
(www.geeksforgeeks.org/count-maximum-points-on-same-line/)