DSA Assignment - 3

A. Checkpoints

1 second, 256 megabytes

You are playing a game called collecting checkpoints. In the game, starting from any checkpoint your task is to collect all the checkpoints. Initially there are N checkpoints. There are Q levels. In each level, a checkpoint is either added or removed. Find the minimum distance you must travel in order to collect all the checkpoints at each level.

All the checkpoints lie on positive x-axis. Note that there can be multiple checkpoints at the same coordinate. Also only one checkpoint can be removed at a time. At each level there is atleast one checkpoint.

Input

The first line contains two space separated integers N and Q $(1 \le N, Q \le 10^5)$.

The next line contains N space separated integers, the coordinates of initial checkpoints. It is guaranteed that the coordiantes are positive and do not exceed 10^9.

Q lines follows.

There are two types of queries -

- ADD k - Add a checkpoint at coordinate k.
- DEL k - Remove a checkpoint from coordinate k.

Output

Print Q lines, the minimum distance you must travel to collect all checkpoints at each level.

input
3 3 2 1 3 DEL 3 ADD 2 DEL 1
output
1 1 0

Initially you have check points at position 1, 2, 3;

In the first level checkpoint at 3 is removed. So you can start from either 1 or 2. The distance is 1 in both cases.

In the second level a checkpoint is added at 2. So you can start from either 1 or 2. The distance is 1 in both cases.

In the third level a checkpoint at 1 is removed. So you can start from 2. The distance is 0.

B. Prime Triplets

1 second, 256 megabytes

Alice loves playing with prime numbers. He wants to know if there exists a triplet a, b, c satisfying the following conditions -

- a, b and c are distinct primes.
- $a^2 + b^2 + c^2 = N$, where N is an even integer.

Input

The only line of input contains a single integer N $(2 \le N \le 10^{12})$. It is guaranteed that N is an even number.

Output

If Alice could find such a triplet, print "Yes", otherwise print "No" (without the quotes).

input
38
output
Yes

$2^2 + 3^2 + 5^2 = 38$

C. Easiest Problem

1 second, 256 megabytes

The problemsetters were busy fighting in the World War III so they didn't have time to sort the problems according to difficulty. **The problems in this contest are NOT sorted according to difficulty.** Ananya Pandey struggled for hours trying to find the easiest problem of the contest. After finding the easiest problem, she said, "It isn't as easy as people say it is". She needs your help, can you solve the problem?

Given two positive integers n and k, find the smallest positive integer which is a multiple of k and is $\mathbf{strictly}$ greater than n.

Input

The only line of the input contains two integers n and k $(1 \le n \le 100, 1 \le k \le 100)$.

Output

Print a single integer — the answer to the given problem.

input
9 7
output
14

input
10 5
output
15

In the first example, the answer is 14 because it is the smallest multiple of 7 which is strictly greater than 9.

In the second example, the answer is 15 due to similar reasons. **Note that 10 is not strictly greater than 10, hence it is not the right answer to this example.**

D. Another Missile Problem

1 second, 256 megabytes

Tonald Drump has n missiles. It has been estimated that the i-th missile kills a_i people. Tonald lost his mind and shot a missile on Youran. The probability that Tonald shot the i-th missile is p_i.

Youran is counting casualties, by now they have counted till m (which means m or **more** people died).

For each $1 \le i \le n$ calculate the probability that Tonald shot the i-th missile.

It is guaranteed that there is at least 1 missile that kills at least m people.

Input

The first line contains two integers $n(1 \le n \le 100)$ and $m(0 \le m \le 10^4)$—the number of missiles Tonald has, and the minimum number of deaths.

The second line contains n real numbers, the i-th of these numbers is $p_i(0 \le p_i \le 1$ and $\sum_{1 \le i \le n} p_i = 1)$, the probability that Tonald shot the i-th missile.

The third line contains n integers, the i-th of these integers $a_i(0 \le a_i \le 10^4)$ Also, $a_j \ge m$ for some j.

Output

Output n real numbers in one line. (The absolute error must not exceed 10^{-6})

input
3 5 0.25 0.15 0.6 4 5 9
output
0.000000000 0.200000000 0.800000000

input
4 14 0.32 0.16 0.22 0.3 14 2 8 19
output
0.516129032 0.000000000 0.000000000 0.483870968

In the first test, the first missile kills only 4 people and $4 < m$ so the probability that the first missile was shot is zero.

E. Hasty Harmonium

1 second, 256 megabytes

Abba is going to ~~eat~~ play his harmonium. The tune he is going to play can be represented by a string of only lowercase english characters. It's war time! The airstrike has been started, abba can only play a subsequence of the tune. Abba wants to play more than at least 1 note and wants his tune to be lexicographically minimum(strange desires!).

Given a sequence of characters of length n, find the lexicographically smallest possible subsequence of characters of any length greater than one.

A subsequence is a sequence that can be derived from the given sequence by deleting zero or more elements without changing the order of the remaining elements.

String p is lexicographically smaller than string q, if p is a prefix of q, is not equal to q or there exists i, such that $p_i < q_i$ and for all $j \le i$ it is satisfied that $p_j = q_j$. For example, `abc` is lexicographically smaller than `abcd`, `abd` is lexicographically smaller than `abec`, `afa` is not lexicographically smaller than `ab` and `a` is not lexicographically smaller than `a`.

Input

The first and only line contains string s $(2 \le |s| \le 10^6)$. String s contains only lowercase English letters.

Output

Output the string t conforming to the requirements above.

input
abesaale
output
aa

input
az
output
az