# VK Cup 2012 Round 2 (Unofficial Div. 2 Edition)

## A. Chores

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Petya and Vasya are brothers. Today is a special day for them as their parents left them home alone and commissioned them to do $n$ chores. Each chore is characterized by a single parameter — its complexity. The complexity of the $i$-th chore equals $h_i$.

As Petya is older, he wants to take the chores with complexity larger than some value $x$ ($h_i > x$) to leave to Vasya the chores with complexity less than or equal to $x$ ($h_i \le x$). The brothers have already decided that Petya will do exactly $a$ chores and Vasya will do exactly $b$ chores ($a + b = n$).

In how many ways can they choose an integer $x$ so that Petya got exactly $a$ chores and Vasya got exactly $b$ chores?

### Input

The first input line contains three integers $n$, $a$ and $b$ ($2 \le n \le 2000$; $a, b \ge 1$; $a + b = n$) — the total number of chores, the number of Petya's chores and the number of Vasya's chores.

The next line contains a sequence of integers $h_1, h_2, ..., h_n$ ($1 \le h_i \le 10^9$), $h_i$ is the complexity of the $i$-th chore. The numbers in the given sequence are not necessarily different.

All numbers on the lines are separated by single spaces.

### Output

Print the required number of ways to choose an integer value of $x$. If there are no such ways, print `0`.

**Sample test(s)**

| input |
| --- |
| 5 2 3<br>6 2 3 100 1 |

| output |
| --- |
| 3 |

| input |
| --- |
| 7 3 4<br>1 1 9 1 1 1 1 |

| output |
| --- |
| 0 |

### Note

In the first sample the possible values of $x$ are 3, 4 or 5.

In the second sample it is impossible to find such $x$, that Petya got 3 chores and Vasya got 4.

# B. Replacing Digits

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are given an integer $a$ that consists of $n$ digits. You are also given a sequence of digits $s$ of length $m$. The digit in position $j$ ($1 \le j \le m$) of sequence $s$ means that you can choose an arbitrary position $i$ ($1 \le i \le n$) in $a$ and replace the digit in the chosen position $i$ with $s_j$. Each element in the sequence $s$ can participate in no more than one replacing operation.

Your task is to perform such sequence of replacements, that the given number $a$ gets maximum value. You are allowed to use not all elements from $s$.

## Input

The first line contains positive integer $a$. Its length $n$ is positive and doesn't exceed $10^5$. The second line contains sequence of digits $s$. Its length $m$ is positive and doesn't exceed $10^5$. The digits in the sequence $s$ are written consecutively without any separators.

The given number $a$ doesn't contain leading zeroes.

## Output

Print the maximum value that can be obtained from $a$ after a series of replacements. You are allowed to use not all elements from $s$. The printed number shouldn't contain any leading zeroes.

**Sample test(s)**

| input |
| --- |
| 1024<br>010 |
| output |
| 1124 |

| input |
| --- |
| 987<br>1234567 |
| output |
| 987 |

# C. Substring and Subsequence

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

One day Polycarpus got hold of two non-empty strings $s$ and $t$, consisting of lowercase Latin letters. Polycarpus is quite good with strings, so he immediately wondered, how many different pairs of "$x$ $y$" are there, such that $x$ is a substring of string $s$, $y$ is a subsequence of string $t$, and the content of $x$ and $y$ is the same. Two pairs are considered different, if they contain different substrings of string $s$ or different subsequences of string $t$. Read the whole statement to understand the definition of different substrings and subsequences.

The *length* of string $s$ is the number of characters in it. If we denote the length of the string $s$ as $|s|$, we can write the string as $s = s_1 s_2 \ldots s_{|s|}$.

A *substring* of $s$ is a non-empty string $x = s[a \ldots b] = s_a s_{a+1} \ldots s_b$ ($1 \le a \le b \le |s|$). For example, "`code`" and "`force`" are substrings or "`codeforces`", while "`coders`" is not. Two substrings $s[a \ldots b]$ and $s[c \ldots d]$ are considered to be *different* if $a \ne c$ or $b \ne d$. For example, if $s$="`codeforces`", $s[2 \ldots 2]$ and $s[6 \ldots 6]$ are different, though their content is the same.

A *subsequence* of $s$ is a non-empty string $y = s[p_1 p_2 \ldots p_{|y|}] = s_{p_1} s_{p_2} \ldots s_{p_{|y|}}$ ($1 \le p_1 < p_2 < \ldots < p_{|y|} \le |s|$). For example, "`coders`" is a subsequence of "`codeforces`". Two subsequences $u = s[p_1 p_2 \ldots p_{|u|}]$ and $v = s[q_1 q_2 \ldots q_{|v|}]$ are considered *different* if the sequences $p$ and $q$ are different.

## Input

The input consists of two lines. The first of them contains $s$ ($1 \le |s| \le 5000$), and the second one contains $t$ ($1 \le |t| \le 5000$). Both strings consist of lowercase Latin letters.

## Output

Print a single number — the number of different pairs "$x$ $y$" such that $x$ is a substring of string $s$, $y$ is a subsequence of string $t$, and the content of $x$ and $y$ is the same. As the answer can be rather large, print it modulo $1000000007$ ($10^9 + 7$).

**Sample test(s)**

| input |
| --- |
| aa<br>aa |
| output |
| 5 |

| input |
| --- |
| codeforces<br>forceofcode |
| output |
| 60 |

## Note

Let's write down all pairs "$x$ $y$" that form the answer in the first sample: "$s[1 \ldots 1]$ $t[1]$", "$s[2 \ldots 2]$ $t[1]$", "$s[1 \ldots 1]$ $t[2]$","$s[2 \ldots 2]$ $t[2]$", "$s[1 \ldots 2]$ $t[1\ 2]$".

# D. Lemmings

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

As you know, lemmings like jumping. For the next spectacular group jump $n$ lemmings gathered near a high rock with $k$ comfortable ledges on it. The first ledge is situated at the height of $h$ meters, the second one is at the height of $2h$ meters, and so on (the $i$-th ledge is at the height of $i \cdot h$ meters). The lemmings are going to jump at sunset, and there's not much time left.

Each lemming is characterized by its climbing speed of $v_i$ meters per minute and its weight $m_i$. This means that the $i$-th lemming can climb to the $j$-th ledge in $\frac{j \cdot h}{v_i}$ minutes.

To make the jump beautiful, heavier lemmings should jump from higher ledges: if a lemming of weight $m_i$ jumps from ledge $i$, and a lemming of weight $m_j$ jumps from ledge $j$ (for $i < j$), then the inequation $m_i \le m_j$ should be fulfilled.

Since there are $n$ lemmings and only $k$ ledges ($k \le n$), the $k$ lemmings that will take part in the jump need to be chosen. The chosen lemmings should be distributed on the ledges from $1$ to $k$, one lemming per ledge. The lemmings are to be arranged in the order of non-decreasing weight with the increasing height of the ledge. In addition, each lemming should have enough time to get to his ledge, that is, the time of his climb should not exceed $t$ minutes. The lemmings climb to their ledges all at the same time and they do not interfere with each other.

Find the way to arrange the lemmings' jump so that time $t$ is minimized.

## Input

The first line contains space-separated integers $n$, $k$ and $h$ ($1 \le k \le n \le 10^5$, $1 \le h \le 10^4$) — the total number of lemmings, the number of ledges and the distance between adjacent ledges.

The second line contains $n$ space-separated integers $m_1, m_2, ..., m_n$ ($1 \le m_i \le 10^9$), where $m_i$ is the weight of $i$-th lemming.

The third line contains $n$ space-separated integers $v_1, v_2, ..., v_n$ ($1 \le v_i \le 10^9$), where $v_i$ is the speed of $i$-th lemming.

## Output

Print $k$ different numbers from $1$ to $n$ — the numbers of the lemmings who go to ledges at heights $h, 2h, ..., kh$, correspondingly, if the jump is organized in an optimal way. If there are multiple ways to select the lemmings, pick any of them.

**Sample test(s)**

| input |
| --- |
| 5 3 2<br>1 2 3 2 1<br>1 2 1 2 10 |
| output |
| 5 2 4 |

| input |
| --- |
| 5 3 10<br>3 4 3 2 1<br>5 4 3 2 1 |
| output |
| 4 3 1 |

## Note

Let's consider the first sample case. The fifth lemming (speed 10) gets to the ledge at height 2 in $\frac{1}{5}$ minutes; the second lemming (speed 2) gets to the ledge at height 4 in 2 minutes; the fourth lemming (speed 2) gets to the ledge at height 6 in 3 minutes. All lemmings manage to occupy their positions in 3 minutes.

# E. Conveyor

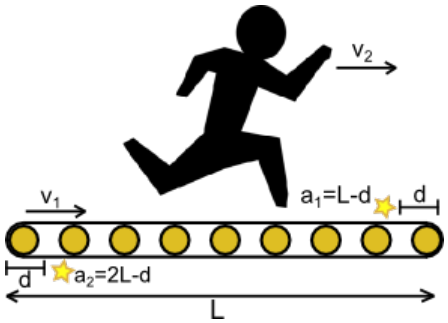
time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Anton came to a chocolate factory. There he found a working conveyor and decided to run on it from the beginning to the end.

The conveyor is a looped belt with a total length of $2l$ meters, of which $l$ meters are located on the surface and are arranged in a straight line. The part of the belt which turns at any moment (the part which emerges from under the floor to the surface and returns from the surface under the floor) is assumed to be negligibly short.

The belt is moving uniformly at speed $v_1$ meters per second. Anton will be moving on it in the same direction at the constant speed of $v_2$ meters per second, so his speed relatively to the floor will be $v_1 + v_2$ meters per second. Anton will neither stop nor change the speed or the direction of movement.

Here and there there are chocolates stuck to the belt ($n$ chocolates). They move together with the belt, and do not come off it. Anton is keen on the chocolates, but he is more keen to move forward. So he will pick up all the chocolates he will pass by, but nothing more. If a chocolate is at the beginning of the belt at the moment when Anton starts running, he will take it, and if a chocolate is at the end of the belt at the moment when Anton comes off the belt, he will leave it.




The figure shows an example with two chocolates. One is located in the position $a_1 = l - d$, and is now on the top half of the belt, the second one is in the position $a_2 = 2l - d$, and is now on the bottom half of the belt.

You are given the positions of the chocolates relative to the initial start position of the belt $0 \le a_1 < a_2 < ... < a_n < 2l$. The positions on the belt from $0$ to $l$ correspond to the top, and from $l$ to $2l$ — to the the bottom half of the belt (see example). All coordinates are given in meters.

Anton begins to run along the belt at a random moment of time. This means that all possible positions of the belt at the moment he starts running are equiprobable. For each $i$ from $0$ to $n$ calculate the probability that Anton will pick up exactly $i$ chocolates.

## Input

The first line contains space-separated integers $n$, $l$, $v_1$ and $v_2$ ($1 \le n \le 10^5$, $1 \le l, v_1, v_2 \le 10^9$) — the number of the chocolates, the length of the conveyor's visible part, the conveyor's speed and Anton's speed.

The second line contains a sequence of space-separated integers $a_1, a_2, ..., a_n$ ($0 \le a_1 < a_2 < ... < a_n < 2l$) — the coordinates of the chocolates.

## Output

Print $n + 1$ numbers (one per line): the probabilities that Anton picks up exactly $i$ chocolates, for each $i$ from $0$ (the first line) to $n$ (the last line). The answer will be considered correct if each number will have absolute or relative error of at most than $10^{-9}$.

**Sample test(s)**

| input |
| --- |
| 1 1 1 1<br>0 |
| output |
| 0.7500000000000000000<br>0.2500000000000000000 |

| input |
| --- |
| 2 3 1 2<br>2 5 |
| output |
| 0.3333333333333331000<br>0.6666666666666663000<br>0.0000000000000000000 |

## Note

In the first sample test Anton can pick up a chocolate if by the moment he starts running its coordinate is less than 0.5; but if by the moment the boy starts running the chocolate's coordinate is greater than or equal to 0.5, then Anton won't be able to pick it up. As all positions of the belt are equiprobable, the probability of picking up the chocolate equals $\frac{0.5}{2} = 0.25$, and the probability of not picking it up equals $\frac{1.5}{2} = 0.75$.