Problem A. FFT-1

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Given two polynomials

$A(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_0$

$B(x) = b_m x^m + b_{m-1} x^{m-1} + \cdots + b_0$

Calculate $C(x) = A(x)B(x)$

Input

$n, a_n, a_{n-1}, \ldots, a_0$

$m, b_m, b_{m-1}, \ldots, b_0$

$0 \le n, m < 2^{16}$, $|a_i|, |b_j| \le 9$

$a_n \neq 0, b_m \neq 0$

Output

Print coefficients of C in the same format.

Examples

standard input	standard output
`2    1 0 2` `1    2 3`	`3    2 3 4 6`

Problem B. Duel

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Alex and his rival George are preparing for the duel because of fair lady Nathalie. The duel will take place at a dark alley. The alley has n trees and bushes growing along, the distance between adjacent plants is one meter. Alex and George decided that the duel will proceed as follows. Some tree is selected as the starting point and marked accordingly. Two trees at equal distance from the starting tree are marked as shooting points. Alex and George will start at the starting tree and move in opposite directions. When they reach shooting trees they will turn around and shoot at each other.

Given the positions of the trees, help Alex and George find the starting tree and shooting trees. First the duelists would like to know the number of ways they can choose the trees.

Input

Input file contains a non-empty string of 0-s and 1-s that describes the alley, 0 stands for the bush (that is not suitable to be neither starting nor shooting point), 1 stands for the tree. The length of the string doesn't exceed 10^5.

Output

Output the number of ways the duelists can choose starting and shooting trees.

Examples

standard input	standard output
101010101	4
101001	0

In the first example the following configurations of the duel are possible (starting and shooting trees are marked as bold): **1**0**1**0**1**0101, 10**1**0**1**0**1**01, 1010**1**0**1**0**1** and **1**010**1**010**1**.

Problem C. The number of integers...

Input file:	*standard input*
Output file:	*standard output*
Time limit:	6 seconds
Memory limit:	256 megabytes

You are given integers n, d and m. For each $i = 0, 1, 2, \ldots, m$ you need to count the number of integers with sum of digits not more than i, which are divisible by d and have not more than n digits. Since the answers can be very large, return them modulo 998244353.

Input

The only line of input contains three integers n, d, m ($1 \le n \le 10^9$, $1 \le d \le 16$, $1 \le m \le 8 \cdot 10^3$) separated by spaces.

Output

Print $(m+1)$ integers separated by spaces, $(i+1)$-th of them should be the number of such integers with sum of digits i, taken modulo 998244353.

Examples

standard input	standard output
2 3 3	1 1 1 5

Note that $998244353 = 119 \cdot 2^{23} + 1$.

Problem D. Linear Recursive Sequence

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	512 mebibytes

A well-known linear recursive sequence $f(n)$ is defined as follows:

- for $k \le 0$, $f(k) = 1$;
- for $k \ge 1$, $f(k) = a \cdot f(k-p) + b \cdot f(k-q)$.

Given n, a, b, p, q, find the value of $f(n)$ modulo 119.

Input

First line of the input contains 5 integers n, a, b, p, q $(1 \le n \le 2 \cdot 10^9, 0 \le a, b \le 2 \cdot 10^9, 1 \le p < q \le 10^4)$.

Output

Print the value of $f(n)$ modulo 119.

Examples

standard input	standard output
`1 1 1 1 2`	`2`
`1000000000 1 2 3 4`	`100`

Problem E. BankCraft

Input file:	*standard input*
Output file:	*standard input*
Time limit:	10 seconds
Memory limit:	512 mebibytes

Osya and his gang want to expropriate some money from a backstreet millionaire Koreyko. But there is a problem: Koreyko stores all his money in a bank. The bank uses public-key cryptography to authenticate its clients. Each client has his own public key which is a polynomial $P(x)$ over the field of integers modulo p, and a secret key which is a polynomial $Q(x)$ over the same field. The secret key is considered to be valid if there exists a polynomial $R(x)$ such that $P(x) \cdot Q(x) = 1 + x^m \cdot R(x)$ for a known integer m.

Osya knows the polynomial $P(x)$ and integers p (it is always equal to $7\,340\,033$) and m, but he doesn't know the secret key. He offers you a key to the house full of money for your help with finding the secret key. You can't reject such a generous proposition.

Input

The first line of input contains two integers: m and n ($1 \le m, n \le 10^5$). Here, n is the degree of $P(x)$. The second line contains $n+1$ integers a_i ($0 \le a_i \le p-1$) separated by spaces, which are the coefficients of $P(x)$. The i-th of them ($0 \le i \le n$) is the coefficient of x^i.

Output

If it is impossible to construct the required polynomial of degree less than m, output the message "`The ears of a dead donkey`" (without quotes). If a solution exists output m integers b_i ($0 \le b_i \le p-1$) which are the coefficients of $Q(x)$, separated by spaces. If there are multiple valid answers, output your favorite one.

Examples

standard input	standard input
2 1 1 2	1 7340031
4 2 1 0 1	1 0 7340032 0

Problem F. Grasshoppers

Input file:	*standard input*
Output file:	*standard output*
Time limit:	15 seconds
Memory limit:	512 mebibytes

While relaxing on a meadow you've noticed an incredible spectacle: a group of grasshoppers was jumping in a circle. You found the dance particularly beautiful, as you realized that their moves were not random, but followed a mathematical pattern.

There are m points marked on the circle. These points are numbered from 1 to m in the order they appear on the circle and divide the circle into arcs of equal length. There are grasshoppers in some of these points, possibly more than one grasshopper in the same point. The grasshoppers are numbered from 1 to n. Each second grasshoppers jump to new locations according to the following rule: If at the beginning of the second the grasshoppers $1, 2, \ldots, n$ are standing in points $A_1, A_2, \ldots, A_n$ respectively, and O is the center of the circle, then at the end of the second the grasshoppers will be standing at positions $B_1, B_2, \ldots, B_n$, where B_k is the reflection of point A_k over the line OA_{k+1} for $k = 1, 2, \ldots, n-1$, and B_n is the reflection of point A_n over the line OA_1. The grasshoppers' numbers do not necessarily correspond to their order in the circle, and do not change during the dance.

You need to go back home now, but you are wondering what will happen later on. Given the initial arrangement of the grasshoppers, find their positions after t seconds.

Input

The first line of input contains the number of test cases z ($1 \leq z \leq 10^9$). The descriptions of the test cases follow.

The first line of each test case contains three integers n, m, t ($1 \leq n \leq 100\,000$, $3 \leq m \leq 100$, $1 \leq t \leq 10^9$): the number of grasshoppers, the number of arcs and the number of seconds. The second line contains n integers denoting initial positions of the grasshoppers. The positions are integers between 1 and m inclusive. The total number of grasshoppers in all test cases does not exceed 200 000.

Output

For each test case, output positions of the grasshoppers after t seconds, separated by spaces.

Example

standard input	standard output
2 3 5 1 1 1 2 3 5 4 1 1 2	1 3 5 5 4 5

Problem G. Ash and shopping

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	256 mebibytes

This problem is provided by *hackerearth.com*.

Ash goes to a shop which has n different items. The price of each of the items is 1 unit. Ash is a rich guy and has infinite coins each of value k units. Now he wants to buy some of the items, but he wants to make sure that he can pay for all the items he buys using the coins he has. Formally, the total price of the items he buys must be a multiple of k.

Find the number of ways in which he can buy some of the items from the shop. Since this number can be pretty huge, print only last 5 digits of the answer.

Two ways are considered distinct if there exists an i, such that item i is bought in only one of them. Buying no item is also a valid way.

Input

The only line in the input contains two integers separated by a space, n and k. Here $1 \leq n \leq 10^{13}$ and $1 \leq k \leq 10^4$.

Output

Print the last 5 digits of the number of ways in which he can buy some of the items, as specified above.

Example

standard input	standard output
3 2	4

Problem H. Product

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2.5 seconds
Memory limit:	256 megabytes

Given two integers, print their product.

Input

Each line of the input contains one integer, consisting of no more than 239 000 digits.

Output

Print the answer to the problem.

Examples

standard input	standard output
2 2	4

Problem I. Division of Polynomials

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Given two polynomials with coefficients from $\mathbb{Z}/7\mathbb{Z}$.

Highest coefficient of each polynomial is **non-zero**. You need to divide one by another and print the quotient and the remainder.

Input

Each of two lines contains the description of a polynomial. First line contains dividend, second line — divisor. Description of polynomial $a_k x^k + \cdots + a_2 x^2 + a_1 x + a_0$ is started with integer k ($0 \le k \le 50\,000$) followed by $k+1$ integers between 0 and 6: $a_k, \ldots, a_2, a_1, a_0$.

Output

Print two lines: the quotient on the first line and the remainder on the second in the same format as described in input section. If a polynomial is a zero, use $k = 0$ while printing the answer (follow the sample to clarify).

Examples

standard input	standard output
3 1 1 1 1 1 1 1	2 1 0 1 0 0
3 1 1 3 1 2 1 1 1	1 1 0 1 2 1
8 2 1 2 1 2 1 2 1 2 4 1 2 3 4 5	4 2 4 2 5 2 3 3 1 3 6