Problem A. BankCraft

Input file:	*standard input*
Output file:	*standard output*
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 output
2 1 1 2	1 7340031
4 2 1 0 1	1 0 7340032 0

Problem B. Duel

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 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 100 000.

Output

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

Examples

standard input	standard output
101010101	4
101001	0

Note

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**0101010**1**.

Problem C. Equation

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

Given an equation of the form $X^N + Y^N \equiv Z^N \mod M$.

You are to find a number of different solutions to this equation for fixed N and M. The solution is such three integers (X, Y, Z) that:

- $1 \le X \le Y < M$
- $1 \le Z < M$
- $X^N + Y^N \equiv Z^N \mod M$

Input

In the first line of input file there are integers N and M ($1 \le N \le 7^7$, $1 \le M \le 7^7$).

Output

Output one integer — answer to the problem.

Example

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

Problem D. Multiplicacion

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

You are given two numbers. Find their product.

Input

Two lines contain one integer each. Length of each integer is no more than $250,000$ symbols.

Output

Output one integer — product of given integers.

Examples

standard input	standard output
2 2	4

Problem E. Even division

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	1024 mebibytes

We need your help to divide candies at a very unusual party! There are n different candies in total. There are three kinds of people at party:

1. a of them want to get *o*dd number of candies;
2. b of them want to get *e*ven number of candies;
3. c of them simply don't care about parity of candies they get.

Find out the number of ways to divide all of n candies between everybody ($a + b + c$ people), such that everyone is satisfied. Some people may not receive a candy.

Input

One line of input contains four space-separated integers n, a, b, c.

$1 \le n \le 10^9$, $0 \le a, b, c \le 50,000$, $1 \le a + b + c$.

Output

Output one line containing answer to the problem modulo 7340033.

Examples

standard input	standard output
3 1 1 0	4

Problem F. Transition

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	256 mebibytes

Change base-a integer to base-b.

Input

The first line contains one integer a ($2 \le a \le 10$). Next line contains base-a integer of length no more than $100,000$ symbols. Next line contains integer b ($2 \le b \le 10$).

Output

Output integer in base-b.

Examples

standard input	standard output
3 1000 10	27

Problem G. Reverse The Bits

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

Let $n = 2^s$, where $s \geq 0$ is integer. Consider $b_{s-1}b_{s-2}\ldots b_0$ binary representation of integer i $(0 \leq i < n)$ with leading zeros. Let $c_j = b_{s-1-j}$, so $c_{s-1}c_{s-2}\ldots c_0$ is reversed binary representation of i. Let define a_i such number that $c_{s-1}c_{s-2}\ldots c_0$ is its binary representation.

For example $s = 3, i = 3$. Binary representation of i — 011_2, reversed binary representation of i — 110_2 and $a_3 = 6$ for $s = 3$.

You should answer the queries for calculating sum $(a_l + a_{l+1} + \cdots + a_r) \mod (10^9 + 7)$

Input

In the first line of input are written integer s $(0 \leq s \leq 31)$. In the second line are written integer k — number of queries $(1 \leq k \leq 5 \cdot 10^5)$. The next k lines contain descriptions of queries, each consists of two integers l, r $(0 \leq l \leq r < 2^s)$.

Output

Output k lines with answers for queries.

Example

standard input	standard output
3 1 3 3	6
2 2 0 3 0 1	6 2
25 1 17 239	742367723

Problem H. Strongly Connected Tournaments

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	1024 mebibytes

A *t*ournament is a labeled oriented graph with exactly one edge between any two vertices.

An oriented graph is *s*trongly connected if there is an oriented path between any ordered pair of vertices.

For each k between 1 and n, find the number of strongly connected tournaments with k vertices, modulo 7340033.

Input

The input consists of one integer n on a single line ($1 \leq n \leq 100,000$).

Output

Output n lines. The kth line should contain a single integer, the number of strongly connected oriented graphs on k vertices modulo 7340033.

Examples

standard input	standard output
3	1 0 2

Problem I. Triangle

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	256 mebibytes

N points are located on the plane. Three different points are chosen randomly; all sets of three points have equal probability of being chosen. These points are then connected by line segments, and the perimeter of the resulting triangle is calculated. Note that the triangle may be degenerate.

Given the coordinates of points, find the expectation of the perimeter of the resulting triangle. The *expectation* of the perimeter is the sum $\sum_{\triangle} p_{\triangle} \cdot f_{\triangle}$ where $p_{\triangle}$ is the probability that the triangle $\triangle$ is chosen and $f_{\triangle}$ is its perimeter.

Input

The first line of input contains two integers H and W ($1 \le H, W \le 700$). Next H lines contain W symbols each; j-th symbol of i-th line is '`1`' if there is a point with coordinates (i, j), and '`0`' otherwise. There are at least three points present.

Output

The first line of output should contain one real number — the expectation of triangle perimeter. Your answer should be accurate to at least six digits after the decimal point.

Example

standard input	standard output
11 20 10000000001000000000 00000000000000000000 00000000000000000000 00000000000000000000 00000000000000000000 00000000000000000000 00000000000000000000 00000000000000000000 00000000000000000000 00000000000000000000 10000000000000000000	34.142135624
3 3 101 010 101	5.794112550