Problem A. Avg

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Find a sequence of steps of the following kind (if it exists) that would make all elements of any array of real numbers $a_1, a_2, \ldots, a_n$ equal:

- pick k distinct indices $b_1, b_2, \ldots, b_k$ $(1 \le b_i \le n)$ and change the values of $a_{b_1}, a_{b_2}, \ldots, a_{b_k}$ to their arithmetic mean (that is, $\frac{1}{k}(a_{b_1} + a_{b_2} + \ldots + a_{b_k})$) simultaneously.

Input

The only line contains two integers n and k ($2 \le k \le n \le 1000$; n is divisible by k).

Output

If a required sequence of steps doesn't exist, display a single integer -1.

Otherwise, display the number of steps in your sequence t ($1 \le kt \le 10^6$), followed by t step descriptions. Each step description must consist of k distinct integers $b_1, b_2, \ldots, b_k$ $(1 \le b_i \le n)$.

It can be shown that if a valid sequence of steps exists, a sequence satisfying $kt \le 10^6$ exists as well.

Examples

standard input	standard output
4 2	4 1 2 3 4 1 3 2 4
6 3	-1

Problem B. Bin (Div. 2 Edition)

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Find the number of full binary trees (every vertex has 0 or 2 children) with n leaves such that for every vertex with two children, the number of leaves in its left subtree doesn't exceed the number of leaves in its right subtree by more than k, and display it modulo 998 244 353.

Input

The only line contains two integers n and k ($2 \le n \le 1000$; $0 \le k \le 100$).

Output

Display the required number.

Examples

standard input	standard output
2 0	1
3 0	1
3 1	2
4 0	2
4 1	3
4 2	5
6 2	23
7 42	132
10 1	400
13 4	42003
239 17	385818773

Problem C. Cat

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

How many distinct strings can be obtained by concatenating a non-empty suffix of string a with a non-empty prefix of string b?

Input

The first line contains a single integer t ($1 \le t \le 10^5$), denoting the number of test cases.

Each test case is described with strings a and b on separate lines. Both strings consist of lowercase English letters and have length between 1 and 10^5, inclusive.

The total length of strings over all test cases does not exceed $2 \cdot 10^5$.

Output

For each test case, display the required number.

Example

standard input	standard output
5 abb bba aaa aaaaa winter camp ehehe heheh aaaaaaabaaaa aabaaaaaa	8 7 24 16 97

Note

In the first test case, all obtainable strings are `abbb`, `abbbb`, `abbbba`, `bb`, `bbb`, `bbba`, `bbbb`, `bbbba`.

In the second test case, only strings consisting of at least 2 and at most 8 letters `a` can be obtained.

Problem D. Div (Div. 2 Edition)

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

How many integers $x > 0$ exist such that $x^{a_1} + x^{a_2} + \ldots + x^{a_n}$ is divisible by $x + 1$?

Input

The first line contains a single integer n ($1 \le n \le 10^5$).

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($0 \le a_i \le 10^9$).

Output

Display the required number, or -1 if it is infinite.

Examples

standard input	standard output
5 0 0 0 0 0	1
4 0 1 1 2	-1
8 9 9 4 7 3 1 15 7	3

Note

In the first test case, $x = 4$ is the only solution.

In the second test case, $x^2 + 2x + 1$ is divisible by $x + 1$ for any $x > 0$.

In the third test case, the solutions are $x = 1$, $x = 2$, and $x = 5$.

Problem E. Exp (Div. 2 Edition)

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Find the expected amount of experience a hero will get for beating n monsters one by one, given that beating each monster gives the hero i units of experience ($0 \le i \le k$) with probability p_i independently.

Input

The first line contains two integers n and k ($1 \le n \le 10^7$; $1 \le k \le 100$).

The second line contains $k + 1$ real numbers $p_0, p_1, \ldots, p_k$ ($0 < p_i < 1$), given with exactly 4 decimal digits. The sum of p_i is equal to 1.

Output

Display the expected amount of experience the hero will get.

Your answer will be considered correct if its absolute or relative error doesn't exceed 10^{-9}.

Examples

standard input	standard output
2 1 0.5000 0.5000	1.0000
4 2 0.2000 0.5000 0.3000	4.4000
10 4 0.4533 0.2906 0.1618 0.0071 0.0872	9.8430

Note

In the first test case, the hero will get 0 units of experience with probability $\frac{1}{4}$, 1 unit of experience with probability $\frac{1}{2}$, and 2 units of experience with probability $\frac{1}{4}$.

Hence, the expected amount is $0 \cdot \frac{1}{4} + 1 \cdot \frac{1}{2} + 2 \cdot \frac{1}{4} = 1$.

Problem F. Flip (Div. 2 Edition)

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Assuming people numbered from 1 to $2n$ are assigned to two teams of size n using the following non-deterministic procedure, find the probability that people $a_1, a_2, \ldots, a_n$ end up on the same team:

- in order from 1 to $2n$, each person flips a fair coin;
- if the coin lands heads up, the person joins the first team unless that team already has n people, in which case the person joins the second team;
- similarly, if the coin lands tails up, the person joins the second team unless that team already has n people, in which case the person joins the first team.

Input

The first line contains an integer n ($2 \le n \le 10$).

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_1 < a_2 < \ldots < a_n \le 2n$).

Output

Let the probability that people $a_1, a_2, \ldots, a_n$ end up on the same team be $\frac{p}{q}$ ($p, q > 0$). Display p and q.

The greatest common divisor of p and q must be 1 (that is, fraction $\frac{p}{q}$ must be irreducible).

Examples

standard input	standard output
2 1 2	1 2
2 1 3	1 4
2 1 4	1 4
2 2 3	1 4
2 2 4	1 4
2 3 4	1 2
4 2 5 7 8	1 32
5 1 2 3 5 7	1 64

Note

In the first test case, people 1 and 2 have to flip the coin in the same way, the probability of which is $\frac{1}{2}$.

In the second test case, person 2 has to flip the coin differently from person 1, and person 3 has to flip the coin in the same way as person 1. The probability of this is $\frac{1}{4}$.

Problem G. Grp (Div. 2 Edition)

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Distribute all non-empty subsets of $\{\mathtt{a}, \mathtt{b}, \mathtt{c}, \ldots\}$ (first n lowercase English letters) into as few groups as possible, subject to the following conditions:

- each subset must belong to exactly one group;
- subsets belonging to the same group must have no common elements.

Input

The only line contains an integer n ($1 \le n \le 15$).

Output

Display the smallest number of groups g, followed by g group descriptions.

Group description i must consist of an integer s_i, followed by s_i subset descriptions. Each subset description must be a string containing subset elements in any order without spaces.

Examples

standard input	standard output
3	4 1 abc 2 ab c 2 ac b 2 bc a
4	8 1 abcd 2 abc d 2 abd c 2 acd b 2 bcd a 2 ad bc 2 bd ac 2 cd ab

Problem H. Hit (Div. 2 Edition)

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Place at most two integer points on the number line in such a way that segment $[l_1, r_1]$ contains exactly one point, and segment $[l_2, r_2]$ contains exactly one point as well.

Input

The first line contains two integers l_1 and r_1 ($-100 \le l_1 < r_1 \le 100$).

The second line contains two integers l_2 and r_2 ($-100 \le l_2 < r_2 \le 100$).

Output

Display the number of points you place k ($1 \le k \le 2$), followed by k distinct integers x_i ($-1000 \le x_i \le 1000$), denoting the coordinates of the points you place.

Examples

standard input	standard output
1 3 2 5	1 2
-7 -4 -9 3	1 -7
-10 -1 1 10	2 -10 1
0 10 -10 0	1 0
99 100 -100 -99	2 99 -100

Note

Segment $[a, b]$ contains point c if and only if $a \le c \le b$.

Problem I. Ineq

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Given a set of integer pairs $S = \{(x_1, y_1), \ldots, (x_n, y_n)\}$, determine if a set of integer triples $T = \{(a_1, b_1, c_1), \ldots, (a_m, b_m, c_m)\}$ exists such that $a_i x_j + b_i y_j < c_i$ for all i and j, and there doesn't exist an integer pair (x', y') not belonging to S such that $a_i x' + b_i y' < c_i$ for all i.

Input

The first line contains a single integer t ($1 \le t \le 10^5$), denoting the number of test cases.

Each test case is described with an integer n ($1 \le n \le 10^5$), followed by n lines containing two integers x_i and y_i each ($-10^9 \le x_i, y_i \le 10^9$). All pairs (x_i, y_i) within one test case are distinct.

The sum of n over all test cases does not exceed 10^5.

Output

For each test case, display a separate line with 1 if the answer is positive, and 0 otherwise.

Example

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

Note

In the first test case, one possible set of triples is $\{(1, 0, 1), (0, 1, 1), (-1, 0, 1), (0, -1, 1)\}$.

Problem J. Joy

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Assuming that $n-1$ other people with skill levels $a_1, a_2, \ldots, a_{n-1}$ are standing in a queue prepared for a Rock Paper Scissors tournament and your own skill level is x, find the probability that you will win the tournament after inserting yourself into any of the n positions in the queue (before person 1, between people 1 and 2, ..., after person $n-1$):

- while the queue has at least two people, two people are popped from the front of the queue and play a match (if people with skill levels p and q play a match, the first one wins with probability $\frac{p}{p+q}$ and the second one wins with probability $\frac{q}{p+q}$, there are no draws);
- the winner of the match gets pushed to the back of the queue, while the loser is eliminated;
- the last person standing in the queue is declared the winner of the tournament.

Input

The first line contains two integers n and x ($2 \le n \le 4096$; $n = 2^k$ for an integer k; $1 \le x \le 10^4$).

The second line contains $n-1$ integers $a_1, a_2, \ldots, a_{n-1}$ ($1 \le a_i \le 10^4$). a_1 is the skill level of the person at the front of the queue, while a_{n-1} corresponds to the person at the back.

Output

For each of the n positions in the queue where you can insert yourself, from the front to the back, display the probability of winning the tournament.

Your answer will be considered correct if its absolute or relative error doesn't exceed 10^{-9}.

Examples

standard input	standard output
4 2 1 1 1	0.444444444444444 0.444444444444444 0.444444444444444 0.444444444444444
4 3 4 5 2	0.188265306122449 0.188265306122449 0.239285714285714 0.239285714285714
8 8 1 2 3 4 5 6 7	0.393768719371413 0.393768719371413 0.353382184051268 0.353382184051268 0.248207450668989 0.248207450668989 0.230924146560510 0.230924146560510

Note

In the first test case, you beat any opponent with probability $\frac{2}{3}$. To win the tournament, you need to beat two opponents, hence the answer is $\frac{4}{9}$ regardless of your initial position.

Problem K. Kilk

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Find the number of strings consisting of x letters 'a' and y letters 'b' that have the length of their longest substring consisting of equal letters as small as possible under these conditions, and display it modulo 998 244 353.

Input

The first line contains a single integer t ($1 \le t \le 10^5$), denoting the number of test cases.

Each of the next t lines describes one test case and contains two integers x and y ($1 \le x, y \le 2000$).

Output

For each test case, display the required number.

Example

standard input	standard output
5 2 4 7 8 7 7 9 3 239 58	6 1 2 20 868098448

Note

In the first test case, the strings are abbabb, bababb, babbab, bbaabb, bbabab, bbabba. In each of these strings, the length of the longest substring consisting of equal letters is 2, and there are no strings consisting of 2 letters 'a' and 4 letters 'b' with a smaller value.