Problem A. Arbitrary

Input file: stdin
Output file: stdout

As we know, Mr. B becomes a loser in 2017, for some reasons. He is very sad and wants to take a random walk on the 4th ring road.

Mr. B walks in a ring. There are n houses in the street, numbered from 0 to $n-1$. If Mr. B is in front of house i now, the probability of that he will be in front of house $((i+1) \bmod n)$ or $((i+n-1) \bmod n)$ is $\frac{1}{4}$ and the probability of that he will stay in front of house i is $\frac{1}{2}$, at the next second. At second 0, Mr. B is in front of house 0. After $t(0 \le t \le 10^{18})$ seconds, what's the probability of that he will be in front of house $x(0 \le x < n)$?

Input

The only line of the input contains three integers $t(0 \le t \le 10^{18}), n(262144 \le n \le 262144), x(0 \le x < n)$.

Output

You should output an integer - the probability mod 998244353, which means, if the probability equals to $\frac{p}{q}$, where $p, q \in \mathbb{N}$ and $\gcd(p,q) = 1$, you should output an integer $0 \le z < 998244353$, satisfying $qz \equiv p \pmod{998244353}$.

Example

stdin	stdout
1 262144 1	748683265

stdin	stdout
5 262144 4	988495873

Note

This problem is (almost) not related with "Problem A Littrain is a loser, in 2018" by Wu Zuofan.

Problem B. Bipartite

Input file: stdin
Output file: stdout

Taiji generates two Yi. Two Yi generates four Xiang. Four Xiang generates eight Gua.

Now, here comes the problem. Given an integer $n(|n| \leq 10^{100000})$, you should output whether it's a power of two.

If it's a power of two, you should output "Yes", otherwise you should output "No".

Input

The first line contains an integer $T(T \leq 10)$ denoting the number of test cases.

In the following T lines, each line contains a case. In each case, there is an integer n.

Output

For each test case, output the answer "Yes" or "No" in one line.

Example

stdin	stdout
8 -1 0 1 2 3 4 5 6	No No Yes Yes No Yes No No

Note

There is no word for "easy" in adult life.

Problem C. Communist

Input file: stdin
Output file: stdout

You are given an article, which can be considered as a sequence of words, and a dictionary, which can be consider as a sequence of words.

The words in the dictionary are distinct, but the article not.

In each operation, you can choose a common subsequences of the article and the dictionary, and then remove it from the article.

Mr. B wants know what is the minimum number of operations to remove all words in the article.

The sum of the lengths of all words in the article is no more than 100000.

The sum of the lengths of all words in the dictionary is no more than 100000.

Only the lower case letters are allowed, which means there are 26 letters.

The words in the sequence must occur in the dictionary, but the words in the dictionary may not occur in the sequence.

Input

The first line contains an integer $T(T \leq 10)$, denoting the number of test cases.

Each case contains two lines.

The first line of each case is the article.

The second line of each case is the dictionary.

Output

For each test case, output the minimum number of operations in one line.

Example

stdin	stdout
3 bo wo i wen yue wo yi li bo wo i wen yue yi li a a b a a b a b b b a a a a a b c	2 4 6

Note

I-Wen is one of the most powerful contestants, who gave a speech in the opening ceremony.

Problem D. Determination

Input file: stdin
Output file: stdout

Mr. B has n robots and n integer $a_1, a_2, \ldots, a_n (a_i < a_{i+1})$.

At first, the i-th robots are located at $(-a_i, a_i)$.

In every second, a robot at (x, y) might go to $(x+1, y)$ or $(x, y+1)$, they can't stay at (x, y).

To avoid collusion, two robots can't go to the same position at any time, .

After m seconds, the i robots are located at $(a_{n+1-i}, m - a_{n+1-i})$.

Mr. B wants to know the number of plans the robots can move from the start positions to the end positions.

As the result might be very large, he wants to know the result modulo p.

p will be given in the input.

Input

The first line contains three integers $n, m, p (1 \le n \le 100, 1 \le m \le 10^{18}, 2 \le p \le 10^9 + 7)$.

The next line contains n integers $a_i (0 \le a_i \le 1000)$.

The sequence $\{a_i\}$ is strictly increasing.

Output

Output the answer in one line.

Example

stdin	stdout
2 6 175 1 2	0

stdin	stdout
1 16 12870 4	0

Note

In the examples, the answer is the same as p, so you should output 0.

Problem E. Expectation

Input file: stdin
Output file: stdout

Mr. B has an array with size n. He wants do some operations

- For $i(l \le i \le r)$, change a_i to $a_i + x$.
- Get the result of $\sum_{i=l}^{r} a_i$.

But he made some mistakes, the actual operation inteval is chosen randomly $L \le l \le r \le R$.

In other words, for a interval L, R, there are $\frac{(R-L+1)(R-L+2)}{2}$ pairs of (l, r).

He will uniform randomly choose a interval (l, r) for both change and query operations.

He wants to know the expectation of each query.

To reduce the difficulty of this problem, all change operations are before all query operations.

Input

The first line contains two integers $n, m(1 \le n \le 100000, 1 \le m \le 100000)$.

In the following m lines, each line contains 1 operation.

It might be

1. `0 L R x` for the change operations.
2. `1 L R` for the query operations.

$$1 \le L \le R \le n, 0 \le x < 998244353$$

Output

For each query operations, you should output the result in one line.

We recall the rules in Problem A.

You should output an integer - the expectation mod 998244353, which means, if the expectation equals to $\frac{p}{q}$, where $p, q \in \mathbb{N}$ and $\gcd(p, q) = 1$, you should output an integer $0 \le z < 998244353$, satisfying $qz \equiv p \pmod{998244353}$.

Example

stdin	stdout
7 10 0 1 5 15 0 3 7 15 1 1 1 1 2 2 1 3 3 1 4 4 1 5 5 1 6 6 1 7 7 1 1 7	5 8 14 16 14 8 5 499122210

Note

Nothing can be done with beautiful expectations only.

Problem F. Farmland

Input file: stdin
Output file: stdout

Given $n(1 \le n \le 6)$ strings, Mr. B wants to know the number of strings with length l, that contain all the given strings as substrings.

As the result might be very large, he wants to know the result modulo 998244353.

Only the lower case letters are allowed, which means there are 26 letters.

The length of each given string is at most 6.

Input

The first line contains two integers $l(0 \le l \le 10^9), n(1 \le n \le 6)$.

The next n lines contains n strings.

Output

Output the answer in one line.

Example

stdin	stdout
3 2 a b	150

stdin	stdout
6 2 xyy xxy	2030

stdin	stdout
100 1 bike	422613838

Note

Farm is very important for a carry.

Problem G. Gatehouse

Input file: stdin
Output file: stdout

Mr. B has two arrays, $\{a_i\}, \{b_i\}$. with length $n = 2^k (1 \le k \le 17)$.

Mr. B wants to implement the following procedure.

Initially, $\{c_i\}$ are all zero.

```
for (int i = 0; i < n; i++) {
    for (int j = 0; j < n; j++) {
        c[i op j] += a[i] * b[j];
    }
}
```

`a[i]` is the same as a_i.

`b[i]` is the same as b_i.

`c[i]` is the same as c_i.

Mr. B knows that we can use FWT to optimize this procedure, if `op` is xor.

Now, he wants you to optimize this procedure, if `op` is and.

Input

The first line contains one integer $k (1 \le k \le 17)$.

The second line contains 2^k integers, denoting $a_0, a_1, \ldots, a_{n-1} (0 \le a_i \le 10^3)$.

The third line contains 2^k integers, denoting $b_0, b_1, \ldots, b_{n-1} (0 \le b_i \le 10^3)$.

Output

Output the result $c_0, c_1, \ldots, c_{n-1}$, one number per line.

Example

stdin	stdout
2 1 2 4 8 2 3 5 8	68 46 92 64

Note

I try my best to make no less than 5 teams accept no less than 5 problem.

Problem H. Harvest

Input file: `stdin`
Output file: `stdout`

Let's consider a recurrence relation

$$f_n = af_{n-1} + bf_{n-2} + cf_{n-3}(n \geq 3)$$

We want to know the value of f_{f_n} mod p, in other words `f[f[n]]` mod p.

Input

The first line contains an integer $T(T \leq 10)$ denoting the number of test cases.

In the following T lines, each line contains a case.

In each case, there is eight integers $n, p, f_0, f_1, f_2, a, b, c$.

$$0 \leq n, f_0, f_1, f_2, a, b, c \leq 10^9$$

$$2 \leq p \leq 10^9 + 7$$

Output

For each test case, output the answer.

Example

stdin	stdout
1 8 100000007 0 1 1 0 2 1	10946

Note

Congratulations on your harvest.

Problem I. Interpreter

Input file: stdin
Output file: stdout

The Brain is a Chinese scientific reality and talent show originating in Germany.

Mr. B watched it for 1 hour, and found an interesting problem.

Given an undirected graph, you want to know the minimum number of edges to add, such that there is an Eulerian path from every vertex.

In other words, for every vertex, we can choose it as the starting vertex and find a path that pass all edges. You have to add a minimum number of edges to achieve this goal.

There will be no self-cycles and multi-edges in the input.

However you can add edges to create them as you want.

Input

The first line contains two integers $n(2 \leq n \leq 100000), m(1 \leq m \leq 200000)$, denoting the number of vertices and the number of edges.

In the following m lines, each line contain two integers x, y, denoting an edge.

Output

Output the minimum number of edges to add, such that there is an Eulerian path from every vertex.

Example

stdin	stdout
3 1 1 2	2

stdin	stdout
5 3 3 4 4 5 5 3	3

Note

Brain is a very good thing, which I hope everybody has.

Problem J. Juggernaut

Input file: stdin
Output file: stdout

Mr. B wants to fill an $n \times m$ sheet with 0s and 1s.

Mr. B wants the xor sum for each row and each column is 0.

In other words there is a even number of 1 in each row and each column.

Two sheets are considered the same, if they are identical after cyclic shift (vertical or horizontal).

Formally, for two sheets A and B, if we can find x and y such that

$$\forall i(0 \le i < n), \forall j(0 \le j < m), A_{i,j} = B_{(i+x) \bmod n,(j+y) \bmod m}$$

we will consider A and B are the same sheet.

As the result might be very large, he wants to know the result modulo 1000000007.

Input

The first line contains an integer $T(T \le 100)$, denoting the number of test cases.

For each test case, there is only one line, with three integers $n, m(1 \le n, m \le 10^9)$.

Output

For each test case, output the answer in one line.

Example

stdin	stdout
5 2 2 3 5 4 4 4 6 3968 344	2 18 48 1448 201359346

Note

0s and 1s make black and white world colorful.