A. Di-visible Confusion

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

YouKn0wWho has an integer sequence $a_1, a_2, \ldots, a_n$. He will perform the following operation until the sequence becomes empty: select an index i such that $1 \le i \le |a|$ and a_i is **not** divisible by $(i+1)$, and erase this element from the sequence. Here $|a|$ is the length of sequence a at the moment of operation. Note that the sequence a changes and the next operation is performed on this changed sequence.

For example, if $a=[3,5,4,5]$, then he can select $i=2$, because $a_2=5$ is not divisible by $i+1=3$. After this operation the sequence is $[3,4,5]$.

Help YouKn0wWho determine if it is possible to erase the whole sequence using the aforementioned operation.

Input

The first line contains a single integer t $(1 \le t \le 10\,000)$ — the number of test cases.

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

The second line of each test case contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^9$).

It is guaranteed that the sum of n over all test cases doesn't exceed $3 \cdot 10^5$.

Output

For each test case, print "YES" (without quotes) if it is possible to erase the whole sequence using the aforementioned operation, print "NO" (without quotes) otherwise. You can print each letter in any register (upper or lower).

Example

input

```
5
3
1 2 3
1
2
2
7 7
10
384836991 191890310 576823355 782177068 404011431 818008580 954291757 160449218 155374934 840594328
8
6 69 696 69696 696969 6969696 69696969 696969696
```

output

```
YES
NO
YES
YES
NO
```

Note

In the first test case, YouKn0wWho can perform the following operations (the erased elements are underlined): $[1, \underline{2}, 3] \rightarrow [\underline{1}, 3] \rightarrow [\underline{3}] \rightarrow [\,]$.

In the second test case, it is impossible to erase the sequence as i can only be 1, and when $i=1$, $a_1=2$ is divisible by $i+1=2$.

B. Moderate Modular Mode

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

YouKn0wWho has two **even** integers x and y. Help him to find an integer n such that $1 \le n \le 2 \cdot 10^{18}$ and $n \bmod x = y \bmod n$. Here, $a \bmod b$ denotes the remainder of a after division by b. If there are multiple such integers, output any. It can be shown that such an integer always exists under the given constraints.

Input

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

The first and only line of each test case contains two integers x and y ($2 \le x, y \le 10^9$, both are **even**).

Output

For each test case, print a single integer n ($1 \le n \le 2 \cdot 10^{18}$) that satisfies the condition mentioned in the statement. If there are multiple such integers, output any. It can be shown that such an integer always exists under the given constraints.

Example

input
4 4 8 4 2 420 420 69420 42068

output
4 10 420 9969128

Note

In the first test case, $4 \bmod 4 = 8 \bmod 4 = 0$.

In the second test case, $10 \bmod 4 = 2 \bmod 10 = 2$.

In the third test case, $420 \bmod 420 = 420 \bmod 420 = 0$.

C. Extreme Extension

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

For an array b of n integers, the *extreme value* of this array is the minimum number of times (possibly, zero) the following operation has to be performed to make b **non-decreasing**:

- Select an index i such that $1 \le i \le |b|$, where $|b|$ is the current length of b.
- Replace b_i with two elements x and y such that x and y both are **positive** integers and $x + y = b_i$.
- This way, the array b changes and the next operation is performed on this modified array.

For example, if $b = [2, 4, 3]$ and index 2 gets selected, then the possible arrays after this operation are $[2, \underline{1}, \underline{3}, 3]$, $[2, \underline{2}, \underline{2}, 3]$, or $[2, \underline{3}, \underline{1}, 3]$. And consequently, for this array, this single operation is enough to make it non-decreasing: $[2, 4, 3] \rightarrow [2, \underline{2}, \underline{2}, 3]$.

It's easy to see that every array of positive integers can be made non-decreasing this way.

YouKn0wWho has an array a of n integers. Help him find the sum of *extreme values* of all nonempty subarrays of a modulo $998\,244\,353$. If a subarray appears in a multiple times, its extreme value should be counted the number of times it appears.

An array d is a subarray of an array c if d can be obtained from c by deletion of several (possibly, zero or all) elements from the beginning and several (possibly, zero or all) elements from the end.

Input

The first line contains a single integer t ($1 \le t \le 10\,000$) — the number of test cases.

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

The second line of each test case contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^5$).

It is guaranteed that the sum of n over all test cases doesn't exceed 10^5.

Output

For each test case, print a single integer — the sum of *extreme values* of all subarrays of a modulo $998\,244\,353$.

Example

input
4 3 5 4 3 4 3 2 1 4 1 69 8 7264 40515 28226 92776 35285 21709 75124 48163

output
5 9

```
0
117
```

Note

Let $f(l, r)$ denote the *extreme value* of $[a_l, a_{l+1}, \ldots, a_r]$.

In the first test case,

- $f(1, 3) = 3$, because YouKn0wWho can perform the following operations on the subarray $[5, 4, 3]$ (the newly inserted elements are underlined):
  $[5, 4, 3] \to [\underline{3}, \underline{2}, 4, 3] \to [3, 2, \underline{2}, \underline{2}, 3] \to [\underline{1}, \underline{2}, 2, 2, 2, 3]$;
- $f(1, 2) = 1$, because $[5, 4] \to [\underline{2}, \underline{3}, 4]$;
- $f(2, 3) = 1$, because $[4, 3] \to [\underline{1}, \underline{3}, 3]$;
- $f(1, 1) = f(2, 2) = f(3, 3) = 0$, because they are already non-decreasing.

So the total sum of *extreme values* of all subarrays of $a = 3 + 1 + 1 + 0 + 0 + 0 = 5$.

D. Artistic Partition

time limit per test: 3 seconds
memory limit per test: 1024 megabytes
input: standard input
output: standard output

For two positive integers l and r ($l \le r$) let $c(l, r)$ denote the number of integer pairs (i, j) such that $l \le i \le j \le r$ and $\gcd(i, j) \ge l$. Here, $\gcd(i, j)$ is the greatest common divisor (GCD) of integers i and j.

YouKn0wWho has two integers n and k where $1 \le k \le n$. Let $f(n, k)$ denote the minimum of $\sum\limits_{i=1}^{k} c(x_i + 1, x_{i+1})$ over all integer sequences $0 = x_1 < x_2 < \ldots < x_k < x_{k+1} = n$.

Help YouKn0wWho find $f(n, k)$.

Input

The first line contains a single integer t ($1 \le t \le 3 \cdot 10^5$) — the number of test cases.

The first and only line of each test case contains two integers n and k ($1 \le k \le n \le 10^5$).

Output

For each test case, print a single integer — $f(n, k)$.

Example

input

```
4
6 2
4 4
3 1
10 3
```

output

```
8
4
6
11
```

Note

In the first test case, YouKn0wWho can select the sequence $[0, 2, 6]$. So $f(6, 2) = c(1, 2) + c(3, 6) = 3 + 5 = 8$ which is the minimum possible.

E. A Perfect Problem

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

A sequence of integers $b_1, b_2, \ldots, b_m$ is called *good* if $max(b_1, b_2, \ldots, b_m) \cdot min(b_1, b_2, \ldots, b_m) \ge b_1 + b_2 + \ldots + b_m$.

A sequence of integers $a_1, a_2, \ldots, a_n$ is called *perfect* if every non-empty subsequence of a is *good*.

YouKn0wWho has two integers n and M, M is prime. Help him find the number, modulo M, of *perfect* sequences $a_1, a_2, \ldots, a_n$ such that $1 \le a_i \le n + 1$ for each integer i from 1 to n.

A sequence d is a subsequence of a sequence c if d can be obtained from c by deletion of several (possibly, zero or all) elements.

Input

The first and only line of the input contains two space-separated integers n and M ($1 \le n \le 200$; $10^8 \le M \le 10^9$). It is guaranteed that M **is prime**.

Output

Print a single integer — the number of *perfect* sequences modulo M.

Examples

input
2 998244353
output
4

input
4 100000007
output
32

input
69 999999937
output
456886663

Note

In the first test case, the *perfect* sequences are $[2, 2]$, $[2, 3]$, $[3, 2]$ and $[3, 3]$.

In the second test case, some of the *perfect* sequences are $[3, 4, 3, 5]$, $[4, 5, 4, 4]$, $[4, 5, 5, 5]$ etc. One example of a sequence which is not *perfect* is $[2, 3, 3, 4]$, because, for example, the subsequence $[2, 3, 4]$ is not an *good* as $2 \cdot 4 < 2 + 3 + 4$.

F. October 18, 2017

time limit per test: 4 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

It was October 18, 2017. Shohag, a melancholic soul, made a strong determination that he will pursue Competitive Programming seriously, by heart, because he found it fascinating. Fast forward to 4 years, he is happy that he took this road. He is now creating a contest on Codeforces. He found an astounding problem but has no idea how to solve this. Help him to solve the final problem of the round.

You are given three integers n, k and x. Find the number, modulo $998\,244\,353$, of integer sequences $a_1, a_2, \ldots, a_n$ such that the following conditions are satisfied:

- $0 \le a_i < 2^k$ for each integer i from 1 to n.
- There is no non-empty subsequence in a such that the bitwise XOR of the elements of the subsequence is x.

A sequence b is a subsequence of a sequence c if b can be obtained from c by deletion of several (possibly, zero or all) elements.

Input

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

The first and only line of each test case contains three space-separated integers n, k, and x ($1 \le n \le 10^9$, $0 \le k \le 10^7$, $0 \le x < 2^{\min(20,k)}$).

It is guaranteed that the sum of k over all test cases does not exceed $5 \cdot 10^7$.

Output

For each test case, print a single integer — the answer to the problem.

Example

input
6 2 2 0 2 1 1 3 2 3 69 69 69 2017 10 18 5 7 0
output
6 1

```
15
699496932
892852568
713939942
```

Note

In the first test case, the valid sequences are $[1,2]$, $[1,3]$, $[2,1]$, $[2,3]$, $[3,1]$ and $[3,2]$.

In the second test case, the only valid sequence is $[0,0]$.