ACPC
AFRICA & ARAB
Collegiate Programming
Championship

International Collegiate Programming Contest
The 2022 ECPC Contest
AAST, Egypt
August 2022

The International Collegiate Programming Contest
Sponsored by ICPC Foundation

ECPC
EGYPTIAN COLLEGIATE
PROGRAMMING CONTEST

The 2022 ECPC Contest

20-08

(Contest Problems)

AAST, Egypt
August 2022

Problem A. A Story

Input file:	standard input
Output file:	standard output
Balloon Color:	Orange

Once upon a time in a world that looks like ours a story of a person who looks like many of us is about to begin and it unravels like a jigsaw puzzle. Make sure to open your eyes and focus, as things can look like a duplicated version of another person's story but soon you will know that it is exceptionally different than any other story you've experienced.

For it being a great harmonic and very imminent journey where paths may cross. Kudos to those who hone their knowledge and leverage their skills as marching into the future would definitely require them.

You are given an array A with N numbers and a number P, you can make another array B such that for every i should $1 \leq B_i \leq A_i$.

After making an array B, you have to put either $\times$ or $+$ between the $i-$th and $(i+1)-$th numbers for every $1 \leq i < N$.

For example if $B = [3, 5, 2]$, there are $2^{N-1} = 4$ ways to put $\times$ or $+$ between the numbers:

$3 \times 5 \times 2$

$3 \times 5 + 2$

$3 + 5 \times 2$

$3 + 5 + 2$

You have to calculate the number of ways to make an array B and put $\times$ or $+$ between the numbers and the result of the expression is divisible by P.

print the answer modulo $10^9 + 7$.

Note: if there is multiplication in the expression, should calculate it before doing the add operations.

For example, if the expression is $3 + 5 \times 2$ then the answer is 13, not 16.

Input

The input consists of multiple test cases. The first line contains an integer t – the number of test cases. The description of the test cases follows.

The first line of each test case contains two integers n $(1 \leq n \leq 70)$, P $(1 \leq P \leq 70)$.

The next line of each test case contains n integers a_i $(1 \leq a_i \leq 100000)$.

we guarantee that the $\sum n$ over all test cases doesn't exceed 70.

Output

For each test case, output a single integer - the solution.

Example

standard input	standard output
1 2 1 2 2	8

Problem B. Begins and it

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`White`

Just like any story, it begins with an ambitious person, Mona. And as it moves forward, paths start to appear and connect. And as it takes two to Tango, Endure Capital, the ACPC Community Partner, believing in the relentless execution to build and achieve hyper-growth, starts investing in Mona's future journey.

Mona has M minutes and N tasks, the ith task needs A_i minutes to do it independently and needs your help to calculate the minimum days needed, and minimum minutes needed to do all tasks.

You can split the N tasks into subarrays such that for each subarray of tasks, you have to do all tasks in this subarray on the same day.

A subarray is a contiguous part of the array.

For example, consider the array $[1, 2, 3, 4]$, There are 10 non-empty sub-arrays, the subarrays are $(1), (2), (3), (4), (1, 2), (2, 3), (3, 4), (1, 2, 3), (2, 3, 4)$ and $(1, 2, 3, 4)$.

But if you do X tasks in a day, the total minutes needed on that day is $(1 \times A_i) + (2 \times A_{i+1}) + \ldots + (X \times A_{i+X-1})$.

For example, if the tasks of a day are $[5, 3, 9]$, the total minutes needed on this day is $1{\times}5{+}2{\times}3{+}3{\times}9 = 38$.

You have to provide conditions:

1. Do all tasks in minimum days.
2. The total minutes needed overall days doesn't exceed M.
3. If there are many ways to do that, you have to do it with the minimum total minutes needed.

Moreover, you have one magic operation, you can use it before beginning to do tasks, choose an element A_i from the array and insert it in any place in this array.

For example if the array $A = [2, 5, 1, 4]$ and you choose A_2, there are 4 possible ways to put it:

$A = [5, 2, 1, 4]$.

$A = [2, 5, 1, 4]$.

$A = [2, 1, 5, 4]$.

$A = [2, 1, 4, 5]$.

Note: we guarantee that the sum of elements in A doesn't exceed M.

Input

The input consists of multiple test cases.

The first line contains an integer t — the number of test cases.

The first line of each test case contains two integers n $(1 \le n \le 50)$ and M $(1 \le M \le 10^9)$.

The second line of each test case contains n integers $A_1, A_2, \ldots, A_n$ $(0 \le A_i \le 10^9)$ — the elements of the array A.

we guarantee that the sum of elements in A doesn't exceed M , the sum of n over all test cases doesn't exceed 50

Output

For each test case, output a two integers — Minimum days needed, and minimum minutes needed.

Example

standard input	standard output
3 4 30 3 4 1 2 5 30 4 3 6 2 9 6 25 1 3 2 1 3 2	1 21 3 29 2 20

Problem C. Can look like a

Input file: standard input
Output file: standard output
Balloon Color: Yellow

A deja vu is a French word expressing the feeling that one has lived through the present situation before. It seems that this story of the passionate Ali can look like a story written by a different self in a different universe, yet something seems to be a bit different.

Ali has three numbers N, M, and K, and M segments and needs your help.

Assume that you have a permutation P with length N, and you can arrange it.

Each one of the segments has L_i, R_i, and V_i, where $1 \leq L_i \leq R_i \leq N$, the value of segment i is the mex of the elements in P which are in the range $[L_i, R_i]$, the cost of using the segment i is V_i.

You have to pay at most K to use some of the segments in such that the sum of mex of these segments is maximum.

Notes:A permutation is a sequence of integers from 1 to N of length N containing each number exactly once. for example, $[1], [4, 3, 5, 1, 2], [3, 2, 1]$ are permutations, and $[1, 1], [4, 3, 1], [2, 3, 4]$ are not. mex of a set denotes the smallest positive integer that is not present in the set. for example, $mex(1, 5, 3, 2) = 4$, $mex(2, 5, 3) = 1$.

Input

The input consists of multiple test cases. The first line contains an integer t the number of test cases. The description of the test cases follows.

The first line of each test case contains three integers n $(1 \leq n \leq 10^5)$, M $(1 \leq M \leq 22)$, and K $(1 \leq K \leq 2000)$.

The next m lines of each test case contains 3 integers l, r, v $(1 \leq l \leq r \leq n, 1 \leq v \leq 100)$.

we guarantee that the sum of n over all test cases doesn't exceed 10^5 , the sum of M over all test cases doesn't exceed 22.

Output

For each test case, output one integer, the solution.

Example

standard input	standard output
1 8 3 4 1 2 1 3 3 4 4 8 2	7

Problem D. Duplicated version but

Input file:	standard input
Output file:	standard output
Balloon Color:	Silver

A deja vu is a French loanword expressing when one feels they have lived through the same situation in the past. It almost looked like a duplicated version and they certainly got us in the first part, but even when things look exactly similar, the tiniest butterfly movement can make the whole difference.

Alaa gives you Q queries, for the ith query you are given two numbers L_i and R_i.

For each X and Y such that $L_i \leq X < Y \leq R_i$, you have to calculate the gcd (Greatest common divisor) of X and Y.

The answer for ith query is the maximum gcd among all values of gcd.

Input

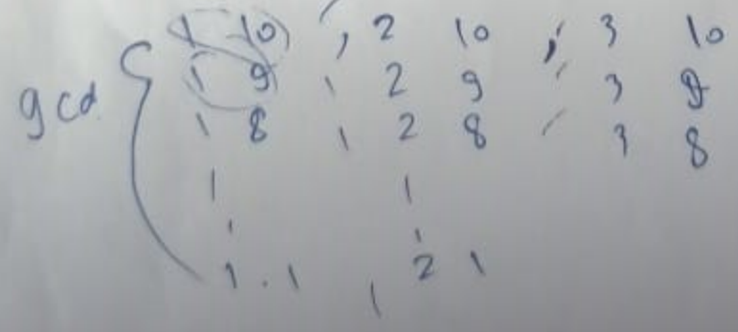
The first line contains an integer Q ($1 \leq Q \leq 10^5$), denoting the number of elements in L and R. Each line i of the Q subsequent lines (where $0 \leq i < Q$) contains two integer describing L_i and R_i ($1 \leq L_i < R_i \leq 10^5$).

Output

Q lines containing the answer to each query.

Examples

standard input	standard output
1 1 100000	50000
3 1 10 6 11 3 4	5 3 1
4 1 2 1 3 1 4 1 5	1 1 2 2



Problem E. Exceptionally different

Input file:	standard input
Output file:	standard output
Balloon Color:	Red

Reading through others' lives, Lolo discovers that everything looks so familiar, yet everything is so exceptionally different. Lolo decides that for it being a great harmonic imminent journey, it is worth a little bit of a spoiler alert. But eventually, kudos to those who figure the story out. And as always Coach Academy, the ACPC Training Partner, jumps into the picture with training opportunities to provide guidance and lend a hand to Lolo through their big journey ahead.

Lolo has an array of n positive integers where each element is strictly greater than 1.

Help him to find the number of common divisors that are greater than 1 of all subarrays.

print the answer modulo $10^9 + 7$.

Input

The input consists of multiple test cases. The first line contains an integer T the number of test cases. The description of the test cases follows.

The first line of each test case contains an integer $n (1 \leq n \leq 6 \times 10^4)$.

The next line of each test case contains n integers $a_i (2 \leq a_i \leq 6 \times 10^4)$.

We guarantee that the sum of n over all test cases doesn't exceed 6×10^4.

Output

For each test case, output the answer modulo $10^9 + 7$.

Example

standard input	standard output
2 3 2 10 15 6 3 6 11 22 44 2	9 22

Problem F. For it being a

Input file:	standard input
Output file:	standard output
Balloon Color:	Blue

It is the year 2008, and people are so excited about the newest inventions. Who could imagine that one day humans will step foot on another planet. It is the new era of terraforming. For it being so full of potential, Amr can't wait to pursue his goals and think much bigger, as now, ideas are out of this planet.

Amr has an array A of n integers and q queries.

You have to answer q queries:

For the i_{th} query, given 2 integers B_i and C_i, you have to choose any two integers L and R such that:

- $B_i \leq L \leq R \leq C_i$.
- the elements $A_L, A_{L+1}, ..., A_R$ are distinct.
- $(R - L + 1)$ is maximum possible.

For each query, the answer will be $R - L + 1$.

Input

The input consists of multiple test cases. The first line contains an integer T the number of test cases. The description of the test cases follows.

The first line of each test case contains two integers $n, q (1 \leq n, q \leq 10^5)$.

The next line of each test case contains n integers $ai (1 \leq A_i \leq 10^5)$.

The next q lines of each test case contain $B_i, C_i (1 \leq B_i \leq C_i \leq n)$.

we guarantee that the sum of n over all test cases doesn't exceed 10^5, and the sum of q over all test cases doesn't exceed 10^5.

Output

For each test case, print q lines the answers to the queries.

Example

standard input	standard output
3 4 1 1 1 1 1 1 4 5 2 1 2 1 2 1 1 3 3 5 7 2 1 4 3 5 1 2 3 1 7 5 7	1 2 2 5 3

TLE

Problem G. Great

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Rose`

What an eventful year, it's 2008, a year since Moa started his plan. Pursuit of one's goal has never been so fulfilling. As the impact is so rewarding. The great plan continues with the great support of the Arab Academy for Science and Technology (AAST), the ACPC Headquarter. It is for sure, a base reason for establishing Moa's future plans.

Moa has two integers n and k and needs your help to find the number of pairs (i, j) such that $0 \leq i < j \leq n$ and k divides $(j - i)$.

Input

The first line contains an integer, $T (1 \leq T \leq 10^5)$ — the number of test cases.

each line of each test case contains two integers n and k $(1 \leq k \leq n \leq 10^9)$.

Output

For each test case, output the answer.

Example

standard input	standard output
2 3 1 5 2	6 6

Problem H. Harmonic

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Black`

A journey is never the end. It is always only a checkpoint that was completed if you really think about it. As one path comes to an end, it suddenly forks into many. Moka was just there, their choice of the next move was everything harmonic for our story.

Moka has a matrix consists of N rows and M columns, and an integer K.Help him to find the maximum possible sum of sub rectangle whose area is equal to K.

Input

The first line contains a single integer T denoting the number of test cases.

Each test case starts with a line containing three space separated integers N, M and K ($1 \leq N, M \leq 1000, 1 \leq K \leq \mathrm{N} \times \mathrm{M}$) denoting the number of rows and columns, and the area of rectangle.

The next N lines contain M space-separated integers each $A_{i,j}$ ($-10^5 \leq A_{i,j} \leq 10^5$).

It is **guaranteed** that the sum of $\mathrm{N} \times \mathrm{M}$ in all testcases do not exceed 10^6.

Output

For each test case print one line containing a single number, the maximum sum of a sub rectangle whose area equal to K.

If there is no sub rectangle with area k print **N̈o such rectangle."** without the quotes.

Example

standard input	standard output
2 3 4 4 0 5 5 0 0 5 5 0 5 5 5 5 3 3 5 1 1 1 1 1 1 1 1 1	20 No such rectangle.

Note

The length and width of the sub rectangle can be equal.

Problem I. Imminent

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Green`

With the upcoming plans, Fatma knows that crossing paths again with others' stories is imminent. She knows that even if things appear to take the same turns, it is always different when you look up close and invest in seeing. Fatma is very considerate to this when she plans her next move.

Fatma has an array of n elements and a number $X(1 \leq X \leq 10^{1000})$.

Merging subsequence is concatenating its elements to form one number. In other words, if we have an array $[10, 5, 7, 4]$, choosing the subsequence$[10, 7, 4]$, concatenating these elements will form 1074.

Fatma wants to find the number of all merged subsequences greater or equal to X, Help her for do that.

Print the answer modulo $10^9 + 7$.

Input

The input consists of multiple test cases. The first line contains an integer T the number of test cases. The description of the test cases follows.

The first line of each test case contains an integer $n(1 \leq n \leq 10^4)$.

The next line of each test case contains n integers $a_i(1 \leq a_i \leq 10^9)$.

The next line of each test case contains an integer $X(1 \leq length(X) \leq 10^3)$.

we guarantee that the sum of n over all test cases doesn't exceed 10^4, and the sum of length of X over all test cases doesn't exceed 10^3.

Output

For each test case, output the solution modulo $10^9 + 7$.

Example

standard input	standard output
2 3 10 4 2 10 3 4 10 5 320	5 2

Note

Explanation of the first test case: $a = [10, 4, 2], X = 10$

The 5 subsequences that are greater or equal to 10: $[10], [10, 4], [10, 2], [10, 4, 2], [4, 2]$

Problem J. Journey

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Purple`

Have you noticed yet? It's never been about the end of the journey. There is always what is coming next. It is about what happens throughout the journey with all the paths and turns. It is like an Arena, or to be more specific, a Talents Arena, the place where geeks just like Tito find what he has always been looking for!

Tito is facing a new challenge. He is given the following task. Let $g(i)$ be the number of *nice strings* of size i.

A string is considered to be nice if it satisfies the following conditions:

- All its letters are R or L.
- No two L are close to each other.

Explanation: "RRLR", "RLRL" and "RRRR" are *nicestrings*, but "LLRR", "LLLL" and "RLLR" are not.

For example $g(3) = 5$ because there are 5 possible nice strings with size 3 which are: "RRR", "RRL", "RLR", "LRR" and "LRL".

Tito is given an integer n, your task is to help him find the value of $\sum_{i=1}^{n} g(i)^2$ modulo $10^9 + 7$.

Input

The first line contains an integer, $T(1 \leq T \leq 10^5)$ — the number of test cases.

The only line of each test case contains a single integer n $(1 \leq n \leq 10^9)$.

Output

For each test case, output the answer modulo $10^9 + 7$.

Example

standard input	standard output
2 2 3	13 38

Problem K. Kudos to those who

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Light Blue`

Zizi is almost there. A new checkpoint in her story is over there. Kudos to those who seek it. Zizi definitely claims it.

Zizi has always been clever in Number Theory. One day she faced a problem and solved it immediately, so she wonders if you can solve it too. Zizi gives you an integer N, consider the number **sumodd** which denotes the sum of the first N odd numbers and the number **sumeven** which denotes the sum of the first N even numbers. Print the gcd of these two numbers.

Input

The first line contains a single integer T denoting the number of test cases ($1 \leq T \leq 10^5$). Each test case contains a single integer N ($1 \leq N \leq 10^{18}$).

Output

For each test case print one line containing the answer to the problem.

Example

standard input	standard output
2 1 4	1 4

Note

The first test case: $gcd\ (1,2) = 1$.

The second test case: $gcd\ (\ 1 + 3 + 5 + 7\ ,\ 2 + 4 + 6 + 8) = gcd(16,20) = 4$

2X+1

Problem L. Leverage their skill

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Bronze`

The future is certainly uncertain. But throughout the story, knowledge is gained. Building a book of wisdom, Ali knows how to leverage his skill for one more chapter of the story of a lifetime from another verse.

Ali is a clever boy. His teachers know that he is good at maths so they asked him about one problem. If you have a square with a positive integer side length X and a positive integer N, suppose you cut the square into four triangles with equal area, how many squares of lengths X such that $1 \leq X \leq N$, and the area of each triangle is a perfect square. Bomba solved this problem instantly, can you?

A perfect square is a number that can be expressed as a product of two equal numbers.

Input

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

Each test case contains a single integer N ($1 \leq N \leq 10^{18}$).

Output

For each test case print one line containing the answer to the problem.

Example

standard input	standard output
2 1 2	0 1

Note

In a square of side length 2, each triangle has an area equals 1 which is a perfect square.

Problem M. Marching into the future

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Light Green`

Have you seen it yet? it has been there all along. Sometimes it takes an outsider point of view, to notice what is really there. Stories of people's lives have never been so similar. It only requires a thoughtful look. And the differences are suddenly clear.

Maha hates AND and all bitwise operations and she doesn't know why people create problems about them. One day she got stuck in a problem that involves AND and wants your help to solve it. You are given an array of size N, you want to partition it into one or more contiguous subarrays. The joy of these subarrays is the sum of the bitwise AND of the numbers in each subarray. You must print the difference between the maximum joy and the minimum joy that can be achieved. Please, help Maha with this problem.

Input

The first line contains a single integer T denoting the number of test cases ($1 \leq T \leq 10$).

Each test case contains a single integer N represents the size of the array. ($1 \leq N \leq 10^5$) .

Then N lines each contains a single integer which is an element of the array. Each element in the array is at least 1 and at most 2^{30}.

Output

For each test case print one single line contains the difference between the maximum and minimum joy that can be achieved.

Example

standard input	standard output
2 3 2 4 6 10 489 104 776 546 557 322 37 408 620 620	12 4479

Note

For the first test case all the valid partitions are:

1. $[2,4,6]$ with total $= (2 \,\&\, 4 \,\&\, 6) = 0$
2. $[2][4,6]$ with total $= 2 + (4 \,\&\, 6) = 6$
3. $[2,4][6]$ with total $= (2 \,\&\, 4) + 6 = 6$
4. $[2][4][6]$ with total $= 2 + 4 + 6 = 12$

The answer is $12 - 0 = 12$

Problem N. Now and next

Input file:	`standard input`
Output file:	`standard output`
Balloon Color:	`Gold`

As the future is unknown, it is hard to guess what is coming next. But we are living in the current moment, now, and it should be utilized for the best. It is a great imminent journey Yosri needs to take. It is all about now, then, and what is next.

Yosri has X cakes, he wants to distribute them between N judges equally so each judge gets the same integer number of cakes without any remaining cakes.

Can you check if this is possible or not?

Input

The first line contains an integer T representing the number of test cases.

In each test case, you get two integers X, N ($1 \leq X, N \leq 100$)

Output

For each test case, output "YES" (without quotes) if Yosri can distribute them, and "NO" (without quotes) otherwise.

Example

standard input	standard output
2 10 5 3 2	YES NO