The International Collegiate Programming Contest
Sponsored by ICPC Foundation

The 2021 Lebanese Collegiate Programming Contest

(Contest Problems)

Lebanon
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Problem A. Kofta never lose

Input file:	`kofta.in`
Output file:	`standard output`
Balloon Color:	`Pink`

Kofta is challenging Hwawshi in a game.

There is a box that generates a random number in between 1 and 10^5

If the generated number x is less than 10^9, Kofta wins. Otherwise Hwawshi wins.

Input

The first line contains a single integer N ($1 \leq \mathrm{N} \leq 10^5$)

Output

print 1 if kofta wins, print 0 otherwise.

Example

kofta.in	standard output
6	1

Problem B. perfect subarrays

Input file:	`perfect.in`
Output file:	`standard output`
Balloon Color:	`Orange`

Nour likes data structures so much so that he calls himself the King of DS, unlike Nour, his teammate Ali likes greedy problems.

Nour gave Ali a problem and told him I will buy you a kilo of shawarma if you can solve it without my secret data structure.

So he wants your help with this problem.

You are given an array A of N integers.

Nour defines a bad subarray as a subarray with the sum of its elements equal to zero.

$$\sum_{i=l}^{r} a_i = 0$$

And defines a perfect subarray as a subarray that doesn't contain any bad subarray.

You are going to find how many perfect subarrays are in the given array.

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

For example if $A = [1, -1, 2]$:

- $[1, -1]$ is bad subarray because sum of this subarray equal 0.
- $[1, -1, 2]$ isn't perfect subarray because contain bad subarray $[1, -1]$.
- $[-1, 2]$ is perfect subarray.

Input

The input file begins with an integer $T(1 \leq 1000)$, the number of test cases.

Each test case consists of an integer $N(1 \leq N \leq 10^5)$, the size of the given array.

Followed by N integers in a separated line, where a_i $(-10^3 \leq a_i \leq 10^3)$.

It's guaranteed that sum of N over all tests dosen't exceed 10^6.

Output

For each array, print the number of different perfect subarrays that can be found in it.

Example

perfect.in	standard output
2 5 3 2 -1 0 1 5 1 -3 -1 1 0	7 7

Problem C. Even Pairs

Input file:	even.in
Output file:	standard output
Balloon Color:	Yellow

Adel loves Pascalands So much, so he was searching for great things that Pascalands has, he loves Math as much as he loves Pascalands so he remembered that Pascal is a Pascalandian Mathematician and he really likes him.

He started to write Pascal Triangle on a piece of paper which looks like:

1

11

121

And so on using the recurrence relation: $P(n, m) = P(n-1, m-1) + P(n-1, m)$.

Adel Loves even numbers because Pascalands has even number of cities

Adel Wants to count the number of pairs (i, j) in row n such that $i < j$ where $P(n, i) + P(n, j)$ is an even number.

Input

You are given T ($T \leq 10^5$) Test cases. Each test you are given an integer n ($1 \leq n \leq 10^{18}$) where n represents the number of the row.

Output

A where A is the number of pairs with even sum modulo $10^9 + 7$.

Example

even.in	standard output
3 2 4 5	1 6 4

Note

For example when $n = 2$

1 1 so the Answer = 1

Problem D. Somar's game

Input file:	`arr.in`
Output file:	`standard output`
Balloon Color:	`Light Green`

Given an array A with n integers. Somar and Bob are playing a game with this array.

At first, Somar's position is x and Bob's position is y. Players alternate turns and Somar starts the game, in each turn if a player's position is i then he adds A_i to his score which makes $A_i = 0$, then he changes his position to a new position either to the left or the right of his current position, The new position should not be occupied by the other player and should be inside the array. If the two players play optimally, what is the maximum score that Somar can achieve.

Input

The first line contains a single integer T $(1 \leq T \leq 50)$ — the number of test cases. The description of the test cases follows.

The first line of each testcase contains three integers $n, x, y (1 \leq n \leq 10^5), (1 \leq x, y \leq n), x \neq y)$, the number of elements in the array A, Somar's position and Bob's position, respectively.

The second line of each testcase contains n integers where the i_{th} integer $A_i (0 \leq A_i \leq 10^9)$ denotes the i_{th} element of the array A.

Output

Print one integer, the maximum score Somar can achieve.

Example

arr.in	standard output
2 7 3 6 1 1 2 3 4 5 0 2 1 2 2 3	7 2

Problem E. Somar's challenge

Input file:	ch.in
Output file:	standard output
Balloon Color:	White

Somar heard that Bob is a good problem solver. He wants to check Bob's problem-solving abilities, so Somar challenged Bob with this problem. He gives Bob an array of n integers and asked him if he can find the **maximum** Psum possible of this array. Psum of an array is defined as follows:

- Choose any segment $[l, r]$ of this array where $1 \leq l \leq r \leq n$, or the segment can be empty.
- Multiply the other array elements outside the chosen segment by -1.
- Psum would be the sum of elements of the array.

Bob asks you if you can help him finding maximum Psum for the given array.

Input

The first line contains a single integer T $(1 \leq T \leq 30)$ — the number of test cases. The description of the test cases follows.

The first line of each test case contains one integer n where $(1 \leq n \leq 10^5)$ denotes the number of elements in the array.

The second line of each test case contains n integers where the i_{th} integer $a_i(-10^4 \leq a_i \leq 10^4)$ denotes the i_{th} element of the array.

Output

Print one integer denotes the maximum Psum possible in the array.

Example

ch.in	standard output
2 4 -1 2 -3 4 6 -1 3 -1 2 -4 2	6 7

Note

In the first testcase we can choose the segment $[4, 4]$ then $psum = 1 - 2 + 3 + 4 = 6$

Problem F. Strange school

Input file:	`school.in`
Output file:	`standard output`
Balloon Color:	`Dark Blue`

In a strange school there are n students in the school.

Initially, each student has energy equal to zero. The lessons begin exactly at the S minute. If a student arrives to school at time T which is $(T \geq S)$, he will get punished by decreasing his/her energy by x.

Each student wakes up at the a_i minute. If he takes a breakfast his energy will increase by $e1_i$ energy units. Taking a breakfast needs $b1_i$ minutes (it is possible that he doesn't take a breakfast). Each student i must walk from the dorm to his school which takes $b2_i$ minutes and increases the student energy by $e2_i$ energy units. its possible that some students start their day at school with a negative energy value.

For each student choose the best scenario so that the sum of final energy units for all students is as maximum as possible.

Input

The first line contains a single integer T $(1 \leq T \leq 50)$ — the number of test cases. The description of the test cases follows.

The first line of each test case contains three integers n, S, x $(1 \leq n \leq 10^4)$ and $(0 \leq S, x \leq 10^9)$ denotes the number of students, The minute when the lessons will start and how many energy units will decrease from the student energy if he will be late, respectively.

The second line of each test case contains n integers where the i_{th} integer $a_i (0 \leq a_i \leq 10^9)$ denotes the the minutes when the i_{th} student wakes up.

The third line of each test case contains n integers where the i_{th} integer $e1_i (0 \leq e1_i \leq 10^9)$ denotes how many energy units the i_{th} student will get if he has a breakfast.

The fourth line of each test case contains n integers where the i_{th} integer $b1_i (1 \leq b1_i \leq 10^9)$ denotes how many minutes will i_{th} student takes in his breakfast.

The fifth line of each test case contains n integers where the i_{th} integer $e2_i (0 \leq e2_i \leq 10^9)$ denotes how many energy units the i_{th} student will get when he walk to the school.

The sixth line of each test case contains n integers where the i_{th} integer $b2_i (1 \leq b2_i \leq 10^9)$ denotes how many minutes will i_{th} student takes in his way to the school.

Output

Print one integer denotes the maximum sum of the final energy over all the students.

Example

school.in	standard output
1 3 6 2 2 0 3 2 0 1 1 2 3 0 3 0 1 2 1	5

Problem G. How to be a Legend

Input file:	square.in
Output file:	standard output
Balloon Color:	Silver

Yasser found two positive integers, n and m on his way to reach Green rating again.

So Ezzat promised him if he answers this question he will tell him the secret way to be a Legend.

The question is to determine whether the concatenation of n and m in this order (nm) is a Perfect square number.

Input

The only line of input contains two numbers n and m ($1 \leq n, m \leq 10^4$).

Output

If the concatenation of n and m in this order is a square number, print "YES"otherwise print "NO". (without any quotes)

Examples

square.in	standard output
1 21	YES
12 10	NO

Note

In the first example when we concatenate n and m the result will be 121 and 121 is the square of 11.

Problem H. ggcd

Input file:	ggcd.in
Output file:	standard output
Balloon Color:	Purple

given an array A of N integers and an integer K.

You can do the following move at most K times:

1– Choose two different indices that weren't chosen before i,j then calculate $x = |A_i - A_j|$ and $y = A_i + A_j$.

2– then make $A_i = x$, $A_j = y$.

You want to maximize the GCD of the array .

Note that $GCD(x, 0) = x$.

it is guaranteed that there is at least one positive integer in the array.

Input

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

The first line of each test case contains two integers N and K consecutively ($2 \leq N \leq 10^5, 0 \leq 2 \times K \leq N$).

the second line contains N integers the i_{th} integer is A_i ($0 \leq A_i \leq 10^9$) .

Output

print a single integer , the maximum GCD that can be achieved .

Example

ggcd.in	standard output
2 8 2 3 11 5 10 5 7 10 1 3 1 3 11 14	1 2

Problem I. New LIS Problem

Input file:	`lis.in`
Output file:	`standard output`
Balloon Color:	`Red`

Longest Increasing Subsequence is a well-known problem where you have to find the length of the longest subsequence of a given sequence such that all elements of the subsequence are sorted in non-decreasing order.

Now a more sophisticated problem has emerged, which is to find the maximum sum of elements of any such LIS.

Input

The first line contains one integer the number of testcases ($1 \leq t \leq 1000$).

The first line of each test contains one integer ($1 \leq n \leq 10^5$) represenrs the size of the array.

The second line of each test contains n integers represents the elements of the array ($1 \leq A_i \leq 10^5$).

Output

For each test print one integer the maximum sum of elements of any LIS.

Example

lis.in	standard output
3 4 3 2 5 1 4 10 1 2 3 3 1 1 1	8 6 3

Problem J. Yet Another Partition Problem

Input file:	`splitit.in`
Output file:	`standard output`
Balloon Color:	`Dark Green`

You are given an array of N integers and an integer K. You want to split the array into K continuous segments.

For example, if the array A is: $[1, 3, 4, 2, 5]$ and K is 2: Some of the possible partitions are: $[1][3, 4, 2, 5]$ or $[1, 3, 4][2, 5]$ but not $[1, 4][3, 2, 5]$.

After the partition, for every pair i, j where $i \neq j$ and that belong to the same segment, if $a_i \times a_j$ is a perfect square you must remove the greater element between them (if a_i is equal to a_j you can remove any). The beauty of the array is the number of the remaining elements. Note the you can't remove any element before partition. You want to split the array into K segments in a way that the total beauty is maximum possible, print the maximum beauty.

Input

The first line contains two integers $N, K (1 \leq N \leq 2 \times 10^4, 1 \leq K \leq min(N, 100))$. Next line contains N integers the values of the array $A (1 \leq A_i \leq 10^6)$.

Output

Print the maximum beauty after splitting the array into K continuous segments.

Examples

splitit.in	standard output
4 3 4 1 4 9	3
5 2 1 2 3 4 5	5
5 2 4 6 9 5 16	4

Problem K. Consistent Tournament

Input file:	`tennis.in`
Output file:	`standard output`
Balloon Color:	`Black`

There are N teams participating in a round-robin table tennis tournament, where each team plays exactly one match against every other team. The result of each match is one of two possible outcomes:

- The first team wins.
- The second team wins.

Ali calls a tournament **consistent** if there exists three distinct teams, A, B and C, such that each team won exactly once against one of the other two teams.

The tournament hasn't started yet, but Ali is wondering, of all possible outcomes of matches in this tournament, what is the number of consistent tournaments?

Input

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

The only line of each test case contains one integer number N, $(1 \leq N \leq 10^6)$, representing the number of teams in the tournament. You can assume that team numbers are from 1 to N.

Output

For each test case, print a single line containing one integer — the number of consistent tournaments, the answer could be very large, so please print its remainder after division by $10^9 + 7$.

Example

tennis.in	standard output
3 1 3 137	0 2 487466874

Problem L. Photo Album

Input file:	`album.in`
Output file:	`standard output`
Balloon Color:	`Gold`

Valentino has just come home from his summer vacation. He took n photos and now he wants to collect all the photos in an album. He has bought a photo album-making machine to help him with this task. The machine can perform two types of operations:

- Create a new album and add up to k photos to it.
- Merge up to k albums together into a single album.

These are the only operations that the machine can perform. It can't add photos or remove them from an already existing album.

Since the machine runs on electricity, Valentino wants to minimize the number of operations that the machine has to perform. Help Valentino determine the minimum number of operations needed to collect all the n photos in a single album. If it is not possible to collect all photos in a single album, print -1.

Input

The first line contains a single integer t, the number of test cases.

The only line of the description of each test case contains two integers n, k ($1 \leq n, k \leq 10^9$).

Output

For each test case print the answer on a single line or -1 if it is not possible to collect all photos in a single album.

Example

album.in	standard output
3 4 2 3 3 654215845 21	3 1 32710793