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 3 arrays A, B and C of lengths N, M and O respectively.

Your task is to evaluate the following:

$$\sum_{i=1}^{N}\sum_{j=1}^{M}\sum_{k=1}^{O} A_i B_j C_k$$

but because the result will be very big you will print the result module 10^9+7

Input

The first line contains 3 integers N, M, and O ($1 \le N, M, O \le 10^5$)– denotes the lengths of A, B, and C respectively.

The second line contains n integers $A_1, A_2, \ldots, A_N$ ($1 \le A_i \le 10^5$)– denotes the values of the array A.

The third line contains m integers $B_1, B_2, \ldots, B_M$ ($1 \le B_i \le 10^5$)– denotes the values of the array B.

The fourth line contains o integers $C_1, C_2, \ldots, C_O$ ($1 \le C_i \le 10^5$)– denotes the values of the array C.

Output

Print the evaluation of the mentioned equation module 10^9+7

Example

standard input	standard output
3 3 2 5 8 7 3 9 6 8 4	1872

Problem B. Begins and it

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

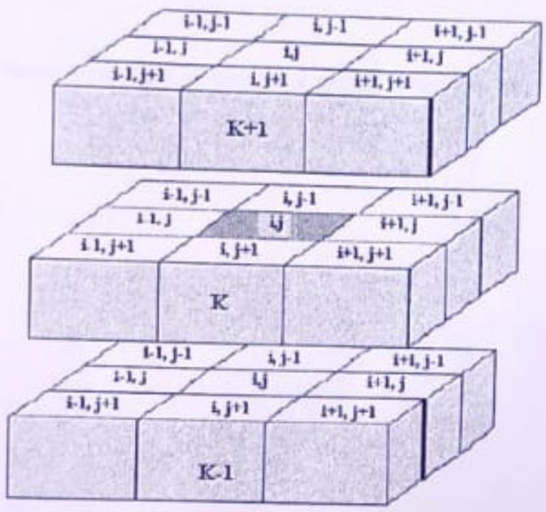
Just like any story, it begins with an ambitious person, Magda. And as it moves forward, paths start to appear and connect. And as it takes two to Tango, Endure Capital, the ACPC Community Partner, believing in the relentless execution to build and achieve hyper-growth, starts investing in Magda's future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

Magda gives you a cube C of length N represented by a 3-D array which contains 'x' or '.' only

The Point $C_{i,j,k}$ is located at the i^{th} depth, the j^{th} row and at the k^{th} column.

A Point $C_{i,j,k}$ is called good if all its neighbors are 'x'.

All the 26 neighbor points of the point $C_{i,j,k}$ are shown in the figure below.



Your task is to count the number of good points $C_{i,j,k}$.

Input

The first line contains an integer n ($1 \le n \le 100$)– denotes the length of the cube.

The cube is represented by n grids separated by an empty line, each of the next n grid will contain n lines

Each of the next n lines will contain n symbols $C_{i,j,k}$ ('x' or '.')

Output

Print the number of good points.

Examples

standard input	standard output
3 .xx xxx xxx xxx xxx xxx xxx xxx xxx	20
1 .	1

Note

There are some points that have a number of neighbor points less than 26.

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 Yasser can look like a story written by a different self in a different universe, yet something seems to be a bit different.

Yasser has an integer N and a sequence A of N integers, and he wants you to help him to detect if there is at least one integer in subarray $A_l, A_{l+1}, \ldots, A_{r-1}, A_r$ its occurrence is odd.

Yasser wants your help to solve this problem, can you help him?

Input

The first line contains an integer N ($1 \leq N \leq 10^5$) — the number of elements in the sequence.

The second line contains N integers ($1 \leq A_i \leq 10^9$) — A_i denotes the i_{th} element in the sequence.

The third line contains an integer Q ($1 \leq Q \leq 10^5$) — the number of queries.

In the next Q lines, each line contains l, r ($1 \leq l \leq r \leq N$) — the lower and upper bound of the interval that we want to check in it.

Output

Q lines, each line contains "YES" if there is at least one integer in subarray $A_l, A_{l+1}, \ldots, A_{r-1}, A_r$ its occurrence is odd otherwise print "NO".

Example

standard input	standard output
6 1 3 1 2 2 1 3 1 3 3 6 4 6	YES NO YES

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.

Samar knows that Menna is good at math, so she decides to challenge her in her field.

Samar gives Menna two integers N and M, and an array A of integers with size N. She asks Menna to tell her the number of integers from 1 to M that are divisible by any element from the array A.

For example, if $N = 3$, $M = 10$, and $A = [2, 7, 9]$ The answer will be 7 since $2, 4, 6, 7, 8, 9, 10$ are divisible by at least one element from the array A.

Input

The first line contains T $(1 \leq T \leq 20)$ — number of test cases.

Each test case contains two lines:

The first line contains two integers N, M $(1 \leq N \leq 18, 1 \leq M \leq 10^{18})$ — N is the size of the array.

The second line contains N integers $(1 \leq A_i \leq 10^{18})$ — A_i denotes the i_{th} element from the array.

It's guaranteed that the product of the array doesn't exceed 10^{18}

Output

The number of integers from 1 to M that are divisible by any element from the array A.

Example

standard input	standard output
3 3 10 2 7 9 3 20 15 12 14 1 50 2	7 3 25

Problem E. Exceptionally different

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

Reading through others' lives, Mahmoud discovers that everything looks so familiar, yet everything is so exceptionally different. Mahmoud 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 Mahmoud through his big journey ahead.

Mahmoud gives you a string S consisting of digits from 0 to 9, find the sum of all C_i for all i $(1 \leq i \leq |S|)$ where C_i is the number of substrings of S equal to i.

for example if S = "103" all substrings are "1", "10", "103", "0", "03", "3", $C_1 = 1$, $C_2 = 0$, $C_3 = 2$. Note "03" is counted as 3

Input

A single line containing a string S $(1 \leq |S| \leq 10^5)$, formed by digits from 0 to 9 where $|S|$ is the length of S.

Output

A single integer the sum of C_i for all $(1 \leq i \leq |S|)$.

Examples

standard input	standard output
1234	4
0123	4

Note

The strings you count could contain leading zeros "03" is the same as 3.

Problem F. For it being a

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

It is the year 2308, and people are so excited about the newest inventions. Who could imagine that interstellar travel will be so soon. It is the new era for going above and beyond. For it being so full of potentials Compo can't wait to pursue his goals and jump across the galaxy. So many places and things to do.

Compo gives you two integers N and D. Determine how many arrays A of length D,such that $\sum_{i=1}^{D} A_i = N$, and $(0 \leq A_i \leq N)$.

See notes for exmple.

Input

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

The second line of input contains two integers N and D $(0 \leq N \leq 1073741824)$, $(1 \leq D \leq 50)$.

Output

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

Example

standard input	standard output
3 2 3 2 4 5 13	6 10 6188

Note

In the first test case, different values that can be obtained are:

200 ,002 ,101 ,020 ,110 ,011

So the answer is 6.

In the second test case, different values that can be obtained are:

0002 ,0011 ,0020 ,0101 ,0110 ,0200 ,1001 ,1010 ,1100 ,2000

So the answer is 10.

Problem G. Great

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

What an eventful year, it's 2308, a year since Adhom started his plan. A 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 Adhom's future plans.

Adhom have always been passionate towards mathematics and problem solving. As a coincidence, his accommodation supervisor loves mathematics too. Each year new students come to the boarding school and are assigned to different rooms.

The rooms can have any size; also, the supervisor wants to give each student in each room a distinct ID to be known with. Two students must have different ID's if they share the same room. Assume that the supervisor has infinite amount of IDs of any number, he wants to assign the IDs to the students so that the greatest common divisor of the IDs of every pair of students in the same room is exactly k.

If the room has one student, then he can assign any ID to him. Imagine the boarding school as a grid with dimensions n x m. An empty cell in the room is denoted by "."and a wall cell is denoted by "W". Two cells share the same room if there exists a path from one cell to the other without passing through walls. Each cell is connected to its four adjacent cells: up, down, left, right. Assuming that the supervisor wants to minimize the sums of all the IDs of students, print the minimum sum of IDs of the students if the supervisor choses the numbers of the IDs optimally.

Input

The first line contains a single integer t denoting the number of test cases ($1 \leq t \leq 10$). Each test case contains three integers n , m and k representing the dimensions of the boarding school and the exact greatest common divisor of every pair in the same room. ($3 \leq n, m \leq 1000$, $1 \leq k \leq 10^5$) . Then each of the n lines contain m characters that are either "W"if it is a wall or "."if it is an empty cell for a room. It is guaranteed that the border of the school contains walls.

Output

For each test case print the minimum sum that can be achieved if the accommodation supervisor chooses the ID's optimally.

Example

standard input	standard output
3 3 3 10 WWW W.W WWW 5 5 2 WWWWW W.WWW W..WW WWW.W WWWWW 3 4 3 WWWW W..W WWWW	1 13 9

Note

In the first test case there is one room with only one student, the answer is 1.

In the second test case there is two rooms: one contains with one student with ID 1, the second contains 3 students with ID's: 2 , 4 , 6. The total sum of ID's is 13 and the gcd of every pair of ID's in the same room is exactly 2.

In the third test case there is one room that contains two students with ID's: 3 , 6. The total sum of ID's is 9 and the gcd of every pair of ID's in the same room is exactly 3.

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. Yosri was just there, his choice of the next move was everything harmonic for our story.

Yosri will give you an integer n and an array A of n integers.

Let $f(x)$ is $\sum_{i=1}^{n} \sum_{j=0}^{31} \min((x \,\&\, 2^j) \oplus (A_i \,\&\, 2^j), 1)$.

Find the minimum possible integer x which gets the minimum possible $f(x)$

In another format:

$f(x)$ is $\sum_{i=1}^{n} popcount((x \oplus A_i))$.

Input

The first line contains t ($1 \le t \le 1000$) — the number of test cases.

The first line of each test contains n ($1 \le n \le 10^5$) — the number of elements of the sequence.

The second line of each test contains n elements ($1 \le A_i \le 10^9$) — A_i denotes the i_{th} element of the sequence.

The sum of n overall test cases is 2×10^5

Output

t lines each line contains the minimum possible integer x which get the minimum possible $f(x)$ of the array A.

Example

standard input	standard output
5 5 1 2 3 4 5 6 8 4 5 6 3 1 8 1 2 8 9 4 10 8 9 2 1 8 1 6	1 0 8 0 6

Note

$popcount(X)$ is the number of 1 bits in the value of X.

In the first test case

$A = [1, 2, 3, 4, 5]$, $x = 1$:

$\sum_{j=0}^{31} \min((1 \,\&\, 2^j) \oplus (1 \,\&\, 2^j), 1) = 0$

$\sum_{j=0}^{31} \min((1 \,\&\, 2^j) \oplus (2 \,\&\, 2^j), 1) = 2$

$\sum_{j=0}^{31} \min((1 \,\&\, 2^j) \oplus (3 \,\&\, 2^j), 1) = 1$

$\sum_{j=0}^{31} \min((1 \,\&\, 2^j) \oplus (4 \,\&\, 2^j), 1) = 2$

$\sum_{j=0}^{31} \min((1 \,\&\, 2^j) \oplus (5 \,\&\, 2^j), 1) = 1$

so $\sum_{i=1}^{n} \sum_{j=0}^{31} (1 \,\&\, 2^j) \oplus (A_i \,\&\, 2^j) = 6$

Problem I. Imminent

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

With the upcoming plans, Amr knows that crossing paths again with others' stories is imminent. They know that even if things appear to take the same turns, it is always different when you look up close and invest in seeing. Amr is very considerate of this when they plan their next move.

Amr gives you a permutation P of N integers from 1 to N.

$F(L, R)$ $(1 \leq L \leq R \leq N)$ is defined as

$$\sum_{j=L}^{R} |i - j|$$

where i is the index of the minimum number of the subarray $P_L \dots P_R$.

Find the sum of $F(L, R)$ of all subarrays of the given permutation.

Note that, $|X|$ denotes the absolute value of a number X.

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.

Input

The first line contains an integer T $(1 \leq T \leq 100)$ denotes the number of test cases.

The next $2 \times T$ lines, each 2 line consists of:

The first line contains an integer N $(1 \leq N \leq 10^5)$ — the number of elements in the permutation.

The second line contains a permutation of N.

It's guaranteed that summation of N overall test cases doesn't exceed 2×10^5.

Output

Find the sum of $F(L, R)$ of all subarrays of the given permutation modulo 1000000007.

Example

standard input	standard output
3 3 3 2 1 4 1 4 3 2 7 1 7 4 5 3 2 6	5 15 115

Note

In the first test case:

- The weights of the subarrays $[1, 1], [2, 2], [3, 3]$ are 0 as $i = j$ in all these subarrays.
- Subarray $F(L, R) = F(1, 2) = 1$ as $i = 2$ and $j = 1$.
- Subarray $F(L, R) = F(2, 3) = 1$ as $i = 3$ and $j = 2$.
- Subarray $F(L, R) = F(1, 3) = 1$ as $i = 3$ and $j = [1, 2]$.

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 Moamen find what they have always been looking for!

Moamen gives you an integer N and your task to check if the right most digit of N is "Even"or "Odd".

Input

One line contains one integer number N ($1 \leq N \leq 100$).

Output

Output "Even" (without quotes) if the right most digit of N is even, and "Odd" (without quotes) otherwise.

Examples

standard input	standard output
3	Odd
10	Even

Problem K. Kudos to those who

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

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

Moamen gives you two integers N, K and asks you to print the smallest integer greater than or equal N and consist of the sum of distinct power of K.

For example if $N = 11, K = 3$ so the answer will be $12 = 3^1 + 3^2$.

Note that if $N = 5, K = 3$ so the answer will be $9 = 3^2$ not 6 because $6 = 3^1 + 3^1$ and it's necessary to be a distinct power of K

Input

The first line contains an integer T $(1 \le T \le 10^4)$ — number of test cases.

In the next T lines, each line contains two integer N, K $(1 \le N \le 10^{15}, 2 \le K \le 32)$.

Output

The smallest integer is greater than or equal N and consist of the sum of distinct power of K.

Example

standard input	standard output
4 120 3 60 2 48 4 18 9	120 60 64 81

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 their skill for one more chapter of the story of lifetime from another verse.

Ali gives you two positive integers N, K.

if $K = 1$:

then calculate:

$$A_N = 1 + 2 + \ldots + N$$

print: A_N

if $K = 2$:

then calculate:

$$A_N = 1 + 2 + \ldots + N$$
$$B_N = A_1 + A_2 + \ldots + A_N$$

print: B_N

if $K = 3$:

then calculate:

$$A_N = 1 + 2 + \ldots + N$$
$$B_N = A_1 + A_2 + \ldots + A_N$$
$$C_N = B_1 + B_2 + \ldots + B_N$$

print: C_N

and so on...

In another word

if $K = 1$:

Calculate: $\sum_{a=1}^{n} a$.

if $K = 2$:

Calculate: $\sum_{a=1}^{n} \sum_{b=1}^{a} b$.

if $K = 3$:

Calculate: $\sum_{a=1}^{n} \sum_{b=1}^{a} \sum_{c=1}^{b} c$.

and so on...

As the result may be very large print it modulo 1000000007 (the remainder when divided by 1000000007).

Input

Given only two positive integers N, K ($1 \leq N, K \leq 10^5$).

Output

print the answer of the problem modulo 1000000007.

Examples

standard input	standard output
5 1	15
3 2	10
3 3	15
2 3	5

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.

Hossam was overthinking about a problem, and he asks your help to solve it.

The problem that you have q queries, each query consists of an integer x, your task is to print $f(x)$.

Let $D_i(x)$ is the ith smallest divisor of x (1-based) and s is the number of divisors of x, so $f(x) = 1 + \sum_{i=1}^{s-1} f(D_i(x))$.

Input

The first line is an integer q ($1 \le q \le 10^5$) — the number of queries.

The next q lines, each line, contain an integer x ($1 \le x \le 10^5$).

Output

For each query, print $f(x)$.

Example

standard input	standard output
5 10 2 1 8 7	6 2 1 8 2

Note

In the fourth example, when $x = 8$, so $D = [1, 2, 4, 8]$, $s = 4$, $f(x) = f(1) + f(2) + f(4) = 8$.