The International Collegiate Programming Contest
Sponsored by ICPC Foundation

The 2024 Palestinian Collegiate Programming Contest

(Contest Problems)

Palestine
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Problem A. Candies

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

A candy store sells candies. You can buy candies with the following criteria:

- Buy one candy for X pounds.
- Buy 3 candies for Y pounds.

Find the minimum amount of pounds you need to buy **exactly** N candies.

Input

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

Then one line for each test case contains 3 integers, X, Y, and N ($1 \leq X, Y, N \leq 100$).

Output

Print the minimum amount of pounds you need to buy **exactly** N candies.

Example

standard input	standard output
1 2 3 8	10

Problem B. Odd Pairs

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

Numbers are crazy and weird. They form strange relations when pairing them with each other.

One of those relations is the odd sum of 2 numbers. Summing 2 numbers will result in either an odd or an even number.

We are here interested in odd sums, but what we actually need to figure out is the number of odd sums available for a bunch of integers, but we do not care about ordering, so the pair (a_i, a_j) is considered the same as the pair (a_j, a_i).

Input

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

The first line of each test case contains a single integer n ($1 \leq n \leq 10^5$) – denoting the number of integers given.

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

Output

Print the number of odd pair sums for each test.

Example

standard input	standard output
2 4 1 2 3 4 6 11 2 77 4 44 4	4 8

Problem C. Sailing Trip

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

Bob wanted to go on a sailing trip to an island in the middle of the sea for a year-end vacation. However, on his way to the island, he was attacked by a gang who took him to their own island. Bob had a lot of money with him, and the gang leader wanted to take some of that money. But he also wanted to have some fun, so he challenged Bob and said he would ask him some questions. For each question Bob answered incorrectly, the gang leader would charge him a certain amount.

If Bob answered a question correctly, he wouldn't have to pay anything. The writer set the cost of the first question at one dollar, and the cost of each subsequent question was double the cost of the previous one.

Input

First line contains an interger n ($1 \leq n \leq 60$) the number of questions.

Second line contains a string of length n consists of 0's and 1's.

Zero means that Bob answerd this question right and One means he didn't.

Quersions are numbered from 1 to n **from right to left**.

Output

Print the total cost Bob payed to the leader.

Examples

standard input	standard output
3 101	5
7 1010111	87

Problem D. Max Difference

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

You are given an integer N. You will apply the following steps exactly two times:

- Pick a digit x ($0 \leq x \leq 9$).
- Pick another digit y ($0 \leq y \leq 9$). **The digit y can be equal to x.**
- Replace all the occurrences of x in the decimal representation of N by y. The new integer **cannot** have any leading zeros, also the new integer **cannot** be 0.

Let a and b be the results of applying the operations to N the first and second times, respectively.

Print the maximum difference between a and b.

Input

Only one line containing a single number N ($1 \leq N \leq 10^6$).

Output

Output the maximum difference between a and b.

Example

standard input	standard output
113	883

Problem E. Binary Range Query

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

You are given a binary string s of length $|s|$ and q queries. Each query consists of two integers l and r.

For each query, find two indices i and j ($1 \leq i \leq j \leq |s|$) such that the decimal value of the substring $s_i s_{i+1} \ldots s_j$ lies within the range $[l, r]$.

If multiple valid solutions exist:

- Choose the one with the smallest decimal value of the substring.
- If there are still ties, choose the one with the smallest starting index i.
- If there are still ties, choose the one with the smallest ending index j.

If no valid indices exist, output "$-1\ -1$".

Input

The first line contains a binary string s with a length $|s|$ such that ($1 \leq |s| \leq 2 \cdot 10^5$).

The second line contains an integer q such that ($1 \leq q \leq 10^5$), which represents the number of queries.

Each of the next q lines contains two integers l and r such that ($0 \leq l \leq r \leq 10^9$). These integers represent the range of values $[l, r]$ for each query.

Output

For each query, output two integers i and j, the indices that define a substring $s[i, i+1, \ldots, j]$ whose decimal representation falls within the range specified in the query.

If there are multiple valid solutions, choose the one with the smallest decimal value when the substring is converted from binary to decimal. If there are multiple solutions with the same decimal value, choose the one with the smallest starting index i. If there are still ties, choose the one with the smallest ending index j.

If there is no valid solution, output "$-1\ -1$".

Example

standard input	standard output
101110101 5 1 1 0 0 0 2444 4000 4000 16 256	1 1 2 2 2 2 -1 -1 5 9

Problem F. Game

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

Alaa played a game and scored A points. She remembers winning the game by just one point.

Can you print the opponent's score?

Input

One integer number A ($1 \leq A \leq 100$)

Output

Print the opponent's score

Examples

standard input	standard output
9	8
100	99

Problem G. Path Tree

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

Ahmed has a tree consisting of n nodes, with a lowercase letter written on each node. Additionally, he has several queries, each consisting of four nodes: a, b, c, and d.

For each query, Ahmed wants to compare the path identifier from node a to node b with the path identifier from node c to node d in the tree. The path identifier is the concatenation of the lowercase letters along the path from one node to another.

If the path identifier from a to b is greater than the path identifier from c to d, print 1. If the path identifier from a to b is smaller than the path identifier from c to d, print 2. If the path identifiers are equal, print 0.

Input

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

For each test case:

- The first line contains an integer n ($2 \leq n \leq 10^5$), the number of nodes in the tree.
- The second line contains a string of n lowercase letters, representing the letters written on each node of the tree.
- The next $n-1$ lines each contain two integers x and y ($1 \leq x, y \leq n$), representing an edge between nodes x and y, describing the structure of the tree.
- The next line contains an integer q ($1 \leq q \leq 10^5$), the number of queries.
- Each of the next q lines contains four integers a, b, c, and d ($1 \leq a, b, c, d \leq n$), representing the nodes in the query.

Output

For each query, output a single integer according to the conditions mentioned above.

Example

standard input	standard output
1 5 ababc 1 2 2 3 3 4 4 5 4 1 2 3 4 4 3 1 2 1 3 5 2 2 4 4 2	0 1 2 0

Problem H. GcD

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

Elgoker will give you a positive integer x. He wants you to count the ordered pairs of positive integers a and b such that $GCD(a,b) + LCM(a,b) = x$.

As a reminder, $GCD(a,b)$ is the greatest integer that divides both a and b. Similarly, $LCM(a,b)$ is the smallest integer such that both a and b divide it.

By saying ordered pairs we mean that $a \leq b$.

Input

The first line contains a single integer t ($1 \leq t \leq 10^6$) — the number of testcases.

Each testcase consists of one line containing a single integer, x ($1 \leq x \leq 10^6$).

Output

For each testcase, output the number of ordered pairs of positive integers a and b ($1 \leq a \leq b \leq 10^6$) such that $GCD(a,b) + LCM(a,b) = x$.

Example

standard input	standard output
3 2 8 14	1 3 4

Note

In the third testcase of the sample:

$GCD(1,13) + LCM(1,13) = 1 + 13 = 14$.

$GCD(2,12) + LCM(2,12) = 2 + 12 = 14$.

$GCD(4,6) + LCM(4,6) = 2 + 12 = 14$.

$GCD(7,7) + LCM(7,7) = 7 + 7 = 14$.

Problem I. Ahmed's Journey

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

Coach Ahmed lives in a forest with N safe places connected by M undirected paths. Whenever Coach Ahmed needs to travel from his home to another place in the forest, he carefully plans his route, considering the Beauty of the journey. Beauty measures how pleasant each path is, and Coach Ahmed always tries to maximize the minimum Beauty on his chosen route. If multiple routes have the same minimum Beauty, he will choose the shortest one.

Your task is to help Coach Ahmed find a route from a starting safe place S to an ending safe place E, such that:

- The minimum Beauty of the paths on the route is maximized.
- If there are multiple routes with the same minimum Beauty, the shortest route is preferred.

Input

- The first line contains two integers N and M ($1 \leq N \leq 10^6, N-1 \leq M \leq \min(10^6, \frac{N(N-1)}{2})$) representing the number of safe places and the number of paths, respectively.
- The second line includes two distinct integers S and E ($1 \leq S, E \leq N$) representing the starting and destination places.
- The next M lines each contain four integers X_i, Y_i, B_i, D_i ($1 \leq X_i, Y_i \leq N, X_i \neq Y_i, 1 \leq B_i, D_i \leq 10^9$), representing an undirected path between places X_i and Y_i with Beauty B_i and length D_i.

Output

Output two integers representing the maximum possible minimum Beauty encountered on the selected route and the length of that route.

Example

standard input	standard output
3 2 1 3 1 2 25 5 2 3 40 4	25 9

Problem J. Frogs

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

Bob was walking and he was very bored, so he searched for anything around him to entertain himself. He found a street in front of him.

The street is of length l and some frogs stand on it. The street is represented as an array a of length l.

Each frog is facing a specific direction, either left or right, and they can only move in that direction.

For every element $i(1 \leq i \leq n)$:

- if a_i equal 0 then there is no frog in this point.
- if a_i equal 1 then there is a frog in this point and it will move right.
- if a_i equal -1 then there is a frog in this point and it will move left.

All frogs move one step in their respective directions every second. Bob wondered, what's the smallest length of an interval on the street that contains all the frogs at any second. Can you help him.

Input

First line contains an integer l , the length of the street $(1 \leq l \leq 10^6)$.

Second line contains l integers , the state of each point.

It's guarantee that there is at least one frog.

Output

Print the smallest length of an interval on the street that contains all the frogs at any second.

Examples

standard input	standard output
6 1 1 0 0 0 -1	2
4 1 1 1 1	4

Note

During moving. More than one frog can stand on the same point.

Problem K. Random Palindrome

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

For the given string S, for all $(1 \leq i \leq |S|)$, $S[i]$ is one of the following:

- English lowercase letter
- The character '?'

All '?' in the string S will be replaced by a random English lowercase letter. Through all possible combinations , what is the probability of getting a palindrome string?

Input

The first line contains a single integer T $(1 \leq T \leq 10^4)$, the number of testcases.

For each testcase, a single line contains a single string S $(1 \leq |S| \leq 10^5)$.

It is guaranteed that the summation of $|S|$ over all testcases doesn't exceed 10^6.

Output

Print the probability of getting a palindrome string modulo $10^9 + 7$.

Formally, let $M = 10^9 + 7$. It can be shown that the answer can be expressed as an irreducible fraction $\frac{p}{q}$, where p and q are integers and $q \not\equiv 0 \ mod \ M$.

Output the integer equal to $p \cdot q^{-1} \mod M$. In other words, output such an integer x that $0 \leq x \leq M$ and $x \cdot q \equiv p \mod M$.

Example

standard input	standard output
5 ? a? ?az as?v?s? ????	1 576923081 576923081 60650888 60650888

Note

In the first testcase, all combinations will be palindrome.

In the second testcase, the only case is to replace '?' with 'a' and the rest 25 combinations will lead to a non-palindrome string.

The third testcase is the same as the second.

Problem L. Good triplets

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

One day, Hamoda was about to sleep, but he remembered a problem that he had not solved two years ago, so he decided that he would not sleep until he solved it, and he wanted your help because you are good at problem solving. So you are given a sequence of integers of length n and an integer number x. You should print the number of **good triplets** in the sequence.

The triple is called **good** if

- $1 \leq i < j < k \leq n$.
- $max(a_i, a_j, a_k) - min(a_i, a_j, a_k) \leq x$.

Input

The first line of the input contains integer numbers n and k ($1 \leq n \leq 2 \cdot 10^5$, $1 \leq x \leq 10^9$). The second line of the input contains n integer numbers $a_1, a_2, \ldots, a_n$ ($1 \leq a_i \leq 10^9$).

Output

Print the number of **good triplets**.

Examples

standard input	standard output
3 2 1 2 3	1
7 8 1 1 1 2 3 5 10	23

Problem M. The Great Salah

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

Salah is a skilled problem solver with a passion for working with numbers. Recently, he was given two integers, l and r, which have the same number of digits, along with a string s. The string s consists of characters either '<' or '>', and its length is equal to the number of digits in l minus one.

Salah's task is to find how many integers x in the range $[l, r]$ satisfy the following conditions:

1. For each character $s[i]$ (where i starts from 1):
   - If $s[i] = '>'$, the i-th digit (from the left) of x must be greater than the $(i+1)$-th digit of x.
   - If $s[i] = '<'$, the i-th digit (from the left) of x must be less than the $(i+1)$-th digit of x.

In other words, for each pair of consecutive digits in the number x, the relationship between them must match the corresponding character in the string s.

Since the result can be very large, output the answer modulo $10^9 + 7$.

Input

The first line contains the number of test cases t ($1 \le t \le 10^4$).

The first line of each test case contains two integers l and r ($10 \le l \le r \le 10^{100}$).

The second line of each test case contains a string s.

It is guaranteed that l and r have the same number of digits.

Output

For each test case, output a single integer, the number of integers in the range that satisfy the conditions, modulo $10^9 + 7$.

Example

standard input	standard output
3 12 20 > 123 456 <> 90 97 <	1 128 0

Problem N. Yet another easy problem

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

Zezo has discovered a very large number s, which is created by repeating a sequence of n digits exactly k times.

Zezo wants to play a game with this large number using the following rules:

1. **Choose two consecutive digits** from anywhere in the large number s.
2. These two digits will form the last two digits of a new number x.
3. Optionally, you can take some digits that appear **before** these two chosen digits in s and **add them to the beginning** of x.

Zezo's goal is to find out how many different ways he can form a number x such that x is divisible by 4.

A way is considered different if either the two consecutive digits selected from s or any of the optional digits added to the beginning of x differ from another way.

Input

In the first line, you're given a string of digits representing an integer s with exactly n digits ($3 \leq n \leq 10^5$).

In the second line, you're given an integer k ($1 \leq k \leq 10^9$), which represents how many times the sequence s is repeated to form a larger number.

Output

Print a single integer — the total number of valid ways to form a number x that is divisible by 4, modulo $10^9 + 7$.

Examples

standard input	standard output
15524 1	12
22341 2	16

Note

The valid integers x are: 24 152 552 52 1552 15524 1524 1524 5524 124 524 524