Problem A. A

Time limit	10000 ms
Mem limit	1536000 kB
OS	Windows

Problem Statement

Professor Neo has established contact with an alien civilization! His team have been intercepting encoded messages since then from the alien colony. Messages contained chunk of random integers. After getting no clue for weeks finally they were able to decode it.

The random integers are to be decoded according to their parity. An even integer correspond to 1, and an odd integer corresponds to 0. So, every chunk of integers can be converted to a string containing 0 and 1. As there are lots of messages, you came into play!

You have to write a code that decodes the messages. There are two points you have to be careful about:

1. There will be no chunk where all of the integers are odd. That means, in a chunk there will be at least one even integer. For example, there will be no chunk like: 5 5 5.
2. After the message is decoded, you have to skip the leading zeros before printing. For example, consider a chunk of three integers: 5 5 4. After decoding you will get 001, but you need to print 1.

Input

The first line will contain an integer T ($T \leq 100$).
Each test case will contain an integer N ($1 \leq N \leq 50$) in the first line, and the second line will contain N space separated positive integers within the range [1, 1000].

Output

For each test case, output a single line in the format “Case T: D” without the quotes. Here, T is the case number and D is the desired decoded message.

Sample input

3
1
4

3
4 4 5
3
5 5 4

Sample output

Case 1: 1
Case 2: 110
Case 3: 1

Problem B. B

Time limit 1000 ms
Mem limit 524288 kB

Mikasa always wants to protect Eren at any cost. Even when Eren transforms into his "Attack Titan" form. The country where Mikasa and Eren live is surrounded by a rectangular wall named "Wall Maria" of size **A×B** where A is the length and B is the width of the wall. There's another rectangular wall **within** Wall Maria named "Wall Sina" of size **C×D** where C is the length and D is the width of the wall. Mikasa knows Eren is fighting with some mindless Titans somewhere between Wall Maria and Wall Sina.

Now, Mikasa wants to reach Eren and fight alongside him. But, She doesn't know how much area she has to search in order to find Eren. Since, Mikasa has only one talent which is killing Titans mercilessly, She needs your help to find the total area between Wall Maria and Wall Sina. Help her to find Eren.

Input

Input starts with an integer **T (≤ 100000)**, denoting the number of test cases. Each of the next T lines contains 4 integers **A, B, C, D (1<=A,B,C,D<=10^18, C<=A , D<=B)** indicating the length and width of the outer Wall, the length and width of the inner Wall.

Output

For each case print the area which lies between Wall Maria and Wall Sina. Since the answer could be very big, print it modulo **1000000007**.

Sample

Input	Output
6 4 5 2 3 10 20 2 4 10 20 10 20 7 8 7 7 2 2 1 1 1000000000000000000 1000000000000000000 1 1	14 192 0 7 3 2400

Problem C. C

Time limit 2000 ms
Mem limit 1048576 kB

Problem Statement

There are N baskets numbered $1, 2, \ldots, N$ arranged in a circle.
For each $1 \leq i \leq N-1$, basket $i+1$ is to the immediate right of basket i, and basket 1 is to the immediate right of basket N.

Basket i now contains A_i apples.

Durjoy starts in front of basket 1 and repeats the following action.

- If the basket he is facing contains an apple, take one and eat it. Then, regardless of whether he has eaten an apple now, go on to the next basket to the immediate right.

Find the number of apples remaining in each basket when Durjoy has eaten exactly K apples in total.

Constraints

- $1 \leq N \leq 10^5$
- $0 \leq A_i \leq 10^{12}$
- $1 \leq K \leq 10^{12}$
- There are at least K apples in total. That is, $\sum_{i=1}^{N} A_i \geq K$.
- All values in the input are integers.

Input

The input is given from Standard Input in the following format:

N K
A_1 A_2 $\ldots$ A_N

Output

Print N integers, with spaces in between.
The i-th integer should be the number of apples remaining in basket i when Durjoy has eaten exactly K apples in total.

Sample 1

Input	Output
3 3 1 3 0	0 1 0

Durjoy will do the following.

- Basket 1, which he is facing, contains an apple, so he takes one and eats it. Then, he goes on to basket 2. Now, the baskets have $0, 3, 0$ apples.
- Basket 2, which he is facing, contains an apple, so he takes one and eats it. Then, he goes on to basket 3. Now, the baskets have $0, 2, 0$ apples.
- Basket 3, which he is facing, contains no apple. Then, he goes on to basket 1. Now, the baskets have $0, 2, 0$ apples.
- Basket 1, which he is facing, contains no apple. Then, he goes on to basket 2. Now, the baskets have $0, 2, 0$ apples.
- Basket 2, which he is facing, contains an apple, so he takes one and eats it. Then, he goes on to basket 3. Now, the baskets have $0, 1, 0$ apple(s).

Sample 2

Input	Output
2 1000000000000 1000000000000 1000000000000	500000000000 500000000000

Problem D. D

Time limit 1000 ms
Mem limit 262144 kB

Vasya has a string s of length n. He decides to make the following modification to the string:

1. Pick an integer k, ($1 \leq k \leq n$).
2. For i from 1 to $n - k + 1$, reverse the substring $s[i : i + k - 1]$ of s. For example, if string s is `qwer` and $k = 2$, below is the series of transformations the string goes through:
   - `qwer` (original string)
   - `wqer` (after reversing the first substring of length 2)
   - `weqr` (after reversing the second substring of length 2)
   - `werq` (after reversing the last substring of length 2)

   Hence, the resulting string after modifying s with $k = 2$ is `werq`.

Vasya wants to choose a k such that the string obtained after the above-mentioned modification is lexicographically smallest possible among all choices of k. Among all such k , he wants to choose the smallest one. Since he is busy attending Felicity 2020, he asks for your help.

A string a is lexicographically smaller than a string b if and only if one of the following holds:

- a is a prefix of b, but $a \neq b$;
- in the first position where a and b differ, the string a has a letter that appears earlier in the alphabet than the corresponding letter in b.

Input

Each test contains multiple test cases.

The first line contains the number of test cases t ($1 \leq t \leq 5000$). The description of the test cases follows.

The first line of each test case contains a single integer n ($1 \leq n \leq 5000$) — the length of the string s.

The second line of each test case contains the string s of n lowercase latin letters.

It is guaranteed that the sum of n over all test cases does not exceed 5000.

Output

For each testcase output two lines:

In the first line output the lexicographically smallest string s' achievable after the above-mentioned modification.

In the second line output the appropriate value of k ($1 \leq k \leq n$) that you chose for performing the modification. If there are multiple values of k that give the lexicographically smallest string, output the smallest value of k among them.

Examples

Input	Output
6 4 abab 6 qwerty 5 aaaaa 6 alaska 9 lfpbavjsm 1 p	abab 1 ertyqw 3 aaaaa 1 aksala 6 avjsmbpfl 5 p 1

Note

In the first testcase of the first sample, the string modification results for the sample `abab` are as follows :

- for $k = 1$: `abab`
- for $k = 2$: `baba`
- for $k = 3$: `abab`
- for $k = 4$: `baba`

The lexicographically smallest string achievable through modification is `abab` for $k = 1$ and 3. Smallest value of k needed to achieve is hence 1.

Problem E. E

Time limit 2000 ms
Mem limit 1048576 kB

Problem Statement

We have a simple directed graph G with N vertices and M edges. The vertices are labeled as Vertex 1, Vertex 2, ..., Vertex N. The i-th edge $(1 \leq i \leq M)$ goes from Vertex U_i to Vertex V_i.

Takahashi will start at a vertex and repeatedly travel on G from one vertex to another along a directed edge. How many vertices of G have the following condition: Takahashi can start at that vertex and continue traveling indefinitely by carefully choosing the path?

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $0 \leq M \leq \min(N(N-1), 2 \times 10^5)$
- $1 \leq U_i, V_i \leq N$
- $U_i \neq V_i$
- $(U_i, V_i) \neq (U_j, V_j)$ if $i \neq j$.
- All values in input are integers.

Input

Input is given from Standard Input in the following format:

$$
\begin{aligned}
&N\ \ M \\
&U_1\ \ V_1 \\
&U_2\ \ V_2 \\
&\vdots \\
&U_M\ \ V_M
\end{aligned}
$$

Output

Print the answer.

Sample 1

Input	Output
5 5 1 2 2 3 3 4 4 2 4 5	4

When starting at Vertex 2, Takahashi can continue traveling indefinitely: $2 \to 3 \to 4 \to 2 \to 3 \to \cdots$ The same goes when starting at Vertex 3 or Vertex 4. From Vertex 1, he can first go to Vertex 2 and then continue traveling indefinitely again.
On the other hand, from Vertex 5, he cannot move at all.

Thus, four vertices —Vertex 1, 2, 3, and 4— satisfy the conditions, so 4 should be printed.

Sample 2

Input	Output
3 2 1 2 2 1	2

Note that, in a simple directed graph, there may be two edges in opposite directions between the same pair of vertices. Additionally, G may not be connected.

Problem F. F

Time limit	2000 ms
Code length Limit	50000 B
OS	Linux

Read problems statements in Mandarin Chinese and Russian as well.

Statement

Chef gives you a book with **N** pages. The pages are numbered from **1** to **N**.

Chef randomly selects a **Secret Digit** from **0** to **9**. Now he asks you to open one page of the book without looking at the book. You win the game if that page number contains the **Secret Digit**. For example if the **Secret Digit** is 8, then 8, 80, 1238213, 98 are all winning pages and 9, 90, 1239123 are loosing pages.

What is the probability of winning, if both Chef's choice and your choice has uniform distribution?

Input

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

Each test case consists of a single line with integer **N**.

Output

For each test case, output the required probability **P/Q**. **P/Q** is an irreducible fraction.

Constraints

- $1 \le T \le 10000$
- $1 \le N \le 10^{17}$

Example

Input:

2

```
1
5
```

Output:

```
1/10

1/10
```

Explanation

Chef can choose any **Secret Digit** from **0** to **9**. But you can only open page with number **1**. Probability that the **Secret Digit** is **1** after you opened the page with number **1** is **1/10**.

Problem G. Try!!!

Time limit	1000 ms
Mem limit	262144 kB
OS	Windows

You are given a grid with n rows and m columns. The coordinates (x, y) represent the cell on the grid, where $x(1 \leq x \leq n)$ is the row number counting from the top and $y(1 \leq y \leq m)$ is the column number counting from the left. Your friend Alice is situated in any cell (a, b). You will be given the Manhattan distance between cell $(1, 1)$ and (a, b) also the Manhattan distance between cell $(1, m)$ and (a, b).More formally you will be given

1. d1 = |a-1| + |b-1|
2. d2 = |a-1| + |b-m|

Find the cell (a, b) where Alice is situated.

Input

The first line contains a single integer T $(1 \leq T \leq 10^3)$ — the number of test cases.

The first line of every test case will contain two integer n and m $(2 \leq n, m \leq 10^5)$ and the second line of every test case will contain two integer $d1$ and $d2$ $(0 \leq d1, d2 < m + n - 1)$.

Output

Find the cell (a,b) where Alice is situated.

Examples

Input	Output
1 3 5 2 4	2 2