Problem A. Josephus Queries

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a game where there are n children (numbered $1, 2, \ldots, n$) in a circle. During the game, every second child is removed from the circle, until there are no children left.

Your task is to process q queries of the form: "when there are n children, who is the kth child that will be removed?"

Input

The first input line has an integer q: the number of queries.

After this, there are q lines that describe the queries. Each line has two integers n and k: the number of children and the position of the child.

Output

Print q integers: the answer for each query.

Constraints

- $1 \leq q \leq 10^5$
- $1 \leq k \leq n \leq 10^9$

Example

Input	Output
4 7 1 7 3 2 2 1337 1313	2 6 1 1107

Problem B. Exponentiation

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to efficiently calculate values a^b modulo $10^9 + 7$.

Note that in this task we assume that $0^0 = 1$.

Input

The first input line contains an integer n: the number of calculations.

After this, there are n lines, each containing two integers a and b.

Output

Print each value a^b modulo $10^9 + 7$.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $0 \le a, b \le 10^9$

Example

Input	Output
3 3 4 2 8 123 123	81 256 921450052

Problem C. Exponentiation II

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to efficiently calculate values a^{b^c} modulo $10^9 + 7$.

Note that in this task we assume that $0^0 = 1$.

Input

The first input line has an integer n: the number of calculations.

After this, there are n lines, each containing three integers a, b and c.

Output

Print each value a^{b^c} modulo $10^9 + 7$.

Constraints

- $1 \le n \le 10^5$
- $0 \le a, b, c \le 10^9$

Example

Input	Output
3 3 7 1 15 2 2 3 4 5	2187 50625 763327764

Problem D. Counting Divisors

Time Limit 1000 ms
Mem Limit 524288 kB

Given n integers, your task is to report for each integer the number of its divisors.

For example, if $x = 18$, the correct answer is 6 because its divisors are $1, 2, 3, 6, 9, 18$.

Input

The first input line has an integer n: the number of integers.

After this, there are n lines, each containing an integer x.

Output

For each integer, print the number of its divisors.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq x \leq 10^6$

Example

Input	Output
3 16 17 18	5 2 6

Problem E. Common Divisors

Time Limit 1000 ms
Mem Limit 524288 kB

You are given an array of n positive integers. Your task is to find two integers such that their greatest common divisor is as large as possible.

Input

The first input line has an integer n: the size of the array.

The second line has n integers $x_1, x_2, \ldots, x_n$: the contents of the array.

Output

Print the maximum greatest common divisor.

Constraints

- $2 \le n \le 2 \cdot 10^5$
- $1 \le x_i \le 10^6$

Example

Input	Output
5 3 14 15 7 9	7

Problem F. Sum of Divisors

Time Limit 1000 ms
Mem Limit 524288 kB

Let $\sigma(n)$ denote the sum of divisors of an integer n. For example, $\sigma(12) = 1 + 2 + 3 + 4 + 6 + 12 = 28$.

Your task is to calculate the sum $\sum_{i=1}^{n} \sigma(i)$ modulo $10^9 + 7$.

Input

The only input line has an integer n.

Output

Print $\sum_{i=1}^{n} \sigma(i)$ modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 10^{12}$

Example

Input	Output
5	21

Problem G. Divisor Analysis

Time Limit 1000 ms
Mem Limit 524288 kB

Given an integer, your task is to find the number, sum and product of its divisors. As an example, let us consider the number 12:

- the number of divisors is 6 (they are 1, 2, 3, 4, 6, 12)
- the sum of divisors is $1 + 2 + 3 + 4 + 6 + 12 = 28$
- the product of divisors is $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12 = 1728$

Since the input number may be large, it is given as a prime factorization.

Input

The first line has an integer n: the number of parts in the prime factorization.

After this, there are n lines that describe the factorization. Each line has two numbers x and k where x is a prime and k is its power.

Output

Print three integers modulo $10^9 + 7$: the number, sum and product of the divisors.

Constraints

- $1 \le n \le 10^5$
- $2 \le x \le 10^6$
- each x is a distinct prime
- $1 \le k \le 10^9$

Example

Input	Output
2 2 2 3 1	6 28 1728

Problem H. Prime Multiples

Time Limit 1000 ms
Mem Limit 524288 kB

You are given k distinct prime numbers $a_1, a_2, \ldots, a_k$ and an integer n.

Your task is to calculate how many of the first n positive integers are divisible by at least one of the given prime numbers.

Input

The first input line has two integers n and k.

The second line has k prime numbers $a_1, a_2, \ldots, a_k$.

Output

Print one integer: the number integers within the interval $1, 2, \ldots, n$ that are divisible by at least one of the prime numbers.

Constraints

- $1 \leq n \leq 10^{18}$
- $1 \leq k \leq 20$
- $2 \leq a_i \leq n$

Example

Input	Output
20 2 2 5	12

Explanation: the 12 numbers are $2, 4, 5, 6, 8, 10, 12, 14, 15, 16, 18, 20$.

Problem I. Counting Coprime Pairs

Time Limit 1000 ms
Mem Limit 524288 kB

Given a list of n positive integers, your task is to count the number of pairs of integers that are coprime (i.e., their greatest common divisor is one).

Input

The first input line has an integer n: the number of elements.

The next line has n integers $x_1, x_2, \ldots, x_n$: the contents of the list.

Output

Print one integer: the answer for the task.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq x_i \leq 10^6$

Example

Input	Output
8 5 4 20 1 16 17 5 15	19

Problem J. Next Prime

Time Limit 1000 ms
Mem Limit 524288 kB

Given a positive integer n, find the next prime number after it.

Input

The first line has an integer t: the number of tests.

After that, each line has a positive integer n.

Output

For each test, print the next prime after n.

Constraints

- $1 \leq t \leq 20$
- $1 \leq n \leq 10^{12}$

Example

Input	Output
5 1 2 3 42 1337	2 3 5 43 1361

Problem K. Binomial Coefficients

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to calculate n binomial coefficients modulo $10^9 + 7$.

A binomial coefficient $\binom{a}{b}$ can be calculated using the formula $\frac{a!}{b!(a-b)!}$. We assume that a and b are integers and $0 \le b \le a$.

Input

The first input line contains an integer n: the number of calculations.

After this, there are n lines, each of which contains two integers a and b.

Output

Print each binomial coefficient modulo $10^9 + 7$.

Constraints

- $1 \le n \le 10^5$
- $0 \le b \le a \le 10^6$

Example

Input	Output
3 5 3 8 1 9 5	10 8 126

Problem L. Creating Strings II

Time Limit 1000 ms
Mem Limit 524288 kB

Given a string, your task is to calculate the number of different strings that can be created using its characters.

Input

The only input line has a string of length n. Each character is between a–z.

Output

Print the number of different strings modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 10^6$

Example

Input	Output
aabac	20

Problem M. Distributing Apples

Time Limit 1000 ms
Mem Limit 524288 kB

There are n children and m apples that will be distributed to them. Your task is to count the number of ways this can be done.

For example, if $n = 3$ and $m = 2$, there are 6 ways: $[0, 0, 2]$, $[0, 1, 1]$, $[0, 2, 0]$, $[1, 0, 1]$, $[1, 1, 0]$ and $[2, 0, 0]$.

Input

The only input line has two integers n and m.

Output

Print the number of ways modulo $10^9 + 7$.

Constraints

- $1 \le n, m \le 10^6$

Example

Input	Output
3 2	6

Problem N. Christmas Party

Time Limit 1000 ms
Mem Limit 524288 kB

There are n children at a Christmas party, and each of them has brought a gift. The idea is that everybody will get a gift brought by someone else.

In how many ways can the gifts be distributed?

Input

The only input line has an integer n: the number of children.

Output

Print the number of ways modulo $10^9 + 7$.

Constraints

- $1 \le n \le 10^6$

Example

Input	Output
4	9

Problem O. Permutation Order

Time Limit 1000 ms
Mem Limit 524288 kB

Let $p(n, k)$ denote the kth permutation (in lexicographical order) of $1 \ldots n$. For example, $p(4, 1) = [1, 2, 3, 4]$ and $p(4, 2) = [1, 2, 4, 3]$.

Your task is to process two types of tests:

1. Given n and k, find $p(n, k)$
2. Given n and $p(n, k)$, find k

Input

The first line has an integer t: the number of tests.

Each test is either "$1\ n\ k$" or "$2\ n\ p(n, k)$".

Output

For each test, print the answer according to the example.

Constraints

- $1 \leq t \leq 1000$
- $1 \leq n \leq 20$
- $1 \leq k \leq n!$

Example

Input	Output
6 1 4 1 1 4 2 2 4 1 2 3 4 2 4 1 2 4 3 1 5 42 2 5 2 4 5 3 1	1 2 3 4 1 2 4 3 1 2 2 4 5 3 1 42

Problem P. Permutation Rounds

Time Limit 1000 ms
Mem Limit 524288 kB

There is a sorted array $[1, 2, \ldots, n]$ and a permutation $p_1, p_2, \ldots, p_n$. On each round, all elements move according to the permutation: the element at position i moves to position p_i.

After how many rounds is the array sorted again for the first time?

Input

The first line has an integer n.

The next line contains n integers $p_1, p_2, \ldots, p_n$.

Output

Print the number of rounds modulo $10^9 + 7$.

Constraints

- $1 \le n \le 2 \cdot 10^5$

Example

Input	Output
8 5 3 2 6 4 1 8 7	4

Explanation: The array changes as follows after the rounds:

- Round 1: $[6, 3, 2, 5, 1, 4, 8, 7]$
- Round 2: $[4, 2, 3, 1, 6, 5, 7, 8]$
- Round 3: $[5, 3, 2, 6, 4, 1, 8, 7]$
- Round 4: $[1, 2, 3, 4, 5, 6, 7, 8]$

Problem Q. Bracket Sequences I

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to calculate the number of valid bracket sequences of length n. For example, when $n = 6$, there are 5 sequences:

- `()()()`
- `()(())`
- `(())()`
- `((()))`
- `(()())`

Input

The only input line has an integer n.

Output

Print the number of sequences modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 10^6$

Example

Input	Output
6	5

Problem R. Bracket Sequences II

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to calculate the number of valid bracket sequences of length n when a *prefix* of the sequence is given.

Input

The first input line has an integer n.

The second line has a string of k characters: the prefix of the sequence.

Output

Print the number of sequences modulo $10^9 + 7$.

Constraints

- $1 \le k \le n \le 10^6$

Example

Input	Output
6 (()	2

Explanation: There are two possible sequences: `(()())` and `(()(()))`.

Problem S. Counting Necklaces

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of different necklaces that consist of n pearls and each pearl has m possible colors.

Two necklaces are considered to be different if it is not possible to rotate one of them so that they look the same.

Input

The only input line has two numbers n and m: the number of pearls and colors.

Output

Print one integer: the number of different necklaces modulo $10^9 + 7$.

Constraints

- $1 \le n, m \le 10^6$

Example

Input	Output
4 3	24

Problem T. Counting Grids

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of different $n \times n$ grids whose each square is black or white.

Two grids are considered to be different if it is not possible to rotate one of them so that they look the same.

Input

The only input line has an integer n: the size of the grid.

Output

Print one integer: the number of grids modulo $10^9 + 7$.

Constraints

- $1 \le n \le 10^9$

Example

Input	Output
4	16456

Problem U. Fibonacci Numbers

Time Limit 1000 ms
Mem Limit 524288 kB

The Fibonacci numbers can be defined as follows:

- $F_0 = 0$
- $F_1 = 1$
- $F_n = F_{n-2} + F_{n-1}$

Your task is to calculate the value of F_n for a given n.

Input

The only input line has an integer n.

Output

Print the value of F_n modulo $10^9 + 7$.

Constraints

- $0 \le n \le 10^{18}$

Example

Input	Output
10	55

Problem V. Throwing Dice

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to calculate the number of ways to get a sum n by throwing dice. Each throw yields an integer between $1 \ldots 6$.

For example, if $n = 10$, some possible ways are $3 + 3 + 4$, $1 + 4 + 1 + 4$ and $1 + 1 + 6 + 1 + 1$.

Input

The only input line contains an integer n.

Output

Print the number of ways modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 10^{18}$

Example

Input	Output
8	125

Problem W. Graph Paths I

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a directed graph that has n nodes and m edges. Your task is to count the number of paths from node 1 to node n with exactly k edges.

Input

The first input line contains three integers n, m and k: the number of nodes and edges, and the length of the path. The nodes are numbered $1, 2, \ldots, n$.

Then, there are m lines describing the edges. Each line contains two integers a and b: there is an edge from node a to node b.

Output

Print the number of paths modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 100$
- $1 \leq m \leq n(n-1)$
- $1 \leq k \leq 10^9$
- $1 \leq a, b \leq n$

Example

Input	Output
3 4 8 1 2 2 3 3 1 3 2	2

Explanation: The paths are $1 \to 2 \to 3 \to 1 \to 2 \to 3 \to 1 \to 2 \to 3$ and $1 \to 2 \to 3 \to 2 \to 3 \to 2 \to 3 \to 2 \to 3$.

Problem X. Graph Paths II

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a directed weighted graph having n nodes and m edges. Your task is to calculate the minimum path length from node 1 to node n with exactly k edges.

Input

The first input line contains three integers n, m and k: the number of nodes and edges, and the length of the path. The nodes are numbered $1, 2, \ldots, n$.

Then, there are m lines describing the edges. Each line contains three integers a, b and c: there is an edge from node a to node b with weight c.

Output

Print the minimum path length. If there are no such paths, print -1.

Constraints

- $1 \leq n \leq 100$
- $1 \leq m \leq n(n-1)$
- $1 \leq k \leq 10^9$
- $1 \leq a, b \leq n$
- $1 \leq c \leq 10^9$

Example

Input	Output
3 4 8 1 2 5 2 3 4 3 1 1 3 2 2	27

Problem Y. System of Linear Equations

Time Limit 1000 ms
Mem Limit 524288 kB

You are given $n \cdot (m+1)$ coefficients $a_{i,j}$ and b_i which form the following n linear equations:

- $a_{1,1}x_1 + a_{1,2}x_2 + \cdots + a_{1,m}x_m = b_1 \pmod{10^9+7}$
- $a_{2,1}x_1 + a_{2,2}x_2 + \cdots + a_{2,m}x_m = b_2 \pmod{10^9+7}$
- $\ldots$
- $a_{n,1}x_1 + a_{n,2}x_2 + \cdots + a_{n,m}x_m = b_n \pmod{10^9+7}$

Your task is to find any m integers $x_1, x_2, \ldots, x_m$ that satisfy the given equations.

Input

The first line has two integers n and m: the number of equations and variables.

The next n lines each have $m+1$ integers $a_{i,1}, a_{i,2}, \ldots, a_{i,m}, b_i$: the coefficients of the i-th equation.

Output

Print m integers $x_1, x_2, \ldots, x_m$: the values of the variables that satisfy the equations. The values must also satisfy $0 \le x_i < 10^9+7$. You can print any valid solution. If no solution exists print only -1.

Constraints

- $1 \le n, m \le 500$
- $0 \le a_{i,j}, b_i < 10^9+7$

Example

Input	Output
3 3 2 0 1 7 1 2 0 0 1 3 1 2	2 1000000006 3

Problem Z. Sum of Four Squares

Time Limit 1000 ms
Mem Limit 524288 kB

A well known result in number theory is that every non-negative integer can be represented as the sum of four squares of non-negative integers.

You are given a non-negative integer n. Your task is to find four non-negative integers a, b, c and d such that $n = a^2 + b^2 + c^2 + d^2$.

Input

The first line has an integer t: the number of test cases.

Each of the next t lines has an integer n.

Output

For each test case, print four non-negative integers a, b, c and d that satisfy $n = a^2 + b^2 + c^2 + d^2$.

Constraints

- $1 \leq t \leq 1000$
- $0 \leq n \leq 10^7$
- the sum of all n is at most 10^7

Example

Input	Output
3 5 30 322266	2 1 0 0 1 2 3 4 314 159 265 358

Problem AA. Triangle Number Sums

Time Limit 1000 ms
Mem Limit 524288 kB

A triangle number is a positive integer of the form $1 + 2 + \cdots + k$. The first triangle numbers are 1, 3, 6, 10 and 15.

Every positive integer can be represented as a sum of triangle numbers. For example, $42 = 21 + 21$ and $1337 = 1326 + 10 + 1$.

Given a positive integer n, determine the smallest number of triangle numbers that sum to n.

Input

The first line has an integer t: the number of tests.

After that, each line has a positive integer n.

Output

For each test, print the smallest number of triangle numbers.

Constraints

- $1 \leq t \leq 100$
- $1 \leq n \leq 10^{12}$

Example

Input	Output
5 1 2 3 42 1337	1 2 1 2 3

Problem AB. Dice Probability

Time Limit 1000 ms
Mem Limit 524288 kB

You throw a dice n times, and every throw produces an outcome between 1 and 6. What is the probability that the sum of outcomes is between a and b?

Input

The only input line contains three integers n, a and b.

Output

Print the probability rounded to six decimal places (rounding half to even).

Constraints

- $1 \leq n \leq 100$
- $1 \leq a \leq b \leq 6n$

Example

Input	Output
2 9 10	0.194444

Problem AC. Moving Robots

Time Limit 1000 ms
Mem Limit 524288 kB

Each square of an 8×8 chessboard has a robot. Each robot independently moves k steps, and there can be many robots on the same square.

On each turn, a robot moves one step left, right, up or down, but not outside the board. It randomly chooses a direction among those where it can move.

Your task is to calculate the expected number of *empty* squares after k turns.

Input

The only input line has an integer k.

Output

Print the expected number of empty squares rounded to six decimal places (rounding half to even).

Constraints

- $1 \leq k \leq 100$

Example

Input	Output
10	23.120740

Problem AD. Candy Lottery

Time Limit 1000 ms
Mem Limit 524288 kB

There are n children, and each of them independently gets a random integer number of candies between 1 and k.

What is the expected maximum number of candies a child gets?

Input

The only input line contains two integers n and k.

Output

Print the expected number rounded to six decimal places (rounding half to even).

Constraints

- $1 \leq n \leq 100$
- $1 \leq k \leq 100$

Example

Input	Output
2 3	2.444444

Problem AE. Inversion Probability

Time Limit 1000 ms
Mem Limit 524288 kB

An array has n integers $x_1, x_2, \ldots, x_n$, and each of them has been randomly chosen between 1 and r_i. An inversion is a pair (a, b) where $a < b$ and $x_a > x_b$.

What is the expected number of inversions in the array?

Input

The first input line contains an integer n: the size of the array.

The second line contains n integers $r_1, r_2, \ldots, r_n$: the range of possible values for each array position.

Output

Print the expected number of inversions rounded to six decimal places (rounding half to even).

Constraints

- $1 \le n \le 100$
- $1 \le r_i \le 100$

Example

Input	Output
3 5 2 7	1.057143

Problem AF. Stick Game

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a game where two players remove sticks from a heap. The players move alternately, and the player who removes the last stick wins the game.

A set $P = \{p_1, p_2, \ldots, p_k\}$ determines the allowed moves. For example, if $P = \{1, 3, 4\}$, a player may remove 1, 3 or 4 sticks.

Your task is find out for each number of sticks $1, 2, \ldots, n$ if the first player has a winning or losing position.

Input

The first input line has two integers n and k: the number of sticks and moves.

The next line has k integers $p_1, p_2, \ldots, p_k$ that describe the allowed moves. All integers are distinct, and one of them is 1.

Output

Print a string containing n characters: `W` means a winning position, and `L` means a losing position.

Constraints

- $1 \le n \le 10^6$
- $1 \le k \le 100$
- $1 \le p_i \le n$

Example

Input	Output
10 3 1 3 4	WLWWWWLWLW

Problem AG. Nim Game I

Time Limit 1000 ms
Mem Limit 524288 kB

There are n heaps of sticks and two players who move alternately. On each move, a player chooses a non-empty heap and removes any number of sticks. The player who removes the last stick wins the game.

Your task is to find out who wins if both players play optimally.

Input

The first input line contains an integer t: the number of tests. After this, t test cases are described:

The first line contains an integer n: the number of heaps.

The next line has n integers $x_1, x_2, \ldots, x_n$: the number of sticks in each heap.

Output

For each test case, print "first" if the first player wins the game and "second" if the second player wins the game.

Constraints

- $1 \leq t \leq 2 \cdot 10^5$
- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- the sum of all n is at most $2 \cdot 10^5$

Example

Input	Output
3 4 5 7 2 5 2 4 1 3 3 5 6	first first second

Problem AH. Nim Game II

Time Limit 1000 ms
Mem Limit 524288 kB

There are n heaps of sticks and two players who move alternately. On each move, a player chooses a non-empty heap and removes 1, 2, or 3 sticks. The player who removes the last stick wins the game.

Your task is to find out who wins if both players play optimally.

Input

The first input line contains an integer t: the number of tests. After this, t test cases are described:

The first line contains an integer n: the number of heaps.

The next line has n integers $x_1, x_2, \ldots, x_n$: the number of sticks in each heap.

Output

For each test case, print "first" if the first player wins the game and "second" if the second player wins the game.

Constraints

- $1 \leq t \leq 2 \cdot 10^5$
- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- the sum of all n is at most $2 \cdot 10^5$

Example

Input	Output
3 4 5 7 2 5 2 4 1 3 4 4 4	first first second

Problem AI. Stair Game

Time Limit 1000 ms
Mem Limit 524288 kB

There is a staircase consisting of n stairs, numbered $1, 2, \ldots, n$. Initially, each stair has some number of balls.

There are two players who move alternately. On each move, a player chooses a stair k where $k \neq 1$ and it has at least one ball. Then, the player moves any number of balls from stair k to stair $k-1$. The player who moves last wins the game.

Your task is to find out who wins the game when both players play optimally.

Note that if there are no possible moves at all, the second player wins.

Input

The first input line has an integer t: the number of tests. After this, t test cases are described:

The first line contains an integer n: the number of stairs.

The next line has n integers $p_1, p_2, \ldots, p_n$: the initial number of balls on each stair.

Output

For each test, print "first" if the first player wins the game and "second" if the second player wins the game.

Constraints

- $1 \leq t \leq 2 \cdot 10^5$
- $1 \leq n \leq 2 \cdot 10^5$
- $0 \leq p_i \leq 10^9$
- the sum of all n is at most $2 \cdot 10^5$

Example

Input	Output
3 3 0 2 1 4 1 1 1 1 2 5 3	first second first

Problem AJ. Grundy's Game

Time Limit 1000 ms
Mem Limit 524288 kB

There is a heap of n coins and two players who move alternately. On each move, a player chooses a heap and divides into two nonempty heaps that have a different number of coins. The player who makes the last move wins the game.

Your task is to find out who wins if both players play optimally.

Input

The first input line contains an integer t: the number of tests.

After this, there are t lines that describe the tests. Each line has an integer n: the number of coins in the initial heap.

Output

For each test case, print "first" if the first player wins the game and "second" if the second player wins the game.

Constraints

- $1 \leq t \leq 10^5$
- $1 \leq n \leq 10^6$

Example

Input	Output
3 6 7 8	first second first

Problem AK. Another Game

Time Limit 1000 ms
Mem Limit 524288 kB

There are n heaps of coins and two players who move alternately. On each move, a player selects some of the nonempty heaps and removes one coin from each heap. The player who removes the last coin wins the game.

Your task is to find out who wins if both players play optimally.

Input

The first input line contains an integer t: the number of tests. After this, t test cases are described:

The first line contains an integer n: the number of heaps.

The next line has n integers $x_1, x_2, \ldots, x_n$: the number of coins in each heap.

Output

For each test case, print "first" if the first player wins the game and "second" if the second player wins the game.

Constraints

- $1 \le t \le 2 \cdot 10^5$
- $1 \le n \le 2 \cdot 10^5$
- $1 \le x_i \le 10^9$
- the sum of all n is at most $2 \cdot 10^5$

Example

Input	Output
3 3 1 2 3 2 2 2 4 5 5 4 5	first second first