PROBLEM A. CATCHING CRICKETS

Time limit: 2 seconds

Nam is about to participate in the upcoming Cricket Fight Championship, a competition where participants use cricket, a small insect, to fight with each other.

To prepare for this competition, Nam has to catch a lot of strong crickets. He has investigated the nearby field and discovered n cricket nest, each with one cricket inside. Nam's house and n cricket nest positions can be modeled in a line where Nam's house is at coordinate $x = 0$ and the i-th cricket nest is at coordinate $x = x_i$ ($0 < x_1 < x_2 < \cdots < x_n$).

Catching crickets is not an easy job since they hide very well. As a cricket "expert", Nam knows that he needs t_i seconds to catch the i-th cricket. Besides, he needs 1 second to move 1 unit distance. Nam wants to catch as many crickets as possible as well as not spending too much time catching them (since his homework is waiting for him).

Your task is to help Nam answer Q independent queries. In the i-th query, determine the largest number of cricket that Nam can catch with the assumption he has at most a_i seconds to do so. Nam always starts at his house and after catching the last cricket he does not need to return home.

Input

The first input line contains a positive integer T, the number of test cases. T groups of lines followed, each describes a test case. Each test case consists of:

- One line with a positive integer n.
- Then i lines followed, the i-th line contains two positive integers x_i, t_i ($x_i \leq 10^9, t_i \leq 10^9$).
- Q will be given in the next line ($Q > 0$).
- The last line contains Q non-negative integers $a_1, a_2, \ldots, a_n$ ($a_i \leq 10^{15}$).

Both the sum of all n and the sum of all Q in all T test cases do not exceed 100000.

Output

Output T lines, each contains Q integers where the i-th one is the largest number of crickets Nam can catch in the i-th query.

Sample

INPUT	OUTPUT
1 3 1 100 2 1 3 1 2 4 106	1 3

PROBLEM B. BINARY STRING

Time limit: 1 second

A substring is a contiguous sequence of characters in a string. For example, "a", "bcd", "e" are substrings of "abcde" but "ace" isn't.

You are given 2 binary strings A and B (binary string only consists of '0' and '1'). Your task is to find a binary string C with smallest length such that C is not a substring of A and C is not a substring of B. If there are multiple strings with smallest length, find one with smallest lexicographical order.

String $X = x_1x_2 \dots x_n$ is lexicographically smaller than string $Y = y_1y_2 \dots y_n$ if $x_i < y_i$ for the first i where x_i and y_i differ. In this problem, character '0' is considered less than character '1'.

Input

The first line of input contains binary string A. The second line of input contains binary string B. Both are not empty and their length does not exceed 1000.

Output

Output string C in one line.

Sample

INPUT	OUTPUT
0001 110	010

PROBLEM C. GOVERNMENT BUDGET

Time limit: 1 second

The government has m national key projects. Every day project i consumes s_i million VND.

To limit the impact of the economic downturn, the government decided to launch n stimulus packages, each worth p million VND for the national key projects. Package j will start disbursing from day r_j. If it is given to project i then after t_i days, the package will be fully spent where t_i is the lowest integer not lower than $\frac{p}{s_i}$. Each stimulus package must be given as a whole to a key project. Each project can receive multiple packages but they must finish spending a package before receiving another. It is not allowed to consume from more than 1 package within the same day.

The stimulus packages must be spent as soon as possible. The minister requests to know the earliest possible time to spend all of them. Your task is to help them calculate this number.

For example, if there are 2 projects with daily cost 2 and 5 million VND respectively and 4 stimulus packages, each worth 22 million, allowed to be disbursed starting from day 1, 3, 8 and 12. 17 days will be the earliest for all packages to be fully spent.

You are given m, n, p, s_i and r_i $(1 \leq m, n \leq 100, 1 \leq p, s_i, r_i \leq 10\text{^}9)$. Find the least number of days to spend all the packages.

Input

The first input line contains three integers m, n, p.

The second line contains m integers $s_1, s_2, \dots, s_m$.

The third line contains n integers $r_1, r_2, \dots, r_n$.

Output

Output the least number of days to spend all the packages.

Sample

INPUT	OUTPUT

`2 4 22`
`2 5`
`1 3 8 12`
	`17`

PROBLEM D. UNIQUELY DECODABLE CODE

Time limit: 1 second

In information theory, a code defines a mapping of source symbols into codewords.

You are given a code in which the i-th symbol of a source symbols consists of n distinct symbols, denoted by X_i, is mapped to codeword s_i.

A sequence of source symbols is encoded by concatenating the corresponding codewords. An encoded message is decodable if there is at least one sequence of source symbols that can be encoded to it. A code is uniquely decodable if for all decodable encoded messages there is only one corresponding sequence of source symbol.

For example, consider a code with $n = 2$, $s_1 = a$, $s_2 = bc$. The sequence of source symbol $X_1X_2X_1$ is encoded to $abca$. We can prove that this code is uniquely decodable.

Consider another code with $n = 5$, $s_1 = a$, $s_2 = bcd$, $s_3 = e$, $s_4 = abc$, $s_5 = de$. This code is not uniquely decodable, since with encoded message $abcde$ we have 2 ways to decoded it, they are $X_1X_2X_3$ and X_4X_5.

Your task is to determine whether the given code is uniquely decodable or not.

Input

The first input line contains a positive integer T, the number of test cases. T groups of lines followed, each describes a test case. Each test case consists of:

- One line with a positive integer n.
- Then n lines followed, the i-th of them contains string s_i. s_i only consists of lower case letter ‘a’ to ‘z’.

The sum of all n in all T test cases does not exceed 100000. The sum of length of all codewords s_i in all T test cases does not exceed 250000.

Output

Output T lines, each line contains “YES” or “NO” corresponds to the given code is uniquely decodable or not.

Sample

INPUT	OUTPUT
2 2 a bc 5 a bcd e abc de	YES NO

PROBLEM E. SOLVING EQUATION

Time limit: 1 second

Given the equation:

$$a_n X^n + a_{n-1} X^{n-1} + \cdots + a_1 X^1 + a_0 = 0$$

Your task is to find the smallest integer value of X satisfying the above equation.

Input

The first input line contains a positive integer T ($T \leq 50000$), the number of test cases. T groups of lines followed, each describes a test case. Each test case consists of:

- One line with a positive integer n ($n \leq 3$).
- The next line contains $n + 1$ integers $a_n, a_{n-1}, \dots, a_0$. Their absolute value do not exceed 30000 and $a_n \neq 0$. It is guaranteed that the given equation has at least one integer solution.

Output

Output T lines, the i-th line contains the smallest integer solution of the i-th test case.

Sample

INPUT	OUTPUT
2 2 1 4 4 2 1 -4 3	-2 1

PROBLEM F. TOTAL PAIRWISE MIN COST

Time limit: 1 second

You are given a simple undirected weighted graph. Cost of a path in this graph is defined as the product of smallest edge weight on this path and the number of edges on this path. Path may visit a vertex, an edge multiple times. For two vertices u and v, let $D(u, v)$ be the smallest cost among all paths from u to v if u and v can be connected by a path, or 0 otherwise.

Your task is calculating S where S is the total of $D(u, v)$ for all unordered pair of vertices u, v.

Input

The first input line contains two integers n $(2 \leq n \leq 300)$ and m $(0 \leq m \leq 1000)$, they are the number of vertices and the number of edges of the given graph respectively. Vertices of the graph are enumerated from 1 to n.

Then m lines followed, each contains three positive integers u, v, c $(u \leq n, v \leq n, c \leq 10^{15})$ with meaning there is an edge with weight c between vertices u and v.

Output

Since the value of S can be very large, output value of S if S has no more than 9 digits. Otherwise, output the last 9 digits of S.

Sample

INPUT	OUTPUT
4 4 1 2 1 2 3 2 3 4 4 2 4 2	13

PROBLEM G. PATH IN GRID

Time limit: 1 second

An and Nam are playing a game.

An gave Nam a grid of size $n \times m$ with its rows enumerated from 1 to n from up to down and its columns enumerated from 1 to m from left to right. Cell at the intersection of row i and column j is represented as (i, j). Each cell of the grid contains a non-negative integer smaller than 3.

An asked Nam to find a path from the top-left corner cell $(1,1)$ to the bottom-right corner cell (n, m) meeting the following constraints:

- Nam can only move down or right only. Formally, from cell (i, j) Nam can move to cell $(i + 1, j)$ or $(i, j + 1)$. All cells on the path must be inside the grid.
- The sum of numbers on all cells on the path must be X.

An doesn't want the game take too long, so he will not choose a value X which no satisfied path exists. Help An determine all possible values of X that he can choose.

Input

The first input line contains a positive integer T, the number of test cases. T groups of lines followed, each describes a test case. Each test case consists of:

- One line with two positive integers n, m.
- Then n lines followed, the i-th of them contains m numbers (without space separated) on row i of the grid.

The sum of all n and the sum of all m in all T test cases do not exceed 1000.

Output

Output T lines, each line lists all possible value of X that An can choose in increasing order.

Sample

INPUT	OUTPUT
1 3 3 020 100 020	1 2 3 4

PROBLEM H. GROUPING

Time limit: 1 second

There are n teams participating in an international sport tournament. Teams are numbered from 1 to n and team i has s_i members. In an exchange event, the tournament committee decided to organize a game. To play the game, players must be divided into groups. Each group must have exactly k members and no 2 members are from the same team. It is not required to participate so some may not take part in. At the start, only R teams $1, 2, \dots, R$ participated. As the game becomes more exciting, teams $R+1, R+2, \dots, n$ sequentially register to participate. The committee wants to reorganize the groups every time a new team joins. The number of groups should be maximized and still satisfy the requirements above (each group has exactly k members and no 2 members are from the same team).

You are given $s_1, s_2, \dots, s_n$ and R, help the committee calculate the maximum possible number of groups after each team join.

Input

The first input line contains a positive integer T, the number of test cases. T groups of lines followed, each describes a test case. Each test case consists of:

- The first line contains there positive integers n, k, R $(n > 2, k \leq 100, R < n)$.
- The second line contains n positive integers s_i $(1 \leq s_i \leq 10^9, i = 1, 2, \dots, n)$.

The sum of all n over T test cases does not exceed 100000.

Output

Output T lines, each line consists of $n - R$ integers where the j-th number is the maximum possible number of groups after team $R + j$ join.

Sample

INPUT	OUTPUT
1 5 4 4 4 4 4 4 4	5

PROBLEM I. K-th DIGIT

Time limit: 1 second

Given a positive integer w, create a sequence of digits by the following rules:

- Firstly, write down all natural numbers in the interval $[1,10^{15}]$ that divisible by w in increasing order.
- Next, write down all natural numbers in the interval $[1,10^{15}]$ that divide w remains 1 in increasing order.
- Next, write down all natural numbers in the interval $[1,10^{15}]$ that divide w remains 2 in increasing order.
- So on and finally write down all natural numbers in the interval $[1,10^{15}]$ that divide w remains $w - 1$ in increasing order.

Given an integer k, your task is to find the k-th digit in the above sequence.

Input

The first input line contains a positive integer T $(T \leq 1000)$, the number of test cases.

Then T lines followed, each contains two positive integers w and k $(w, k \leq 10\text{^}15)$.

Output

Output T lines, each line contains answer for the corresponding test case.

Sample

INPUT	OUTPUT
2 1 9 10 2	9 0

PROBLEM J. LONGEST COMMON SUBSEQUENCE

Time limit: 1 second

A string X is subsequence of another string Y if we can obtained X by deleting some (maybe no or all) characters of Y without changing order of remaining characters. For example, "ace" is a subsequence of "abcde" but "ca" isn't.

You are given 2 strings A, B and Q queries where i-th query is represented by 3 integers L_i, R_i and K_i. For each query, you task is to find the length of longest common subsequence of 2 substrings $A[1 \ldots K_i]$ and $B[L_i \ldots R_i]$.

Input

The first input line contains a positive integer T ($T \leq 5$), the number of test cases. T groups of lines followed, each describes a test case. Each test case consists of:

- The first line contains string A.
- The second line contains string B.
- Both A and B consist of lower case letter 'a' to 'z' only. Their lengths do not exceed 2000.
- The third line contains a positive integer Q ($Q \leq 2000$).
- Then Q lines followed, the i-th of them contains three positive integers L_i, R_i, K_i ($L_i \leq R_i \leq |B|, K_i \leq |A|$).

Output

Output T lines, each line contains Q integers where i-th of them is the answer for i-th query.

Sample

INPUT	OUTPUT

`1`
`abcb`
`acab`
`2`
`1 4 2`
`2 4 3`
	`2 2`

PROBLEM K. TAXI DRIVER

Time limit: 1 second

A taxi driver on his way home want to make some extra cash, he looks up the taxi booking system for customers. His way home is a straight road with n positions $(1,2,\ldots,n)$ where he start from position 1 and drive to his home at position n. There are m customers are booking on the system, customer i wants to move from position a_i to position b_i and willing to pay c_i thousand VND. At most 2 customers can be on the taxi at any point of time and the customers won't pay if the driver doesn't take them all the way until the position they want. Please help him pick customers to serve so he can make the most profit on his way home without round trips (driving backward).

Input

The first input line contains a positive integer T, the number of test cases. T groups of lines followed, each described a test case. Each test case consists of:

- One line with a two integer n, m ($n \geq 2, m \geq 0$).
- The next m lines, i-th line contains three integers a_i, b_i, c_i ($1 \leq a_i < b_i \leq n$, $1 \leq c_i \leq 10^9$).

The sum of n and the sum of m over all test cases will not exceed 2000.

Output

Output T lines, each line contains the largest amount of money that the taxi driver can make.

Sample

INPUT	OUTPUT
2 3 3 1 3 1 1 2 1 2 3 1 5 4 1 4 10 1 3 3 1 2 2 2 5 2	3 14

PROBLEM L. COUNTING TRIANGLE

Time limit: 1 second

There are n wooden sticks, the i-th stick is d_i cm long. With 3 sticks, we may form a triangle. You task is to count the number of ways to form isosceles triangles (all angles less than 90 degrees), right triangles (one square angle) and scalene triangles (one angle wider than 90 degrees).

Input

The first input line contains positive integer n ($n \leq 2500$).
The second line contains n positive integer $d_1, d_2, \dots, d_n$ ($d_i \leq 10^9$).

Output

Output 3 numbers: the number of isosceles triangles, the number of right triangles and the number of scalene triangles.

Sample

INPUT	OUTPUT
3 1 2 3	0 0 0
4 1 1 1 1	4 0 0
3 3 4 5	0 1 0