The International Collegiate Programming Contest
Sponsored by ICPC Foundation

The 2020 Aleppo Collegiate Programming Contest

(Contest Problems)

Virtual
January 2021

Problem K. The Peaky Coacheena

Input file:	`peaky.in`
Output file:	`standard output`
Balloon Color:	`Pink`

Based on a true story

The Peaky Coacheena team went to Sharm El-Sheikh to participate in the Africa and Arab Collegiate Programming Championship. They had to wait so much before the beginning of the contest, so they started playing some card games. one of the managers came to them and said: "What are you doing? Give me the Coacheena!". They did not understand what he meant, which made him angry. So, he gave them a problem, and if they managed to solve it, he would not disqualify them.

He gave the Peaky Coacheena a permutation p as an array of n elements numbered from 1 to n. In one move, they can select any index i from this permutation and move the element p_i to the end of the array. The resulting permutation will be q, where for each q_j $(1 \leq j < i)$, $q_j = p_j$. For each $(i \leq j < n)$, $q_j = p_{j+1}$ and $q_n = p_i$.

Their task is to find the minimum number of moves they need to perform so that the resulting permutation would be sorted. Can you help them?

Recall that a permutation p of n elements is an array of length n where $(1 \leq p_i \leq n)$ and $(p_i \neq p_j)$ for each $(1 \leq i, j \leq n, i \neq j)$.

Input

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

The first line of each test case contains a single integer number n $(1 \leq n \leq 1000)$. The length of the permutation.

The following line contains n space-separated integer numbers $(1 \leq p_i \leq n)$, where p_i is the i-th element in the permutation. It is guaranteed that no two elements in the permutation are equal.

It is guaranteed that the sum of n over all test cases is less than or equal to 5×10^3

Output

For each test case, print a single line containing a single integer number — the minimum number of moves the Peaky Coacheena need to perform to sort the permutation.

Example

peaky.in	standard output
3 6 1 4 5 2 6 3 4 4 3 2 1 5 1 4 2 5 3	3 3 2

Problem L. Specialist Dude

Input file:	`dude.in`
Output file:	`standard output`
Balloon Color:	`Brown`

Based on a true story

Most of the 2020 Tishreen University and Tartous University Collegiate Programming Contest judges rented a farm in Damascus. Slman kept talking but no one could hear what he was trying to say, so he wanted his voice to be as loud as possible.

A new sound amplifier was made in 2020. If some sound has loudness x and the sound amplifier has strength y, then the new sound loudness would be x^y.

Slman wanted to say n words. The i-th word has loudness a_i. There were n sound amplifiers in the farm. The i-th sound amplifier has strength b_i. He wanted to use each sound amplifier once so that the sum of loudness of all words would be maximized. More formally, Slman wanted to reorder the array b such that the following value is maximized:

$$\sum_{i=1}^{n} a_i^{b_i}$$

Slman can't solve such problems for a reason. Can you help them so the judges can hear him?

Input

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

The first line of each test case contains a single integer number n ($1 \le n \le 10^5$). The number of words Slman will say and the number of sound amplifiers he has.

The following line contains n space-separated integer numbers $a_1, a_2, \ldots, a_n$ ($-10^9 \le a_i \le 10^9$), where a_i is the loudness of the i-th word Slman will say. It is guaranteed that $|a_i| < |a_{i+1}|$ for each $1 \le i < n$.

The following line contains n space-separated integer numbers $b_1, b_2, \ldots, b_n$ ($1 \le b_i \le 10^9$), where b_i is the strength of the i-th sound amplifier.

Output

For each test case, print a single line containing n space-separated integer numbers — the order of the array b that gives the maximum loudness sum.

If there are multiple answers, print the minimum array.

An array a is called less than array b if there is an index i, where for each index $(1 \le j < i), a_j = b_j$, and $a_i < b_i$. It is guaranteed that the sum of n over all test cases is less than or equal to 10^5.

Example

dude.in	standard output
2 4 1 2 -3 -4 1 2 3 6 5 -1 2 -4 5 12 1 3 2 100000 2	1 3 2 6 1 2 2 3 100000

Problem M. Ali Is Always Wasting His Time

Input file:	`ali.in`
Output file:	`standard output`
Balloon Color:	`Orange`

Ali is a famous coach at Tishreen University. This year he wants to win first place in the Tishreen University and Tartous University Collegiate Programming Contest for the first time. As we know, Ali failed to choose the most appropriate problems to solve during the contest last year, so his team finished third. To avoid repeating the same mistake this year, Ali needs your help.

There are n problems in our contest. Each one has a unique number from 1 to n. These problems are linked together using $n-1$ edges to form a connected tree rooted at problem 1. The i-th problem has two integers a_i and b_i denote two possible periods of time (in minutes) to solve this problem. You can do one of the following:

- Solve the i-th problem in a_i minutes.
- Solve the i-th problem in b_i minutes only if Ali has solved all the problems in its sub-tree or it does not have any sub-trees (note that you can still choose to solve it in a_i minutes even if Ali has solved all problems in its sub-tree).
- Leave the i-th problem unsolved.

Given a non-negative integer k denoting the duration of the contest in minutes. Your task is to help Ali calculate the maximum number of problems he can solve during the contest.

Input

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

The first line of each test case contains two space-separated integer numbers n and k ($1 \le n \le 1000, 0 \le k \le 10^9$). The number of problems in the contest and the duration of the contest, respectively.

The following line contains n space-separated integer numbers $a_1, a_2, \ldots, a_n$ ($0 \le a_i \le 10^9$), where a_i is the required minutes to solve the i-th problem.

The following line contains n space-separated integer numbers $b_1, b_2, \ldots, b_n$ ($0 \le b_i \le 10^9$), where b_i is the required minutes to solve the i-th problem only if Ali has solved all the problems in its subtree.

Each of the following $n-1$ lines contains two space-separated integer numbers ($1 \le u_i, v_i \le n, u_i \ne v_i$), denoting the endpoints of i-th edge.

It is guaranteed that the edges form a tree and the sum of n over all test cases is less than or equal to 6000

Output

For each test case, print a single line containing a single integer number. The maximum number of problems that Ali can solve.

Example

ali.in	standard output
1 5 10 5 3 8 2 7 2 4 3 4 2 1 2 1 3 3 4 3 5	4

Problem N. In honor of Nour Alhadi

Input file:	`nour.in`
Output file:	`standard output`
Balloon Color:	`Yellow`

Hussain Kara Fallah has written a statement about Nour Alhadi and his button phobia. However, we think that statement is not enough for such a legendary story, so here is another one.

Nour Alhadi is always pressing a button next to the one he wants on the keyboard in the last few minutes of any programming contest. In honor of Nour Alhadi, you are given a lowercase Latin letter, print the previous one in the alphabet, if it was the first letter in the alphabet then print the previous letter in the alphabet. Note that the previous letter to letter a is z.

Input

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

Each test case consists of a single line that contains a single lowercase Latin character c.

Output

For each test case, print a single line containing a single lowercase Latin letter — the letter before c in the alphabet.

Example

nour.in	standard output
4 m a r s	l z q r

Problem O. Zaher, The Master of Tea

Input file:	`zaher.in`
Output file:	`standard output`
Balloon Color:	`Gold`

Zaher is known for his exceptional skills in making the most delicious tea in Syria. So, his teammates Salim and Adel always ask him to make tea during their training. Salim wants x spoons of sugar in his cup, Adel wants y spoons, and Zaher himself wants z spoons. Unfortunately, Zaher has some problems in logic. Therefore, he needs your help to calculate the total number of sugar spoons he must add.

Input

The first line of the input contains a single integer number T — the number of test cases ($0 \leq T \leq 100$).

Each test case consists of a single line contains three space-separated integer numbers x, y and z ($0 \leq x,\ y,\ z \leq 1000$). The number of sugar spoons each of Salim, Adel, and Zaher wants, respectively.

Output

For each test case, print a single line containing a single integer number — the total number of sugar spoons he must add.

Example

zaher.in	standard output
2 1 2 3 0 1 10	6 11

Problem P. Post-Graduation Plans

Input file:	`plans.in`
Output file:	`standard output`
Balloon Color:	`Green`

Based on a true story

Salim graduated from Damascus University and could not find a job. That's why he decided to join a geometry club to cover his financial expenses.

Once Salim joined the club, he saw a coach and n trainees numbered from 1 to n. The club can be considered as a two-dimensional space (a Cartesian coordinate plane). The i-th trainee is initially located at the point (x_i, y_i).

When the coach is at coordinates (x_1, y_1), and he tracks a trainee at coordinates (x_2, y_2) for t seconds, the trainee rotates around (x_1, y_1) by an angle t in the anticlockwise direction.

The following four types of events happen every now and then:

- 1 l r a b. This event means that the coach will tell each trainee has an index $l \le i \le r$ to change his coordinates to $(x_i + a, y_i + b)$.
- 2 l r x y. This event means that the coach will tell each trainee has an index $(l \le i \le r)$ to move to point (x, y).
- 3 l r x y t. This event means that the coach will stand at point (x, y) and track each trainee has an index $(l \le i \le r)$.
- 4 x. This event means that the coach will ask Salim about the coordinates of the x-th trainee.

Salim wants help to solve this problem. Can you help him?

Input

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

The first line of each test case contains a single integer number n $(1 \le n \le 10^5)$. The number of the trainees in the club.

The following n lines each contain two space-separated integer numbers $(-100 \le x_i, y_i \le 100)$, where x_i and y_i denotes the coordinates of the i-th trainee in the club.

The following line contains a single integer number q $(1 \le q \le 10^5)$. The number of events.

Each of the next q lines is one of the following four types:

- 1 l r a b $(1 \le l \le r \le n, -100 \le a, b \le 100)$. This event means that the coach will tell each trainee has an index $l \le i \le r$ to change his coordinates to $(x_i + a, y_i + b)$.
- 2 l r x y $(1 \le l \le r \le n, -100 \le x, y \le 100)$. This event means that the coach will tell each trainee has an index $(l \le i \le r)$ to move to point (x, y).
- 3 l r x y t $(1 \le l \le r \le n, -100 \le x, y \le 100, -360 < t < 360)$. This event means that the coach will stand at point (x, y) and track with every trainee has an index $(l \le i \le r)$.
- 4 x $(1 \le x \le n)$. This event means that the coach will ask Salim about the coordinates of the x-th trainee.

It is guaranteed that the sum of each of n and q over all test cases is less than or equal to 10^5.

Output

For each test case, for each event of the fourth type, print two space-separated real numbers — the coordinates of the trainee that the coach asked about.

The answer will be considered correct if the relative or absolute error of your answer is less than or equal to 10^{-4}.

Example

plans.in	standard output
1 4 0 0 1 2 2 3 10 12 10 1 2 4 5 6 4 3 3 1 4 2 3 45 4 1 4 3 1 1 4 2 4 4 2 2 1 2 5 5 4 1 4 4	7.000000 9.000000 2.707107 -0.535534 1.292893 10.778175 3.292893 13.363961 5.000000 5.000000 2.585786 26.798990

Problem Q. Loud Laughs

Input file:	`laughs.in`
Output file:	`standard output`
Balloon Color:	`Blue`

As coach Basheer Tleimat once said: "The ICPC in Syria is good, but it would be even better without Naseem and Khaled."

Naseem and Khaled are well-known for their loud laughs. Naseem lives in Homs, while Khaled lives in Damascus.

There are n places numbered from 1 to n in Homs, where Naseem likes to laugh, and a_i people live in the i-th place in Homs.

Similarly, there are m places numbered from 1 to m in Damascus, where Khaled likes to laugh, and b_i people live in the i-th place in Damascus.

If Naseem laughed at the i-th place in Homs and Khaled laughed at the j-th place in Damascus at the same time, the total number of cells that die in people's brains equal to $GCD(a_i, b_j)$, where $GCD(a_i, b_j)$ is the Greatest Common Divisor of a_i and b_j.

From time to time, Naseem and Khaled discover new places to laugh at, and sometimes they get banned from some places.

As 2020 is not disastrous enough with the COVID-19 pandemic, q events happened as follows:

- $1\ t\ x$. This event means that one of them has discovered a new place to laugh at, where x people live. If $t = 1$ then it is Naseem, if $t = 2$ then it is Khaled.
- $2\ t\ x$. This event means that one of them has got banned from a place where x people live. If $t = 1$ then it is Naseem, if $t = 2$ then it is Khaled.

After each event, Naseem and Khaled choose a place a_i in Homs and a place b_j in Damascus such that if Naseem laughs at a_i and Khaled laughs at b_j at the same time, the $GCD(a_i, b_j)$ will be as maximum as possible.

Naseem and Khaled are busy because they are fighting in their war on who would become a Master on Codeforces first. So, can you help them solve this problem?

Input

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

The first line of each test case contains three space-separated integer numbers n, m, and q ($1 \le n, m, q \le 10^5$). The number of places that Naseem likes to laugh at, the number of places that Khaled likes to laugh at and the number of events that happened in 2020, respectively.

The following line contains n space-separated integer numbers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^5$), where a_i is the number of people that live at the i-th place in Homs.

The following line contains m space-separated integer numbers $b_1, b_2, \ldots, b_n$ ($1 \le b_i \le 10^5$), where b_i is the number of people that live at the i-th place in Damascus.

Each of the next q lines is one of the following two types:

- $1\ t\ x$ ($1 \le t \le 2, 1 \le x \le 10^5$). This event means that either Naseem (if $t = 1$) or Khaled (if $t = 2$) discovered a new place to laugh at where x people live.
- $2\ t\ x$ ($1 \le t \le 2, 1 \le x \le 10^5$). This event means that either Naseem (if $t = 1$) or Khaled (if $t = 2$) got banned from a place where x people live. It is guaranteed that before getting banned, the person knew some place where x people live.

It is guaranteed that each of n, m, and q over all test cases has a sum less than or equal to 10^5.

Output

For each test case, print q lines. In the i-th line, print a single integer number, which is the maximum value they can achieve. If Naseem or Khaled doesn't know any place to laugh at, print -1.

Example

laughs.in	standard output
2 2 4 3 1 2 1 2 3 4 1 1 4 1 2 8 1 1 8 2 2 2 2 4 4 2 2 2 4 1 2 8	4 4 8 2 4

Problem R. Adel and ketchup

Input file:	`adel.in`
Output file:	`standard output`
Balloon Color:	Cyan

Based on a true story

Most of the 2020 Tishreen University and Tartous University Collegiate Programming Contest judges rented a summer house with small land in Damascus. Before they met, the judges had asked Khaled to buy a sufficient amount of meat, but due to some random events, he had bought some packs of ketchup. Adel ate much of it and then he got sick because of the large amount of ketchup he had eaten as well as the cold at night. After several minutes of thinking outside the box, Slman suggested to put Adel in the swimming pool, as the judges thought it was the only way to reduce his body's temperature and save him from death.

Let's consider the house as a one-dimensional space where Adel lies on the point 1, and the swimming pool lies on the point n. The judges can carry Adel from the point p to the point $p+1$, spending b calories. Additionally, Salim noticed that there are m force fields, each of them is defined by l_i, r_i, x_i, and w_i, where the judges can teleport Adel from any point that lies within the range $[l_i, r_i]$ to x_i using w_i calories. More formally, if Adel is currently at point $l_i \leq p \leq r_i$, the judges can move him to point x_i using w_i calories. The judges can throw Adel in the swimming pool using 0 calories only if Adel is currently at the point n.

The judges are so tired from eating ketchup. Can you find the minimum amount of calories required to put Adel in the swimming pool?

Input

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

The first line of each test case contains three space-separated integer numbers n, m, and b ($2 \leq n \leq 10^5$) ($0 \leq m, b \leq 10^5$). The house's length, the number of force fields, and the cost of move from one point to the next one.

The following m lines each contain four space-separated integer numbers l_i, r_i, x_i, and w_i ($1 \leq l_i \leq r_i \leq n, r_i < x \leq n, 1 \leq w_i \leq 10^5$). The range of the i-th force field, the point it teleports Adel to, and the calories the judges need to spend to use the force field. It is guaranteed that the sum of n, m over all test cases is less than or equal to 10^6

Output

For each test case, print a single line containing a single integer number — the minimum amount of calories the judges need to spend to put Adel in the swimming pool.

Example

adel.in	standard output
1 5 2 4 1 2 3 1 2 3 4 2	7

Problem S. Who Is the Chief Judge?

Input file:	`chief.in`
Output file:	`standard output`
Balloon Color:	`Violet`

Salim and Mouhanad were chosen to be the chief judges of the 2020 Tishreen University and Tartous University Collegiate Programming Contest. Both of them prefer being the only chief judge in the contest. That is why they decided to play a game, and the winner will be the only chief judge.

There is a grid consisting of n rows numbered from 1 to n from top to bottom and m columns numbered from 1 to m from left to right. The cell (x, y) is the cell at the intersection of the x-th row and the y-th column. Each cell is either a tree or a road, and each player has a pawn. Mouhanad's pawn is initially located at the cell $(1, 1)$ and wants to reach the cell (n, m), while Salim's pawn is initially located at the cell $(n, 1)$ and wants to reach the cell $(1, m)$. Each player can move his pawn up, down, left, or right if that adjacent cell contains a road. More formally, if the player's pawn is at the cell (x, y), then in one move a player can do one of the following:

- Move his pawn to the cell $(x - 1, y)$ if it exists and if it is a road.
- Move his pawn to the cell $(x + 1, y)$ if it exists and if it is a road.
- Move his pawn to the cell $(x, y - 1)$ if it exists and if it is a road.
- Move his pawn to the cell $(x, y + 1)$ if it exists and if it is a road.

A path of length n between two cells (x_s, y_s) and (x_d, y_d) is a sequence of cells (x_1, y_1), (x_2, y_2), ..., (x_n, y_n), where the cell (x_i, y_i) can reach the cell (x_{i+1}, y_{i+1}) for every $1 \leq i < n$ and $x_1 = x_s$, $y_1 = y_s$, $x_n = x_d$ and $y_n = y_d$.

The shortest path between two cells (x_s, y_s) and (x_d, y_d) is the path between the two cells that has the minimum possible length. There can be more than one path between two cells all have the same minimum length.

A cell (x, y) is called good for the two cells (x_s, y_s) and (x_d, y_d) if it belongs to one of the shortest paths between them.

If one of the pawns cannot reach its destination, then the game is considered a tie. Mouhanad wins if the number of cells which are good for $(1, 1)$ and (n, m) and also good for $(1, m)$ and $(n, 1)$ is odd. Otherwise, Salim wins.

Salim and Mouhanad are busy doing chief judges' stuff. Can you determine the winner?

Input

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

The first line of each test case contains two space-separated integer numbers n and m ($1 \leq n,\ m \leq 1000$). The number of rows and the number of columns of the grid, respectively.

Each of the following n lines contains m characters, where the j-th character of the i-th line is either '.' (denoting a road) or '#' (denoting a tree).

It is guaranteed that each of the cells $(1, 1)$, $(1, m)$, $(n, 1)$, and (n, m) contains a road. It is also guaranteed that the sum of $n \times m$ over all test cases is less than or equal to 5×10^6.

Output

For each test case, print a single line containing one word as follows:

- if one of the pawns cannot reach its destination, print "tie".
- If both pawns can reach their destination and the number of good cells for both pawns is odd, print "Mouhanad".
- If both pawns can reach their destination and the number of good cells for both pawns is even, print "Salim".

Example

chief.in	standard output
2 3 3 ... .#. .#. 3 3 ... .#. ...	Mouhanad Salim

Problem T. The Best of Us

Input file:	`best.in`
Output file:	`standard output`
Balloon Color:	`White`

Based on a true story

In the 2019 Syrian Collegiate Programming Contest, Naseem wanted to tease his friend Tony. That is why he named his team "Can we defeat SyrianTony?". After the contest, Mohamed Fouad asked "Who is Tony?" and introduced him at the stage. So, Naseem tried to challenge Tony by giving him a problem.

Naseem gave Tony a string s of n lowercase Latin letters numbered from 1 to n and q queries of the following types:

- 1 l r x. Naseem will tell Tony to apply Caesar cipher to each character has an index ($l \le i \le r$) with a key x.
- 2 l r. Naseem will tell Tony to do a circular right shift to the substring $s_l, s_{l+1}, \ldots, s_r$.
- 3 l r. Naseem will ask Tony whether the characters of the substring $s_l, s_{l+1}, \ldots, s_r$ can be reordered to get a palindrome.

Recall that applying Caesar cipher on a string a with a key x results in a string b in which each character from a is replaced by a letter x positions down the alphabet. For example, applying Caesar cipher to the string "abcwxy" with a key 3 results in the string "defzab".

Recall that a circular right shift of a string a results in a string b where for each character has an index ($1 < i \le n$), $b_i = a_{i-1}$, and $b_0 = a_n$. For example, applying a circular right shift to the string "abcd" results in the string "dabc".

Tony is busy preparing for the next contest. Can you help Tony?

Input

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

The first line of each test case contains a single integer number n ($1 \le n \le 10^5$). The length of the string.

The following line contains n lowercase Latin letters, denoting the string s.

The following line contains a single integer number q ($1 \le q \le 10^5$). The number of queries Naseem will give Tony.

Each of the following q lines is one of the following three types:

- 1 l r x ($1 \le l \le r \le n, 1 \le x \le 26$). Naseem will tell Tony to apply Caesar cipher to each character has an index ($l \le i \le r$) with a key x.
- 2 l r ($1 \le l \le r \le n$). Naseem will tell Tony to do a circular right shift to the substring $s_l, s_{l+1}, \ldots, s_r$.
- 3 l r ($1 \le l \le r \le n$). Naseem will ask Tony whether the characters of the substring $s_l, s_{l+1}, \ldots, s_r$ can be reordered to get a palindrome.

It is guaranteed that the sum of n over all test cases is less than or equal to 10^5 and the sum of q over all test cases is less than or equal to 10^5 and.

It is guaranteed that, for each test case, at least one query of the third type will occur.

Output

For each test case, for each query of the third type, print "YES" if Tony can reorder the characters of the substring to get a palindrome. Otherwise, print "NO".

A palindrome is a string that reads the same forward or backward.

Example

best.in	standard output
1 5 ababb 5 3 1 3 1 1 3 2 3 1 4 2 1 4 3 1 5	YES NO YES

Problem U. Miss S. and THE KING OF MATH

Input file:	`king.in`
Output file:	`standard output`
Balloon Color:	`Silver`

Miss S. hates mathematics, and she needs to improve her skills in solving math problems. So, she asked **Zaher**, also known as "THE KING OF MATH", to help her.

Zaher gave Miss S. two integer numbers a and b, and he asked her to find the minimum number of jumps needed to reach b from a or report that she cannot reach b from a.

In one jump, she can move from a number x to a number y if $GCD(x,y) = 2$, where $GCD(x,y)$ is the Greatest Common Divisor of x and y.

As Miss S. hates math, she needs your help to solve this problem.

Input

The first line of the input contains a single integer number T — the number of test cases ($1 \leq T \leq 100$).

Each test case consists of a single line that contains two space-separated integer numbers a and b ($1 \leq a,\ b \leq 1000$).

Output

For each test case, print a single line containing a single integer number. The minimum number of jumps to reach b from a. Otherwise, print -1 if she cannot reach b from a.

Example

king.in	standard output
3 2 4 4 8 5 6	1 2 -1

Problem V. ACPC Trip

Input file:	`trip.in`
Output file:	`standard output`
Balloon Color:	`Black`

Based on a true story

Last year, n contestants qualified to compete in the 2019 Africa and Arab Collegiate Programming Contest. The contestants were so happy that they are finally going to Sharm El-Sheikh. Unfortunately, Mouhanad packed his bad luck with him, which made all Syrian teams suffer from a tiring trip that resulted in a awful trip experience, during which they lost the will to live.

Mouhanad woke up on the contest day tired, upset, and unfocused, which led to a disappointing performance for him during the contest. After the contest ended, Mouhanad was frustrated, so to comfort him, a genius executive started telling him that it is OK, he did his best, and what happened cannot be changed.

Because of that experience, Mouhanad took it on himself to prevent this issue from ever happening to anyone else.

Mouhanad knows that the budget (the amount of money that is available to spend) was k coins. There are m buses numbered from 1 to m travelling from Damascus to Sharm El Sheikh and vice versa (i.e. they are also travelling from Sharm El Sheikh to Damascus). Initially, all of the m buses are at Damascus. The maximum number of contestants the i-th bus can transport is a_i, and it requires t_i minutes to reach Sharm El-Sheikh from Damascus or vice versa. Also, each bus can transport at most a_i contestants and return empty to Damascus an unlimited number of times. The driver of any bus asks for q coins, where q is the square of the number of contestants on the bus, i.e., for x contestants on a bus, the driver will ask for $q = x^2$ coins. The total cost of the trip is the sum of coins the bus drivers ask for.

Mouhanad wants to choose a subset of buses to transport all the contestants so that the total coins the drivers ask for is less than or equal to k and the time is as minimum as possible. All the buses leave Damascus at the same time.

Mouhanad's bad luck continues and he is busy doing stuff our brains cannot comprehend. Can you solve the issue?

Input

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

The first line of each test case contains three space-separated integer numbers m, n and k ($1 \le m \le 10^5, 1 \le n \le 10^9, 1 \le k \le 2 \times 10^6$). The number of buses, the number of contestants, and the budget, respectively.

Each of the following m lines contains two space-separated integer numbers a_i and t_i ($1 \le a_i, t_i \le 10^6$), where a_i is the maximum number of contestants the i-th bus can transport, and t_i is the required time the i-th bus needs to reach Sharm El-Sheikh.

It is guaranteed that m over all test cases has a sum less than or equal to 10^5, and k over all test cases has a sum less than or equal to 2×10^6.

Output

For each test case, print a single line containing a single integer number, which is the minimum time required to transport all the contestants to Sharm El-Sheikh using the budget. Otherwise, print -1 if they cannot transport all the contestants.

Example

trip.in	standard output
2 3 8 8 9 2 7 5 3 11 3 10 20 9 2 7 5 3 11	18 11

Problem W. Mourad > 2 × Khaled

Input file:	`mourad.in`
Output file:	`standard output`
Balloon Color:	Red

Based on a true story

"If you multiplied Mourad's rank by two, he would still beat you". Khaled used to hear this sentence every now and then. While trying to forget this shameful truth, Khaled tried to bully the players who ranked even worse than him.

There are m players in the bowling contest. Khaled know only n players in the competition. The i-th player that Khaled knows ranked a_i and has some value v_i. If Khaled bulled the i-th player, his happiness increases by v_i (v_i could be negative if the player reminds him that Mourad beat him).

Khaled will bully the players **he knows** who ranked below him or the same as him in the order from the better one to the worst. More formally, if Khaled ranked x, Khaled will bully the players who ranked i where $x \leq i$. If two players ranked i and j where $x \leq i < j$, then Khaled will bully the player who ranked i before the player who ranked j.

If Khaled ranked x with happiness p, he will bully the players **he knows** in the order described above. After he bullies a player, his happiness increases by v_i. If his happiness became **strictly** less than zero, He gets mad and leaves the competition hall. If he bullied all the players he knows who ranked below him, he also leaves the competition hall.

Khaled forgot his rank since it was really low, so you are given several proposed ranks of Khaled,

so you are asked to handle q events, each of them is one of the following three types:

- 1 r v. Khaled got to know a player who ranked r and would get v happiness if he bullied him.
- 2 r. Khaled forgot who was the player who ranked r.
- 3 r p. If Khaled ranked r with happiness p and started his bullying issue, how many players he would bully before leaving the competition hall?

Naseem is worried about Khaled's mental health, but he is now celebrating Mourad's win. Can you answer the questions?

Input

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

The first line of each test case contains three space-separated integer numbers n, m, and q ($1 \leq n, m, q \leq 10^6$). The number of players, the number of players Khaled knows and the number of events, respectively.

The next n lines each contains two space-separated integer numbers x_i and v_i ($1 \leq x_i \leq m, -10^9 \leq v_i \leq 10^9$). The rank of the i-th player and the happiness Khaled gets if he bullied the i-th player, respectively.

It is guaranteed that no two players are ranked the same.

The next q lines each is one of the following three types:

- 1 x v ($1 \leq x \leq m, -10^9 \leq v \leq 10^9$), Khaled got to know the player who ranked x and his happiness would increase by v if he bullied him. It is guaranteed that Khaled doesn't know this player before this event.

- 2 x ($1 \le x \le m$), which means Khaled forgot who was the player who ranked x. It is guaranteed that Khaled knew this player before this event.
- 3 x p ($1 \le x \le m, 1 \le p \le 10^{18}$), which means you need to find the number of players Khaled would bully if Khaled ranked x and his happiness was p.

It is guaranteed that the sum of n, m and q over all test cases is less than or equal to 10^6.

Output

For each test case, for each event of type 3, print a single line containing a single integer number — the number of players Khaled will bully before leaving the competition hall.

Example

mourad.in	standard output
2 5 12 4 1 11 7 -5 3 2 10 -40 6 -3 1 12 1000 2 6 3 4 20 2 12 4 4 2 1 1 2 -1 3 2 4 -2 3 1 1 3 1 0	1 4 4