Problem A. Rikka with Quicksort

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	256 megabytes

Rikka is interested in computer science, and she has been practicing coding for two years and a half. Today, she wants to do a simple summary of the algorithms she has learned.

The first, and also, one of the most important algorithm is Quicksort. Though the idea of Quicksort is quite simple, Rikka remembers that it took her a while to prove the time complexity. Let $f(n)$ be the expected number of comparisons required by Quicksort on a sequence with length n. Then $f(n)$ follows the following equations:

$$f(0) = 0$$

$$f(i) = i - 1 + \frac{1}{i}\sum_{j=1}^{i}(f(j-1) + f(i-j)) \quad i \geq 1$$

After some simple derivations, Rikka finishes the proof and obtains the result that $f(n) = O(n \log n)$: As an outstanding undergraduate student, this problem is just a piece of cake for her.

To make the task more challenging, Rikka asks Yuta, her boyfriend, to set several exercises for her. The following is the hardest one of them:

Consider a modified version of Quicksort: the recursive process will terminate once the length of the interval is less than m. At this time, the expected number of comparisons $g_m(n)$ can be described with the following equations:

$$g_m(i) = 0 \qquad 0 \leq i \leq m$$

$$g_m(i) = i - 1 + \frac{1}{i}\sum_{j=1}^{i}(g_m(j-1) + g_m(i-j)) \qquad i > m$$

Now, Yuta shows the value of n, m, and he wants Rikka to calculate $g_m(n)$. It is generally known that Rikka is not good at math. Therefore she wants you to help her calculate the answer.

Input

The first line is an integer $t(1 \leq t \leq 10)$, the number of test cases.

For each test case, the input contains a single line with two positive integers $n, m(1 \leq m \leq n \leq 10^9)$.

Output

For each test case, output a single line with a single number, the value of $g_m(n)$.

Clearly, $g_m(n)$ is a rational number. Therefore, you are required to print $g_m(n)$ mod 1000000007, i.e., print $x \times y^{-1}$ mod 1000000007 where $\frac{x}{y}$ is the irreducible fraction representation of $g_m(n)$.

Example

standard input	standard output
5 3 1 5 1 5 3 10 5 1000 500	666666674 800000013 400000008 308730177 3107840

Problem B. Rikka with Cake

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Rikka's birthday is on June 12th. The story of this problem happens on that day.

Today is Rikka's birthday. Yuta prepares a big cake for her: the shape of this cake is a rectangular of n centimeters times m centimeters. With the guidance of a grimoire, Rikka is going to cut the cake.

For simplicity, Rikka firstly builds a Cartesian coordinate system on the cake: the coordinate of the left bottom corner is $(0, 0)$ while that of the right top corner is (n, m). There are K instructions on the grimoire: The ith cut is a ray starting from (x_i, y_i) while the direction is D_i. There are four possible directions: L, passes $(x_i - 1, y_i)$; R, passes $(x_i + 1, y_i)$; U, passes $(x_i, y_i + 1)$; D, passes $(x_i, y_i - 1)$.

Take advantage of the infinite power of Tyrant's Eye, Rikka finishes all the instructions quickly. Now she wants to count the number of pieces of the cake. However, since a huge number of cuts have been done, the number of pieces can be very large. Therefore, Rikka wants you to finish this task.

Input

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

For each test case, the first line contains three positive integers $n, m, K(1 \leq n, m \leq 10^9, 1 \leq K \leq 10^5)$, which represents the shape of the cake and the number of instructions on the grimoire.

Then K lines follow, the ith line contains two integers $x_i, y_i (1 \leq x_i < n, 1 \leq y_i < m)$ and a char $D_i \in \{\text{'L'},\text{'R'},\text{'U'},\text{'D'}\}$, which describes the ith cut.

The input guarantees that there are no more than 5 test cases with $K > 1000$, and no two cuts share the same x coordinate or y coordinate, i.e., $\forall 1 \leq i < j \leq K$, $x_i \neq x_j$ and $y_i \neq y_j$.

Output

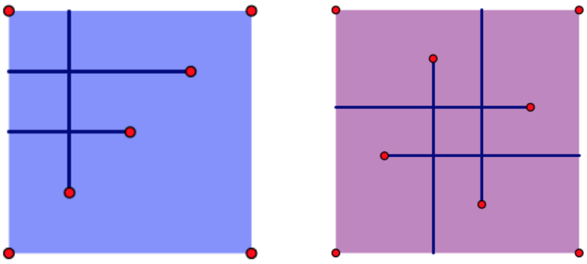
For each test case, output a single line with a single integer, the number of pieces of the cake.

Example

standard input	standard output
2 4 4 3 1 1 U 2 2 L 3 3 L 5 5 4 1 2 R 3 1 U 4 3 L 2 4 D	3 5

Note

The left image and the right image show the results of the first and the second test case in the sample input respectively. Clearly, the answer to the first test case is 4 while the second one is 5.



Problem C. Rikka with Mista

Input file:	`standard input`
Output file:	`standard output`
Time limit:	14.444 seconds
Memory limit:	444 megabytes

Rikka is a fervent fan of JoJo's Bizarre Adventure. As the last episode of Golden Wind has been aired, Rikka, with the help of Yuta, sets up this problem to express the love to Mista.

Mista's lucky number is 4. Today, Mista wants to test his luck with n magic cards: For each card, there is a non-negative integer on each side. The two numbers on the ith card are w_i and 0.

Firstly, Mista puts these n cards to table one by one. For each card, the probability of the w_i side to be upward is $\frac{1}{2}$, and these probabilities are independent with each other. As a result, there are n integers on the table. Mista then sums up all these integers and counts the number of 4s in the decimal representation of this sum: He uses this result to measure his luckiness.

Since it's possible for each side of each card to be upward, there are 2^n possible states in total. You are required to calculate the sum of the results for all these situations.

Input

The first line of the input contains a single integer $T(4 \leq T \leq 4)$, the number of test cases.

For each test case, the first line contains a single integer $n(4 \leq n \leq 40)$, the number of the cards.

The second line contains n integers $w_1, \dots, w_n(4 \leq w_i \leq 44444444)$, the positive numbers on the cards.

Output

For each test case, output a single line with a single integer, the answer.

Example

standard input	standard output
4 4 4 4 4 4 4 4 4 44 44 4 4 44 44 4444 4 444 44444 44444 4444444	4 10 24 38

Note

There are 44 4s in the sample input. Mista would like this sample input.

In the first test case, there is 1 state with the sum equal to 0; 4 states with the sum equal to 4; 6 states with the sum equal to 8; 4 states with the sum equal to 12 and 1 state with the sum equal to 16.

Therefore, there are only 4 situations with the result equal to 1 while on other cases, the result is 0. So the answer should be 4.

Problem D. Rikka with Geometric Sequence

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	512 megabytes

A long time ago, Rikka was not good at math. Worrying about Rikka's grades, Yuta always set interesting math problems for Rikka to help her improve her skills.

Now, as Rikka makes more and more progress on math, more and more she feels the joy of solving math tasks. Today, Yuta is quite busy and has no time to seek for new problems for Rikka. Therefore, for the first time, Rikka tries to come up with a problem herself.

Setting a problem is just like building blocks. The first step is to choose the bricks. Rikka selects the concepts of "geometric sequence"and "subsequence":

Sequence $a_1, \dots, a_k$ is a geometric sequence if and only if for each index $i \in [2, n-1]$, the values in the sequence holds $a_i^2 = a_{i-1} \times a_{i+1}$.

Sequnce $b_1, \dots, b_t$ is a subsequence of $a_1, \dots, a_k$ if and only if there exists an index sequence $c_1, \dots, c_t (1 \leq c_i \leq k)$ which satisfies $c_i < c_{i+1}$ for each $i \in [1, n)$ and $a_{c_i} = b_i$ for each $i \in [1, n]$.

The second step is to combine the bricks. It is quite simple for Rikka: she soon finds an interesting problem:

Given a positive integer n, count the number of different geometric subsequences of $1, 2, \dots, n$.

The last step, and also the most important step, is to solve the problem. However, this task seems to be too difficult for Rikka. Therefore she seeks for help from you: Could you please help her solve this interesting math problem?

Input

The first line of the input contains a single integer $T (1 \leq T \leq 1000)$.

For each test case, the input contains a single line with a single integer $n (1 \leq n \leq 5 \times 10^{17})$.

The input guarantees that there are no more than 3 test cases with $n > 10^9$.

Output

For each test case, output a single line with a single integer, the answer. The answer can be very large, you only need to print the answer modulo 998244353.

Example

standard input	standard output
10 1 2 3 4 5 6 7 8 9 100	1 3 6 11 16 22 29 39 50 5187

Note

When $n = 4$, the valid subsequences are $\{1\}, \{2\}, \{3\}, \{4\}, \{1, 2\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{2, 4\}, \{3, 4\}, \{1, 2, 4\}$.

Therefore the answer is 11.

Problem E. Rikka with Game

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Though both Rikka and Yuta are busy with study, on their common leisure, they always spend time with each other and sometimes play some interesting games.

Today, the rule of the game is quite simple. Given a string s with only lowercase letters. Rikka and Yuta need to operate the string in turns while the first operation is taken by Rikka.

In each turn, the player has two choices: The first one is to terminate the game, and the second one is to select an index i of s and right shift the value of char s_i, i.e., $a \to b, b \to c, \dots, y \to z, z \to a$.

If the game is still alive after 2^{101} turns, i.e., after Yuta finishes his 2^{100} turns, the game will end automatically. The final result is the value of s when the game ends.

Now, Rikka wants to minimize the lexicographical order of the result while Yuta wants to maximize it. You are required to calculate the result of the game if both Rikka and Yuta play optimally.

For two string a and b with equal length m, a is lexicographically smaller than b if and only if there exists an index $i \in [1, n]$ which satisfies $a_i < b_i$ and $a_j = b_j$ holds for all $j \in [1, i)$.

Input

The first line of the input contains an integer $T (1 \le T \le 100)$, the number of test cases.

For each test case, the input contains a single line with a single string with only lowercase letters, the initial value of $s (1 \le |s| \le 100)$.

Output

For each test case, output a single line with a single string, the answer.

Example

standard input	standard output
2 a zbc	a bbc

Problem F. Rikka with Coin

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	256 megabytes

Rikka hates coins, and she used to never carry any coins with her. These days, Rikka is doing her summer internship abroad. Without mobile payment, Rikka has to face strange prices of commodities, and as a result of always using paper currency, she has to face mountainous coins on here table.

In the local currency system, there are 4 kinds of coins: 10 cents, 20 cents, 50 cents and 1 dollar. Up to now, Rikka has gained at least 10^{100} coins for each kind.

Now, Rikka is going to have dinner in the canteen, and she decides to pay the bill only with coins. There are n different combos in the canteen and the price of the ith is w_i cents. Rikka would like to choose one combo as dinner but she has not decided to choose which one yet. Therefore, she wants to take some coins so that whichever she chooses, she can always pay the bill without receiving any change.

Since Rikka hates coins, she wants to carry as few as possible coins with her. As it is generally known that Rikka is not good at math, she wants you to help her make the decision.

Input

The first line of the input contains a single integer $T (1 \leq T \leq 500)$, the number of test cases.

For each test case, the first line contains a single integer $n (1 \leq n \leq 100)$, the number of combos sold in the canteen.

The second line contains n positive integers $w_1, \ldots, w_n (1 \leq w_i \leq 10^9)$, which represents the prices.

Output

For each test case, output a single line with a single integer which represents the minimum number of coins. If there is no valid solution, output -1.

Example

standard input	standard output
3 5 10 20 30 40 50 5 100 200 300 400 500 1 1	3 5 -1

Note

In the first test case, one optimal solution is to bring one coin of 10 cents and two coins of 20 cents.

In the second test case, one optimal solution is to bring 5 coins of one dollar.

Problem G. Rikka with Travels

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

To enjoy their summer vacations, Rikka and Yuta decide to go travels. According to past experiences, contradictions always arose when they were planning for the same trip. This time, they decide to make plans dividually and will go travel twice.

Coincidentally, they choose the same country *Fantasy* as the destination, which is a small island country on Pacific. There are n cities in *Fantasy* and they are connected with $n-1$ two-way roads. It is guaranteed that any two cities can reach each other by the road system.

Though Rikka and Yuta love travels, visiting the same city more than once is still boring for them. Therefore, both Rikka and Yuta choose a simple path (i.e., a path without visiting any city more than once) as her/his plan. Moreover, they want to ensure the two paths do not intersect on any city.

Suppose Rikka chooses the path from a to b, Yuta chooses the path from c to d (both $a = b$ and $c = d$ are allowed), they define the feature of the plan is an ordered pair $(L(a, b), L(c, d))$, where $L(x, y)$ represents the number of cities on the path from x to y.

Now, Rikka wants to count the number of different features, i.e., the number of different integer pairs (l_1, l_2) which satisfies there exists a valid travel plan (a, b, c, d) meets $L(a, b) = l_1, L(c, d) = l_2$. Since Rikka and Yuta are busy with planning their trip, Rikka asks you to help her calculate the answer.

Input

The first line of the input contains a single integer $T (1 \leq T \leq 300)$, the number of test cases.

For each test case, the first line contains a single integer $n (1 \leq n \leq 10^5)$, the number of cities in *Fantasy*.

Then $n - 1$ lines follow. Each line contains two integers $u_i, v_i (1 \leq u_i, v_i \leq n)$ which represents a two-way road (u_i, v_i) in the road system.

The input guarantees that there are no more than 5 test cases with $n > 500$.

Output

For each test case, output a single line with a single integer, the answer.

Example

standard input	standard output
2 4 1 2 1 3 1 4 5 1 2 2 3 3 4 3 5	5 10

Note

In the first test case, the possible features are $(1, 1), (1, 2), (1, 3), (2, 1), (3, 1)$. Therefore the answer is 5.

In the second test case, the possible features are $(1, 1), (1, 2), (1, 3), (1, 4), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (4, 1)$. Therefore the answer is 10.

Problem H. Rikka with Stable Marriage

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	512 megabytes

People in love always feel humble. Sometimes, Rikka is worried about whether she deserves love from Yuta.

Stable marriage problem is an interesting theoretical model which has a strong connection with the real world. Given n men and n women, where each person has ranked all members of the opposite sex in order of preference. We use a permutation p of length n to represent a match that the ith man get marriage with the p_ith woman. A match is stable if and only if there are no two people of opposite sexes who would both rather have each other than their current partners, i.e., $\forall i \neq j, \neg(r_i(p_j, p_i) \wedge r_{p_j}(i, j))$ where $r_a(b, c)$ represents whether person a loves b more than c.

Rikka wants to resolve the confusion in her mind by considering a special case of the stable marriage problem. Rikka uses a feature integer to represents a person's character, and for two persons with feature integers equal to x and y, Rikka defines the suitable index of them as $x \oplus y$, where $\oplus$ represents binary exclusive-or.

Given n men with feature integers $a_1, \dots, a_n$ and n women with feature integers $b_1, \dots, b_n$. For the ith man, he loves the jth woman more than the kth woman if and only if $a_i \oplus b_j > a_i \oplus b_k$; for the ith woman, she loves the jth man more than the kth man if and only if $b_i \oplus a_j > b_i \oplus a_k$.

Rikka wants to calculate the best stable match for this problem, i.e., suppose $\mathbb{P}$ be the set of all stable match, she wants to calculate $\max_{p \in \mathbb{P}} \left(\sum_{i=1}^{n} \left(a_i \oplus b_{p_j}\right)\right)$. Since n is quite large, this problem is too difficult for Rikka, could you please help her find the answer?

Input

The first line of the input contains a single integer $T (1 \leq T \leq 50)$, the number of test cases.

For each test case, the fisrt line contains a sigle integer $n (1 \leq n \leq 10^5)$.

The second line contains n integers $a_1, \dots, a_n (1 \leq a_i \leq 10^9)$ which represents the feature number of each man.

The third line contains n integers $b_1, \dots, b_n (1 \leq b_i \leq 10^9)$ which represents the feature number of each woman.

The input guarantees that there are no more than 5 test cases with $n > 10^4$, and for any $i, j \in [1, n], i \neq j$, $a_i \neq a_j$ and $b_i \neq b_j$.

Output

For each test case, output a single line with a single integer, the value of the best stable match. If there is no stable match, output -1.

Example

standard input	standard output
2 4 1 2 3 4 1 2 3 4 5 10 20 30 40 50 15 25 35 45 55	20 289

Note

In the first test case, one of the best matches is $(2, 1, 4, 3)$. Therefore the answer is $(1 \oplus 2) + (2 \oplus 1) + (3 \oplus 4) + (4 \oplus 3) = 20$.

Problem I. Rikka with Traffic Light

Input file: `standard input`
Output file: `standard output`
Time limit: 2.5 seconds
Memory limit: 256 megabytes

Rikka is now doing summer intern abroad. Every night, she walks home from school. There is a large crossroad on the shortest path, and in most times, it takes Rikka a long time to wait for the traffic light become green, even though sometimes there are not any cars or pedestrians passing through in the contradict direction. To reduce the waiting time, Rikka wants to help the government reschedule the traffic light.

To make things easier, Rikka does some simplification: Suppose there are n pedestrians, some of them will cross the road vertically and some of them will cross the road horizontally. The ith pedestrian will arrive at the crossroad after t_i seconds.

The traffic light has two possible colors: green and red. The green light means pedestrians can now cross the road vertically while red means crossing the road horizontally is allowed. Initially (i.e., at time 0), the color of the light is green, and the color of the traffic light can be changed at any moment for any times.

For any pedestrian, it will take him/her T_1 seconds to cross the road vertically and T_2 seconds to cross the road horizontally. Therefore, the ith pedestrian can cross the road at time w_i (w_i can be a floating number) if and only if $w_i \geq t_i$ and one of the following two conditions is held:

- The pedestrian wants to cross the road vertically, and at any moment in $(w_i, w_i + T_1)$, the traffic light is green.
- The pedestrian wants to cross the road horizontally, and at any moment in $(w_i, w_i + T_2)$, the traffic light is red.

Notice that several pedestrians can cross the road at the same time: they will not impact others.

Now, Rikka can schedule the state of the traffic light and the time for each pedestrian to cross the road. She wants to find the optimal valid plan so that the total waiting time is minimized, i.e., $\sum_{i=1}^{n} (w_i - t_i)$ is minimized. Since t_i can be quite large and Rikka does not have enough patience to stay there to control the traffic light, she asks you to help her calculate the answer.

Input

The first line of the input contains a single integer $T (1 \leq T \leq 200)$, the number of test cases.

For each test case, the first line contains three positive integers $n, T_1, T_2 (1 \leq n \leq 3000, 1 \leq T_1, T_2 \leq 10^9)$.

Then n lines follow, each line with two integers $k_i, t_i (k_i \in \{1, 2\}, 1 \leq t_i \leq 10^9)$, which describes the ith pedestrian: The ith pedestrian will arrive at the crossroad after t_i seconds, and if $k_i = 1$, he/she will cross the road vertically, otherwise he/she will cross the road horizontally.

The input guarantees that there are at most 5 test cases with $n > 500$.

Output

For each test case, output a single line with a single integer, the answer.

Example

standard input	standard output
3 6 1 1 1 1 2 1 1 2 2 2 1 3 2 3 6 1 2 1 1 2 1 1 2 2 2 1 3 2 3 6 1 3 1 1 2 1 1 2 2 2 1 3 2 3	3 5 6

Note

In the first test case, one of the optimal plans is: Set the traffic light to green in time period $[0,2] \cup [3,4] \cup [5,6]$, and let $w = \{1,2,3,2,3,4\}$. Therefore the answer is 3.

In the second test case, one of the optimal plans is: Set the traffic light to green in time period $[0,3] \cup [5,6]$, and let $w = \{1,3,2,3,5,3\}$. Therefore the answer is 5.

In the third test case, one of the optimal plans is: Set the traffic light to green in time period $[0,4]$, and let $w = \{1,4,2,4,3,4\}$. Therefore the answer is 6.

Problem J. Rikka with Defensive Line

Input file:	`standard input`
Output file:	`standard output`
Time limit:	10 seconds
Memory limit:	256 megabytes

As an undergraduate student at Peking University, Rikka is always busy with her study. Therefore, to relax in the summer vacation, Rikka spends a lot of time playing computer games.

Today, Rikka is playing a game about a war between two tribes. As the player, Rikka controls the warriors of one tribe to attack the other tribe. The hostile tribe has n strongholds, and the coordinate of the ith stronghold is (x_i, y_i). A defensive line is built among the strongholds: it is a straight line on the coordinate system which divides the whole plane into two regions. The first goal of the game is to capture this defensive line.

As a sophisticated player, Rikka finds that if some of the strongholds are destroyed and all of the remaining strongholds are strictly lying on the same side of the defense line (lying exactly on the defensive line is not allowed), she can capture the defense line with a very small price. Therefore, Rikka will firstly achieve this condition by destroying the minimum number of strongholds at the beginning of the game.

After repeating the game 10^{100} times, Rikka finds that she can always achieve the goal by destroying at most K strongholds. She is curious about this phenomenon. Therefore, Rikka asks Yuta, a master of information technology, to read the source code of the game and find out the reason.

Yuta finds that while initializing, the game will always choose two strongholds and make the defensive line be the only straight line passing through them. Then, to decrease the difficulty, the game will check whether the "easy condition"(i.e., the condition found by Rikka) can be achieved by destroying at most K strongholds: If not, the game will repeat the initialize process until the chosen defensive line is valid.

After observing this secret, Rikka gives the map of the games, i.e., the coordinates of the strongholds. For each stronghold x, Rikka wants you to calculate the number of other strongholds y so that line x, y is a valid defensive line.

Input

The first line of the input contains a single integer $T (1 \leq T \leq 50)$, the number of test cases.

For each test case, the first line contains two positive integers $n, K (1 \leq n \leq 5 \times 10^4, 1 \leq K \leq 50)$, the number of strongholds and the secret constant in the source code.

Then n lines follow, each line with two integers $x_i, y_i (|x_i|, |y_i| \leq 10^8)$, which represents the coordinates of the strongholds.

The input guarantees that there are no more than 2 test cases with $n > 1000$ and no two strongholds share the same x coordinate or y coordinate, i.e., for any two different strongholds i, j, $x_i \neq x_j$ and $y_i \neq y_j$.

Output

For each test case, output the single line with n integers which represent the answer for each stronghold.

Example

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

Note

In the first two test cases, only the $(1, 2), (2, 3), (3, 4), (1, 4)$ are valid defensive lines where (a, b) represents the straight line passing through the ath and bth strongholds.

In the third test case, any pair of strongholds can from a valid defensive line.

Problem K. Rikka with Segment Tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Rikka is a master of data structures and Segment tree is Rikka's favorite data structure. This problem is a simple exercise about it.

Given a positive integer n, the segment tree on $[1, n]$ can be built by a recursive process: Starting with $[1, n]$, suppose the current interval $[l, r]$, the process recursively builds subtrees for $\left[l, \left\lfloor \frac{l+r}{2} \right\rfloor\right], \left[\left\lfloor \frac{l+r}{2} \right\rfloor + 1, r\right]$ until $l = r$.

For example, when $n = 5$, there are 9 intervals on the segment tree: $[1, 1], [2, 2], [3, 3], [4, 4], [5, 5], [1, 2], [4, 5], [1, 3], [1, 5]$.

To explore the structure of segment trees, Rikka defines a magic function $f(i, n)$ which represents the depth of node $[i, i]$ on a segment tree on $[1, n]$ (the depth of the root is defined as 1). For example, $f(1, 5) = f(2, 5) = 4, f(3, 5) = f(4, 5) = f(5, 5) = 3$.

Now Rikka gives you two positive integers $L, R (L \leq R)$, and she wants you to calculate:

$$\sum_{n=L}^{R} \sum_{i=1}^{n} (f(i, n) \times i)$$

Input

The first line of the input contains a single integer $T (1 \leq T \leq 1000)$, the number of test cases.

For each test case, the input contains a single line with two positive integers $L, R (1 \leq L \leq R \leq 10^{18})$.

Output

For each test case, output a single line with a single integer, the answer. The answer may be very large, you only need to output the answer modulo 998244353.

Example

standard input	standard output
5 4 4 1 4 1 10 1 100 1 1000	30 52 843 1236922 763123843