Problem A. Alice the Magician

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

Alice is a magician who has a special ability to predict the weather in TTCPC kingdom.

Alice has a special formula which can predict today's temperature based on the past three days' temperature. Let X, Y, Z be the temperature in the previous three days, today's temperature Alice predicts will be $Z^3 - 50Y^2 + 600X$.

Please write a program that given the past three days' temperature, output the temperature Alice predicts.

Input

The first line of the input contains three integers X, Y, Z, indicating the temperature in the past three days.

- $20 \leq X, Y, Z \leq 30$

Output

Output Alice's prediction in one line.

Examples

standard input	standard output
22 24 25	25

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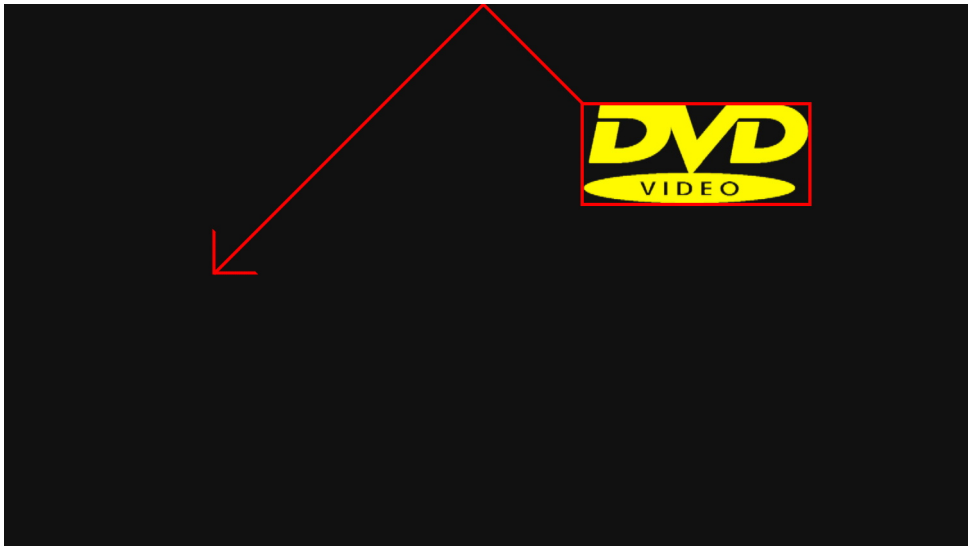
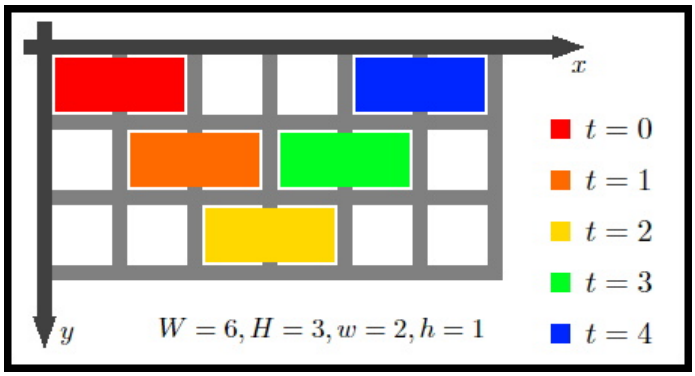
Problem B. Bouncing DVD Logo

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

Jimmy has an old DVD Player in his house. The screensaver of the DVD player is a DVD logo bouncing in the screen repeatedly.



The logo moves in the screen with a speed $v = (\Delta x, \Delta y)/sec, \Delta x, \Delta y \in \{+1, -1\}$. Whenever the logo collides with the edge of the screen, the speed factor of that direction gets reversed like the following image, and it is called a collision.



Jimmy likes to stare at his DVD player's screensaver in his free time, and try to witness the moment when the logo touches the corner of the screen. Sadly, he also watches his favorite Vtubers' streams at the same time, so he cannot keep staring at the screensaver. Your task is to help Jimmy find out the pattern of his DVD player's screensaver.

It's known that the origin of the screen and the logo are located at their upper-left corner. The logo starts at the origin of the screen, with the speed $v = (+1, +1)/sec$. Write a program to tell Jimmy how long does it take for the logo to touch a corner again, and the number of collisions that will occur.

It is guranteed that the time it takes will not exceed 10^{18}.

Input

The first line contains four integers W, H, w, h, indicating the width of the screen, the height of the screen, the width of the logo, and the height of the logo.

- $1 \leq w < W \leq 10^{18}$
- $1 \leq h < H \leq 10^{18}$
- It is guranteed that the time it takes will not exceed 10^{18}.

Output

Output two integers p, q, separated with a space.

- p: The number of collisions before the logo touches the corner again.
- q: The time it takes in seconds.

Examples

standard input	standard output
5 5 2 2	0 3
6 3 2 1	1 4
868 617 65 46	1372 458513
221464165 192991 228 482	221656444 42633801047933

Problem C. Colorful Streets

Input file:	standard input
Output file:	standard output
Time limit:	1.5 seconds
Memory limit:	1024 MB

Today, the TTCPC(Towns Traveling Combination Project Committee) received a task that is to give a traveling plan to the CSIE town. The task mentions that the tourists may want to travel among N attractions, so the committee needs to arrange several streets that can be controlled to ensure the safety of the tourists. Unfortunately, the cost of controlling any street is very heavy. Therefore, the committee wants to minimize the number of controlled streets.

Of course, to make sure the tourists can travel back and forth between any two attractions at will, the committee should choose $N-1$ streets due to the minimization. Especially, each of the streets in the CSIE towns has a special color. In order to maximize the beauty of the traveling plan, the committee decides to maximize the number of distinct colors among the chosen streets.

Given M available streets that can be chosen to be controlled by the committee. Please write a program to generate a street combination that gives the maximum possible number of distinct colors when the number of streets is minimum.

Input

The first line of the input contains two integers N, M, indicating the number of attractions in the CSIE towns and the number of available streets. Next, followed by M lines, each line contains three integers u_i, v_i, c_i, indicating the i-th available street connect town u_i and v_i, and the street's color is c_i.

- $1 \leq N \leq 5000$
- $N-1 \leq M \leq 30000$
- $1 \leq u_i, v_i \leq N, \forall 1 \leq i \leq M$
- $u_i \neq v_i, \forall 1 \leq i \leq M$
- $1 \leq c_i \leq M, \forall 1 \leq i \leq M$
- For each pair of towns, one can pass through some available streets respectively to reach another.

Output

Output two lines. The first line contains a positive integer C, indicating the maximum possible number of distinct colors when the number of streets is minimum. The second line contains $N-1$ distinct integers $p_1, \cdots, p_{N-1}$, all between $[1, M]$, indicating a possible street indices combination that can reach the maximum number of distinct colors.

For the streets you choose, if there is more than one possible choice, you can output any of them in any order. But notice that you should guarantee that for each pair of towns, one can pass through some of the streets you choose respectively to reach another.

Examples

standard input	standard output
6 7 1 2 1 1 3 2 2 3 5 2 4 4 4 5 3 4 6 2 5 6 4	5 1 3 4 5 6
3 3 1 2 1 2 3 1 1 3 1	1 1 2

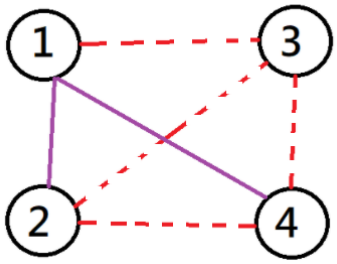
Problem D. DD Maze

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

DD Maze has N rooms. Some rooms are connected with roads. Two rooms can be connected by one or more roads, and some roads may connect the same room. There is exactly one monster on every road.

There are K adventurers who want to conquer the maze. Each of the adventurers can depart from any one of the rooms, passing through some roads, killing every monster encountered, and finally reach any other room or get back to the original one. However, it's ok for an adventurer to stay in the room and go nowhere else.

If all monsters are killed and each road is passed through by exactly one of the adventurers exactly once, the maze is conquered.



Take the above for example, the dotted path is $1-3-4-2-3$, meaning the roads an adventurer passes; while the other one is $2-1-4$, meaning the roads another adventurer passes. Under these circumstances, since every road is passed by only one adventurer once, the maze is conquered.

You are curious about if the DD Maze can be conquered by the K adventurers or not.

Input

The first line of the input contains three integers N, M, Q, indicating the number of rooms, the number of roads, and the number of queries.

In the next M lines, the i-th line contains two integers u_i, v_i, indicating that the i-th road connects the u_i-th room and the v_i-th room.

In the next Q lines, each line represents a query. A query contains an integer K, indicating that there are K adventurers who want to conquer the maze in this query.

- $1 \leq N, M, Q \leq 2 \times 10^5$
- $1 \leq u_i, v_i \leq N$
- $0 \leq K \leq 10^9$

Output

For each query, print "YES" (without quote) if the maze can be conquered successfully. Otherwise, print "NO" (without quote).

Examples

standard input	standard output
4 6 3 1 2 2 3 3 4 4 1 1 3 2 4 1 2 1000	NO YES YES

Problem E. Expressions

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

There are three common ways to format an arithmetic expression: Infix expressions place their operators in between the operands it works on; prefix expressions make the operators precedes the operands; while postfix expressions' operators appears after the operands.

Prefix	Infix	Postfix
$* + 1\ 2\ 3$	$(1 + 2) * 3$	$1\ 2 + 3*$
$+1 * 2\ 3$	$1 + 2 * 3$	$1\ 2\ 3 * +$

Infix expression is the most commonly used format in our life. However, prefix and postfix expressions have the advantage of the fact that they don't need parentheses symbols to specify the order of operations. Now, write a program to calculate the answer of the given prefix expressions.

The details of the prefix expression are given in the Input section.

Input

The first line contains an integer N, indicating the number of testcases in a single testdata.

Each two of the following $2N$ lines represents a testcase.

The first line of each testcase contains an integer M_i, indicating the number of operators and operands in the expression.

The second line of each testcase contains a prefix expression E_i, operands and operators are separated with spaces.

- $1 \leq N \leq 100$
- $3 \leq M_i \leq 50467$
- operators $\in \{+, -, *\}$
- For each operand e in the input file, it is guaranteed that $0 \leq e \leq 20$.
- Let S be the summation of M_i in a single testdata. It is guaranteed that $S \leq 999001$.
- It is guaranteed that E_i is a valid prefix expression.
- In the process of evaluation, it is guaranteed that the values are in range $[-10^7, 10^7]$.

Output

Output N lines, each line contains an integers a_i, indicating the answer of the expression E_i.

Examples

standard input	standard output
2 5 * + 1 2 3 9 * - + 1 2 10 + 4 3	9 -49

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Problem F. Funny Courses

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

Harry is a student of the Great University. Since the university recently changed the timecode of its course timetable, Harry, who does not understand the timecode, needs us to help him plan his course schedule of S semesters in the future.

The i-th course, which is in the s_i-th semester, has c_i credits and its satisfaction score is v_i. And Harry will need to pay w_i for each credit. A week is seperated into sequentially numbered time slots, and the i-th course takes up slots from a_i to b_i, including a_i and b_i. However, courses often overlap with each other, and Harry can only have one course in each time slot.

Please write a program to help Harry get the maximum satisfaction score within his budget!

Input

The first line contains three integers N, B and S, indicating the total number of courses in the university, Harry's budget and the number of semesters.

Each of the following N lines contains integers s_i, a_i, b_i, c_i, w_i, v_i, indicating the i-th course.

- $1 \leq N \leq 25000$
- $1 \leq B \leq 2000$
- $1 \leq S \leq 10$
- $1 \leq s_i \leq S$
- $1 \leq a_i \leq b_i \leq 100000$
- $0 \leq c_i, w_i \leq 5$
- $1 \leq v_i \leq 500000$

Output

Print a single integer, indicating the maximum satisfaction score Harry can get.

Examples

standard input	standard output
3 5 2 1 1 7 1 3 3 1 6 10 2 2 4 2 1 5 1 2 2	5
2 10 1 1 1 2 2 2 2 1 2 3 3 2 2	2
5 20 2 1 1 7 1 3 4 1 5 8 3 1 10 1 9 10 2 5 7 2 1 5 3 3 5 2 6 10 4 4 40	50

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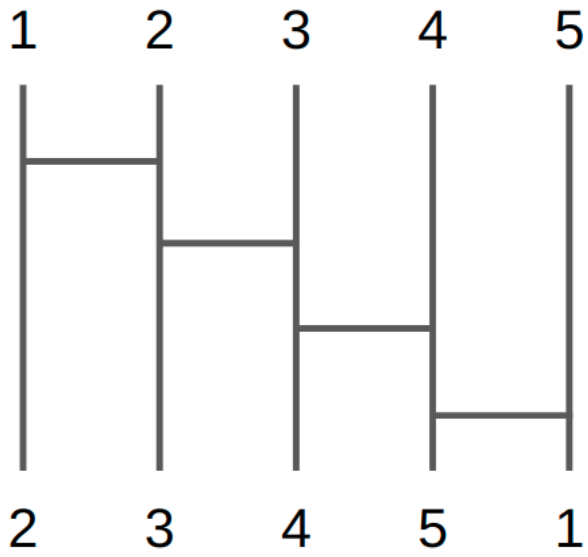
Problem G. Ghost Leg

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

A Ghost Leg consists of N vertical lines and M horizontal lines connecting two neighboring vertical lines. The vertical lines have equal length and are aligned with each other. Each of N people starts from the top of a vertical line and walks along the lines in the following rules: Walk downwards along the vertical line. When encountering a horizontal line, follow the horizontal line and switch to the neighboring vertical line, and then continue walking downwards. Finally stops at the bottom of a vertical line.

For example, there are 5 people and the i-th of them starts from the top of the i-th vertical line. When they reach the bottom, their order left-shifted for one vertical line.



Given a Ghost Leg and the vertical line each person stops at. Please output the vertical line each person starts with.

Input

The first line contains two integer N, M, indicating the number of vertical lines, the number of horizontal lines in the Ghost Leg.

The second line contains N integers $p_1, p_2, \ldots, p_N$. p_i indicates the vertical line the i-th person stops at.

In the next M lines, each line contains three integers y, l_1, l_2, meaning that a horizontal line is drawn y units away from the top of the vertical lines, connecting the l_1-th and l_2-th vertical lines. It is guaranteed that all horizontal lines have distinct y and l_1-th line is neighboring to l_2-th line.

- $2 \leq N \leq 2000$
- $0 \leq M \leq 2000$
- $1 \leq l_1 < l_2 \leq N$ and $l_1 + 1 = l_2$
- $0 \leq y \leq 10^9$

Output

Output N integers in one line, separated with spaces. The i-th integer indicates the vertical line the i-th person starts from.

Examples

standard input	standard output
5 4 2 3 4 5 1 10 1 2 20 2 3 30 3 4 40 4 5	1 2 3 4 5
5 6 1 3 2 4 5 3 3 4 25 1 2 11 4 5 20 2 3 5 2 3 70 4 5	3 1 4 2 5

Problem H. Happy Birthday

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

Today is your birthday, so your father prepares a sequence, $A_1, A_2, \ldots, A_N$, as a birthday gift for you. Since your father wants you to learn that there ain't no such thing as a free lunch, he asks you to calculate the number of pairs (i, j), such that $1 \leq i, j \leq N$ and $|i - j| \leq k$ and $|A_i - A_j| \leq t$ in the sequence A to own this gift.

Input

The first line contains three integers N, k, t.

The next line contains N integers representing $A_1, A_2, \ldots, A_N$.

The meanings of the parameters above have been explained in the problem statement.

- $1 \leq N \leq 200000$
- $0 \leq k, t, A_i \leq 10^9$

Output

Output a single integer in one line, indicating the number of pairs (i, j), such that $1 \leq i, j \leq N$ and $|i - j| \leq k$ and $|A_i - A_j| \leq t$.

Examples

standard input	standard output
5 1 5 1 8 9 15 4	7

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Problem I. I Have a Dream

Input file:	standard input
Output file:	standard output
Time limit:	3 seconds
Memory limit:	1024 MB

I have a dream to play the following game with magician Alice.

First of all, I will put N beans on a 2D plane, the i-th bean I put is on (x_i, y_i). All the beans I put have different positions.

Then, Alice needs to draw two parallel lines and divided the 2D plane into three regions. Alice is considered to make a valid drawing if the following conditions are satisfied:

- There should be no beans on the lines Alice draws.
- There should be no beans in the region between the two parallel lines Alice draws.
- In the remaining two regions, there should be at least one bean lies in the region.

I'm wondered, what is the maximum distance between the two parallel lines in a valid drawing. Please write a program to help me!

Also, it's guaranteed that no three beans are colinear.

Input

The first line of the input contains an integer N, indicating the number of beans I put on the 2D plane.

In the next N lines, the i-th line contains two integers x_i, y_i, indicating the position of the i-th bean.

- $2 \leq N \leq 1500$
- $0 \leq x_i, y_i \leq 10^9$
- There are no three beans which are colinear.

Output

Output the maximum distance between the two parallel in a valid drawing.

Your answer is considered correct if its absolute or relative error does not exceed 10^{-9}.

Formally, let your answer be a and the jury's answer be b. Your answer is accepted if and only if $\frac{|a-b|}{\max(1,|b|)} \leq 10^{-9}$.

Examples

standard input	standard output
3 1 1 2 1 3 2	1.414213562256

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Problem J. Just do it

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

It's a simple problem. Just do it!!!

A defective number is a positive integer that is smaller than the sum of its positive divisors, excluding the number itself. For example, 15 is a defective number.

A perfect number is a positive integer that is equal to the sum of its positive divisors, excluding the number itself. For example, 6 is a perfect number.

An abundant number is a positive integer that is greater than the sum of its positive divisors, excluding the number itself. For example, 12 is a abundant number.

Now, given $[L, R]$, please calculate the number of defective number, perfect number, and abundant number in $[L, R]$.

Input

The first line of the input contains two integers L, R.

- $2 \leq L \leq R \leq 5000$

Output

Output three space-separated integers, the number of defective number, perfect number, abundant number in $[L, R]$, in one line.

Examples

standard input	standard output
6 6	0 1 0
12 15	3 0 1

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Problem K. King Game

Input file:	standard input
Output file:	standard output
Time limit:	5 seconds
Memory limit:	1024 MB

Alice and Bob find out a new, cool king game to play, and they want to play the game with you. You will enjoy the game, right?

Alice and Bob will give you two integer sequences $a_1, a_2, \ldots, a_N$, $w_1, w_2, \ldots, w_N$ with length N.

Alice and Bob allow you to do the following operations for many(possibly zero) times:

- change a_i to any integer, this operation will cost you w_i dollars.

Now, they will give you Q indepenedant queries. In the i-th query, they give you four integers L_i, R_i, x_i, y_i. They want you to make the integers $a_{L_i}, a_{L_i+1}, \ldots, a_{R_i}$ has z distinct integers, such that $z \in [x_i, y_i]$. Also, since they are poor, they want you to spend as little as possible.

Please write a program to help them calculate the answers (minimum dollar that they have to spend).

Input

The first line of the input contains two integers N, Q, indicating the length of the sequences, and the number of queries.

The second line contains N integers $a_1, a_2, \ldots, a_N$.

The third line contains N integers $w_1, w_2, \ldots, w_N$.

In the following Q lines, the i-th line indicates the i-th query. The i-th line contains four integers L_i, R_i, x_i, y_i.

The meanings of the parameters above have been explained in the problem statement.

- $1 \leq N, Q \leq 10^5$
- $1 \leq a_i, w_i \leq 10^5$
- $1 \leq L_i \leq R_i \leq N$
- $1 \leq x_i \leq y_i \leq R_i - L_i + 1$

Output

For each query, print the answer to the query in one line.

Examples

standard input	standard output
6 4 3 2 3 1 4 2 2 4 3 1 2 2 1 6 1 3 1 6 4 4 1 6 5 6 2 5 1 1	1 0 2 6

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Problem L. Lolicon

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	1024 MB

In memory of Bearhead, the greatest lolicon of all time, mathematicians have invented a new notation L_N, which stands for the number of distinct simple cycles in the complete graph of size N.

Since you are a fan of Bearhead, you want to write a program to compute L_N modulo 998244353.

A complete graph is a simple undirected graph in which every pair of distinct vertices is connected by a unique edge.

A simple cycle is a cycle in a graph with no repeated vertices (except for the beginning and ending vertex).

Two simple cycles $v = (v_0, v_1, \ldots, v_{n-1}, v_0)$ with n vertices and $u = (u_0, u_1, \ldots, u_{m-1}, u_0)$ with m vertices is considered the same, if the following conditions are met:

- $n = m$
- One of the following two conditions is met:
  - There exist an integer k, such that $v_i = u_{(k+i) \mod m} \forall i \in [0, n-1]$
  - There exist an integer k, such that $v_i = u_{(k-i) \mod m} \forall i \in [0, n-1]$

For example, $(1, 2, 3, 4, 1)$ and $(3, 2, 1, 4, 3)$ are considered the same, while $(1, 2, 3, 4, 1)$ and $(1, 2, 4, 3, 1)$ are considered different.

Input

The first line of the input contains one integer N.

- $3 \leq N \leq 10^5$

Output

Output L_N modulo 998244353.

Examples

standard input	standard output
3	1

standard input	standard output
4	7

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Problem M. MRT

Input file:	standard input
Output file:	standard output
Time limit:	2 seconds
Memory limit:	1024 MB

The Taichung Government is planning to construct the MRT Blue Line.

We can simplify the route of the MRT Blue Line into a straight line, and each residential area can be simplified to an integer point X_i on the route line. MRT stations need to be placed on an integer point on the line, and they can serve residents within a certain range M.

To let people access the MRT easily, the Government plans to make all residential areas be covered by MRT stations' service range with the minimum amount of stations. How many stations do they need to build in total?

Input

The first line contains two integers M and N, indicating the service range of MRT station and the number of residential areas.

In the following N lines, each line contains one integer, indicating the position X_i of each residential area.

- $1 \leq M \leq 10^8$
- $1 \leq N \leq 2 \times 10^6$
- $1 \leq X_i \leq 2.1 \times 10^9$

Output

Print a single integer, indicating the minimum amount of stations to cover all residential areas.

Examples

standard input	standard output
3 3 1 8 7	2
2 5 1 5 100 101 200	3

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