2024 ICPC Jiangxi Provincial Collegiate Programming Contest

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Do not open before the contest has started.

Problem A. Maliang Learning Painting

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

Once upon a time, there was a child named Maliang. His father and mother had died long ago, and he earned his living by collecting firewood and cutting grass. He likes to learn painting since he was young, but he doesn't even have a pen!

However, he is still determined to learn painting and practice diligently every day. When he went to the mountain to gather firewood, he broke a branch and learned to draw birds in the sand. When he went to the river to cut grass, he dipped the grass roots in the river water and learned to draw fish on the shore stones. In the evening, he came home, took a piece of charcoal, and on the wall of the cave, he painted again and again the things that had painted during the day. Without a pen, he still learns to draw. If I tell you how many paintings Maliang painted on the sand, on the shore stones and on the cave walls, can you calculate the total number of paintings Maliang painted?

In the past year by year, Maliang 's study of painting has never been interrupted. Around his cave, there are layers of paintings, densely packed with paintings. Of course, progress was also rapid, and the birds he drew could almost sing, while the fish he drew could almost swim. Once, he drew a little hen at the entrance of the village, and there were eagles circling around in the sky above the entrance. Once, he drew a black haired wolf behind the mountain, which scared the cows and sheep not to eat grass behind the mountain.

But Maliang doesn't have a pen yet! He thought, how great it would be to have a pen for himself!

Input

There are three integers A ($1 \leq A \leq 10^4$), B ($1 \leq B \leq 10^4$), C ($1 \leq C \leq 10^4$) represent the number of paintings Maliang painted on the sand, on the shore stone, and on the cave wall, respectively.

Output

An integer representing the total number of paintings by Maliang.

Example

standard input	standard output
602 2024 259	2885

Problem B. Magic Leeks

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

Starlight Glimmer is directing the ponies to cut magical leeks, and each pony is assigned a particular row in the leek field.

For a given pony, the height of this row of leeks at time 0 is $v_1, v_2, \ldots, v_n$, and the pony is at position p.

At the beginning of time t ($t \geq 1$), each leek grows k units taller due to magic, then the pony instantly cuts the leek in its position, and finally the pony has the option to move to an adjacent position or not.

Now some ponies want to know how many units of leeks they can cut in the time t_0.

Formally, for each set of data:

At time 0, there is an initial array $v_1, v_2, \ldots, v_n$ with a pointer to the p position and sum of 0.

At the beginning of time t ($t \geq 1$), the following operations are performed in sequence:

1. performs $v_i \leftarrow v_i + k$ for each i.
2. $sum \leftarrow sum + v_p$.
3. $v_p \leftarrow 0$.
4. $p \leftarrow p' \in \{p, \max(p-1, 1), \min(p+1, n)\}$.

Find the maximum value of sum at the end of time t_0.

Input

There are multiple test cases. The first line contains an integer T ($1 \leq T \leq 10^5$) indicating the number of test cases, for each test case:

The first line contain two integers n, p ($1 \leq n \leq 2 \times 10^5, 1 \leq p \leq n$) indicating the length of the array and the pointer position.

The second line contain n integers $v_1, v_2, \ldots, v_n$ ($0 \leq v_i \leq 10^6$), represents the initial array.

The third line contains two integers k, t_0 ($0 \leq k \leq 10^6, 1 \leq t_0 \leq 10^6$) indicating the growth parameter and the interrogation time.

It is guaranteed that the sum of n in all data does not exceed 10^6.

Output

For each test case, print a single integer on a line, represents maximum value of sum.

Example

standard input	standard output
3 6 3 1 1 4 5 1 4 3 2 6 3 1 1 4 5 1 4 3 3 6 3 1 1 4 5 1 4 3 4	18 28 44

Problem C. Liar

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

There are n players in a game. Each player is allocated an integer number, which may differ between players, and the total sum of these numbers is s.

The i-th player claims that the number allocated to him is a_i, though this claim may not be true. How many of them could be telling the truth at most?

Input

The first line contains two integers n, s $(1 \le n \le 10^5, -10^9 \le s \le 10^9)$.

The second line contains n integers $a_1, a_2, \ldots, a_n$ $(-10^4 \le a_i \le 10^4)$, representing the numbers that the players claim to have been allocated.

Output

Output a single integer representing the maximum number of players who could be telling the truth.

Examples

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

Note

In the first example, if the numbers allocated to the players are $1, 2, 0$, then the first player and the second player are telling the truth. It can be shown that under no circumstances could more than 2 players be telling the truth.

In the second example, if the numbers allocated to the players are $3, -10, 2, 3$, then all the players are telling the truth. It can be shown that under no circumstances could more than 4 players be telling the truth.

Problem D. Magic LCM

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

Starlight Glimmer has a magic sequence $v_1, v_2, v_3, \ldots, v_n$ of length n, and she can perform the following operations on the sequence an **infinite** number of times:

- Select two subscripts i, j $(1 \le i, j \le n)$, set $x \leftarrow \gcd(v_i, v_j)$, $y \leftarrow \mathrm{lcm}(v_i, v_j)$, then make $v_i \leftarrow x, v_j \leftarrow y$.

Where $\gcd(x, y)$ denotes the greatest common divisor of two positive integers x, y and $\mathrm{lcm}(x, y)$ denotes the least common multiple of two positive integers x, y.

Now she wants to know what the maximum value of the sum of this sequence is after the operation, i.e. $\max \sum v_i$, and to avoid the answer being too large, you need to modulo 998244353 to print it.

Input

There are multiple test cases. The first line contains an integer T $(1 \le T \le 10^6)$ indicating the number of test cases, for each test case:

The first line contains an integer n $(1 \le n \le 10^6)$ indicating the length of magic sequence.

The second line contain n integers $v_1, v_2, \ldots, v_n$ $(1 \le v_i \le 10^6)$, represents the magic sequence.

It is guaranteed that the sum of n in all data does not exceed 10^6.

Output

For each test case, print a single integer, represents the maximum sum modulo 998244353.

Example

standard input	standard output
3 5 1 4 5 2 10 5 2 4 8 16 32 6 9 6 4 27 10 12	34 62 590

Problem E. Magic Subsequence

Input file:	`standard input`
Output file:	`standard output`
Time limit:	8 seconds
Memory limit:	1024 megabytes

Starlight Glimmer has a magic sequence $v_1, v_2, v_3, \ldots, v_n$ of length n, she wants to find two different subsequence of it, which has the same sum.

Formally, find out sets $S_1 = \{p_1, p_2, \ldots, p_{|S_1|}\}$ and $S_2 = \{q_1, q_2, \ldots, q_{|S_2|}\}$ such that:

- $1 \le p_i, q_i \le n$.
- $S_1 \ne S_2$.
- $\sum_{i=1}^{|S_1|} v_{p_i} = \sum_{i=1}^{|S_2|} v_{q_i}$

Note that the elements of a set are not repeatable.

Input

There are multiple test cases. The first line contains an integer T ($1 \le T \le 5$) indicating the number of test cases, for each test case:

The first line contain an integers n ($1 \le n \le 10^5$) indicating the length of the sequence.

The second line contain n integers $v_1, v_2, \ldots, v_n$ ($1 \le v_i \le 2 \times 10^7$), represents the magic sequence.

Output

For each test case, if no set can be found that satisfies the above requirements, print a single "-1" (without quotes) on a line. Otherwise print two lines, each line prints a set in the following way:

First prints the size k of the set, then prints k integers representing the contents of the set, separated by spaces.

Example

standard input	standard output
3 4 6 9 8 7 5 6 13 11 9 12 7 24 23 106 20 11 17 22	2 4 3 2 2 1 -1 5 2 1 7 6 4 1 3

Problem F. The Ropeways

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

On the mysterious planet Taeladus, each of your bases is linked by several ropeways, but due to the scarcity of resources at the time you used the minimum number of $n-1$ ropeways to connect your n bases.

Unfortunately, some of the ropeways have already broken due to damage from the Angel. What's more unfortunate is that the direction of the ropeway station has already been determined, so you and your team **can only repair the ropeways that once existed**.

But luckily, some staff from Rhodes Island helped you fix part of the ropeways.

Right now you only have enough resources on hand to **temporarily repair a ropeway**.We call a base station that can be reached with only the resources at hand **quickly reachable**.

Now you want to know how many bases are **quickly reachable** from the asked base.We are sure as the Endministrator you can figure it out pretty quickly.

Formally, given a tree with edge lengths 0 or 1 and edge lengths that may be modified multiple times. You will be asked several times how many nodes whose distance is less than or equal to 1 from the query node (count itself).

Input

The first row has two numbers n ($1 \le n \le 2 \times 10^5$), m ($1 \le m \le 2 \times 10^5$), where n represents the number of bases and m represents the number of events.

Next, $n-1$ rows, each with three numbers a,b ($1 \le a, b \le n$), and c ($c \in \{0, 1\}$) indicate whether a ropeway links base a to base b and whether it is broken (1 means broken, 0 means link).

Next, m rows, two numbers in each row, op ($op \in \{1, 2\}$) and x. When op is 1, it means to modify the state of the x-th ropeway (1 changes to 0, 0 changes to 1) (in this case $1 \le x \le n-1$). When op is 2, it means to ask how many bases can be reached from base x if only one ropeway can be repaired (in this case $1 \le x \le n$).

Output

For each event with an op of 2, output how many bases can be reached from base x if only one ropeway can be repaired.

Example

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

Problem G. Multiples of 5

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

Given a non-negative base-11 integer with a length less than 10^{14}, determine if it is a multiple of 5.

Due to the large input size, the input is given in the form of n pairs (a_i, b_i) , where each pair (a_i, b_i), represents a_i consecutive digits all being b_i. Concatenating all pairs in order gives the input number.

Here we use the digits `0`,`1`,`2`,...,`9` and the letter `A` to represent the base-11 numeral system.

For example, the input $(1, \texttt{1}), (4, \texttt{5}), (1, \texttt{4})$ represents the number $(155554)_{11}$. Specifically, the decimal number 110 corresponds to the input $(1, \texttt{A}), (1, \texttt{0})$.

Input

The first line contains a single integer T $(1 \le T \le 10^3)$, representing the number of test cases. For each test case:

The first line contains a positive integer n $(1 \le n \le 10^5)$.

The next n lines each contain a positive integer a_i $(1 \le a_i \le 10^9)$ and a character b_i $(b_i \in \{\texttt{0}, \texttt{1}, \texttt{2}, \ldots, \texttt{9}, \texttt{A}\})$ representing the i-th pair.

It's guaranteed that the sum of n over all the test cases will not exceed 10^5.

Note that the data does **NOT** guarantee no leading zeros.

Output

Output T lines, the i-th line representing the answer for the i-th test case. For each test case:

Output "Yes" if the given base-11 number is a multiple of 5, otherwise, output "No".

Case insensitive, no quotes in the output.

Example

standard input	standard output
3 3 1 1 4 5 1 4 3 1 9 19 8 1 0 1 100 A	Yes No Yes

Problem H. Convolution

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

xuxuxuxuxu has recently been obsessed with deep learning. In deep learning, there is an operation called 2D convolution, defined as follows:

A two-dimensional input matrix I, with a size of $n \times m$, is convolved with a kernel matrix K of size $k \times l$, resulting in an output matrix O of size $(n-k+1) \times (m-l+1)$. Each element $O(p,q)$ in the output matrix can be computed as: $O(p,q) = \sum_{x=1}^{k} \sum_{y=1}^{l} K(x,y) \times I(p+x-1, q+y-1)$.

Due to some special reasons, the elements in matrix K can only be -1, 0, or 1.

Given the input matrix I and the size of matrix K, you need to find the maximum **sum** of all elements in the output matrix O among all possible matrix K.

Input

The first line contains four integers n $(1 \le n \le 10^3)$, m $(1 \le m \le 10^3)$, k $(1 \le k \le n)$, l $(1 \le l \le m)$.

Each of the next n lines contains m integers $I_{i,j}$ $(-10^6 \le I_{i,j} \le 10^6)$, denoting the elements of matrix I.

Output

Output a single integer, indicates the maximum sum.

Example

standard input	standard output
5 5 3 3 0 -1 -1 0 0 0 1 -1 2 -2 2 -2 2 2 0 -1 0 0 -2 -1 0 -2 0 1 1	12

Note

If the matrix

$$K = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ -1 & -1 & 1 \end{pmatrix}$$

then the output matrix

$$O = \begin{pmatrix} 1 & 1 & -3 \\ 1 & -1 & 5 \\ 1 & 7 & 0 \end{pmatrix}$$

sum of all elements in the output matrix O is 12.

Problem I. Neuvillette Circling

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

You are a traveler and one day you're traveling on the Tivat mainland. When you are at Fontaine, you find that there are N treasures and there are paths between each pair of them. Each path has a Hilichurl who may appear at any point along the path. If you want to get the treasure, you must kill them. But Hilichurls are too strong to kill by yourself. So you call **Neuvillette** to kill them.

As we all know, Neuvillette can circle as a particular standing point and radius. Every Hilichurl standing on or within the circle will be killed.

Now, Neuvillette can choose any standing point. But he wants to minimize the radius, so that no matter where the Hilichurls are, he can select a starting point to eliminate at least m Hilichurls.

Please tell Neuvillette the minimum radius he circling when $m = 1, 2, 3, ..., \frac{n(n-1)}{2}$.

Input

The first line contains an integer n ($2 \le n \le 100$), representing the number of treasures.

The following n lines, each contain two integers x_i, y_i ($-10^3 \le x_i, y_i \le 10^3, 1 \le i \le n$), representing the coordinates of i-th treasures.

Output

Output $\frac{n(n-1)}{2}$ lines with one integer. The output of i-th line represents the minimum radius Neuvillette circling to eliminate at least i Hilichurls.

Your answer is considered correct if its absolute or relative difference to the correct answer is at most 10^{-6}.

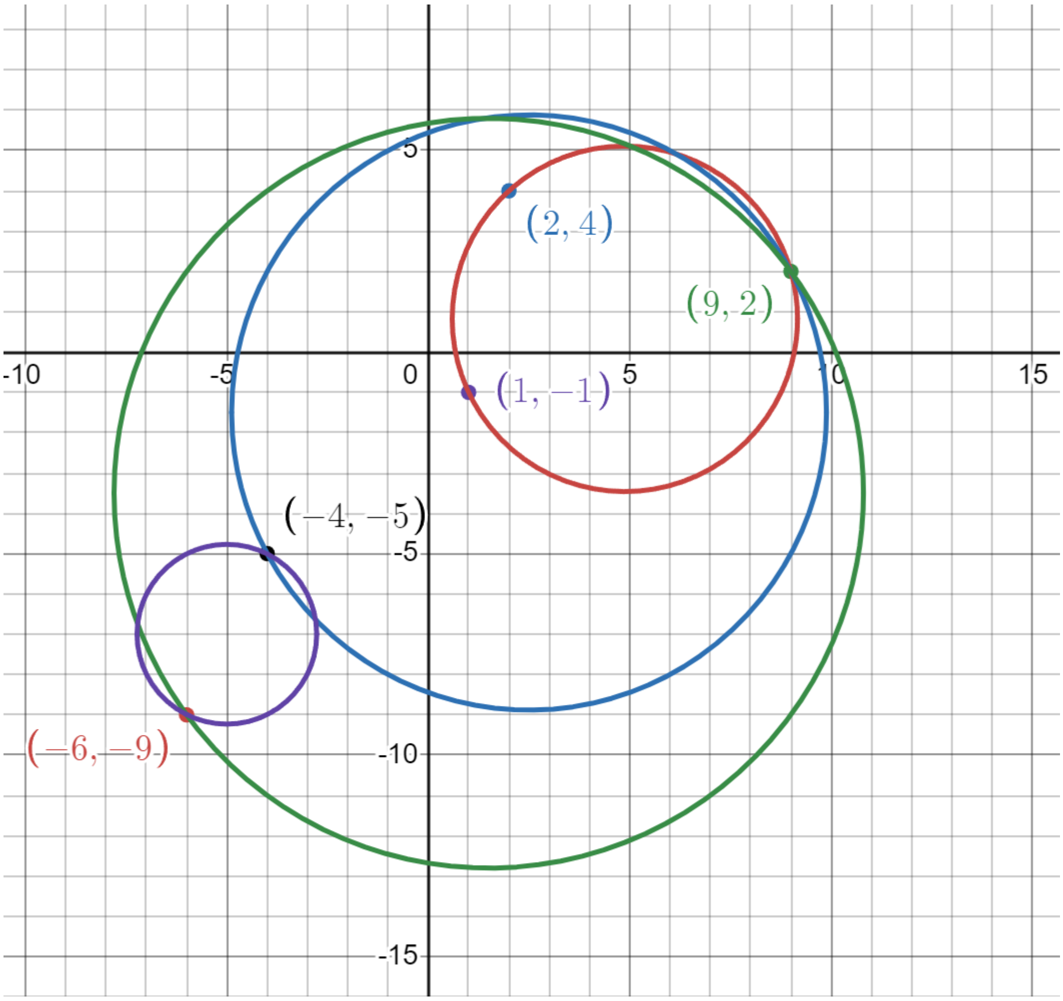
More formally, let a be your answer and b be the correct answer. Your output is considered correct if $\frac{|a-b|}{\max(1,b)} \le 10^{-6}$.

Example

standard input	standard output
5 -6 -9 2 4 9 2 1 -1 -4 -5	2.23606798 4.28602124 4.28602124 7.38241153 7.38241153 7.38241153 9.30053762 9.30053762 9.30053762 9.30053762

Note

This picture shows some circles you choose to eliminate Hilichurls.


-10
-5
0
5
10
15
5
-5
-10
-15
$(2, 4)$
$(9, 2)$
$(1, -1)$
$(-4, -5)$
$(-6, -9)$

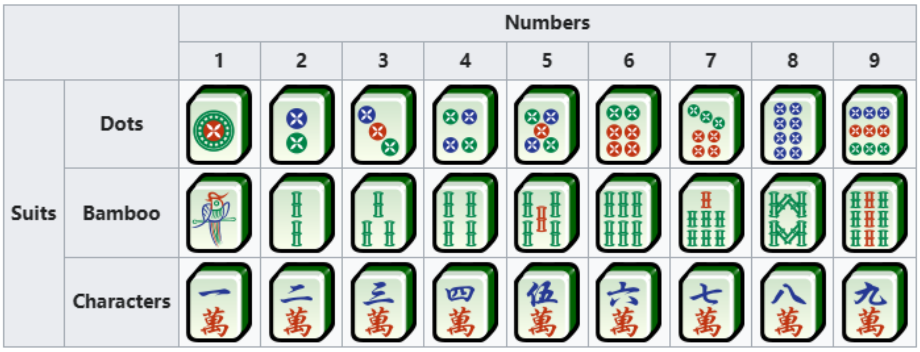
Problem J. Magic Mahjong

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

Starlight Glimmer is working on Magic Mahjong with her friends.

There are two types of Mahjong tiles, Suited and Honors, of which:

Suited tiles are divided into two suits and each are numbered from 1 to 9. The suits are bamboos, dots, and characters. There are four identical copies of each suited tile totaling 108 tiles.



For Honors, there are two different sets of honors tiles: winds and dragons. The winds are east, south, west, and north, beginning with east. The dragons are red, green, and white.

Now, we denote dots by numbers as $P = \{1p, 2p, 3p, 4p, 5p, 6p, 7p, 8p, 9p\}$, and similarly, bamboos as $S = \{1s, 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s\}$, and characters as $M = \{1m, 2m, 3m, 4m, 5m, 6m, 7m, 8m, 9m\}$. For Honors, it is noted as $Z = \{1z, 2z, 3z, 4z, 5z, 6z, 7z\}$ in the order of East, South, West, North, White, Green, Red.

In particular, we call $T = \{1p, 9p, 1s, 9s, 1m, 9m\}$ the terminal tile.

There are three types of Wins in Magic Mahjong, and Starlight Glimmer wants to explore just two of them today, both of which require 14 tiles to reach the Win condition:

- `Thirteen Orphans`, which is a limit hand that consists of **all terminal and honor tile**. In other words, the Win condition must have each 13 terminal and honor tile and attach any card belonging to the first 13 tile. Formally, it must be a muiltset $T \cup Z \cup \{x | x \in T \cup Z\}$.

An example of Thirteen Orphans which has two $1p$.

Note that the set is unordered.

- `7 Pairs`, which consists of only 7 **different** tiles and each tile must appear twice. Formally, consider a set L of size 7 whose element is in Mahjong tiles, the muiltset $L \cup L$ is a legal `7 Pairs`.

Now Starlight Glimmer is given a number of her starting 14 cards, and she wonders if a Win condition has been reached as above.

Input

There are multiple test cases. The first line contains an integer T $(1 \le T \le 1000)$ indicating the number of test cases, for each test case:

A string of length 28 spliced directly from Starlight Glimmer's starting 14 cards (**NOT** separated by spaces).

Output

For each test case, print a single string, for `Thirteen Orphans` Win condition, print "Thirteen Orphans", for `7 Pairs` Win condition, print "7 Pairs", otherwise, print "Otherwise".

Example

standard input	standard output
6 1s9s1p9p1m9m1z2z3z4z5z6z7z9s 1s9s1p9p1s9s1p9p2s2p2s2p3s3s 1s1s1s2s3s4s5s6s7s8s9s9s9s5s 9s1p1s1m1z7z6z5z4z9p9m2z3z2z 1p2p3p1p2p3p7s8s9s7s8s9s1z1z 1p1p1p1p2p2p2p2p3p3p3p3p4p4p	Thirteen Orphans 7 Pairs Otherwise Thirteen Orphans 7 Pairs Otherwise

Note

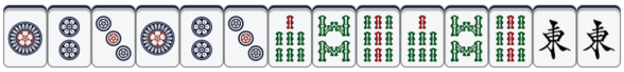
Here are the cards in the sample:

1s9s1p9p1m9m1z2z3z4z5z6z7z9s

1s9s1p9p1s9s1p9p2s2p2s2p3s3s

1s1s1s2s3s4s5s6s7s8s9s9s9s5s

9s1p1s1m1z7z6z5z4z9p9m2z3z2z



1p2p3p1p2p3p7s8s9s7s8s9s1z1z

1p1p1p1p2p2p2p2p3p3p3p3p4p4p

Problem K. Magic Tree

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

Starlight Glimmer has a 2-row, m-column grid, with row i and column j labeled as (i, j).

She performs a depth-first search starting from the lattice labeled as $(1, 1)$ (i.e., the first row and first column), and each lattice can reach a lattice that is adjacent to at least one of its edges. Since the search process does not repeatedly visit lattices, a tree can be used to describe the search process.

Now she wants to know how many possible results of the labelled trees there are in total, and to avoid the answer being too large, you need to modulo 998244353 to print it.

Formally, we use a stack S to describe the depth-first search process and a edge set E to indicate a labelled tree.

In depth-first search process, fristly push lattice $(1, 1)$ in stack S then goto the process as follows:

1. If S is empty, end the process.
2. Suppose the top element of the stack is (x, y) whose unvisit legal adjacent lattice is set N.
3. If N is empty, pop (x, y) and goto step 1.
4. Randomly choose an element (z, w) in N, push it in the stack S and insert edge $(x, y) \to (z, w)$ in edge set E, mark lattice (z, w) as having been visited.
5. Goto step 1.

For lattice (x, y), if a lattice (z, w) satisfies $|z - x| + |w - y| = 1, z \in \{1, 2\}, w \in \{1, 2, 3, \ldots, m\}$ and havn't been visited, it is a unvisit legal adjacent lattice which will be in set N.

The process may produce many different kinds of edge set E, the number of it is the labelled trees describe above.

Input

The first line contains an integer m $(1 \le m \le 10^5)$ indicating the column of the grid.

Output

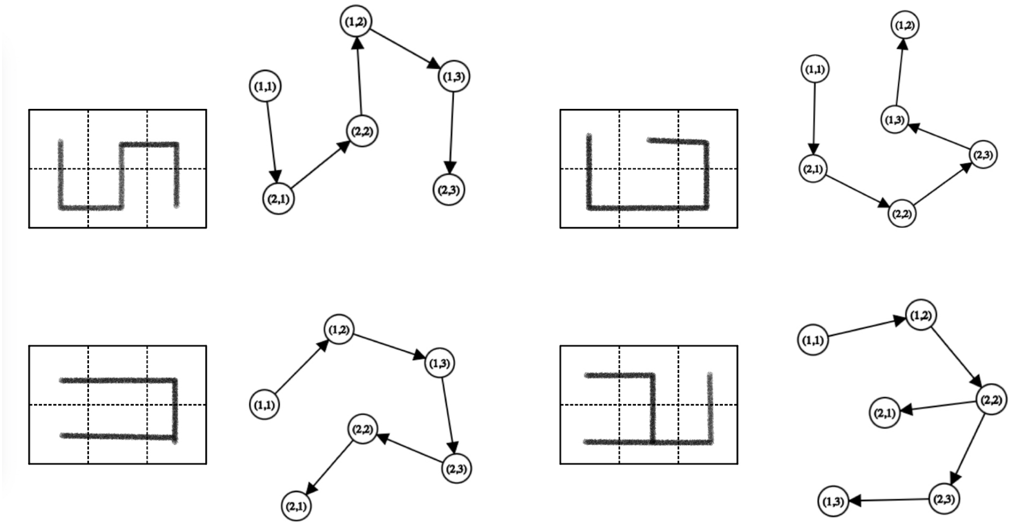
Print a single integer, represents the number of trees modulo 998244353.

Example

standard input	standard output
3	4

Note

Next page is a specific illustration of the 4 labeled trees when m equals 3.



Problem L. Campus

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

During the cherry blossom season, WHU attracts a large number of tourists, which greatly troubles xuxuxuxuxu. Therefore, he invented a magic button that, when pressed, would make all the tourists on campus exit the school through the nearest open gate at the speed of light. xuxuxuxuxu is now very curious about the sum of the distances traveled by the tourists at each moment as they exit the school at the speed of light.

Specifically, WHU is an undirected graph with n nodes and m edges. Each node is occupied by a_i tourists. Among the n nodes, k of them serve as gates, and each gate has an opening time interval $[l_i, r_i]$. The question is, for each moment from 1 to T, what is the sum of the distances traveled by tourists leaving the campus at the speed of light?

Note: If any tourists are unable to exit the school, the sum of the distances should be assumed to be -1.

Guarantee graph connectivity, absence of self-loops, and presence of multiple edges for the given data.

Input

The first line contains four integers n ($1 \le n \le 10^5$), m ($1 \le m \le 10^5$), k ($1 \le k \le 15$), T ($1 \le T \le 10^5$).

The Second line contains n integers a_i ($1 \le a_i \le 10^3$), representing the number of tourists at the i-th node.

Each of the next k lines contains three integers p_i ($1 \le p_i \le n$), l_i, r_i ($1 \le l_i \le r_i \le T$), representing the i-th gate is the node with index p_i in the graph, and the opening time of the gate is $[l_i, r_i]$.

Each of the next m lines contains three integers u, v, w ($1 \le u, v \le n, 1 \le w \le 10^3$), representing a path of length w between u and v.

Output

Print T lines, each containing an integer representing the sum of the distances at the i-th moment.

Example

standard input	standard output
6 8 3 3 1 2 3 4 5 6 4 1 3 5 1 2 6 2 2 1 3 1 1 2 2 2 4 2 3 4 3 5 1 4 5 2 3 1 6 5 3 6 2	47 13 72

Note

At time moment 1, gates at nodes 4 and 5 are open, while the gate at node 6 is closed. One tourist at node 1 can choose either node 4 or 5 to exit, resulting in a total distance of 4. Two tourists at node 2 can choose node 4 to exit, resulting in a total distance of $2 \times 2 = 4$. Three tourists at node 3 can choose node 4 to exit, resulting in a total distance of $3 \times 3 = 9$. Four tourists at node 4 can choose node 4 to exit, resulting in a total distance of 0. Five tourists at node 5 can choose node 5 to exit, resulting in a total distance of 0. Six tourists at node 6 can choose node 4 to exit, resulting in a total distance of $6 \times 5 = 30$. The sum of distances for all individuals is $4 + 4 + 9 + 0 + 0 + 30 = 47$.