ACPC
AFRICA & ARAB
Collegiate Programming
Championship

The International Collegiate Programming Contest
Sponsored by ICPC Foundation

ECPC
EGYPTIAN COLLEGIATE
PROGRAMMING CONTEST

The 2022 ECPC Contest

17-08

(Contest Problems)

AAST, Egypt
August 2022

Problem A. A Story

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

Once upon a time in a world that looks like ours a story of a person who looks like many of us is about to begin and it unravels like a jigsaw puzzle. Make sure to open your eyes and focus, as things can look like a duplicated version of another person's story but soon you will know that it is exceptionally different than any other story you've experienced.

For it being a great harmonic and very imminent journey where paths may cross. Kudos to those who hone their knowledge and leverage their skills as marching into the future would definitely require them.

Today, Engineerer woke up early so his mother found this a good opportunity to make him buy bread for breakfast.

As a good boy, he went to buy bread, He found long two queues the first for men a and the second for women b. He found that when a person arrives at the front of the queue he gets angry when he waits for a long time. So Engineerer wondered how to minimize the maximum waiting time for every person when he arrives at the front of his/her queue.

The waiting time of a person is the number of leaves the baker gives for the other queue For example: $a = [2, 3, 4]$ $b = [4, 5, 6]$

The first person in the men's queue wants 2 leaves, if the baker gives the first two women the number of leaves they want before giving the first man then he will wait 9 seconds $(4 + 5 = 9)$.

Notes:

1- The Baker gives each person the number of leaves he wants and can't give another person until he finishes the current person.

2- Baker can't give leaves to a person in a queue before his turn in the same queue.

Given the number of leaves of each person find the minimum maximum waiting time possible.

Input

The input consists of multiple test cases. The first line contains a single integer $t (1 \le t \le 100)$ — the number of test cases. The description of the test cases follows.

The first line contains two integers m and w $(1 \le m, w \le 10^5)$ — the length of array a and b respectively.

The second line contains m integers $a_1, a_2, ..., a_m$ $(1 \le a_i \le 10^9)$.

The third line contains w integers $b_1, b_2, ..., b_w$ $(1 \le b_i \le 10^9)$.

It is guaranteed that the sum of m and w over all test cases does not exceed $4 \cdot 10^5$.

Output

For each test case, print a line containing a single integer – the minimum maximum waiting time.

Examples

story.in	standard output
1 3 2 2 1 3 2 1	2
1 3 2 2 3 4 3 4	4

Problem B. Begins and it

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

Just like any story, it begins with an ambitious person, Engineerer. And as it moves forward, paths start to appear and connect. And as it takes two to Tango, Endure Capital, the ACPC Community Partner, believing in the relentless execution to build and achieve hyper-growth, starts investing in Engineerer's future journey.

Engineerer started learning computer vision, so he decided to challenge you as a member of his team Falcon.

He will give you an image of N rows and N columns where each cell $A_{i,j}$ (the intersection of $i-$th row from the top and $j-$th column from the left) is either white or black then ask you to find how many Double Edged Arrows (DEAs) are in the image.

A DEA consists of:

1-Body: A straight line of black cells such that if the begging cell is $a_{i,j}$ then the next cells is $A_{i+1,j-1}, A_{i+2,j-2} \ldots A_{i+k-1,j-k+1}$ where k is the length of the line,the cell $A_{i,j}$ is called upper endpoint and $A_{i+k-1,j-k+1}$ is called Lower endpoint.

2-Upper edge: Starts from an upper endpoint of a body $a_{i,j}$ and consists of black cells $A_{i+1,j}, A_{i+2,j} \ldots . A_{i+e,j}$ and black cells $A_{i,j-1}, A_{i,j-2} \ldots . A_{i,j-e}$ where e is the length of the edge.

3-Lower edge: Starts from a lower endpoint of a body $A_{i,j}$ and consists of black cells $A_{i-1,j}, A_{i-2,j} \ldots . A_{i-e,j}$ and black cells $A_{i,j+1}, A_{i,j+2} \ldots . A_{i,j+e}$ where e is the length of the edge.

For each DEA the lower edge and upper edge must be ends of the same body and the length of the edges are equal and the length of the body must be greater than 1.

Count how many DEAs are in the given image.

Because the answer may be very large print it $mod\ 10^9 + 7$

Input

The input consists of multiple test cases. The first line contains an integer T ($1 \leq T \leq 100$) — the number of test cases. The description of the test cases follows.

The first line of each test case contains one integer N ($2 \leq N \leq 1000$) — the number of rows and columns.

The following N lines each contain N characters, each of which is one of 0 and 1. If the $j-$th character on the $i-$th line is 1, then $A_{i,j}$ is black. Similarly, if the $j-$th character on the $i-$th line is 0, then $A_{i,j}$ is white.

It is guaranteed that the sum of $n * n$ over all test cases does not exceed 10^6.

Output

Output the number of DEAs in the image $mod\ 10^9 + 7$.

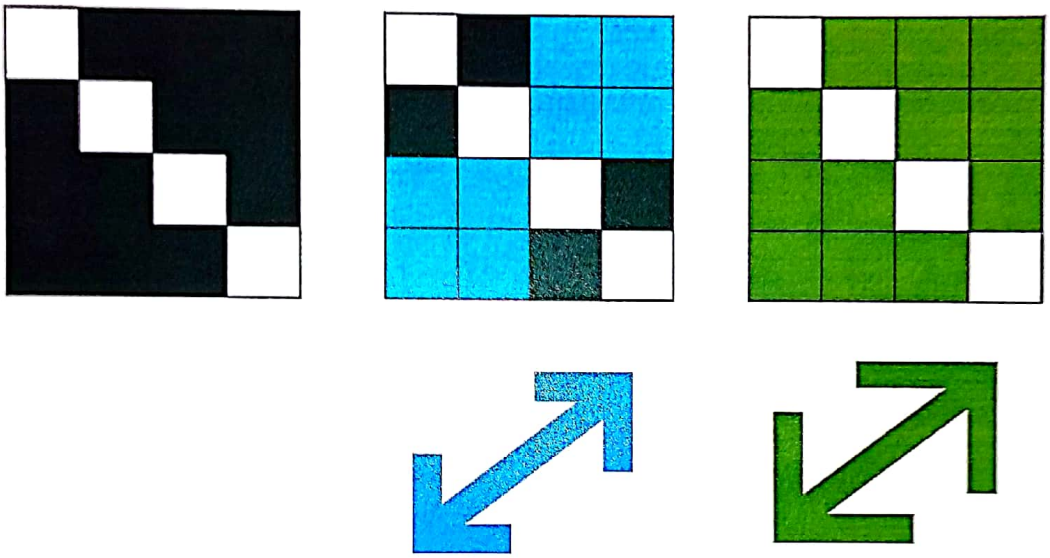
Example

begin.in	standard output
1 4 0011 0111 1100 1100	3

Note

Edges can intersect for the same DEA.

Example for binary image and DEAs in it:



Problem C. Can look like a

Input file:	looklike.in
Output file:	standard output
Balloon Color:	Yellow

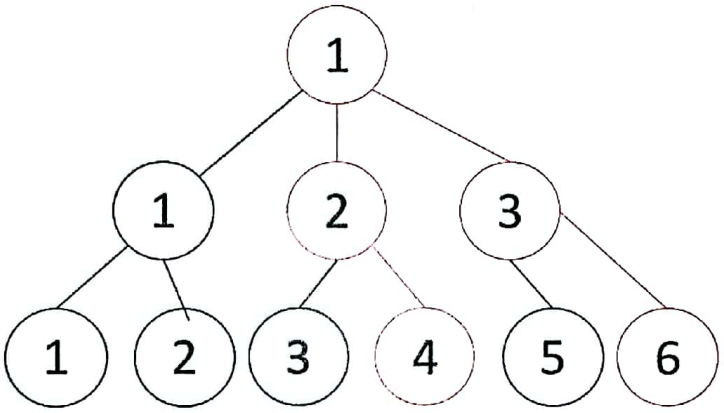
A deja vu is a French word expressing the feeling that one has lived through the present situation before. It seems that this story of the passionate Engineerer can look like a story written by a different self in a different universe, yet something seems to be a bit different.

Engineerer gives you a factorial-tree of height H. Find the path with maximum value.

Value of the path is the sum of values of the nodes of the path.

The factorial-tree is a tree where every node at height h ($1 < h \leq H$) has h children. And in each level h nodes numbered from 1 to $(H - h + 1)!$.

Example of factorial-tree of height 3 and the maximum path:



Input

The only line contains an integer H ($1 \leq H \leq 19$) — the height of the factorial-tree.

Output

Print a single integer — the maximum path value *mod* $10^9 + 7$.

Examples

looklike.in	standard output
1	1
2	4
3	16

Problem D. Duplicated version but

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

A deja vu is a French loanword expressing when one feels they have lived through the same situation in the past. It almost looked like a duplicated version and they certainly got us in the first part, but even when things look exactly similar, the tiniest butterfly movement can make the whole difference.

Engineerer as an elder brother he gave his sister Princes Sunrise a string S as a gift. As a curious girl, she wondered if she can make it palindrome by reversing a prefix.

Check if reversing **at most one prefix** of the string makes it a palindrome.

Input

The input consists of multiple test cases. The first line contains an integer T ($1 \leq T \leq 100$) — the number of test cases. The description of the test cases follows.

The single line of each test case contains a string S ($1 \leq |S| \leq 10^5$).

It is guaranteed that the sum of $|S|$ over all test cases does not exceed 10^6.

Output

Print "YES" (without quotes) if Princes Sunrise can reverse at most one prefix so that the resulting string is palindrome or "NO" (without quotes) otherwise.

Example

duplicated.in	standard output
1 abcbabc	YES

Problem E. Exceptionally different

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

Reading through others' lives, Hima discovers that everything looks so familiar, yet everything is so exceptionally different. Hima decides that for it being a great harmonic imminent journey, it is worth a little bit of a spoiler alert. But eventually, kudos to those who figure the story out. And as always Coach Academy, the ACPC Training Partner, jumps into the picture with training opportunities to provide guidance and lend a hand to Hima through his big journey ahead.

There is a long road that has N buildings each with H_i floors, Hima is at the bottom of building L and wants to go to the top of building R to meet Engineerer. But because he likes to see Engineerer angry he decided to waste time before going to him.

So he decided to go to the top of every building starting from building L to R exactly once.

If Hima is at the bottom of the building he will climb up to its top.

If Hima is at the top of building i and wants to go to building $i+1$ then: If $H_i = H_{i+1}$ He will just from the top of building i to the top of building $i+1$, else he will climb down to the bottom of building i then walk to the bottom of building $i+1$

Note: Hima can't go from building i to $i-1$.

The height of buildings may change.

So you are given q queries of two types:

1. 1 i X $(1 \leq i \leq N)$, $(1 \leq X \leq 10^9)$ change H_i to X.
2. 2 L R $(1 \leq L < R \leq n)$ how many floors will Hima climb up.

Input

The input consists of multiple test cases. The first line contains an integer T $(1 \leq T \leq 100)$ — the number of test cases. The description of the test cases follows.

The first line of each test case contains one integer N $(2 \leq N \leq 10^5)$ — the number of buildings on the road.

The second line contains N integers the $i-$th element is H_i $(1 \leq H_i \leq 10^9)$.

The third line contains one integer Q $(1 \leq Q \leq 10^5)$ — the number of queries.

Then q lines follow. The $i-$th line contains the $i-$th query in the format as in the problem statement.

It is guaranteed that the sum of N and Q over all test cases does not exceed 10^5.

Output

Print answers to queries of the type 2 in the order they appear in the input.

Example

different.in	standard output
1 6 3 3 3 2 2 1 1 2 1 6	6

Problem F. For it being a

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

It is the year 1708, and people are so excited about the newest inventions. Who could imagine that we could do so much with industry. It is the new era for steam engines. For it being so full of potentials, Hossam can't wait to pursue his goals and go even further, as now, distance is no longer a problem.

Hossam has gone to sleep and dreamt of a world that contains the two numbers 9 and 7 only. Yet, he became curious to solve one and only one problem. He wants to check whether a specific number is divisible by 7 or not. The only thing prevents him from solving the problem is that the number contains many digits of 9 concatenated with a single 7. For example if the number contains 3 digits of 9 it will be 9997. You are given a single integer N which is the number of digits of 9 within the specific number. You have to tell whether the number is divisible by 7 or not.

Input

The first line contains a single integer T denoting the number of test cases ($1 \leq T \leq 10^5$). Each of the next t lines contains one integer N the number of digits of 9 in the number ($0 \leq N \leq 10^{18}$).

Output

Print "YES"if by forming n digits of 9 concatenated with one single 7 will produce a number which is divisible by 7 and "NO"otherwise.

Example

being.in	standard output
7	YES
0	NO
1	NO
3	YES
6	NO
7	NO
8	YES
12	

Note

The first test case is the number 7 which is divisible by 7.

The second test case is the number 97 which is not divisible by 7

Problem G. Great

Input file:	great.in
Output file:	standard output
Balloon Color:	Rose

What an eventful year, it's 1708, a year since Engineerer started his plan. A pursuit of one's goal has never been so fulfilling. As the impact is so rewarding. The great plan continues with the great support of the Arab Academy for Science and Technology (AAST), the ACPC Headquarter. It is for sure, a base reason for establishing Engineerer's future plans.

Engineerer has just learned a new math lecture about powers,so (as a normal engineer) he started to flex on his friend From Buffer El-sheikh by giving them a problem about powers.

The problem as follow:Given two ranges $(L1..R1)$,$(L2...R2)$ and two integers A,B, Count how many number i in the first range that $i^A = j^B$ for some j in the second range.

Input

The input consists of multiple test cases. The first line contains an integer T $(1 \leq T \leq 100)$ — the number of test cases. The description of the test cases follows.

The single line of each test case contains six separated integers $L1$, $R1$, $L2$, $R2$, A, B $(1 \leq L1, R1, L2, R2, A, B \leq 10^9)$, $(L1 \leq R1)$, $(L2 \leq R2)$.

Output

For each test case print the answer.

Example

great.in	standard output
1 4 9 8 27 3 2	2

Note

The first range $= [4, 5, 6, 7, 8, 9]$, the second $= [8, 9, 10, ..., 27]$ After applying the powers the first range become $= [64, 125, 216, 243, 512, 729]$ and the second $= [64, 81, 100, ..., 729]$ So the equation is true only for $i = 4$ and $i = 9$ so the answer is 2.

Problem H. Harmonic

Input file:	harmonic.in
Output file:	standard output
Balloon Color:	Black

A journey is never the end. It is always only a checkpoint that was completed if you really think about it. As one path comes to an end, it suddenly forks into many. Lo2lo2 was just there, his choice of the next move was everything harmonic for our story.

Lo2lo2 is a lazy student, he wants to study N subjects in K days, with each subject needing t_i days to be studied in. He can study some subjects right away, but some subjects require studying some other subjects first in order to understand them. He cannot start studying any subject before finishing all of its prerequisites. There are M such prerequisites.
Since he is so lazy, he wants to start studying it as late as possible. What's the latest day he can start studying on and still finish by the $K-th$ day, given that he can study any number of subjects on the same day?

Input

The first line contains two integers N, M and K ($1 \leq N \leq 10^5, 0 \leq M \leq min(10^5, \frac{N*(N-1)}{2}), 1 \leq K \leq 10^5$), – the number of subjects and the prerequisites, respectively.
The second line contains N numbers, the t_i ($1 \leq t_i \leq 1000$) days needed to study the $i-th$ subject.
Each of the next M lines contains two integers x and y ($1 \leq x, y \leq N, x \neq y$) indicating that subject x is a prerequisite and should be completely studied before studying subject y.
It is guaranteed that there is no circular dependencies between the prerequisites.

Output

Print a single integer – the latest day Lo2lo2 can start studying on and still finish on or before the $K-th$ day.
If Lo2lo2 cannot finish studying all N subjects before or on the $K-th$ day, print -1.

Examples

harmonic.in	standard output
4 2 20 8 6 5 4 3 4 2 4	11
2 1 17 9 8 1 2	1
2 1 16 9 8 1 2	-1

Problem I. Imminent

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

With the upcoming plans, Lo2lo2 knows that crossing paths again with others' stories is imminent. He knows that even if things appear to take the same turns, it is always different when you look up close and invest in seeing. Lo2lo2 is very considerate to this when he plans his next move.

Lo2lo2 was doing a treasure hunt at Octaland and finally found the treasure he was looking for. Unfortunately the treasure had a lock on it consisting of N digits long. Alongside there was a note saying that the combination that would open the lock has the following properties:

- Any digit d in the combination is a number between 0 and 7 inclusive (since he is in Octaland of course).
- Any digit d should not appear more than d consecutive times.

Lo2lo2 now wonders, how many combinations satisfy these properties and can be used to open the lock?

Input

The first and only line of input contains an integer N ($1 \leq N \leq 10^4$) – the length of the lock's combination.

Output

The number of combinations of length N satisfying the properties. Since this number can be very huge, print it modulo $10^9 + 7$

Examples

imminent.in	standard output
1	7
3	329
1234	807730764

Problem J. Journey

Input file:	journey.in
Output file:	standard output
Balloon Color:	Purple

Have you noticed yet? It's never been about the end of the journey. There is always what is coming next. It is about what happens throughout the journey with all the paths and turns. It is like an Arena, or to be more specific, a Talents Arena, the place where geeks just like Lo2lo2 find what he has always been looking for!

Lo2lo2 wants to make the greatest cocktail ever. He has N fruits to make his cocktail with. His cocktail has 2 types of constraints on the fruits that are used in making it:

- The cocktail **MUST** contain at least one of the two fruits F_a, F_b
- The cocktail **MUST NOT** contain both of the fruits F_i, F_j together (F_i can be present alone, F_j can be present alone, it's also okay to include neither of them, but it's invalid to include both of them in the same cocktail)

Given M constraints of the 2 mentioned types, can he make such a cocktail? If yes, print any valid cocktail recipe. The fruits in a recipe can be in any order.

Input

The first line of input contains two integers N and M ($2 \leq N \leq 10^4, 0 \leq M \leq 10^4$) – the number of fruits and constraints, respectively. The second line of input contains N space-separated strings where F_i represents the name of the the $i-th$ fruit. ($1 \leq |F_i| \leq 5$). No two fruits will have the same name. Then M lines follow, each line is in the form $(type, F_i, F_j)$. $type \in \{1, 2\}$ ($F_i \neq F_j$). At $type = 1$, this mean that it's a constraint of the first type, while at $type = 2$, it is a constraint of the second type.

Output

On the first line of output, print "YES" if Lo2lo2 can make such a cocktail and "NO" otherwise.
If the answer was "YES", print on the second line the number of fruits K included in a cocktail satisfying the constraints. Afterwards, print the K fruits included at the cocktail, one at a line.

Examples

journey.in	standard output
3 3 apple pear mango 1 apple pear 1 pear mango 2 apple mango	YES 2 apple pear
4 7 a b c d 1 a b 1 b c 1 c d 1 d a 2 a c 2 b d 2 a d	NO

Problem K. Kudos to those who

Input file:	kudos.in
Output file:	standard output
Balloon Color:	Light Blue

Engineerer is almost there. A new checkpoint in his story is over there. Kudos to those who seek it. Engineerer definitely claims it.

Engineerer buys flafel every morning for breakfast. He notices that the person who makes flafel either makes a small flafel with X units of paste and sells it for A pounds or a big flafel with $2 * X$ units of paste and sells it for B pounds.

Engineerer wonders if the flafel person has N units of paste what is the maximum number of pounds they can make. Can you help answering this question?

Input

The input consists of multiple test cases. The first line contains an integer T ($1 \leq T \leq 100$) — the number of test cases. The description of the test cases follows.

The single line of each test case contains four integers N,X,A,B ($1 \leq N, X, A, B \leq 1000$).

Output

For each test case print the maximum number of pounds he can make.

Example

kudos.in	standard output
2 7 3 10 15 7 3 5 15	20 15

Problem L. Leverage their skill

Input file:	leverage.in
Output file:	standard output
Balloon Color:	Bronze

The future is certainly uncertain. But throughout the story, knowledge is gained. Building a book of wisdom, Bomba knows how to leverage his skill for one more chapter of the story of a lifetime from another verse.

Bomba finished his driving test and got a score of X out of Y and to pass the test he must get a score of atleast 74.5%

He wants your help to know if he passed the test or not.

Input

The first line contains an integer T representing the number of test cases.

In each test case, you get two integers X and Y ($1 \leq X \leq Y \leq 100$)

Output

For each test case, output "YES" (without quotes) if Bomba passes the test, and "NO" (without quotes) otherwise.

Example

leverage.in	standard output
3 80 100 5 6 70 100	YES YES NO