ACPC
AFRICA & ARAB
Collegiate Programming
Championship

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ECPC
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The 2022 ECPC Contest

15-08

(Contest Problems)

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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.

Midoriya is a competitive programming coach who loves to teach the student at his university for free, he needs to set up an online session for X minutes

The platform he uses provides a meeting of a maximum of Y minutes without a subscription and if the meeting exceeds Y minutes, Midoriya needs a subscription.

Determine if Midoriya needs a subscription or not.

Input

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

The second line of each test case contains two integers X and Y ($1 \leq X, Y \leq 500$).

Output

For each test case, output "YES" (without quotes) if Midoriya needs a subscription, and "NO" (without quotes) otherwise.

Example

story.in	standard output
3 30 30 30 5 10 15	NO YES NO

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, Lena. 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 Lena's future journey.

Lena has a matrix consists of N rows and M columns, and each cell is either black or white. To solve the problem, Lena has to choose a cell that minimizes the total Manhattan distance to all black cells from the chosen cell.

More formally, let there be $K \geq 1$ black cells in the matrix with coordinates (X_i, Y_i) for every $1 \leq i \leq K$. Lena should choose a cell (A,B) that minimizes

$$\sum_{i=1}^{K}(|A - X_i| + |B - Y_i|)$$

Input

The first line contains two integers N and M ($2 \leq N, M \leq 10^3$) — the dimensions of the matrix.

The following N lines contain M characters each, each character is either '0' or '1'. The j-th character in the i-th of these lines is '0' if the cell (i,j) is white, and '1' if the cell (i,j) is black.

It is guaranteed that at least one black cell exists.

Output

output the optimal cell (A,B) to choose. If multiple answers exist, output the one with minimum row, if there still multiple answers choose the one with minimum column.

Examples

begin.in	standard output
3 3 1 0 1 0 0 0 1 1 1	3 2
2 4 1 0 0 1 0 0 0 0	1 1

Note

For the first test case, the following matrix represent the sum for each cell

11 10 11

10 9 10

9 8 9

so answer is (3,2)

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 Avatar can look like a story written by a different self in a different universe, yet something seems to be a bit different.

Avatar has an array A of N non-positive numbers ($A_i \leq 0$), your task to help him to make all array values equal 0 by doing the following operation any number of times (possibly zero)

Choose any sub-array and increase all values in it by 1, output the minimum number of operations required to make all array values equal zero.

Input

The first line contains N ($1 \leq N \leq 10^5$) .

Then N numbers ($-10^9 \leq A_i \leq 0$) .

Output

Output the minimum number of operations required to make all array values equal zero.

Examples

looklike.in	standard output
7 0 -1 -1 -1 0 -2 -1	3
5 -5 -4 -5 -5 -4	6
6 0 0 0 0 0 0	0

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.

Adham loves math and science, He loves numbers very much and wants to make a number with his name like some scientists, He calls this number **Adham's number.**

"Adham's number"is constructed by multiplying the prime number by itself. let's say that numbers 2,3,5,7,11 are prime numbers. In that case, "Adham's number"is 4, 9, 25, 49, 121.

Osama knows about "Adham's number"so he decided to give Adham N to tell him how many "Adham's number"is less than or equal to N.

Input

Each test contains multiple test cases. The first line of input contains a single integer T $(1 \leq T \leq 10^5)$ — the number of test cases.

The only line of each test case contains a single integer N $(1 \leq N \leq 10^{14})$.

Output

print the number of "Adham's numbers"that is less than or equal to N.

Example

duplicated.in	standard output
4 9 4 16 25	2 1 2 3

Problem E. Exceptionally different

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

Reading through others' lives, Adham discovers that everything looks so familiar, yet everything is so exceptionally different. Adham 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 Adham through his big journey ahead.

Adham's school is the best school where people can learn magic, a lot of people want to go to this school although it has a difficult study. every i^{th} student in the school has a magic power P_i, some students joined together to make groups to help each other, one group may consist of at least one student.

Mohab and Omar are teachers in the school, Mohab has a magic spell when he uses it he can merge two groups of students. Mohab thinks that when he Merges the largest two groups of students, he will get a group with magic power greater than any *Other* group, but Omar doesn't think this is true. So can you tell Mohab and Omar who from them is true?

Input

The first line contains two integers N and M $\left(3 \leq N \leq 10^5, 0 \leq M \leq N-3\right)$ — where N is number of student and M is s the number of pairs of students that in the same group.

The second line of the input contains n integers P_1, P_2,...., P_n $\left(1 \leq P_i \leq 10^9\right)$ where P_i is the magic power of i^{th} student.

The next m lines contains two integers u_i and v_i $(1 \leq u_i, v_i \leq N)$, which describe that u_i and v_i are in the the same group.

Output

print "yes"after merging two large groups of students and Mohab gets a group with magic power greater than any *Other* group. Otherwise, print "no".

Example

different.in	standard output
5 2 15 20 30 40 109 1 2 2 3	yes

Problem F. For it being a

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

It is the year 1508, and people are so excited about the newest inventions. Who could imagine that one can carry time in their own pockets. It is the new era for pocket watches. For it being so full of potentials, Avatar can't wait to pursue their goals and grow even more and make the most use of the time in their pockets.

Avatar has N words in a bucket and Q queries consist of words that contains wild card characters up to one. meaning that one of the word's character might be unknown referring to it with the character "*".

Your job is to help him to find if that word exists in the bucket of N words.

Input

First line of input consist of two integer N, Q $(2 \leq N \leq 10^4), (2 \leq Q \leq 10^6)$ — The number of words in the bucket and the number of queries.

Each of the next N lines contain X lowercase alphabet characters $(2 \leq X \leq 15)$ — representing a word of the bucket.

Each of the next Q lines contain Y characters one of them might be a wild card "*" and the others are lowercase alphabet characters $(2 \leq Y \leq 15)$ — representing the word to search for in the bucket.

Output

For each query print "YES", if the i^{th} word can be found in the bucket; "NO" and in the opposite case.

Examples

being.in	standard output
4 5 foo bar boo foofoo f*o *ar b*r ca* fish	YES YES YES NO NO
2 2 af fa *f f*	YES YES

Problem G. Great

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

What an eventful year, it's 1508, a year since Avatar started their 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 Avatar's future plans.

Avatar is the mayor of Abo tsht. No one in Abo tsht has an internet connection. So, Avatar decided to connect all N houses to the internet.

There are two methods to connect the i-th house to the internet.

The first method is to set up a new internet connection in the i-th house with a cost of C_i.

The second method is to link up the i-th house to another house that is already connected to the internet with a cost equal to the euclidean distance between the two houses.

Avatar is a good mayor, so you will help Avatar, Avatar want to minimize the cost as possible.

Input

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

The first line of each test case contains a single integer N ($1 \leq N \leq 1000$) — the number of houses.

Then $N+1$ lines follow. Each of the first N lines contains two integers x_i and y_i ($-10^9 \leq X_i, Y_i \leq 10^9$) — the coordinates of the i-th house. All coordinates are distinct.

The N+1-th line contains N integers C_1, C_2, ... C_N ($1 \leq C_i \leq 10^{12}$) — the cost to set up a new internet connection in the i-th house.

It is **guaranteed** that the sum of N over all test cases do not exceed 10^3.

Output

For each test case, print one line containing a single number — the minimum possible cost after connecting all the houses to the internet.

Your answer will be considered correct if its absolute or relative error does not exceed 10^{-8}

Example

great.in	standard output
1 4 0 10 5 5 10 0 0 0 10000000 1 10000000 1	16.142135624

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. Bomba was just there, his choice of the next move was everything harmonic for our story

Bomba has an array of n integers and an integer $X(1 \leq X \leq 10^{1000000})$ and needs your help to find the maximum length of a merged subarray that is smaller or equal to X.

A merged subarray is the resulting number after concatenating the element of this subarray.

For example merging this subarray $[50, 243, 90, 1]$ will resulting 50243901.

Note: the length of an subarray$[a_l, a_{l+1}, ..., a_r]$ is equal to $r - l + 1$.

Input

The input consists of multiple test cases. The first line contains an integer T the number of test cases. The description of the test cases follows.

The first line of each test case contains an integer $n(1 \leq n \leq 2 \times 10^5)$.

The next line of each test case contains n integers $a_i(1 \leq a_i \leq 10^9)$.

The next line of each test case contains an integer $X(1 \leq length(X) \leq 10^6)$.

we guarantee that the sum of n over all test cases doesn't exceed 2×10^5, and the sum of lengths of X over all test cases doesn't exceed 10^6.

Output

For each test case, output the solution .

Example

harmonic.in	standard output
3 3 15 2 3 23 3 20 30 500 600 4 503 2 5 20 25615	2 1 3

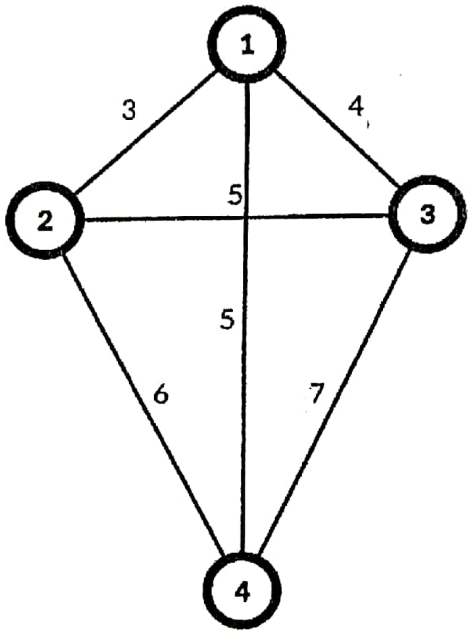
Problem I. Imminent

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

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

ABOGBL is a salesman who lives in a country with N cities and $N \cdot (N-1)/2$ undirected roads.

Each city are numbered from 1 to N the cost to go from city X to city Y is $X + Y$. The problem that ABOGBL want to know the total minimum cost of the hamiltonian cycle from 1 to all $N-1$ cities back to 1.



In this country the minimum cost of the hamiltonian cycle is $1 \Rightarrow 2 \Rightarrow 3 \Rightarrow 4 \Rightarrow 1$ with total cost of $3+5+7+5=20$

Given N the number of cities calculate the total minimum cost of the hamiltonian cycle from 1 to all $N-1$ cities back to 1.

Input

The first line contains a single integer T $(1 \le T \le 10^5)$ - the number of testcases.

The first line of each testcase contains a single integer N $(3 \le N \le 2 \cdot 10^5)$ — the number of cities in the country.

Output

For each test case, print a line containing a single integer – the total minimum cost of the hamiltonian cycle.

Example

imminent.in	standard output
2 3 4	12 20

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 Adham find what they have always been looking for!

Adham has a car factory every car model needs a list of materials to be made. Adham brings his little boy GBL.

GBL asks a lot of questions about the cars because he is very clever He always asks if we can make Q_i cars from the material factory has and his question needs a lot of calculations

Given N the number of materials one car needs The Car needs a list of materials a the $i-th$ material needs A_i from it to make a car The factory has B list of materials which means the factory has B_i amount of material i The factory can make any type of material using the iron so to make **ONE** piece of material i you need C_i of K (iron).

Given Q query answer GBL question of each query Can we make Q_i cars from the material we have?

Help Adham "ABOGBL"to answer Gbl's question.

Input

The first line contains an integer N and K $(1 \leq N \leq 2 \cdot 10^5, 0 \leq K \leq 10^9)$ - the number of materials and the amount of iron in the factory.

The second line contains N integers C $(1 \leq A_i \leq 10^9)$ - the material needed to make one car.

The third line contains N integers B $(1 \leq B_i \leq 10^9)$ - the material factory have.

The fourth line contains N integers C $(1 \leq c_i \leq 10^9)$ - the amount of iron needed to make each material.

The next line contains an integer Q $(1 \leq Q \leq 10^5)$ - number of GBL's questions.

The next Q lines contains GBL's question $(1 \leq Q_i \leq 10^{12})$.

Output

Output q lines, each of which contains the answer to the corresponding question. As an answer, output "YES"if it possible to make this number of car using the material and iron in the factory, and "NO"otherwise.

Example

journey.in	standard output
5 100 3 2 3 5 4 10 9 10 10 10 1 1 2 2 2 2 7 8	NO NO

Problem K. Kudos to those who

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

Fathi is almost there. A new checkpoint in their story is over there. Kudos to those who seek it.

Fathi definitely claims it. Fathi is walking on an old wooden bridge A of length N with many gaps in it. He is able to jump over the gaps but he can jump only for K times.

You are given Q queries. In each query, you want to know if Fathi were to start at position Q_i, would he make it to the other side of the bridge or not.

Input

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

The first line of each test case contains three integers N,K ($1 \le N, K \le 10^5$) and Q ($1 \le Q \le 10^4$) — the length of the bridge, the number of times Fathi can jump, and the number of queries.

The second line of each test case contains exactly N integers $A_1, A_2, \ldots, A_N$ ($0 \le A_i \le 1$) — the description of the bridge. the i-th position of the bridge exists if A_i=1. Otherwise, it's a gap and A_i=0.

Then follows Q lines, each line contains a single integer Q_i ($1 \le Q_i \le n$) — a position in the bridge we want to query.

It's guaranteed that the sum of N over all test cases doesn't exceed 10^5

Output

For each query, print "YES"if Fathi can make it to the other side of the bridge. Otherwise, print "NO".

Answers to the queries are NOT case-sensitive and should be answered in separate lines.

Example

kudos.in	standard output
1 5 2 3 0 0 1 0 0 4 2 5	YES NO YES

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, Hady knows how to leverage his skill for one more chapter of the story of lifetime from another verse.

Hady thinks that maxflow algorithm is very simple and that anyone can write it. You are going to prove his point.

You have a tube composed of N ($1 \le N \le 2 \cdot 10^5$) short tubes called blocks with a diameter D_i each. The diameters of the blocks can be different.

You can apply K ($0 \le K \le 10^9$) operations on the tube. In each operation, you can choose one block of diameter D_i and replace it with another block with diameter $D_i + 1$.

Hady needs you to calculate the MaxFlow after applying no more than K operations knowing that the "MaxFlow"is the narrowest diameter in the tube.

Input

The first line of input data contains a single integer T ($1 \le T \le 10^4$) — the number of test cases.

Each test case consists of two lines.

The first line of each test case contains two integers N and K ($1 \le N \le 2 \cdot 10^5, 0 \le K \le 10^9$) — the number of the blocks and the number of operations respectively.

The second line of each test case contains exactly N integers $D_1, D_2, \ldots, D_n$ ($0 \le D_i \le 10^9$) —the diameters of the blocks

It's guaranteed that the sum of N over all test cases doesn't exceed $2 \cdot 10^5$

Output

For each test case, print a single integer — the MaxFlow

Example

leverage.in	standard output
2 5 1 3 2 3 4 9 3 10 1 2 3	3 5

Problem M. Marching into the future

Input file:	marching.in
Output file:	standard output
Balloon Color:	Light Green

Have you seen it yet? it has been there all along. Sometimes it takes an outsider point of view, to notice what is really there. Stories of people's lives have never been so similar. It only requires a thoughtful look. And the differences are suddenly clear.

Omar, Fudl, and Elhady wanted to meet to practice in a Gym Contest, They wanted to meet in a workspace as Omar was searching for an excellent contest to practice in, Elhady and Fudl were looking for a close workspace to meet there. ELhady and Fudl found N workspaces, for each workspace, it has an id ($workspace_i = i$, where i $(1 \leq i \leq N)$) and they are located at some point, each one of them knows the cost he needs to get to each workspace. They want to see which workspace is the least cost for them and as they are very greedy they want to see which workspace will have the total cost of each one of them as minimized as possible. some workspaces can have the same minimum total cost and at that point, they want the least workspace id.

Input

The input consists of multiple test cases. The first line contains a single integer T $(1 \leq T \leq 10^5)$ the number of test cases. Description of the test cases follows.

the first line of each test case contains one integer N $(1 \leq N \leq 10^5)$ denotes the number of workspaces.

The second line of each test case contains N integers $A_1, A_2, \ldots, A_n$ $(1 \leq A_i \leq 10^9)$ denotes the cost needed for each workspace for Omar.

The third line of each test case contains N integers $B_1, B_2, \ldots, B_n$ $(1 \leq B_i \leq 10^9)$ denotes the cost needed for each workspace for Fudl.

The fourth line of each test case contains n integers $C_1, C_2, \ldots, C_n$ $(1 \leq C_i \leq 10^9)$ denotes the cost needed for each workspace for Elhady.

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

Output

Print the least cost that could be achieved and then the workspace id they will meet there separated by a single space.

Example

marching.in	standard output
2 5 1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 3 1 1 1 1 1 1 1 1 1	6 1 3 1