The International Collegiate Programming Contest
Sponsored by ICPC Foundation

The 2019 Lebanese Collegiate Programming Contest

(Contest Problems)

جامعة بيروت العربية
BEIRUT ARAB UNIVERSITY

Beirut Arab University
Lebanon
October 2019

Problem A. Bitwise OR

Input file: `or.in`
Balloon Color: `Brown`

Given L and R, count how many pairs of numbers a and b ($L \leq a, b \leq R$) such that $a + b = a \mid b$. Where $\mid$ denote the bitwise OR operation.

As the number of pairs can be huge, you should calculate the answer *mod* $10^9 + 7$.

Input

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

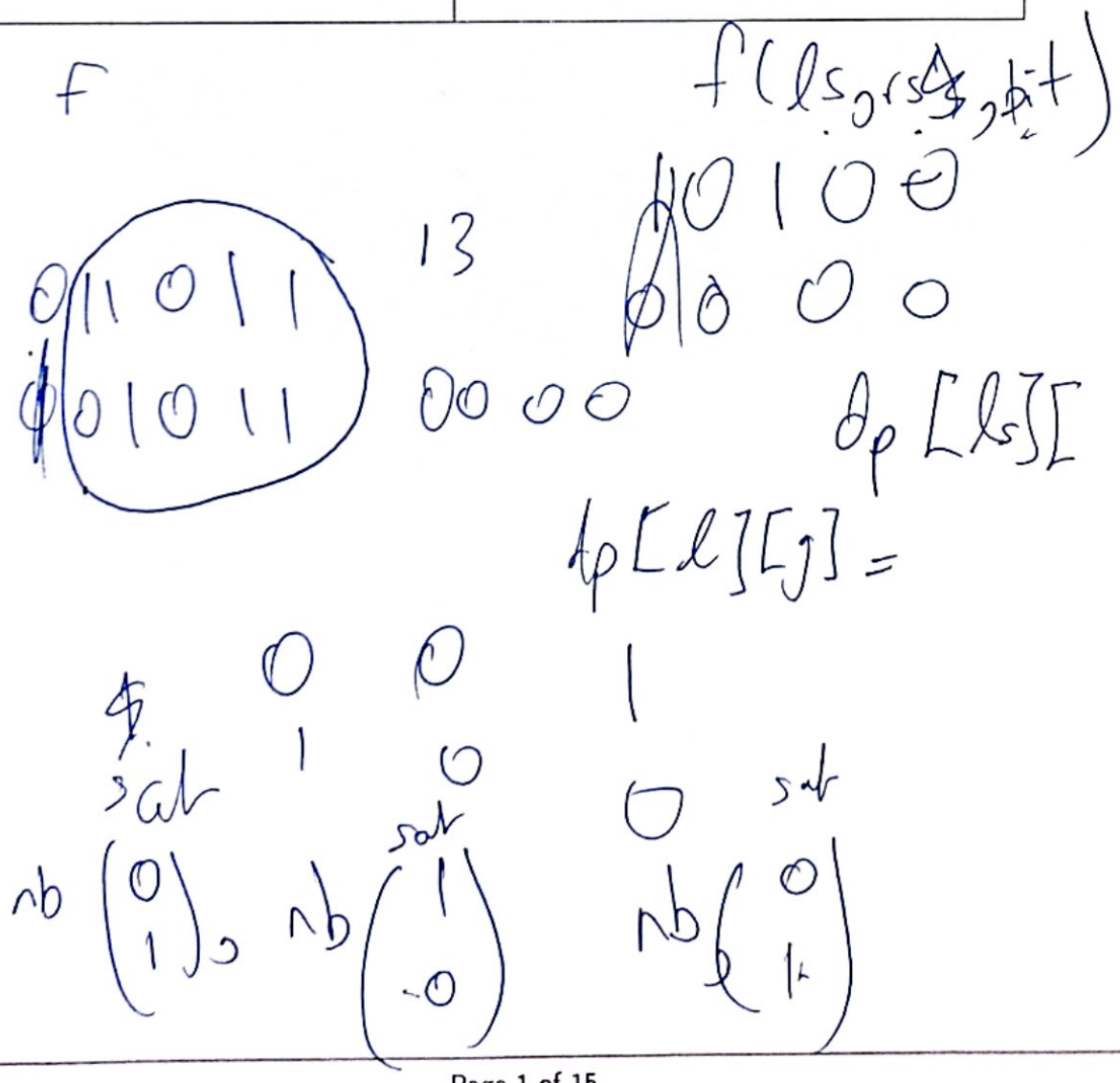
Each test case contains two integers L ($0 \leq L \leq 10^{18}$) and R ($L \leq R \leq 10^{18}$).

Output

For each test case print a single integer — the number of valid pairs *mod* $10^9 + 7$

Example

or.in	standard output
3 1 3 0 8 12 1000	2 43 49840



Problem B. Digit count

Input file: `dahab.in`
Balloon Color: `White`

Dahab, our aspiring young programmer who is only one year old has just learnt to count the numbers from 1 to 100, but she is also interested in the length of the number (the number of digits in it), can you help her?

Input

One number n ($1 \leq n \leq 99$)

Output

Print one number, the number of digits of n

Examples

dahab.in	standard output
5	1
12	2

Problem C. Inequality Headache

Input file: `inequality.in`
Balloon Color: `Orange`

A symbolic inequality is a relation between two strings representing integers that satisfies a **"less than"** condition between its two components. For example, the following inequality xy < yx can be satisfied if we find an integer composed of two digits x and y such that x and y are not equal and the value of xy is less than the value of yx.
Many solutions exist for this inequality; some of them are: 12 < 21, 25 < 52, 38 < 83, but not 72 < 27 since the inequality doesn't hold.The total number of solutions for this inequality is 36.

The rule is that whenever we use two different letters in an inequality (either in one integer or both), then they must be replaced by two different digits. In the same way, whenever we use two identical letters in an inequality (either in one integer or both), then they must be replaced by identical digits.

So, 11 < 131 is a solution of the inequality ee < eke and 1 < 711 is a solution of the inequality f < sff.

Both integers in the inequality are positive, decimal and without any leading Zeros (hence 03 < 303 is not a solution for the inequality tw < wtw.

The headache is to find the total number of different valid solutions of a given symbolic inequality. For example, the inequality s < ss has 9 solutions, namely: 1 < 11 upto 9 < 99.

Input

Your program will be tested on one or more test cases. The first line of the input file contains a single integer N specifying the number of test cases. Each test case is specified by two strings on two consecutive lines which represents an inequality such that the value of the symbolic string in first line should be less than the value of the symbolic string in second line.

The two strings are composed entirely of small alphabet letters and each of them is of length p, where $1 \leq p \leq 9$ and they represent a positive decimal value, with no leading Zeros.

Output

For each test case, output the result on a single line containing one number the required answer.

Example

inequality.in	standard output
2 xy yx s ss	36 9

decided not decided 1563 txyx2 a xx2y

Problem D. World Cup

Input file: wcup.in
Balloon Color: Pink

Ali was sleeping and when he woke up, he discovered that the world cup match has ended with a result of 2-1 for his team. He wondered what was the scenario of the goals,, There are three scenarios:

1- His team scored 2 goals then the other team sored a goal.
2- His team scored and then the other team scored and then his team scored again.
3- The other team scored and then his team scored 2 goals.

However, if the match ended 1-1 then there are two scenarios and if it ended 1-0 then there is only one scenario.
Compute the number of different scenarios for a given result.

Input

Your program will be tested on one or more test cases. Every line of the input file contains two non-negative integers x and y, representing the match result. The total number of goals (scored by the two teams) in any match is less than or equal to 65. The value of x or y being negative will indicate the end of the test cases.

Output

For each test case, output a single number, the count of different scenarios that corresponds to the match result

Example

wcup.in	standard output
1 1	2
1 2	3
2 1	3
1 0	1
0 1	1
0 -4	

$5C_2 \quad 3C_1$

$1C_6$

Problem E. Gunshots

Input file: `gunshots.in`
Balloon Color: `Gold`

A commander of a group of soldiers is thinking of improving the accuracy of gunshots made by the soldiers in his subdivision. Today is the last day of their camp and the bed sheets that the soldiers unfold on their beds will be thrown away after this camp. So, he is planning to use them in an exercise where the soldiers can improve their gun-shooting skill in a challenging and exciting atmosphere.

The exercise is simple: a bed sheet is folded; then a gunshot is aimed towards the folded sheet to make a hole in it. The winner is the soldier who makes the maximum number of holes in the sheet when it gets unfolded. However, the commander needs your help in designing a program which automatically counts number of holes in the unfolded sheet given the coordinates of the bed sheet, the coordinates of the hole, number of folds and how each fold was made.

Input

The input file starts with a single integer the number of test cases tc, then follows tc lines which contains five integers in the following order: the right R and the top T coordinates of the unfolded bed sheet (the original bed sheet), X and Y coordinates of the hole on the folded sheet, and the number of folds F.

The next F lines describe (in order) how the sheet was folded. Each of those lines contains a character and an integer n.

Character 'X' means that the folding is made vertically and the right portion of the sheet folds over left portion by the line x=n, whereas character 'Y' means that the folding was performed horizontally and the top portion of the sheet folds over the bottom portion by the line y=n.

$0 \leq X, Y, R, T \leq 10^9$

$1 \leq F \leq 10^4$

the sum of F over all case $\leq 10^5$

Output

One line for each test case which shows the number of holes made on the original bed sheet when it gets unfolded.

Example

gunshots.in	standard output
1 49 13 3 5 3 X 10 Y 9 X 20	4

Note

a hole is considered inside the sheet if it lies on the border of the sheet.

if in the operation X n there is no part of the sheet to the right of the line x=n you can ignore the command, likewise in the operation Y n if there is no part of i the sheet over the line y=n then ignore that command

Problem F. Baleez

Input file: baleez.in
Balloon Color: Yellow

Baleez is a driver who has a package that he wants to deliver from a city S to another city D in a country of N cities. There is a direct road between every two cities in this country. The problem is that his car has a problem in its fuel tank which makes its real capacity much less than the usual full capacity.

The amount of consumed fuel in the direct trip between any two cities is the distance between these two cities which can be computed from their coordinates and more importantly, there is a gas station in each city, so Baleez can refuel the gas container of his car. Baleez is suffering from his car problem because most of the times, he cannot take the direct road from S to D, which surely costs him less fuel than if he takes some intermediate cities in between.

Your job is to help him in computing the minimum necessary volume of gas needed in the trip from S to D using any number of intermediate cities. Baleez will use this result to decide if his car will be able to make it from S to D or not.

Input

The first line of input contains an integer, the number of test cases. Following, there are data for test cases. Each test case begins with a line containing one integer, N ($2 \leq N \leq 1000$), which is the number of cities. The next N lines each contains two integers x, y ($0 \leq x, y \leq 1000$) representing the coordinates of the N cities in the country, where S and D are the first two cities respectively, followed by the N-2 other cities in the country.

Output

There should be one line for each test case in the output. Each line should contain one floating point number which is the minimum necessary volume of the gas container, printed to 8 decimals.

Example

baleez.in	standard output
2 2 0 0 3 4 3 17 4 19 4 18 5	5.00000000 1.41421356

Problem G. Salah and encryption

Input file: `string.in`
Balloon Color: Red

Salah loves history. He read that there was a real genius roman military general named Julius Caesar. He had a problem that when he sent a message, enemies would steal that message before reaching its destination and know his secrets. One day, he was thinking for a way to change the form of his message to make his friends understand it while preventing his enemies from understanding it.

His way was to shift letters by one. For example:

a becomes b

b becomes c

...

z becomes a

Soon however, his enemies discovered his secret so he decided to change the shifting key.

So given the new shifting key k and a character c output the the character it becomes after shifting.

Input

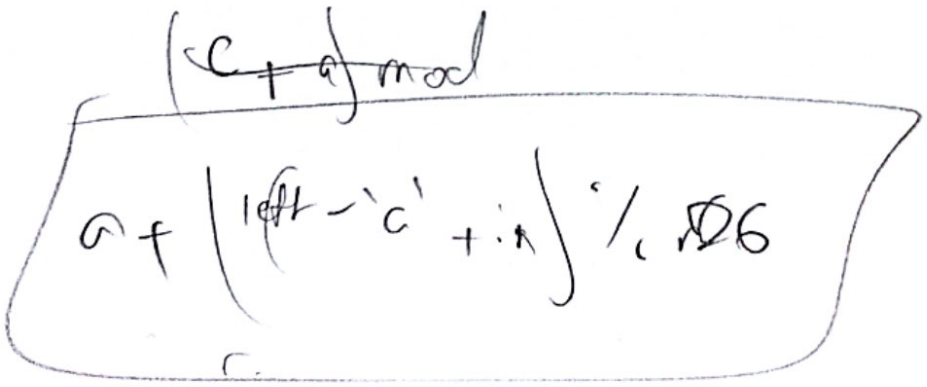
One line that contains k and c where k is the encryption key ($0 \leq k \leq 25$) and c is a lowercase English letter.

Output

Print single line containing one char, the result of shifting c by k.

Examples

string.in	standard output
3 a	d
2 z	b



Problem H. Expected Sum

Input file: sum.in
Balloon Color: Purple

You are given a grid of $N * N$ cells. Cells are numbered from 1 to $N * N$ starting from top left cell to the bottom right one. For example, if $N = 3$, then you'll have the following grid :

1 2 3

4 5 6

7 8 9

You are asked to calculate the expected value of the sum of n distinct cells chosen from the grid randomly such that no two cells are on the same column and no two cells on the same row.

Input

First line of input contains one integer T $1 \leq T \leq 10^5$ the number of cases then follows T lines each line contains one integer N $1 \leq N \leq 10^6$

Output

For each test case print one number the answer, the answer will be accepted if the its absolute or relative error is $\leq 10^{-6}$

Example

sum.in	standard output
5 1 2 3 4 5	1.00000000 5.00000000 15.00000000 34.00000000 65.00000000

Problem I. Get The Sum

Input file: `sumgenerated.in`
Balloon Color: `Dark green`

You have $n * n$ $2D$ array.

Your friend generated a new array of length n where the $i - th$ element of the array is the bitwise xor of minimum number of row i and maximum number of column i in your array.

Your friend challenged you to get the sum of his generated array.

Can you print the sum ?

Input

First line contains single integer t the number of test cases.

First line of each test contains single integer n ($1 \leq n \leq 500$) the dimension of the array.

Following n lines each contains n integer a_{ij} ($1 \leq a_{ij} \leq 10^9$). The numbers in the $2D$ array.

Output

Print t lines each contains single integer the sum of the generated array.

Example

sumgenerated.in	standard output
2 3 1 1 1 1 1 1 1 1 1 5 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	0 84

Problem J. Intergalactic Collegiate Programming Contest

Input file: `subtree.in`
Balloon Color: `Black`

It's year 3000! Many things changed, planets were discovered, earth became a part on a multi-galactic organization, and aliens were basically our allies. However, one thing remained the same, ICPC contests!

ICPC is still a multi-tier contest in year 3000, but there is an extra tier after ICPC, IgCPC! Intergalactic Collegiate Programming Contest, where 3 beings from participating universities across the universe compete to win the one true trophy and become officially the smartest beings in the universe!

The qualified teams from each planet have to travel to planet S where the IgCPC is held.

A network of connections was built between different planets in the universe such that **there is exactly one path between every distinct pair of planets**. Therefor the hierarchy of the universe took the shape of a rooted undirected tree where **planet 1 is the root**.

Now teams from planets in the Andromida galaxy are in trouble, the contest starts tomorrow and they haven't traveled to the planet where the contest is held yet, now it so happens that all the planets in the Andromida galaxy form the subtree of planet R (including R itself)

The the IgCPC asked you to help them compute the total distance traveled by all teams from the Andromida galaxy (subtree of planet R) to the planet where the contest is held (planet S) to help compute the transportation budget of the Andromida galaxy.

Input

First line of input contains one integer T then follows T test cases each case start with two integers N, Q where $1 \leq N, Q \leq 10^5$ then follows N-1 lines each containing three integers u, v, d where $1 \leq u, v \leq N, u \neq v, 1 \leq d \leq 10^5$ indicating that there is a connection between planets u and v with distance d then follows Q lines each containing two integers S and R ($1 \leq S, R \leq N$)

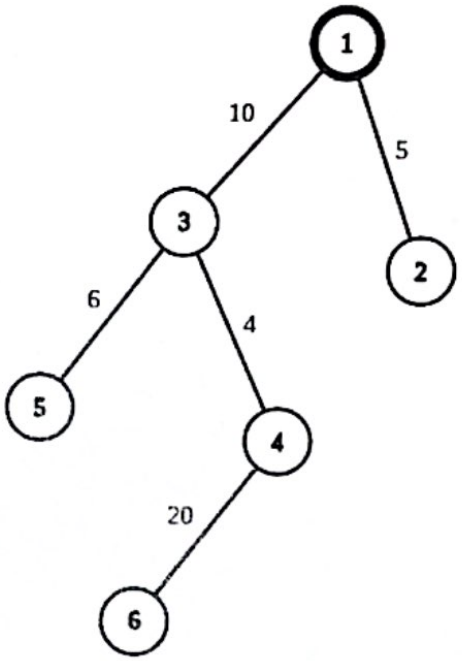
Output

For each query print one number the sum of distance from all planets in the subtree of planet R (including R) to planet S

Example

subtree.in	standard output
1 6 4 1 2 5 1 3 10 3 4 4 3 5 6 4 6 20 1 3 3 1 1 2 5 4	74 59 5 40

Note



In the first query S = 1,R = 3 so the subtree of R is the planets 3,4,5,6 with

distance(3,1) – 10

distance(4,1) = 10 + 4 = 14

distance(5,1) – 10 + 6 = 16

distance(6,1) – 10 + 4 + 20 = 34

so the answer for that query 10+14+16+34 = 74

Problem K. Colored Shelves

Input file: `shelves.in`
Balloon Color: `Light green`

Abanob loves reading a lot, he has many books in his home and some day he decided to create a public library and put his books in it for all people.

Abanob has N books ,each book having a type (represented by an integer code). He wants to buy some colored shelves to put his books on them because each type should have a distinct color for its shelves and also he wants the maximum number of books in each shelf of any type doesn't exceed S books. So, create a program to help Abanob to know how many shelves should buy for each books type.

Input

First line contains single integer T, the number of test cases.

Each test case, contains two lines, the first line having two integers N, S ($1 \leq N \leq 10^5$), ($1 \leq S \leq 50$), the number of Abanob's books and the maximum number of books that he can put in each shelf.The second line contains N integers, $b_1, b_2, \ldots, b_N$ ($1 \leq b_i \leq 10^4$) — the code type of each book.

Output

For each test case, print K, the number of distinct books types that he has, then print K lines, each line print two numbers, the first is the type code and the second is the number of shelves needed for all books of this type.

Note:- Print the books types ordered by ascending order depending on its code number.

Example

shelves.in	standard output
2 15 1 1 2 1 5 1 50 50 2 5 8 1 1 50 1 8 2 2 10 10	5 1 6 2 2 5 2 8 2 50 3 1 10 1

Problem L. Is Divisible?

Input file: `divisible.in`
Balloon Color: `Blue`

You are given two big integers x and y. Since x and y are big integers, they will be represented using four arrays a, b, c and d.

The first integer x is represented as:

$$x = {a_1}^{b_1} \times {a_2}^{b_2} \times \cdots \times {a_n}^{b_n}$$

in which n is the length of arrays a and b.

The second integer y is represented as:

$$y = {c_1}^{d_1} \times {c_2}^{d_2} \times \cdots \times {c_m}^{d_m}$$

in which m is the length of arrays c and d.

A number p is said to be divisible by a number q if p can be divided by q and the result is an exact whole number. For example, 15 is divisible by 3, because $15 \div 3 = 5$ exactly. But 9 is not divisible by 2 because $9 \div 2$ is 4 with 1 left over.

Your task is to determine if x is divisible by y. Can you?

Input

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

The first line of each test case contains two integers n and m ($1 \leq n, m \leq 10^4$), in which n is the length of arrays a and b, and m is the length of arrays c and d.

The second line contains n integers $a_1, a_2 \cdots, a_n$ ($1 \leq a_i \leq 10^4$), giving the array a. The third line contains n integers $b_1, b_2, \cdots, b_n$ ($1 \leq b_i \leq 100$), giving the array b.

The fourth line contains m integers $c_1, c_2, \cdots, c_m$ ($1 \leq c_i \leq 10^4$), giving the array c. The fifth line contains m integers $d_1, d_2, \ldots, d_m$ ($1 \leq d_i \leq 100$), giving the array d.

Output

For each test case, print "YES" (without quotes) if number x is divisible by y. Otherwise, print "NO" (without quotes).

Example

divisible.in	standard output
2 2 2 6 5 1 2 3 5 1 1 2 1 4 3 1 2 7 1	YES NO

Note

In the first test case, the value of x is ($x = 6^1 \times 5^2 = 150$) and the value of y is ($y = 3^1 \times 5^1 = 15$). Since 150 is divisible by 15, the answer is "YES".

Problem M. Mr. AH and the Beautiful Substring

Input file: `substr.in`
Balloon Color: `Silver`

Mr. AH loves to invent new games in his free time. Today, after deep thinking he invents a new game called `Searching for Beautiful Substrings`.

In this game, the player is given a string s and q queries, such that for each query he/she is given an integer k and a sorted string p consisting of unique lowercase English letters, and he/she has to check if string s contains a beautiful substring of length k which consisting **only** from the letters in p, such that each letter in p must appear **at least once** in the substring.

A beautiful substring is a substring from string s that we can rearrange its letters to make it a palindrome.

A `palindrome` is a word, phrase, number, or other sequence of characters which reads the same backward as forward, such as "`madam`" or "`racecar`".

A `substring` of s is a non-empty string $x = s[l \dots r] = s_l s_{l+1} \dots s_r$ $(1 \le l \le r \le |s|)$. For example, "`code`" and "`force`" are substring of "`codeforces`", while "`coders`" is not.

After Mr. AH finished he found out that this game is very hard for him, so he asked you to help him. Mr. AH will give you the string s and the q queries, can you find the answer for each query?

Input

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

The first line of each test case contains two integers n and q $(1 \le n \le 10^3, 1 \le q \le 2 \times 10^4)$, in which n is the length of a string s, and q is the number of queries.

The second line contains a string s of length n consisting of lowercase English letters only.

Then q lines follow, each line contains an integer k and a string p consisting of unique lowercase English letters $(1 \le k \le n, 1 \le |p| \le 26)$, giving the queries.

Output

For each query, print "`YES`" (without the quotes) if there is a beautiful substring that meets the given conditions, otherwise print "`NO`" (without the quotes).

The queries must be answered in the order given in the input.

Example

substr.in	standard output
1 10 3 abccdeaaer 4 abc 1 d 4 ae	NO YES YES