The International Collegiate Programming Contest
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The 2020 Syrian Collegiate Programming Contest

(Contest Problems)

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Problem A. CHECK!

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

Ali and Youssef are friends at the university. They are looking for a way to spend their time doing something together. Therefore, they exchange roles together every day in the choice of entertainment. Today Youssef will choose a way to have fun!

He remembered a game he always played with his brother it is called .. **CHECK!**

One of them (Youssef and his brother) used to start with counting from 1 and the other completing and so on. But when multiples of 5 .. that's different, they say CHECK instead of them. like this: 1, 2, 3, 4, CHECK, 6, 7, 8, 9, CHECK, 11,... Youssef told Ali about it, but Ali already knows it, he used to play it in his city, but in a different way, they say CHECK when multiples of 3 .. like this: 1, 2, CHECK, 4, 5, CHECK, 7, 8, CHECK, 10, 11,...

Now they wonder about what way will they play it ?! After they thought, they decided to play it by combining the two methods... at the multiples of 3 and 5, they would say CHECK instead of these numbers like this: 1, 2, CHECK, 4, CHECK, CHECK, 7, 8, CHECK, CHECK, 11, ... and so on.

But sometimes someone makes a mistake while playing this game, a mistake is said to be made if someone said a number that is multiple of 3 or 5 in his turn instead of CHECK.

And you know that both Youssef and Ali forget the rules of the game and they will always make this mistake.

And because it is the day of Youssef, he will start the counting. They will continue to exchange the count until the number N.

Now you wonder when a mistake has been made what is the probability that this mistake was made by Youssef?

Input

The first line of the input is the number of test cases T ($1 <= T <= 500$).

Each test case consists of a single integer N ($3 <= N <= 10^9$).

Output

For each test case, print a single line containing a single decimal number (rounded to exactly 2 decimal places) representing the probability of Youssef's mistakes.

Example

check.in	standard output
3 10 115 1000000000	0.60 0.50 0.50

Note

In the case of $N = 10$

The mistake will happen in rounds: 3,5,6,9,10 and rounds: 3,5,9 will be Youssef's turn to play so the probability that a mistake is Youssef's = 3 / 5 = 0.60

Problem B. Cars

Input file:	`cars.in`
Output file:	`standard output`
Balloon Color:	`Brown`

Jack is a young kid who likes to play a lot, one day he took the key to his father's car and started playing with it.

The key has one button that locks or unlock the car's doors such that if the doors were locked and the button on the key was pressed the doors get unlocked and if the doors were unlocked and the button on the key was pressed the doors get locked.

You know that Jack pressed the button on the key N times and you know if the doors of the car were locked or unlocked initially, can you tell Jack's father if the doors to his car are locked or unlocked after Jack has done playing with the key?

Input

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

Each test case consists of one line contains two integers N and X $(0 \leq N \leq 100)$,$(0 \leq X \leq 1)$ the number of times Jack pressed the button on the key and the state of the doors initially, $X = 0$ means the doors were initially locked and $X = 1$ means the doors were initially unlocked.

Output

For each test case, print '0' if the doors are now locked or print '1' if the doors are now unlocked, without the quote.

Example

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

Problem C. Super Palindrome

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

A number that is read from left to right as from right to left is called palindrome.

So the number 12321 is a palindrome but the number 147888 is not. Of course, palindromes have neither leading nor trailing zeroes, so 0220 is not a palindrome.

The number 21 (base 10) is not a palindrome in base 10, but the number 21 (base 2) is a palindrome (As the number in base 2 is $(10101)_2$).

A super palindrome number is a number when expressed in at least two of the bases from 2 to 10 formed a palindrome.

Write a program that reads two numbers (expressed in base 10) N and S, and then finds and prints (in base 10) the first N numbers strictly greater than S that are Super Palindromes.

Input

The first line of the input is the number of test cases T. Each test case consists two integers N ($1 \leq N \leq 15$) and S ($0 \leq S \leq 10^5$).

Output

For each test case output N lines each with a base 10 number that is super palindrome ,The numbers should be listed in order from smallest to largest.

Example

super.in	standard output
1 3 25	26 27 28

Note

In the first sample :

- 26 in base 3 $(222)_3$ and in base 5 $(101)_5$ are palindromes
- 27 in base 2 $(11011)_2$ and in base 8 $(33)_8$ are palindromes
- 28 in base 3 $(1001)_3$ and in base 6 $(44)_6$ are palindrome

Problem D. LNDS

Input file:	`nds.in`
Output file:	`standard output`
Balloon Color:	`Yellow`

You are given a digits string S of length N, every character in S is a digit from 0 to 9.

And you are also given Q queries, in each query, you will be given two indices L and R, the answer to the query is the size of the longest non-decreasing subsequence in the substring S[L,R].

A substring S[L,R] is a string equals to $S_L S_{L+1} S_{L+2} ... S_{R-1} S_R$ and its length equals to R - L + 1

A sequence a is called a subsequence of an array b if a can be obtained from b by deletion of zero or more elements. The longest non-decreasing subsequence of an array is the longest subsequence such that its elements are ordered in non-decreasing order.

Input

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

The first line of each test case contains two integers N and Q ($1 \leq N \leq 10^5, 1 \leq Q \leq 10^5$), the length of the string S, and numbers of queries respectively.

The second line contains a string S consists of digits.

The following Q lines contain two integers each, L and R ($0 \leq L \leq R < N$).

Output

For each test case print Q lines with the required answer.

Example

nds.in	standard output
1 8 4 07112556 0 4 1 2 1 3 2 5	4 1 2 4

Problem E. Friends

Input file:	`gift.in`
Output file:	`standard output`
Balloon Color:	`Gold`

There is a group consist of N friends, each one has a unique name. These friends have decided to exchange money rather than present a gift.

Each person will give some money to some (possibly all or none) of his friends. Likewise, each friend might receive money from some of his friends.

You are given for each one from this group a list L consists of names he will give money to and an integer X, the amount of money each one wants to give away.

Each one will divide the amount of money they want to give away evenly among the people in his list such that each of them will get the maximum integer amount of money they can get and the remaining money will go to the giver's bank account.

When anyone receives money they put it in their bank account.

Your goal is to calculate the value of happiness for each person, the value of happiness for someone = (the amount of money in this person's bank account - the amount of money this person was willing to give away at the beginning (X)).

Initially, all bank accounts have no money in it.

Input

The first line of the input is the number of test cases T ($1 \leq T \leq 50$). Each test case starts with a line containing a single integer N,($1 \leq N \leq 100$) indicating the number of friends in the group.

The next line contains N space-separated strings s, which denotes friends's names.($1 \leq |s| \leq 50$).

Then follows N blocks of lines, each block will consist of three lines:

The first line of each block contains a string S, which denotes the giver name, it's guaranteed that string S is a name from the given list of names and each name will appear exactly once as a giver.

Second-line of each block contains two integers X and n, which denotes the amount of money to give and the number of friends that will receive some money from him respectively. ($0 \leq X \leq 10^9$) , ($0 \leq n < N$).

Third-line of each group contains n space-separated distinct names, it's guaranteed that these names appear in the input.

Output

for each test case output N lines, in the i-th line print the name and happiness of the i-th person separated by a single space. The names should be printed in the same order as they appear on line 2 of the test.

Example

gift.in	standard output
1 5 dave laura owen vick amr dave 200 3 laura owen vick owen 500 1 dave amr 150 2 vick owen laura 0 2 amr vick vick 0 0	dave 302 laura 66 owen -359 vick 141 amr -150

Note

First sample explanation:

First, 'dave' will divide 200 dollars evenly between 'laura', 'owen', and 'vick'. each of them will receive 66 dollars and the remaining 2 dollars will go back to dave

Second, 'owen' gives 500 to 'dave':

Third, 'amr' will divide 150 dollars between 'vick' and 'owen' each of them will receive 75 dollars

Fourth, 'laura' divide 0 between 'amr' and 'vick'

Finally, 'vick' gives 0 to no one:

Problem F. Jumper

Input file:	jumper.in
Output file:	standard output
Balloon Color:	Green

Our gamer friend *SilentX* was playing a challenging game named *Jumper*, in this game his task is to jump over some nodes in a tree until he reaches a leaf and he was wondering what is the expected number of jumps it will take him to do so.

Every second *SilentX* randomly chooses a node in the subtree of the current node he's already in, and jumps to that node.

Given the description of the tree rooted at node 1 where *SilentX* starts, calculate the expected number of jumps it will take him to reach a leaf, where a leaf is a node that has no children.

Input

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

The first line of each test case contains a single integer $N(1 \leq N \leq 10^5)$ The number of nodes in the tree.

The next $N-1$ lines each contains two integers X_i and Y_i $(1 \leq X_i, Y_i \leq N)$ Denoting an edge between nodes X_i and Y_i.

Output

For each test case print the expected value in a single line.

Let $M = 10^9 + 7$, it can be shown that the expected value can be expressed as an irreducible fraction $\frac{p}{q}$, where p and q are integers and $q \not\equiv 0 \ (mod\ M)$. Output the integer equal to $p \cdot q^{-1} \ (mod\ M)$. In other words, output such an integer x that $0 \leq x < M$ and $x \cdot q \equiv p \ (mod\ M)$.

Example

jumper.in	standard output
3 1 3 1 2 1 3 3 1 2 2 3	0 1 500000005

Problem G. strings

Input file:	strings.in
Output file:	standard output
Balloon Color:	Blue

You have got a string S of lower case English letters and you are given Q queries

There are two types of queries:

In the query of type 0, you will be given an integer i and character **c** and you should change the value of index i in S to character **c**.

For the query of type 1 you will be given 4 integers $L1$, $R1$, $L2$, $R2$ defining two substrings in S, substring A = S[$L1$, $R1$] and substring B = S[$L2$, $R2$], let string $C = A + B$ (the concatenation of the strings A and B) you should answer whether string C is a palindrome string or not.

A substring S[L,R] is a string equals to $S_L S_{L+1} S_{L+2} ... S_{R-1} S_R$ and its length equals to R - L + 1

A palindrome is a string that reads the same backward as forward, for example, strings "z "aaa "aba "abccba"are palindromes, but strings "jarvis "reality "ab"are not.

Input

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

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

The next line contains an integer Q ($1 \leq Q \leq 10^5$), the number of queries.

The next Q lines contain the description of the queries, query of type 0 are given as 0 i **c** ($0 \leq i < |S|$) and **c** is an lower case English letter

and query of type 1 are given as 1 L_1 R_1 L_2 R_2 ($0 \leq L_1 \leq R_1 < |S|$),($0 \leq L_2 \leq R_2 < |S|$)

Output

For each query of type 2, print "YES"if string C is a palindrome and "NO"otherwise.

Example

strings.in	standard output
1 aabcdaac 5 1 0 2 5 6 1 0 3 0 2 0 4 b 1 2 2 3 4 1 2 4 2 4	YES NO YES YES

Problem H. Playing Marbles

Input file:	`marbles.in`
Output file:	`standard output`
Balloon Color:	`Rose`

Bernard and his friends love to play with marbles. They put them on the ground and start flicking them one by one.

You can picture the surface of the ground as a 2D plane and the marbles as circles with radius r. They start flicking marble i from position (x_i, y_i) with an initial velocity of (v_{xi}, v_{yi}).

The surface of the ground has a resistance of $R\ m/s^2$. That means that the velocity of a marble decreases by $R\ m/s$ each second. After flicking each marble they waited for it to stop moving before they started flicking the next one.

If a moving marble collides with a stationary marble, the moving marble stops immediately.

It is guaranteed that the initial position of each marble won't overlap with the final position of any previously flicked marble.

After they were done flicking all marbles, they noticed that the marbles were forming groups.

A set of marbles is called a group if for each pair of marbles i, j, either marbles i and j are directly touching each other or have an arbitrary number of marbles connecting them.

Your task is to find out the maximum beauty among all groups. The beauty of a group is the number of marbles in that group. Can you figure it out?

Input

The first line contains 3 integers: N, r and R ($1 \le N \le 1000, 1 \le r \le 100, 1 \le R \le 10^7$), the number of marbles, the radius of each marble and the resistance of the ground respectively.

The next N lines contain information about each marble given in the order they are flicked with. Each line contains 4 integers: x_i, y_i, v_{xi} and v_{yi} ($-10^7 \le x_i, y_i, v_{xi}, v_{yi} \le 10^7$), the initial position and velocity of marble i.

Output

Output 1 integer, The maximum beauty of all groups after the flicking is done.

Examples

marbles.in	standard output
5 1 1 0 0 0 2 2 0 0 2 4 0 0 2 6 0 0 2 8 0 0 2	5
5 1 1 0 0 0 1 2 0 0 2 4 0 0 2 6 0 0 2 8 0 0 2	5
2 1 1 0 0 5 0 0 0 -5 0	1

Problem I. Mohamed And The Maximum Power

Input file:	`sub.in`
Output file:	`standard output`
Balloon Color:	`Violet`

Mohamed invents power bottles, the bottle that is marked with x adds x units of power to you, *but* there is a side effect.

if you take two bottles with powers x and y, and absolute(x-y) $> Lim$ your body will explode.

Now, Mohamed prepared N bottles of power and want to increase his power to the maximum without exploding of course :),

but he can't do that, so he wants you to help him.

you will be given an array of size N contains the power of each bottle and you will be given Lim as described above.

print the maximum power you can get if you choose a valid sub-set from the array.

a valid sub-set of the array is any sub-set such that for every pair of elements (x, y) in that sub-set absolute(x-y) $\leq Lim$

Input

The first line of the input contains the number of test cases T. Each test case consists of two lines.

The first line contains two integers N and Lim $(2 \leq N \leq 10^5)$, $(0 \leq Lim \leq 10^9)$.

The second line contains N space-separated integers a_1, a_2, a_3, a_N $(1 \leq a_i \leq 10^5)$ representing the power of each bottle.

Output

for each test case print a single line contains the maximum power you can get if you choose a valid sub-set from the array.

Example

sub.in	standard output
3 3 4 1 2 3 5 5 20 5 6 30 25 5 1 1 2 3 3 5	6 55 8

Note

In the first test case :

Lim = 4 so all the array is a valid sub-set because for every two elements (x, y) their absolute(x-y) <= 4.

In the second test case :

Lim = 5

all valid sub-sets are :

$\{5\}, \{6\}, \{20\}, \{25\}, \{30\}$

$\{5, 6\}, \{20, 25\}, \{25, 30\}$

the maximum subset is $\{25, 30\} = 55$.

In the third test case:

the maximum subset is: $\{2, 3, 3\}$

Problem J. Happiness

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

Some people believe that happiness spreads exponentially. And that the number of people that who are happy in some country is a power of two. You are given a number N and you should tell what is the minimum number of countries such that the total number of happy people in these countries equals to N.

Input

The first line of the input is the number of test cases T. Each test case consists of a single integer N ($1 \leq N \leq 10^5$).

Output

For each test case output a single line with the minimum number of countries that satisfy the rules.

Example

happy.in	standard output
1 60	4

Problem K. Good Zeros

Input file:	`zero.in`
Output file:	`standard output`
Balloon Color:	`Pink`

Given an array A of integers of size N, and Q queries, every query represents one of the following two types:

Type 1: this type is represented by three integers (t, i, val). In this query type t equals to 1 and you need to update the value at the index i in the array to val.

Type 2: this type is represented by three integers (t, i, x), in this query type t equals to 2 and you need to print the number of subarrays of the array A starting at index i and ending at index r $(i <= r <= n)$ and the result of the multiplication of $A[i] \cdot A[i+1] \cdot .. \cdot A[r]$ has at least x trailing zeros.

The number of Trailing zeros in a number denotes the number of zeros at the end of the number, for example, the following numbers have 3 trailing zeros (1001000, 45000, 1000).

The subarray of an array A is a contiguous part of the array $(A[i], A[i+1], ..., A[j])$ for some $(1 \leq i \leq j \leq N)$.

Input

The first line of the input will contains two integers N, Q $(1 \leq N, Q \leq 2 \cdot 10^5)$.

The second line will contain N integers $A[1], A[2], ..., A[n]$ $(1 \leq A[i] \leq 10^{18})$.

The next Q lines either (t, i, val) or (t, i, x) $(1 \leq t \leq 2, 1 \leq i \leq N, 1 \leq val \leq 10^{18}, 1 \leq x \leq 2 \cdot 10^6)$, where t is the type of query (either 1 or 2).

Example

zero.in	standard output
6 6 12 15 6 3 35 4 2 1 2 2 3 2 2 3 1 1 2 1 2 1 2 2 2 1	2 0 2 0 2