Problem A – Palindrome

A palindrome is defined as a string which reads the same backward or forward. For example, "radar" and "level" are palindromes while "foot" is not.

You are given a non-empty string S consists of only capital letters. You can modify the string by replacing a character by one other character.

Your task is to calculate the minimum number of replacing operations you need to apply, in order to transform S into a palindrome.

Input

The first line of the input is T - the number of tests ($T \le 100$). Then T tests follow. Each test consists of a string of no more than 100 capital letters.

Output

For each test, print the minimum number of operations you need to apply.

Sample

Sample input	Output for sample input
4 RADAR LEVEL FOOT ALABAMA	0 0 1 1

Problem B – AB Game

An and Binh are playing a game on numbers. Initially, An has a positive number A, Binh has a positive number B. An and Binh will alternatively do some transformations in their numbers. An plays first.

In each turn, a player will choose an integer number X, so that X is not less than the number of his opponent. Then he will subtract X a few times from his number. The winner is the person who gets the number 0 after finishing his turn.

Given A and B, determine who the winner will be. Suppose that both An and Binh follow the best strategy.

Input
The input contains multiple test cases, each test case is described in one line, consists of two positive integers A, B ($A, B \le 10^9$).

Output
Write the winner for each case in one single line.

Sample

Sample input	Output for sample input
3 3 2 3	An Binh

Explanation
In the first case, An has number 3, Binh has number 3, An will subtract 3 from his number and get 0, so he is the winner.

In the second case, An has number 2, Binh has number 3. An can subtract any numbers greater than or equal to 3 from his number. Apparently, he will get a negative number after his turn. Then, Binh will subtract 3 from his number and get 0. So, Binh is the winner.

Problem C – Escape the pyramid

A group of youngsters get lost in the pyramid of Tutankhamun in Egypt. The foods and drinks are becoming exhausted. But fortunately, they find a magical ancient stone that contains a mathematical problem which people had talked about it for years. There is a rumor that successfully solving the problem, a secret way out would appear magically. It seems like this is their only hope.

There is a natural integer P graved in the stone, which is the number of people have died in the pyramid. There is also an old keypad next to the ancient stone. To escape from the mausoleum, one must type the exact sequence of numbers in the keypad. The stone said that the sequence is the smallest positive integer N that the product of all of its digits is equal to P.

Input

The first line contains a number T, which is the number of test cases ($T \le 1000$).

Each of the next T lines contains one test case, consists of an integer P ($P \le 10^{15}$).

Output

Print the result for each test case in one single line. If there is no such integer, print -1.

Sample

Sample input	Output for sample input
2 1 10	1 25

Problem D – Sequence

Given an integer N, which is created by consecutively writing all the number from 1 to 10^{15}. Thus, the first digits of N are:

N = 123456789101112131415161718192 0...

Now, an integer M will be created by removing k digits from N so that M is largest.

Given 2 integers k and p, find the p^{th} digit of M.

Input
The first line contains a number T, which is the number of test cases.
Each of the next T lines contains a test case, consists of k and p (k, p ≤ 10^{15}).

Output
Print the result of each test case in one single line.

Sample

Sample input	Output for sample input
2 5 3 9 1	8 9

Problem E – Cube

Given 3 solid cuboids with the length of their dimensions. Determine whether or not we could stick these 3 cuboids so that they form a solid cube (there is no empty space inside the cube).

Input

The first line contains a number T which is the number of test cases. Each test case is described as follow:

- The first line contains 3 integers a1, b1, c1 that are the dimensions of the first cuboid.
- The second line contains 3 integers a2, b2, c2 that are the dimensions of the second cuboid.
- The third line contains 3 integers a3, b3, c3 that are the dimensions of the third cuboid.

Output

Print the result of each test case in one single line.

Sample

Sample input	Output for sample input
2 3 3 1 3 3 1 3 3 1 3 3 1 3 3 1 3 2 2	TRUE FALSE

Problem F – Queue

Given an array arr[] of N positive integers. A single operation on this array is to decrease value of the first element by one first, followed by:

- Value of the first element equals to 0. In this case, the first element will be removed from the array,
- Value of the first element is greater than 0. In this case, the first element will be moved to the end of the array.

There are total K operations being applied on the array. Could you determine the array after these operations?

Input

The first line contains an integer T that is the number of test cases. Then, each test case will be described as follow:

- The first line contains two integers N, K ($N \leq 10^5$; $K \leq 10^{18}$).
- The second line contains values of N elements of arr[] ($arr[i] \leq 10^{18}$).

Output

Print all the elements left in each test case in one line. If the array is empty, print -1.

Sample

Sample input	Output for sample input
1 7 10 1 3 3 1 2 3 1	2 1 1

Problem G – Easy tree

Given a rooted tree with N nodes numbered from 1 to N. The root is node 1. Initially, each node has its own value. There are 2 types of query:

- 1 u v: add v to the value of u, subtract v from the value of direct children of u, then add v to the value of direct children of direct children of u, then continue subtract v from directs children of direct children of direct children of u, so forth.
- 2 u: return the value of node u.

Input

The first line contains a number T, which is the number of test cases. Each test case is described as follow:

- The first line contains 2 integers N and M, which are the number of nodes and queries, respectively ($1 \le N, M \le 200{,}000$).
- The second line contains N integers a_1, a_2, a_3,...a_n which are the initial value of N nodes ($|a_i| \le 10^9$).
- Each of the next N – 1 line contains two integers x, y, denoting that there is a edge connecting vertices x and y.
- Each of the next M lines contains a query in one of two types mentioned above ($1 \le u \le N$; $|v| \le 10^9$).

Output

Print result of each query of type 2 in one single line.

Sample

Sample input	Output for sample input
1 10 10 418 45 865 869 745 901 177 773 854 462 4 8 1 4 3 6 1 5 1 10 5 9 1 2 4 7 1 3 2 2 1 6 246 1 4 296 1 2 378 1 8 648 2 6 1 5 288 1 6 981 1 2 868 2 7	45 1147 -119

Problem H – Best spot

In 3D coordinate system, given a group of N points. The i^{th} point has its coordinates (x_i, y_i, z_i). We define function F is the sum of Manhattan distances from a single point (x, y, z) to every point of this group:

$$F(x,y,z) = \sum_{i=1}^{n} |x - x_i| + |y - y_i| + |z - z_i|$$

Find the point P that minimizes the value of function F.

Input

The first line contains an integer T that is the number of test cases. Then, each test case will be described as follow:

- First line contains N ($N \le 10^5$), which is the number of points in the group.
- Each of the next N line contains 3 integers x_i, y_i, z_i that is the coordinates of the i^{th} point of the group ($|x_i|, |y_i|, |z_i| \le 10^9$).

Output

For each test case, print the coordinates x, y, z of the point P in line one.

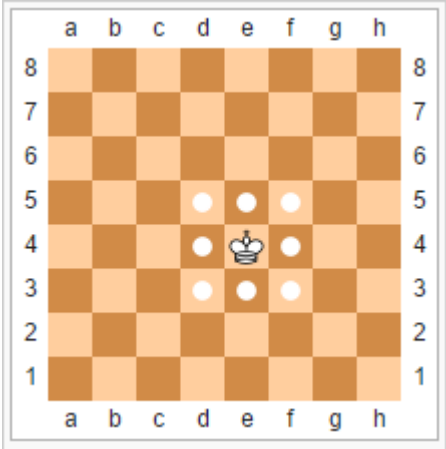
If there are multiple results, print the one with minimum x. If there are multiple results with the same minimum x, print the one with minimum y. If there are multiple results with the same minimum x and y, print the one with minimum z.

Sample

Sample input	Output for sample input
1 1 1 1 1	1 1 1

Problem I – Kings

In chess, a King can attack eight adjacent cells (vertical, horizontal or diagonal). A chess board has 10 rows and n columns. Your task is to count the number of ways to place exactly two kings in each column so that no King can attack any others.



Input

The input consists of multiple test cases. The first line of input contains an integer T ($1 \le T \le 200$), the number of test cases. Each of the next T line contains a test case, which consists of an integer n ($1 \le n \le 10^9$).

Output

For each case, print the result modulo 2^{32} in one single line.

Sample

Sample input	Output for sample input
3 1 2 3	36 210 1350

Problem J – Ninja

Nick is a Ninjaholic, he can spend entire day watching Ninja film. Someday, he decided he would practice very hard to become a ninja. However, Nick did not have a very sharp sword - the most important weapon of a ninja, so he went to Life-Dust-Big-Market to find a desire sword.

He started to practice with the new ninja sword by slashing a straight bamboo of length L. He randomly slashed the bamboo at N - 1 distinct point and gets N pieces. After several passionate-practicing days, Nick became master of ninja sword. Now he wants to train with darts.

He got a creative idea to save money when training with darts. Instead of buying dartboards, he wants to use pieces slashed when he practiced with ninja sword to form bull's eyes: each bull's eye is a triangle formed by exactly 3 of N pieces of the same bamboo that they belong to before being slashed. Nick is afraid that he cannot have enough bull's eyes to train with darts, so he wants to calculate the probability that there exists 3 of the N pieces slashed from a bamboo can form a triangular bull's eye.

Because Nick spends all day watching Ninja film, he does not focus on studying Math much, so he asks you to help him.

Input

The input consists of multiple test cases. The first line of input contains an integer T ($1 \le T \le 50$), the number of test cases. Each of the following T lines contains a test case. Each test case consists of two positive integers L, N ($1 \le L \le 100$, $1 \le N \le 50$).

Output

For each test case, print a single line contains a decimal number - the probability that there exists 3 of the N pieces slashed from a bamboo of length L can form a triangular bull's eye with exactly 13 digits after the decimal point.

Sample

Sample input	Output for sample input
3 1 2 2 3	0.0000000000000 0.2500000000000

Problem K – Subsequence

You are given a list of N positive integers ($1 \le N \le 100{,}000$), each of them is less than or equal 10,000, and a positive integer S ($1 \le S \le 100{,}000{,}000$). A subsequence of a list is defined as a non-empty sequence of contiguous numbers from the list. Your task is to find the minimal length of the subsequence of the given list, which the sum of the elements in the subsequence is greater than or equal to S.

Input

The input consists of multiple test cases. Each test case is described as follow:

- The first line contains two numbers N and S.
- The second line contains N positive integers of the given list.

Output

For each test case, print the result on a single, print 0 if there is not any suitable sequence.

Sample

Sample input	Output for sample input
10 15 5 1 3 5 10 7 4 9 2 8 5 11 1 2 3 4 5	2 3

Problem L – Inner points

Given a triangle in the Cartesian coordinate system. Determine the number of points with integer coordinates that lie inside the triangle. Note that points lying on the edges of the triangle should not be counted in.

Input

The first line contains a number N, which is the number of test cases. Each of the next N lines contains one test case, consists of 6 integers x_A, y_A, x_B, y_B, x_C, y_C that are the coordinates of 3 vertices of the triangle ($-500 \le x_A, y_A, x_B, y_B, x_C, y_C \le 500$).

Output

Print the result for each test case in one single line.

Sample

Sample input	Output for sample input
2 0 0 2 0 0 2 2 1 1 6 -5 -2	0 18