Problem A. Bitcoin

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	256 megabytes

In the last months, Bitcoin value dropped from 19K dollars to 7K. Your friend Johnny is really stressed about the dropping value, he decided to calculate the number of days he loses money (i.e. days where bitcoin value is smaller than the money he invested).
For each day, Johnny wants to calculate the number of days after which he will stop losing money (even for one day, he is so desperate). Johnny is very bad at programming, he is seeking your help!

Let's take an example of 5 days [21,19,19,34,15], the output would be [2,0,0,1,0] because if Johnny invested in the first day he would be in a loss state for the next 2 days before he gains, but if he invests in day 2 or 3, he is in a profit state in the next day since the value of the bitcoin is greater than or equal to its value in the current day.

Input

The first line of the input contains one integer, T, denoting the number of test cases ($1 \leq T \leq 10$).
The first line of each test case contains N ($1 \leq N \leq 10^5$), the total number of days we have as data.
The second line contains N positive integers ($1 \leq d_i \leq 10^{12}$) denoting the values of bitcoin in day i.

Note that this problem has a large amount of input, so please use fast I/O.

Output

For each test case output N positive integers denoting the number of loss days before his investment generates profit.
We suppose that the investment will generate profit after the last day (i.e. day $N + 1$).

Example

standard input	standard output
2 5 21 19 19 34 15 9 2 3 55 2 11 22 122 43 9	2 0 0 1 0 0 0 3 0 0 0 2 1 0

Problem B. Game of Life

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

The Game of Life is a cellular automaton devised by the British mathematician John Horton Conway in 1970. It is a zero-player game, meaning that its evolution is determined by its initial state, requiring no further input. One interacts with the Game of Life by creating an initial configuration and observing how it evolves.

Let's consider the following evolution rules :

1. Each blue cell will become red.
2. Each red cell will split into a red and a blue cell (in this order).

We first start with only one blue cell "B", after 5 generations the sequence will be:

"B" $\rightarrow$ "R" $\rightarrow$ "RB" $\rightarrow$ "RBR" $\rightarrow$ "RBRRB" $\rightarrow$ "RBRRBRBR".

The blue cell we had at the beginning has evolved into a red one, then this new cell gave birth to two new cells : a red and then a blue one. The first one gave birth to two new cells and the second cell became red and so on.

Let Seq(n) be the sequence we'll get after n generations. For instance, Seq(5) = "RBRRBRBR".
Given a pattern S and an integer n, we want you to calculate the number of subpatterns of Seq(n) (number of repetitions, overlapping or not) that are equal to S.
It is guaranteed that S contains only the characters 'R' and 'B'.

Input

The first line of the input contains one integer T giving the number of test cases ($1 \leq T \leq 10$).
Each test case consists of one line containing an integer n ($1 < n \leq 1000$) and a string S ($1 \leq |S| \leq 100\,000$).

Output

For each test case output the maximum number of subpatterns of Seq(n) that are equal to S. This number can be very large, so print it modulo 1000000007.

Example

standard input	standard output
2 2 B 5 B	1 3

Problem C. Passwords

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Saka is the best League of Legends player in the world. On a normal day while carrying a new game, someone was trying to hack his account, so he decided to make his password much stronger and complicated.

A few days later, Saka was trying to connect to his account, but unfortunately he couldn't remember the new password. The only thing he remembers is that the password contains N non-negative integers $(x_i)_{1 \le i \le N}$ separated by a single dot (".") where $\sum_1^N x_i = P$.

Saka wonders, what is the maximum number of passwords he has to test in order to recover his password?

Note that the non-negative integers cannot contain any leading zero.

An example of a password: "15.2.45.6.12" where $N = 5$ and $P = 80$.

Input

The first line of the input file contains one integer $T(1 \le T \le 1000)$ representing the number of test cases followed by T test cases.
Each test case starts with a line containing two integers $N(1 \le N \le 10^5)$ and $P(1 \le P \le 10^5)$.

Output

For each test case print a single line containing the number of possible passwords. Print this value mod $10^9 + 7$.

Example

standard input	standard output
4 4 1 3 2 5 2 3 6	4 6 15 28

Note

In the first test case there are 4 possible passwords ("1.0.0.0", "0.1.0.0", "0.0.1.0", "0.0.0.1").

Problem D. Robot vacuum cleaners

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	64 megabytes

Rajae is a typical Moroccan housewife who cares a lot about the hygiene of her house. One day, while zapping the TV, she came across an advertisement of robot vacuum cleaners. After a long debate with her husband, she managed to convince him to buy one.

Robot vacuum cleaners are a very fun way to get a rather boring household chore done. The main problem with those robots is that they have a very limited battery capacity and robots with higher capacities are very expensive. Here we define the capacity of a robot as the area it is capable to clean before you'll have to recharge it.

The house consists of N rooms connected by M corridors and she is planning to use the robot to clean up the corridors. The robot can be located at any room and will follow a path that she will define, the only condition is that the cleaning process cannot be interrupted (the robot must clean all the corridors) and the starting and the ending positions must be the same.
Rajae is seeking your help to calculate the minimum capacity required to clean all the corridors.

Note that the robot is very heavy and cannot be carried. Also, the robot is allowed to clean a corridor more than once.

Input

The first line of the input file denotes the number of test cases. Each test case starts with one line containing 2 integers : N the number of rooms and M the number of corridors a robot has to clean ($2 < N \leq 20$ and $1 < M \leq 100$).
Then follow M lines with three integers each u,v,w, meaning that a corridor of area w is connecting room u to room v ($0 \leq$ u,v $<$N and $1 \leq w \leq 100$).

Output

For each test case output a single integer : the minimum battery capacity required by the robot to clean all the corridors.

Examples

standard input	standard output
1 6 8 0 1 1 1 2 3 2 5 2 0 3 2 1 3 5 3 4 4 2 4 6 4 5 1	30
1 3 2 0 1 1 1 2 1	4

Note

One optimal path for the second input file is $0 \to 1 \to 2 \to 1 \to 0$.

Problem E. Funny numbers

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Dr. HAMMOU is a brilliant mathematician, this year he received the Fields Medal for his work on funny numbers.
Funny numbers are positive integers that are equal to the sum of factorials of their digits. For example, 145 is funny because : $1! + 4! + 5! = 145$.
More formally, a number J where $J = \sum_{i=0}^{N} x_i \times 10^i$ is funny if $J = \sum_{i=0}^{N} x_i!$.

Given an integer J, we want you to verify if it is funny or not. As this integer can be very large, it will be represented as a product of prime numbers.

Input

Your program will be tested on one or more test cases. The first line of the input file will be a single integer $T(1 \leq T \leq 100)$ representing the number of test cases, followed by T test cases.
In the first line of each test case you'll find one integer n denoting the number of prime factors of J $(1 \leq n \leq 100)$.
Each one of the following n lines will contain two integers p_i and a_i where p is a prime number $(2 \leq p_i \leq 10^{18}$ and $0 \leq a_i \leq 10^6)$.

Output

For each test case print 'Funny' if the number $J = \prod_{i=1}^{n} {p_i}^{a_i}$ is funny, otherwise print 'Not Funny'.

Example

standard input	standard output
2 3 2 0 5 1 29 1 3 2 1 5 1 29 1	Funny Not funny

Note

The factorial of a non-negative integer n, denoted by $n!$, is the product of all positive integers less than or equal to n.

Problem F. Rock piles

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	1024 megabytes

Preparations for the MCPC 2018 begun early this year. In this new edition we promise you something special : As you might have noticed, we always want to offer the best conditions to our contestants, so we decided that this year's contest will be held in Reykjavik, Iceland.
More than half of the Icelandic population believe in Elves, people often build tiny wooden elf houses in their gardens for elves to live in. Iceland road builders take elves very seriously and since elves live in rock outcroppings,builders consult with an elf expert before routing a new road or highway through rock piles that may be elf habitats.

Рис. 1: A rock pile

Elf experts say that if a pile of height $N+1$ is an elf habitat, you'll certainly find under each rock at level i ($i \geq 1$) $i-1$ rocks (at level $i-1$) and at the top of that pile (level $N+1$) there is a rock under which there are N rocks.

Given the height of a pile, we want you to calculate the number of rocks in that pile.

Input

The input consists of multiple test cases, the first line of the input file contains one integer T denoting the number of test cases ($0 < \mathrm{T} \leq 1000$).
Each test case is denoted by a single integer N as described above ($2 \leq N \leq 10^6$).

Output

For each test case output one line containing the number of rocks. This number can be very huge, print it mod $10^9 + 7$.

Example

standard input	standard output
3 2 4 10	5 65 9864101

Problem G. Omar and Fibo-Tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	8 seconds
Memory limit:	256 megabytes

Today is Omar's birthday. His mom being a math teacher, has brought him a fibo-tree.

A fibo-tree is a tree where each node with index i is associated with a number p_i, such that the node's value is $fibo(p_i)$. $fibo(n)$ is the n^{th} fibonacci number.

Omar's mom won't let him cut the cake if he doesn't answer her puzzle: given Q queries, where each one of them contains two integers, representing the indices of nodes in the tree, find the sum of all the nodes' values in the simple path between these given nodes.

Please, help Omar with this puzzle.

The Fibonacci numbers are the sequence of numbers $\{F_n\}_{n=1}^{\infty}$ defined by the linear recurrence equation $F_n = F_{n-1} + F_{n-2}$ with $F_2 = 1$ and $F_1 = 1$.

Input

The first line of the input contains an integer $1 \leq T \leq 10$ denoting the number of test cases. Each test case is described as follows.

The first line contains two integers $1 \leq N, Q \leq 10^5$ representing the number of the tree nodes, and the number of queries to answer.

The next line contains N integers a_i where each one represents the number associated with the node i $(1 \leq a_i \leq 10^9)$.

The next $N-1$ lines contain the tree description, each line contains two integers $1 \leq a, b \leq N$ indicating that there is a bidirectional edge between nodes a and b.

The final Q lines of each test case contain two integers each, the required query.

Output

For each test case, print Q lines, each containing the answer to the query. Output the answer modulo $10^9 + 7$.

Example

standard input	standard output
1 5 2 2 3 2 5 4 1 2 1 3 2 4 2 5 1 5 2 4	6 7

Problem H. Dog house

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You decided to build a new house for your adorable dog. Because you're a big fan of heavy metal music, you want to build a house with titanium plates. The shape of the house is a rectangular parallelepiped with **one face removed** (so that the dog can get in).

You went to the shop to buy materials but you were surprised by the abusive price of titanium sheets: \$572 for a square meter!. You want to build a house with minimum cost but you want the volume of the house to be larger than V. What is the minimum surface area of the house ? The thickness of the titanium plates is so small that it can be considered as null.

Input

The input consists of multiple test cases, the first line of the input denotes the number of test cases. Each test case is given in one line containing one real number V denoting the volume of the house in m^3. $(1 \leq V \leq 10^6)$.

Output

For each test case output one integer corresponding to the minimum surface area (in m^2) rounded **up** to the nearest integer.

Example

standard input	standard output
3 6.66 66.6 666	17 79 364

Problem I. The Interdimensional Tournament

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	256 megabytes

A very important programming tournament is going to be held in Warstars, a planet far far away. Teams from all over the universe take part in this incredible competition. However, it is very difficult to participate as every planet is allowed to send only one team to the tournament. Making it there is therefore a dream for everybody.

In total, n countries want to go to Warstars, and every country i is proposing to send g_i people among his total c_i candidates. One of the tournament's conditions says that the team should be very homogeneous, which is why all the individuals selected should come from the same country. Ba Driss is in charge of selecting the team that will represent Earth, which implies that he has to choose a country among the n countries (say country j) and choose g_j people among the c_j candidates proposed by the country.

Ba Driss does the selection in a rather dummy way, yet understandable since all the candidates have the same incredible skills: He picks the group randomly. Ba Driss is a very maniac and weird man; he wants the probability p of picking some group, assuming equiprobability, to be equal to his fetish rational number $\frac{1}{s}$ as he believes it will help him make the right choice. (*Seriously, who really chooses a rational number for a favorite number?*). To make that happen, he might even foolishly eliminate any number of countries he wants. Could you please tell Ba Driss whether he can achieve that probability?

Input

The first line of the input contains the number of test cases. The first line of each test case contains two integers, n, denoting the number of countries, and s as defined above ($1 \leq n \leq 40, 1 \leq s \leq 10^{17}$). n lines follow, each one containing two integers c_i and g_i: the total number of candidates for country i and the number of allowed ones to be selected, respectively ($1 \leq g_i \leq c_i \leq 53$).

Output

For each test case, print "done" if Ba Driss can restrict his selection to some countries such that the probability p of picking a group amongst these left countries is equal to $\frac{1}{s}$. Print "deal with it" otherwise.

Example

standard input	standard output
2 4 8 2 1 5 4 5 2 3 3 5 3 4 3 8 5 2 1 6 4 8 5	done deal with it

Note

In the first sample test case, there is a way for Ba Driss to achieve the probability he wants by eliminating the third country. With the three left countries, the probability of picking a group is exactly `1 / 8`.
In the second test case, there is no way Ba Driss can get his fetish probability of `1 / 3`.

Problem J. Free AC

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Given two integers x and y, we want you to find the pair (a,b) such as :

- x = a + b
- y = $a \oplus b$ (where $\oplus$ is XOR operator)
- Both a and b are non negative.

Input

Input consists of multiple test cases, the first line of the input file contains the number of them ($1 \leq T \leq 10$).

Each test case consists of one line containing two integers x and y as described above ($1 \leq x, y \leq 10^6$).

Output

For each test case, output the pair (a,b) satisfying the conditions above. If there are many possible answers, print the one having minimum a. if there is no answer, print (-1,-1).

Example

standard input	standard output
2 4 5 5 1	(-1,-1) (2,3)