Dulmál

Problem ID: dulmal

This time around you have been tasked with the job of creating a cipher for secret transmissions. Why? I suppose I could tell you, but you have to promise you'll tell no one! Beneath The University of Iceland is a secret society of cavedwellers that have true control over the university. A secret council that stays hidden so no one can disturb their schemes. They recently built a supercomputer out of several hundred GPUs that they somehow acquired. But now comes the problem. Now they have to transmit data from this supercomputer through The University of Iceland's wifi and the lizard people dwelling in the caves want to be completely sure that no one can read the data even if they were to somehow intercept it, no one but them selves of course. To solve this problem, one of the lizards suggested that they agree on an alphabet along with one secret number and then communicate via a series of numbers. A number would then be decoded into a letter by raising the secret number to that power and then take the remainder when the result is divided by the number of letters in the alphabet plus one. If the remainder were r the resulting letter would be the r-th letter in the alphabet (counting from one). The other lizards quite liked this suggestion but weren't convinced it'd work. They weren't sure if all the letters could be encoded such that this decoding method would work. The lizard suggesting this cipher wasn't able to prove that all letters could be encoded in this fashion. That's where you come in! You have to deduce if a given secret number is valid. The lizards are very computer science oriented so they of course don't just want a one off answer but a program that can solve that problem in general, that way they don't need to ask for help again later.

Input

The only line in the input contains two integers $2 \leq n \leq 10^9$ and $1 \leq k \leq n$ where n is the number of letters in the alphabet and k is the chosen secret number.

Output

One line saying "Gild leynitala!" ("Valid secret number" in Icelandic) if the secret number is valid, "Ogild leynitala!" ("Invalid secret number" in Icelandic) otherwise.

Sample Input 1	Sample Output 1
`4 3`	`Gild leynitala!`

Sample Input 2	Sample Output 2
`5 3`	`Ogild leynitala!`

Sample Input 3	Sample Output 3
`6 2`	`Ogild leynitala!`

Fundir
Problem ID: fundir

The University of Iceland, being such a large and complicated establishment, frequently has to hold meetings. Tremendously many meetings take place on the university's grounds and thus having a good system to plan all the meetings is critical. This is to make sure no one is double booked, since the medical department at the university unfortunately hasn't quite gotten around to figuring out cloning yet. This system has to reject all booking requests that would create a conflict. The computer science department at the university had warned the ones in charge of planning this new planning system that anything to do with dates and computers is an absolute travesty to deal with, so they managed to convince them to measure all times in the system in the number of seconds since the system got booted.

Can you implement such a system?

Input

The first line of the input contains one integer, $1 \leq q \leq 10^5$, the number of booking requests made. Next there are q lines each containing a booking request. Each line contains three integers $1 \leq s, t_1, t_2 \leq 10^{18}$. This means the request is to invite the employee with identification number s to a meeting from time $t1$ to time $t2$, both times being inclusive.

Output

One line for each booking request, "Fundur bokadur" ("Meeting requested" in Icelandic) if the employee is not already requested for a different meeting at that time or "Starfsmadur thegar a fundi" ("Employee already at a meeting" in Icelandic) otherwise.

Sample Input 1

```
3
1 1000 5000
1 6000 10000
1 4000 7000
```

Sample Output 1

```
Fundur bokadur
Fundur bokadur
Starfsmadur er thegar a fundi
```

Sample Input 2

```
5
1 1000 10000
2 1000 10000
1 14000 16000
1 12000 18000
2 10001 20000
```

Sample Output 2

```
Fundur bokadur
Fundur bokadur
Fundur bokadur
Starfsmadur er thegar a fundi
Fundur bokadur
```

Húsahlaup

Problem ID: husahlaup

A new term, new time tables. As usual there is quite some effort needed to get all the time tables to fit together nicely. But one thing that hasn't always been considered when making the time tables is the distance between the various buildings. It's not practical to have students take their first class in VR-II, next one in Askja and the last one in Háskólabíó. Since this is a frequent cause of frustration something has to be done. Thus the distance between the buildings has to be analyzed. Your job is to figure out the distance between the two buildings that are furthest away from one another. For the purposes of these calculations we will assume that the buildings can be represented by a single point, the location of the entrance. Despite tips from the geological department of this being incorrect we will still continue to assume that the Earth is flat in our calculations.

Input

The first line of the input contains one integer $2 \leq n \leq 10^5$, the number of buildings. Next there are n lines, each containing two real numbers $-10^9 \leq x, y \leq 10^9$ each giving the x and y coordinates of one building. These numbers will have at most 6 digits after their decimal point.

Output

One line containing the requested distance. The answer is accepted if its absolute or relative error from the correct answer is within 10^{-5}.

Sample Input 1

```
2
0 0
0 0.5
```

Sample Output 1

```
0.5
```

Sample Input 2

```
4
0 0
0 1
1 0
1 1
```

Sample Output 2

```
1.41421356
```

Sample Input 3

```
6
0 1
1 -1
-1 -1
1 0
2 0
0 0
```

Sample Output 3

```
3.16227766
```

Hola Íslenskra Fræða
Problem ID: islenskaholan

A decision has finally been made regarding the hole which now bears the name Hola Íslenskra Fræða (e. The Pit of Icelandic Studies). It has been decided that the building will never be finished, but something has to be done since at this rate it will be declared a national monument. The solution to this amusing problem is to dig a deeper pit! Your job is to assist in the planning of pit-digging the next two days while the position is being filled. You are to be supervising n employees which are to be digging n smaller pits in the larger pit. You also have access to a number of pumps since, as per usual, it's raining in Reykjavík. Since you didn't show up until around lunch on your first day the employees had already lined themselves up in the pit and began digging n smaller pits. Thus you now need to make two decisions. The first decision is to choose which holes to assign pumps to. You have more than enough pumps for all holes so you can put pumps on as many of the holes as you want, but not more than one pump on a single hole. The catch is that the pumps are so loud that no one wants to work two days in a row next to a pump. Thus when you assign people holes to dig in on the second day you have to make sure that no one is digging in a hole with a pump two days in a row. This perhaps isn't a particularly complicated task but some people in Tæknigarður have begun taking interest in your work. They begin to speculate in how many different ways you could have solved this particular predicament. Can you answer this burning question? Since the number of holes might be enormous the answer has to be given modulo $10^9 + 7$.

Input

The only line in the input contains one integer $1 \leq n \leq 10^7$, the number of holes and employees.

Output

The only line in the output should contain the number of ways you can assign pumps and employees to holes, given modulo $10^9 + 7$.

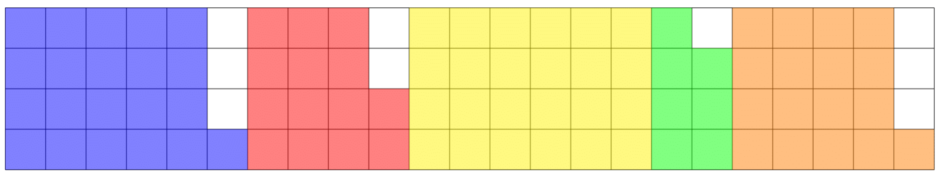
Sample Input 1	Sample Output 1
3	18

Sample Input 2	Sample Output 2
100	725034763

Kaffi
Problem ID: kaffi

Bóas is constructing a new university building and is planning out a room to store chairs in. This room can be as tall as he pleases but due to how the other rooms are planned out it must be exactly w meters wide. The chairs he intends to store are all identical apart from their colour. They are all one meter wide and they can be stacked on top of one another. If k chairs are stacked on top of one another the stack ends up being k meters tall.

Bóas wants the storage room to be organized, so all the chairs in a given stack must be the same colour. There is also only space for w stacks of chairs since the stacks have to be against the w meter wide wall. Bóas not only wants the storage room to be organized, he wants it to look organized. Bóas measures disorganization as being the area of the wall behind the chairs minus the front area of the chairs. Can you find the smallest least disorganized stacking of the chairs if he stacks the chairs according to the rules above?



A possible solution to sample input 1. The disorganization score is the area of the white sections, $3 + 2 + 1 + 3 = 9$.

Input

The first line of the input contains two integers, $1 \leq n \leq 10^5$ and $n \leq w \leq 10^9$ where n is the number of colours Bóas's chairs have and w is the width of the storage room in meters. The second and last line of the input contains n integers $1 \leq e_i \leq 10^9$, where e_i is the number of chairs in Bóas has in the i-th colour.

Output

The only line of the output should contain the minimum disorganization Bóas can achieve.

Sample Input 1	Sample Output 1
`5 23` `21 14 24 7 17`	`9`

Sample Input 2	Sample Output 2
`5 23` `13 19 19 30 1`	`10`

Lög
Problem ID: log

One day, like many others, Kristján and Bergur were sat in a hot tub in one of the capital's swimming pools. They were discussing *The Beatles*, one of Kristján's favourite bands, when Bergur began wondering whether the Beatles had ever released a song with a title that had as many letters as the name of the band. After being given some time to ponder, Kristján pointed out the song *Drive my Car* which contains as many letters as *The Beatles*, not counting spaces. Bergur prefers *Bruce Springsteen* though and thus began to wonder if he had a similar song. He thought for quite a while (since counting to 16 is quite a task) but finally came up with *Highway Patrolman*.

Can you help Bergur and Kristján by making a program that finds all such songs for given musicians and bands?

Input

The first line of the input contains the integer $1 \leq t \leq 100$. After that follow t cases. Each case begins with a line that contains the integer $1 \leq n \leq 100$. After that comes a line that contains the name of a musician or band. After that come n lines that each contain the title of a song. The names of songs, bands and musicians will never be more than 100 characters (counting spaces) and will only contain letters from the English alphabet and spaces.

Output

The output of each case is to begin with the name of the musician or band on their own line with a colon (':') just before the line break. Then, each on their own line, the song titles which have as many letters as the musician or band should follow in alphabetical order.

Sample Input 1

```
3
6
The Beatles
Yesterday
Let it Be
Yellow Submarine
Drive my Car
Penny Lane
Help
5
Bruce Springsteen
The Ties That Bind
Jungleland
Mansion on the Hill
Highway Patrolman
Reason to Believe
3
Nirvana
Smells like Teen Spirit
Even in His Youth
Lithium
```

Sample Output 1

```
The Beatles:
Drive my Car
Bruce Springsteen:
Highway Patrolman
Mansion on the Hill
Nirvana:
Lithium
```

Reikniritit

Problem ID: reiknirit

As a final project in the course Þróun Hugbúnaðar (e. Software Development) Þórður decided to write a program serving a very important purpose. His program is an implementation of the following pseudocode:

1. Takes a list of numbers as input.
2. Prints the list.
3. Removes all instances of the most common number in the list (in case of a draw, remove the largest number).
4. Repeat 2 and 3 until the list is empty.

For example, if the program gets the list $[1, 2, 1, 4, 4]$ it will print $'1\ 2\ 1\ 4\ 4'$, then $'1\ 2\ 1'$ and lastly $'2'$. When Þórður told his friend Garðar about this program, Garðar told him that in the worst case scenario the size of the output could grow proportional to the square of the size of the input. This scared Þórður since he wanted to show the output of the program when he presents it, but if the output gets too big it won't fit on the slides in the presentation. Thus he turns to you for assistance. Given a list of numbers, deduce how many numbers Þórður's program will print.

Input

The first line of the input contains one positive integer $1 \leq n \leq 10^6$. The second and last line of the input contains n integers, the i-th of which, e_i, satisfies $1 \leq e_i \leq 10^9$.

Output

The only line of the output should contain the number of numbers that Þórður's program will print if given the numbers e_i in the input as input.

Sample Input 1	Sample Output 1
5 1 2 1 4 4	9

Sunnlenska
Problem ID: sunnlenska

As often happens, Atli was on his way to the University of Iceland to compete in a programming contest with a few other students. But since he was running late as per usual he had asked Bergur to buy snacks for him to have in the contest. But being from Akureyri, Atli speaks nothing but the purest of northern Icelandic and thus Bergur, being from the south, didn't quite catch what he said. Now you need to translate the snack-list from Atli into southern Icelandic so Bergur can understand it. As is well known, people from southern Iceland are unable to pronounce the letter 'k' so all instances of the letter 'k' need to be replaced with a 'g'. They don't quite like the letter 'y' either and seem quite fond of replacing it with a 'u' so all 'y's also need to be replaced with 'u's. Southern Icelanders despise eliminating letters entirely though so this does not apply to 'K' and 'G'. In addition to this there are a few snack-related words that need to be translated. Firstly norterners speak of "kók í bauk" (meaning a can of cola) while southerners use the word "dós" instead of "bauk". Thus all instances of "bauk" need to be changed for "dos". Lastly there is disagreement on how to write the word for pizza so all instances of "flatbaka" need to be replaced with "petsa". It is important that replacing words takes precedent over replacing letters. For example "flatbakan" would be turned into "petsan" and not "flatbagan" despite this sounding just southern enough to perhaps be understood. Since 'Flatbakan' and 'Bauk' might be names rather than nouns they shouldn't be replaced in this manner.

Can you help Bergur figure out what snacks Atli wants him to buy?

Input

The input is on one line, terminated by a newline character. The text can contain any letters with an ASCII value between 32 and 126 (inclusive) in addition to the ASCII value 9. There are at most 10^4 characters in the input line.

Output

The same text as in the input but translated to southern Icelandic as described above.

Sample Input 1	Sample Output 1
`griptu pylsu og kok i bauk`	`griptu pulsu og gog i dos`

Sample Input 2	Sample Output 2
`flatbaka fra akureyri`	`petsa fra agureuri`

Vittu betur
Problem ID: vittubetur

The last round of the new trivia contest between universities in the capital area of Iceland is closing in. In this contest the universities answer once and for all who has the brightest students. All questions in the contest all questions pertain to the prime factorizations of numbers and all guessing is disallowed. You were chosen to compete as part of a team for The University of Iceland as soon as word gor out that a relative of yours was making the questions for the contest. Once you went to interrogate your relative he replied "All the numbers that I will be asking you to factor will be of the forn $n!$ where n is a positive integer less than or equal to 10^6. How does this help though? Are you going to memorize all the answers before the contest?". That is exactly what your team is going to do. Though, first, you have to obtain all the answers so you have to write a program that can factorize $n!$ for a given n.

Input

The input consists of a number of lines each containing a single integer $0 \leq n \leq 10^6$. There will at most 10^6 lines.

Output

The organizers at the tv station hosting the contest didn't quite like how long the answers could get and thus asked your relative to pick some smaller numbers. As a compromise they decided it would be enough to answer how many prime factors the number has, counted with multiplicities. More specifically, for a given n in the input one can write $n! = \prod i = 0^k p_i^{e_i}$ where p_i is a prime number for all i and the desired output is then $\sum_{i=0}^k e_i$ printed on its own line.

Sample Input 1	Sample Output 1
1 2 3 4 5 6 7 8 9 10	0 1 2 4 5 7 8 11 13 15

Völundarhús
Problem ID: volundarhus

Once again the students of The University of Iceland turn their minds towards the annual design competition. This year the robots have to get through a labyrinth, but unlike previous years the robots are not allowed to know what the track looks like ahead of time. Since the ones designing the contest don't want to be too hard on the contestants they have decided to make sure the robots can't travel in a circle while traversing the maze. They have also made sure that the initial maze is solvable, i.e. there is a path from the starting position to the goal. Guðmundur is now preparing to design his own robot and has devised a plan for how it will find its way through the labyrinth. When the robot comes to an intersection it will choose a random path it has not traversed earlier. If the robot finds itself in a dead end it will use its memory of traversed paths to find the shortest known path to a previous intersection with unexplored paths. The robot will then follow this calculated path and can then resume the previous loop of randomly exploring unexplored paths. The robot will stop exploring once it reaches the goal or when it finds itself back at the starting position with no paths left unexplored. You will now be given the labyrinth, the starting point and the goal. The competition consists of a number of rounds and in each round one path in the labyrinth is closed. Your job is to look at each round and deduce whether the robot will make its way to the goal eventually and if so how long it will take on average.

Input

The first line of the input contains an integer, $1 \leq V \leq 10^5$, the number of intersections in the labyrinth. The intersections are labeled from 1 to V where 1 is the starting position and V is the goal. Next there are $V-1$ lines of input, each containing 3 integers, $1 \leq u, v \leq V$ and $1 \leq w \leq 10^3$ which means that there is a path from intersection u to intersection v (and back) which takes the robot w time units to traverse. Next there is a line with one integer $1 \leq T \leq 10^5$, the number of rounds. Lastly there are T lines of input each containing a single integer $1 \leq s \leq V-1$ which means that the s-th path in the input is closed in that round.

Output

One line for each round, "Kemst ekki" (means can't make it in Icelandic) if the robot won't always finish the course, otherwise the average time it takes the robot to finish the course. The answer is accepted if the absolute or relative error from the correct answer is within 10^{-5}.

Sample Input 1

```
3
1 2 1
1 3 1
2
1
2
```

Sample Output 1

```
1
Kemst ekki
```

Sample Input 2

```
5
1 2 10
1 3 5
3 4 5
3 5 2
3
1
3
4
```

Sample Output 2

```
12
17
Kemst ekki
```