Problem A. Don't Starve

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

NIO purchased a new game, Don't Starve, a sandbox game published by Klei Entertainment Inc. This game revolves around a scientist named Wilson who finds himself in a dark and gloomy world and must survive for as long as possible.

In the very beginning, NIO should help Wilson to gather some food for survival. Assume that when controlling Wilson to walk towards a location on the map, NIO should keep pressing the left button on the mouse, and when Wilson comes to the place where there is food, NIO should stop pressing the mouse, but press the space key on the keyboard to collect the food at this location. As NIO will feel tired of pressing the mouse for a long time and his finger will become very uncomfortable after a long time of pressing, the time he is willing to press the mouse after each collection is **strictly decreased**. Suppose there are N locations on the 2-D plane, and at each point, there is only one unit of food. And NIO will start at the **original point** on the plane.

What is the maximum amount of food can NIO get for Wilson? Note that the food will be refreshed after Wilson left.

Input

The first line is an integer N, representing the number of N distinct locations on the map.

Following by N lines, each line has two integers, x_i, y_i, representing the x-coordinate and the y-coordinate of the location where there is food.

$1 \leq N \leq 2000, -20000 \leq x_i, y_i \leq 20000$

Output

One integer, representing the maximum amount of food Wilson will get.

Example

standard input	standard output
7 -7 21 70 64 45 -52 68 -93 -84 -16 -83 64 76 99	4

Problem B. Watches

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

NIO is the boss of the watch shop. One day, he wants to purchase a batch of watches from the manufactory. However, he lives in Amefica(not a real country), a country in is heavily taxed. If he buys k watches, the i-th watch in his list will cost him a_i (the original price) plus $k \times i$ dollars (the i-th one in the original list). Now NIO only has M dollars, so NIO asks you how many watches he can purchase actually.

Input

There are multiple test cases.

For each test case, there are two lines. The first line contains two integers N, M, denoting the number of watches he would like to buy and the amount of money NIO has, respectively. The second line contains N integers, a_i represents that the price of the i-th watch in the list.

$1 \leq N \leq 10^5, 1 \leq M \leq 10^5, 1 \leq a_i \leq 10^5$

Output

Output a number, representing the maximum number of watches that NIO can purchase.

Example

standard input	standard output
4 5 3 4 5 6	1

Problem C. Bit Transmission

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

NIO is good at programming. He developed an STM32 program to communicate with his robot. When he sends a number to the robot, he will send a binary string of length N, that only consists of 0 and 1 instead of a decimal number. The string is a binary representation of the decimal number NIO wants to send. However, there are some bugs on the robot's intelligent system, when someone asks the robot, it sometimes will translate a wrong digit in the binary string, therefore reporting a wrong decimal number.

Although there are bugs inside the robot, NIO is very lazy to fix them. He can tolerate the bug until the robot constantly reports wrong decimal numbers or crashes down. To find out whether the bug fix is necessary, NIO asked the robot $3 \times N$ times whether the k-th number in the binary string is 1. If there exists a unique string for his question, then NIO considers that there's no need of a bug fix. Note that it's possible that **the same digit** of the string is asked for more than 3 times and some digits will not be asked.

If at most **ONCE** the robot will report a wrong answer for NIO's all queries, can you figure out what binary string NIO sent?

Input

There are multiple test cases.

For each case, the first line is N, the length of the string.

Following by $3 \times N$ lines, each line consists of an integer k and a string "YES" or "NO", denoting the robot's answer for whether the k-th digit in the binary string is 1. (The index is started from 0.)

$1 \leq T \leq 10, 1 \leq N \leq 10^5$

Output

If the binary string can be determined, output it. Otherwise output -1, denoting that the robot will crash down.

Example

standard input	standard output
3 0 NO 1 YES 2 YES 0 YES 1 YES 2 YES 0 YES 1 YES 2 YES	111

Problem D. Birds in the tree

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

One day, when NIO was walking under the tree, he found that there are birds standing on the tree, and each tree is standing on one leave. He wondered about in how many sub-trees form by connected vertex-induced subgraphs from the original tree, all birds are in the same gender. The number would be very large, just mod $10^9 + 7$ in the output.

Input

There are multiple input cases.

For each case, the first line contains an integer, n, denoting the number of nodes on the tree. The second line is a binary string, where 1 denotes the male birds and 0 denotes the female birds.

Following by $n - 1$ lines. In each line there are two integers, x_i, y_i, denoting there is a path connecting node x and node y.

$1 \leq n \leq 3 \times 10^5, 1 \leq x_i, y_i \leq N$

Output

Output a number module $10^9 + 7$, the number of subgraphs of the given tree that form trees where all its leaves are the same color.

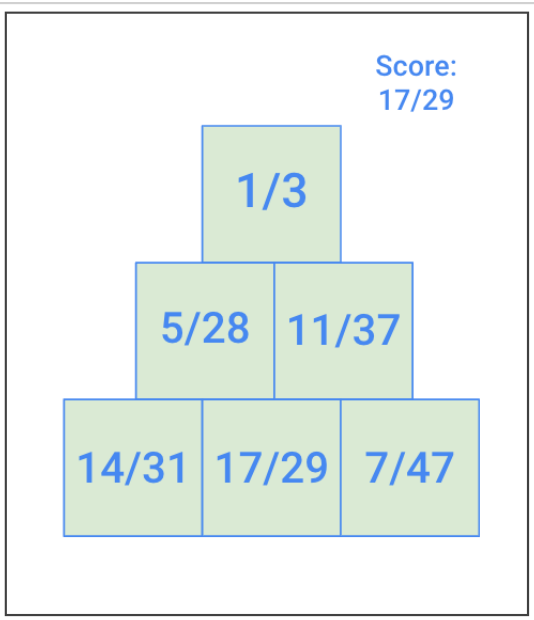
Example

standard input	standard output
7 1011111 1 2 1 3 2 4 3 5 2 6 4 7	34

Problem E. Fraction Game

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

NIO is playing a novel fraction game. The interface is shaped like an isosceles triangle of size N. In each grid there is a fractional number. Every round, an isosceles triangle area of size k is activated to click. And when the round is finished and a new round begins, a new area of a triangle is able to click, and the old area is locked, except the overlap region. For each triangle, NIO can click on a grid, and the fractional number inside this grid will be added to his score. If NIO clicks on a grid slowly, then he will get no score to add. If all possible triangles with size k on the interface can be clicked during the game time. What is the maximum score NIO will get ideally? Size N means that in the i-th line there are i triangles.



Input

The are multiple test cases.

For each test case, the first line contains two numbers, N denotes the height of the game interface and k denoting the size of triangle that each round NIO can operate.

Following by N lines, each line contains i numbers. Each fractional number, a_{ij} is with the format of m/n, represents the j-th number in the i-th line.

$1 \le k \le N \le 1000$, $1 \le m, n \le 1000$

Output

Output the reduction of a fraction, representing the maximum score NIO will get. For example, "4/12" can be reduced to "1/3".

Example

standard input	standard output
3 3 1/3 5/28 11/37 14/31 17/29 7/47	17/29

Note

The test data is guaranteed not to exceed long long during the operation. If the result is "3/1", output "3/1" directly.

Problem F. A Stack of CDs

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

One day, NIO wants to find a CD from a whole bunch of CDs. However, there are too many CDs stacking on the floor so NIO is hard to pick out the one he needs. Looking at the stack of CDs, he is curious about from his vision, what is the length of the edges of the CDs he can see. (Assum that every CD is a simple circle and NIO know the order of circles from bottom to top.)

Input

There are multiple test cases.

For each test case, the first line is N, where $1 \leq N \leq 1000$, representing the number of CDs. Following by N lines, each line three integers, x_i, y_i, r_i where $0 \leq x_i, y_i, r_i \leq 10^4$, denoting the i-th CD's center and its radius from bottom to top.

Output

Output a number representing the length of edges NIO can see.

Example

standard input	standard output
3 45 45 50 20 45 10 52 52 50	481.154633857

Problem G. KFC Crazy Thursday

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

One day, NIO found an email on his computer from his friend Kala. He opened the email and found a picture with a large string of 26 lowercase letters. He asked Kala why he had sent him this picture. Kala said it was a challenge he had given to NIO: if NIO could figure out the number of palindromes end with 'k', 'f' and 'c' , he would buy NIO a KFC combo. The clever NIO turned on a AI software and converted all the letters on the image into a text file. NIO promised that he will share the KFC combo with you if you can help him.

Palindromes with length greater or equal to one is considered. For example, 'k' is a palindrome.

Input

There will be multiple test cases.

The first line a number N, denoting the length of the string.

The second line is a string consists of lower letters 'a' to 'z'.

$1 \leq N \leq 5 \times 10^5$

Output

A line with 3 numbers, denoting the number of palindromes, that end with 'k', 'f' and 'c'.

Example

standard input	standard output
6 kfccfk	3 3 3

Note

For the first 'k', 1 palindrome.

For the second 'k', 2 palindromes.

For the first 'f', 1 palindrome.

For the second 'f', 2 palindromes.

For the first 'c', 1 palindrome.

For the second 'c', 2 palindromes.

Problem H. Paper Cutting

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

NIO and his little four-year-old sister, Yasa, were doing the paper-cutting. NIO drew several line segments and get a close area, a polygon, from a mathematical inequality, $|x| + |y| + |x + y| \leq n$. And Yasa drew a circle which center is coincide with the polygon NIO created, and the radius of the circle is half of n.

They wanted to cut out union area of the polygon and the circle. Assume that they play the cutting game based on a infinate paper. What is the size of the area they cut from the paper?

Input

There are multiple input cases.

Each case there are only one interger, n.

$1 < n \leq 5 \times 10^5$

Output

Output a real number, representing the union area of the circle and the polygon. Float errors within 1e-6 would be considered as correct.

Example

standard input	standard output
2022	3066940.075086390

Problem I. Board Game

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

One day, NIO plays an interesting board game with his four-year-old sister, Yasa. This board game is a confrontation game, that players are divided into the good camp and the evil camp. The good camp has n cards, each card represents a soldier. The evil camp has a mage and a magic crystal, the magic crystal provides the mage with the magic energy to attack. Before the fight, the n soldiers need to be divided into m groups, with at least one person in each group. Each action turn, the soldiers attack the magic crystal. Each living soldier can cause one unit of damage, and the durability of the attacked magic crystal is reduced by one unit. After the good camp's action is over, the evil camp takes its action and the mage can release a spell that kills at most k soldiers in a group. If all soldiers die, then the battle is over.

NIO is on the evil side and his sister is on the good side. NIO is clever and will always cast spells in the best way so that he himself will be attacked less. Yasa asks you for help. Assuming that the magic crystal has a total of x mana points, and it will be destroyed if the mana points becomes to 0. She wants to know if she can defeat the evil camp if she got an optimal group dividing method.

Input

There are multiple test cases.

For each test case, there is a line consists of n, m, k, x.

$1 \le n \le 10^9, 1 \le x \le 10^{13}, 1 \le m, k \le 10^7$

Output

Output "YES", if Yasa can win the game. Followed by a number indicating the maximum damage Yasa can cause on the magic crystal (it can grealty exceed the amount of the magic crystal's durability).

Otherwise output "NO".

Examples

standard input	standard output
10 4 4 5	YES 23
5 6 5 100	NO

Note

The output number can be very big.

Problem J. Check In

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

One day, NIO overslept because of the over-time working last night. Coincidentally, the company's new check-in system went live. As soon as one arrives at anywhere of a building, he/she can open the check-in app and sign in, instead of checking in at a specific card machine. In order not to be late, NIO prepared to walk straightly to his company. He may walk through several buildings, but not get inside them. Suppose all the buildings are in the shape of a triangle, and NIO's starting point is the origin point. Can NIO walk in a straight line to his company without walking in other buildings? And if so, tell him how far he needs to walk.

Input

There are multiple test cases.

For each case, the first line is an integer N, representing the number of buildings on the map.

Following are N lines, each line contains six integers $x_{i_1}, y_{i_1}, x_{i_2}, y_{i_2}, x_{i_3}, y_{i_3}$, representing the location of the three vertex of the i-th building. The first building is NIO's company, and the rest $N-1$ lines denotes other buildings.

$2 \leq N \leq 1000, -10000 \leq x_{i_1}, y_{i_1}, x_{i_2}, y_{i_2}, x_{i_3}, y_{i_3} \leq 10000$

Output

If NIO can walk directly to his company, output a number denoting the distance he should walk.

Otherwise output -1.

Example

standard input	standard output
2 0 0 0 1 1 1 0 0 0 -1 0 1	0

Note

No two lines of a point and the origin point will coincide with each other.

Problem K. Headphones

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

One day, NIO's home is out of power. So Nio and his sister, Yasa, wanted to take some headphones from the drawer. In the dark, If they randomly took some headphones, and Yasa had taken out k pairs of headphones. How many headphones NIO should take to make sure that he get more pairs than his sister, i.e., $k+1$ pairs of headphones. Assume that there are N pairs of headphones in the drawer, and each pair is different from another.

Input

There are multiple test cases.

For each test case, input two integers N and k, representing the number of the total number of pairs in the drawer and the number of pairs Yasa had taken.

If it cannot guarantee that NIO will get more pairs of headphones than his sister, output -1.

$1 \leq k \leq N \leq 10^9$

Output

Output the number of headphones NIO should get.

Example

standard input	standard output
3 1	4