Problem A. HHPaint

The famous in the Volga region $H\&H$ company decided to create a very special graphic tool. The head of $H\&H$ believes that it can be used by scientists for numerical experiments. That's why one of the parts of the tool is "triangulating" module. And this module is one you are responsible for.

You are given N points. No three points lay on the same line. Lets consider the polygon of minimal area containing all the points. Your task is to split the polygon to the set of not overlapped triangles in such a way, that all the vertices of the triangles are points from the given set. Each point should be used as a vertex of at least one triangle.

Input

The first line of the input file contains number of points N ($3 \le N \le 15000$). Each of the following N lines contains the coordinates of the corresponding point ($-10^6 \le x_i, y_i \le 10^6, 1 \le i \le N$). All coordinates are integers.

Output

Write in the first line of the output file the number of the triangles Q. Each of the following Q lines should contain description of the triangle. The description consists of three integers — numbers of points for each vertex of the triangle. The points are numbered from 1 to N in the order of their appearance in the input file. If there are several solutions, output any of them.

Example

standard input	standard output
6 -10 0 10 0 0 3 -1 4 1 4 0 5	7 1 2 3 1 3 4 1 4 6 2 3 5 2 5 6 6 4 5 3 4 5

Problem B. Square Root

Within the Jupiter project $H\&H$ developers should perform a lot of mathematical calculations. One of the most difficult tasks is to calcuate the value of square root of natural number with very high precision. You promised to help $H\&H$ programmers in this challenging task.

You are given two natural numbers N and K ($2 \le N \le 1600$, $1 \le K \le 15000$). Your task is to find $\sqrt{N}$ with K digits after decimal points.

Input

The first line of the input contains numbers N and K.

Output

Write to the output the square root of N with K digits after decimal point. No round-up is necessary, all digits should be precise.

Example

standard input	standard output
2 10	1.4142135623

Problem C. Interesting Places

The $H\&H$ CTO Mr.H. is a very busy and suspicious person. As he is very busy he visits a lot of different places during the day. And as he is suspicious he uses only well-known for him roads between this places. Recently the traffic load on the streets became pretty high. So Mr.H. would like to make sure, that there are at least two different routes he can safely drive between every two places of his interest. Two routes are considered different if they have no common roads (but can have common intermediate places). All roads are bidirectional.

You are given the list of Mr.H.'s places of interest and list of currently safe roads. Your task is to find minimal number of roads to be added to satisfy Mr.H.'s requirements.

Input

The first line of the input file contains two integer numbers: the number of places of interest N ($1 \le N \le 900$) and the number of safe roads M ($1 \le M \le 100000$). Each of the following M lines contains the description of the corresponding road — the number of places it connects. There is not more then one road between every two places.

Output

Write in the first line of the output file number of additional roads Q. Write in the following Q lines descriptions of additional vertices — numbers of places the corresponding road connects in any order separated by a space. If there is no solutions, output single integer "-1". After adding new roads every two places should remain connected with not more then one road.

Example

standard input	standard output
4 3 1 2 2 3 3 4	1 4 1

Problem D. Road to Home

The favourite fairy-tale country of the $H\&H$ employees is Berland. Berland consists of N towns. Some of the towns are connected with the portals. All towns are numbered with numbers from 1 to N. The town with number i has portals to M_i closest towns (portals are unidirectional). If two or more towns are on the equal distance then towns with the smaller numbers are chosen. In Berland the distance between two points (x_1, y_1) and (x_2, y_2) is equal to $\min(|x_1 - x_2|, |y_1 - y_2|) + 1$. For each transfer through the portal between two towns due should be paid. The due is equal to the square root of distance between the towns. The amount of due is rounded to the nearest integer using standard rules.

At the face of the war threat some of the towns are united to the United Union (UU). All towns from the UU are called union towns, and other towns are called non-union. To draw the citizens at the union side the following decision was made: the due of transfer from non-union city to the union one is decreased and the due for some other transfers is increased. So if X is a union town and Z is a non-union, the due for the transfer from Z to X is decreased by D_x and for the transfer from X to Z is increased by D_x. If W is also a union town and Y is a non-union, then the due for the transfer from X to W and back is increased by $D_x + D_w$ and the due for the transfer between cities Z and Y is not changed.

Professor Perlov is visiting his grandchild in the town number N. And now he would like to get back to the town number 1. But he is unsure about the optimal route.

Your task is to help the professor to find the cheapest route from town N to town 1. Note, that it is even possible for the professor

to earn some money — in this case you should find the route with maximum earning.

Input

First line of the input file contains integer number N ($1 \le N \le 10000$). The following N lines contains the description of towns. Each description consists of 4 integer numbers: x_i, y_i, M_i, D_i, where (x_i, y_i) are the town coordinates, M_i — number of portals in the town, D_i — the due change or -1, if this is a non-union city. All coordinates are not more then 1000 by absolute value. You can assume that the sum of all M_i is not more then 1500000 and $-1 \le D_i \le 25$.

Output

Write to the output the optimal route for the professor — the sequence of the numbers of towns he should visit. You can assume that at least one route exists. If there are several solution, output any of them. If the professor can earn infinite amount of money, output only one number "-1".

Example

standard input	standard output
5 0 0 1 10 1 1 3 10 1 0 4 -1 1 -2 4 10 4 5 3 -1	5 3 1

Problem E. Ant and apples

The building of Saratov department of $H\&H$ company is situated at the beautiful place near the bank of the river Volga. In the building courtyard there is an ant hill, where ant known as Apache leaves.

The ant is very small and he wants to grow up as quickly as possible. There is an apple-tree nearby the ant hill, and Apache decided to eat all of the apples to come closer to his goal. All branches of the apple-tree grow up, and if branches were splitted once, they never grow together again. Each branch is finished either by a fork or by an apple.

The branches of the tree are pretty long, so ant's vigor quickly decreases while he is moving to the next apple. For each centimeter ant looses one point of energy of energy contained in this apple. Eating an apple increases ant's energy by certain amount. If energy level will fall below zero, Apache will die.

Your task is to help Apache to survive and find out how much energy he need to accumulate before the trip to successfully get all apples from the tree and return back. Note, ant can crawl along each branch only for two times.

The ant starts and finishes his movement at the beginning of the branch number one. The branch number one is considered as a stem of the tree.

Input

The first line of the input contains integer number N ($1 \le N \le 1000$) — the number of branches. The following N lines contain information about the apple-tree and apples. Each line describes the corresponding branch of the tree. The branch description consists of the following. The first number is integer L ($1 \le L \le 50000$) — the length of the branch. Then Q follows — the amount of branches which grow from the end of the current branch. The following Q numbers are numbers of these branches. If Q equals to zero, the third number E ($0 \le E \le 50000$) gives the amount of energy of the apple at the end of this branch.

Output

Write to the output one integer number — the minimal possible number of energy points ant should accumulate to be able to eat all apples and return to the ground.

Example

standard input	standard output
8 5 3 2 6 3 5 2 4 5 3 2 7 8 5 0 10 4 0 19 11 0 50 4 0 0 9 0 15	15

Problem F. Square

Maintenance department of $H\&H$ company bought a new table. Table has a square form. For a strange reason network patchcords at the $H\&H$ company stick out from the floor at the points with integer coordinates (what is even more strange each point with an integer coordinates has a patchcord).

Maintenance department manager asked you to help to find out the minimum possible number of patchcords covered by the table. Patchcords is covered by the table if it lays strictly inside the square perimeter of bottom surface of the table.

Input

Input contains only one integer S ($1 \le S \le 100$) — the area of the bottom table surface.

Output

Write to the output only one integer — the minimum possible number of points with integer coordinates covered by the table.

Example

standard input	standard output
5	3

Problem G. Pair

At the interview senior $H\&H$ developers like to give newcomers different tasks. One of the tasks is the following. You are given the K different natural numbers from 1 to N. Your task is to find two of them so that one is divided by another.

Input

First line of the input contains numbers N and K ($2 \le N \le 600000, N/2 + 1 \le K \le N$). The second line contains K numbers.

Output

Write to the output indexes of the two numbers you found or two zeros if there are no such numbers.

Example

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

Problem H. The Fence

There is a long fence not far from $H\&H$ office. A while ago boards of the fence were painted in different colors. Now $H\&H$ CTO wants to know, if there are two red boards in the fence with the number of boards between them multiple to K.

Input

The first line contains the integer number K ($1 \le K \le 100000$). The second line contains the description of the fence. Symbol —"1" indicates the red board, and symbol "0" — any other. The fence contains not more than 100000 boards.

Output

Output the numbers of required boards, or output two zeros if they do not exist. Boards are numbered starting with 1 from left to right.

Example

standard input	standard output
3 00101000010	3 10

Problem I. Painting the natural numbers

The $H\&H$ company currently develops AI (artificial intelligence) for the game. The goal of the game is to paint all the natural numbers from 1 to N in 10 colors so that if the numbers a and b (a and b are not necessarily different) are one color, then $a+b$ has to be another color. Help $H\&H$.

Input

The input consists of the only integer N ($1 \le N \le 25000$).

Output

Output N numerals from 0 to 9 (each numeral indicates the color of the current number). If solutions does not exist, write N zeros to the output.

Example

standard input	standard output
10	0102010301

Problem J. Selection

The teacher of the $H\&H$ TCO daughter asked to solve the following problem. You should choose 3 different natural numbers in such a way so that their sum is even. TCO asked you to find out how many different variants there are to solve the problem if all 3 numbers are less or equal N.

Input

Input contains the only integer number N ($1 \le N \le 10000$).

Output

Output the answer for the problem.

Example

standard input	standard output
5	6

Problem K. Parquet

During the redecoration of the $H\&H$ office the decision was made to lay a parquet floor. The floor has a form of $N \times M$ rectangle. Each parquet hoard is a 2×3 rectangle.

Help $H\&H$ maintenance departement to determine if it is possible to lay the parquet with available hoards or not. The parquet hoards cannot be breaked.

Input

The first line of the input contains the number of test cases K ($1 \le K \le 10$). Each of the following K lines contains two integer numbers — N and M ($1 \le N, M \le 10^9$).

Output

For each test case from the input write to the output separate string with word "Yes" if the answer is positive or word "No" in the opposite case.

Example

standard input	standard output
3 3 2 5 12 7 8	Yes Yes No

Problem L. Closing the Loop

Given a bag full of rope segments, you will build the longest loop of rope while alternating colors. The bag contains S segments and each segment will either be blue (`B`) or red (`R`). You are required to alternate between colors and because of this requirement you might not use every segment in the bag. If you only have segments of a single color, you will not be able to tie any knots and should output 0. Each segment length is provided in centimeters and each knot in the loop consumes one centimeter of length from the loop. In other words, a knot consumes one-half of a centimeter from of the two segment it connects.

Note that pieces of string that have length 1, if used in making the cycle, might get reduced to just a pair of knots of total length 0. This is allowed, and each such piece counts as having been used.

Input

One line containing the value S ($1 \le S \le 1000$), the number of rope segments in the bag. One line containing a space separated list of S values. Each value L ($1 \le L \le 100$) indicates the segment length in centimeters followed by the letter `B` or `R` to indicate the segment color.

Output

Print the maximum length of the rope loop that can be generated with the rope segments provided.

Example

standard input	standard output
1 5B	0
4 6R 1B 7R 3B	13
7 5B 4R 3R 2R 5R 4R 3R	8
2 20B 20R	38