Problem A. Help in the RNOS

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

The Russian National Operating System (RNOS) is going to be released soon, and its help system is finished already. A user can open the front page of the help system by pressing the `F1` button. If the front page is open, then pressing `F1` will close it. This seems to be very simple, but the developers of the help system have applied some innovations...

The help information is presented on several pages, and each following page describes the same issues as the preceding page but in more detail and in a smaller type. Each page except for the last one has two buttons: "Open next page" and "Close next page." Of all the open pages, the user can see only the least detailed one, while all the other pages are inaccessible.

You want to learn using the help of the RNOS. Start with the simple task of changing the set of open help pages in a minimum number of operations.

Input

The first line contains the number n of help pages in the RNOS ($1 \leqslant n \leqslant 50$). In the second line you are given the initial set of open pages in the form of a line consisting of n ones and zeros. The i-th symbol is 1 if the i-th page is open and 0 otherwise. In the third line you are given the required set of open pages in the same format.

Output

Output the minimum number of operations (mouse clicks and keystrokes) necessary for changing the set of open pages.

Example

standard input	standard output
3 111 000	5

The optimal sequence of operations: close the first page by pressing `F1`, close the third page using the button on the second page, open the first page by pressing `F1`, close the second page using the button on the first page, and close the first page by pressing `F1`.

Problem B. Tsyfirkin's Lesson

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

Tsyfirkin's new student Feofan is much more intelligent and bright than Mitrofanushka. In the first three lessons, he has learned to add positive integers in columns, not very quickly but without mistakes. For this he uses the following algorithm.

1. Feofan adds numbers from right to left: first he adds units, then tens, and so on.

2. He takes the pair of digit in each successive column and adds them.

3. If a 1 is carried from the previous column, Feofan adds it to the obtained sum.

4. He writes the rightmost digit of the sum in the answer line and, if necessary, makes a mark about carrying 1 to the next column.

5. If there are no more columns and there is a 1 carried from the leftmost column, then Feofan writes 1 on the left of the answer.

Feofan needs one second to write one digit or to make a mark about carrying a 1. If at least one of summands is 0 or 1, then Feofan spends one second adding them; if both numbers are greater than 1, then he adds them in two seconds. However, having added two numbers, Feofan remembers the result and can recall it afterwards in one second. If he needs to calculate $a + b$ and he has calculated $b + a$ before, then he also can use the result obtained earlier. Unfortunately, Feofan does not remember all the results at the next lesson and has to calculate and remember them anew.

For example, Feofan adds the numbers 526 and 625 in 12 seconds: he spends four seconds for writing the digits of the answer, two seconds for making marks about carrying over, two seconds for calculating each of the sums $6 + 5$ and $2 + 2$, and one second for calculating each of the sums $4 + 1$ and $5 + 6$ (since he remembers from the previous calculations that $6 + 5 = 11$).

In the beginning of a new lesson Tsyfirkin writes on the blackboard two k-digit integers and gives Feofan the task of adding them. Tsyfirkin has chosen each of the integers with equal probabilities from the set of positive k-digit integers without leading zeros. Find the mathematical expectation of the time Feofan will need to add the integers.

Input

In the first line you are given the integer k $(1 \leqslant k \leqslant 5\,000)$.

Output

Output the expected time of adding two positive k-digit integers with an absolute or relative error of at most 10^{-6}.

Example

standard input	standard output
2	7.51530864

Problem C. Arirang Show

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

The Arirang Show is a magnificent performance given annually in the North Korean capital Pyongyang. The show is very popular, and the cost of tickets can be as high as 300 dollars.

Tens of thousands of dancers take part in the performance each year. In one of the episodes of the 2011 show n dancers line up and then divide into d groups (d is a proper divisor of n). In each of the groups the dancers make a circle holding each others' hands and circle around. There are dancers with numbers $1, d+1, 2d+1, \ldots, n-d+1$ in the first circle, dancers with numbers $2, d+2, 2d+2, \ldots, n-d+2$ in the second circle, and so on. In the last circle there are dancers with numbers $d, 2d, \ldots, n$.

Organizers of the show ask you to distribute the colors of the dancers' shirts so that in each circle any two neighbors wear shirts of different colors. You have been told the number n, but when you asked about the value of d the organizers said: "You are not allowed to know this number."

The organizer can make shirts of only 26 different colors. Can you satisfy their request regardless of the choice of the number d?

Input

The only line contains the integer n ($2 \leqslant n \leqslant 3 \cdot 10^5$).

Output

Output a line of length n consisting of lowercase English letters. The i-th symbol should denote the color of the i-th dancer's shirt (the colors are coded by letters from 'a' to 'z'). If there are several correct answers, output any of them. If it is impossible to arrange the colors as required, output "`Impossible`".

Example

standard input	standard output
7	acacbdb

Problem D. Hopes of Rowing

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

On August 15, 2008, the rowers from Nizhny Tagil Mikhail Kuznetsov and Dmitry Larionov won a bronze Olympic medal in the men's slalom canoe double event.

After that, the regional administration decided to support the Canoe Slalom School "Polyus" in Nizhny Tagil, where the athletes had trained. There were n young canoeists training at the school at that time. The principal of the school reported that m crews of tandem canoes had won national competitions in the years preceding the Olympics. Some of the athletes had won more than once as members of different crews. The principal asked the administration to pay the athletes bonuses so that the total bonus of each of the winning crews would be at least k roubles.

However, because of the financial crisis, officials from the Ministry for Physical Education and Sport tried to spend as little money as possible for granting the principal's wish. What bonuses were paid to the young athletes?

Input

The first line contains the integers n, k, and m ($2 \leqslant n \leqslant 500$, $1 \leqslant k \leqslant 10^4$, $0 \leqslant m \leqslant 10^5$). In each of the following m lines you are given two different integers separated with a space. These are the numbers of athletes from one of the winning crews. The students of the school are numbered from 1 to n. Each winning crew enters the list only once.

Output

Output in the i-th line the amount of the bonus paid to the i-th athlete with an absolute error of at most 10^{-6}. If there are several answers, output any of them.

Example

standard input	standard output
4 1000 4	146.5
1 2	853.5
1 3	853.5
2 4	146.5
3 4	

Problem E. Tennis Racket (Division 1 Only!)

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

The Battle of Stalingrad ended on February 2, 1943. After that the divisions of the Soviet Army that participated in Operation Ring were re-equipped and sent to other sectors of the front by railway.

When the first train with troops and tanks had been formed, it turned out that the railroaders hadn't thought of the order of the cars. It was decided to use a dead end near the Lazur chemical plant for sorting the cars. Because of its shape, and, perhaps, because of the dozens of German attacks repelled there in November 1942, the dead end was named by German dive-bombers the "Tennis Racket."
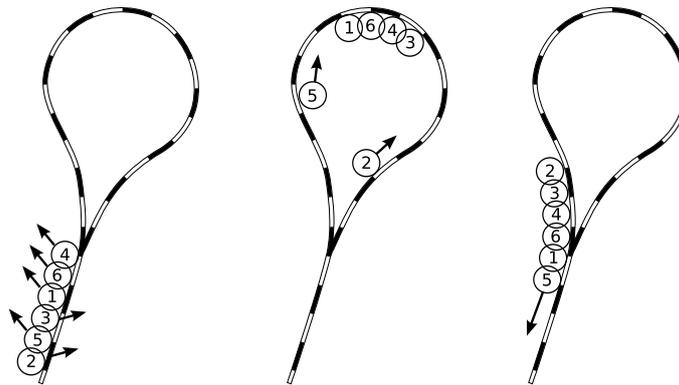
The train is sorted as follows. It is driven tailfirst to the fork and the rear car is uncoupled and brought into the loop. The remaining cars are also uncoupled one by one and brought into the loop along one of the two tracks. They are connected either to the head or to the tail of the newly formed train. When all the cars have been put into the loop, the train is driven out of it headfirst.

The railroaders repeat this operation until the train is sorted. Help them do this task as quickly as possible.

Input

The first line contains the number of cars in the train n ($2 \leqslant n \leqslant 10^4$). In the next line you are given a permutation of the integers from 1 to n, which describes the initial order of the cars from head to tail. The numbers are separated with a space. After the sorting the cars must be ordered according to their numbers starting from 1.

Output

In the first line output the minimal number of times k the train should be brought into the loop for sorting. In each of the following k lines output n integers describing the order of the cars in the train after the corresponding sorting. If there are several answers, output any of them.

Example

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

Problem F. Swamp Doctor (Division 1 Only!)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	7 seconds
Memory limit:	64 MiB

During his recent trip to the center of the Zone, stalker Shtyr got into an earlier unknown anomaly. Things looked black — he started growing fangs and his eyes turned red. Now only the Swamp Doctor can save Shtyr from turning into a vampire. . .

Shtyr does not know the Doctor's email address but suggests that the address is stored in the pocket PC of the dead stalker Semetsky, which Shtyr has found recently. But the problem is that the shrewd Semetsky didn't use an address book but hid all the addresses in the contents of a big text file. Though Shtyr can read this file, he doesn't know which segment of the file is the Doctor's address.

Shtyr wants to find all segments of the text that can be addresses and send an email to each of them. How many emails will he send?

An email address in the vicinity of the Zone consists of a username and domain separated by the '`@`' symbol. The username and domain are nonempty strings consisting of lowercase English letters and dots. They cannot start or end with a dot and cannot contain two consecutive dots.

Input

You are given the contents of the file from Semetsky's pocket PC. The file contains only lowercase English letters, dots, symbols '`@`', spaces, and line breaks. The total number of symbols is at most 10^6.

Output

Output the number of different email addresses in Semetsky's file.

Example

standard input	standard output
a.b@c.d b@c.de. @qq q@.q	5

The file contains the following addresses: "`a.b@c`", "`a.b@c.d`", "`b@c`", "`b@c.d`", "`b@c.de`".

Problem G. Babel Fish

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

The Babel fish is a rare and very useful creature, which saved Arthur Dent in his travels around the Galaxy more than once. If you insert it into your ear, you'll be able to understand representatives of any race in the Galaxy as if they spoke your own language.

Upon his return to the Earth, Arthur took the fish out of his ear and decided to keep it in case his friend Ford Prefect arrived unexpectedly and dragged him off on a new travel. Arthur thought it would be best to keep the fish in the tank the intelligent dolphins had given him. Then he would be able to have the tank with him even if he went far away from home in his car.

The tank was a rectangular parallelepiped with a square base and open top. To control the amount of water in the tank, Arthur mounted a sensor for registering the water level at each of its four vertical edges. Since the state of British country roads was far from ideal, the car tilted often and the water surface was not always parallel to the bottom of the tank, which produced unequal readings of the sensors. Arthur had to invent some method of calculating the amount of water in the tank.
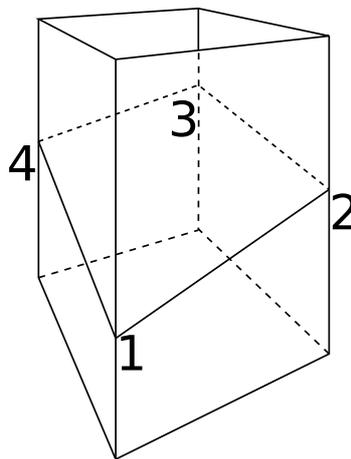
Input

The first line contains the number of tests t ($1 \leqslant t \leqslant 10^4$). In each of the following t lines you are given five integers: the length of the base square of the tank and the water levels at the vertical edges. All the integers are nonnegative and do not exceed 10^6. The edges are described in the order shown in the figure.

Output

For each test output the volume of water in the tank if it is determined uniquely, "**error**" if the data are inconsistent, and "**ambiguous**" if the answer cannot be found uniquely. All the numbers should be given with absolute or relative error of at most 10^{-6}.

Example

standard input	standard output
2	300.000
10 2 3 4 3	error
10 2 3 3 3	

Problem H. Isenbaev's Number

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

Vladislav Isenbaev is a two-time champion of Ural, vice champion of TopCoder Open 2009, and absolute champion of ACM ICPC 2009. In the time you will spend reading this problem statement Vladislav would have solved a problem. Maybe, even two. . .

Since Vladislav Isenbaev graduated from the Specialized Educational and Scientific Center at Ural State University, many of the former and present contestants at USU have known him for quite a few years. Some of them are proud to say that they either played in the same team with him or played in the same team with one of his teammates. . .

Let us define *Isenbaev's number* as follows. This number for Vladislav himself is 0. For people who played in the same team with him, the number is 1. For people who weren't his teammates but played in the same team with one or more of his teammates, the number is 2, and so on. Your task is to automate the process of calculating Isenbaev's numbers so that each contestant at USU would know their proximity to the ACM ICPC champion.

Input

The first line contains the number of teams n ($1 \leqslant n \leqslant 100$). In each of the following n lines you are given the names of the three members of the corresponding team. The names are separated with a space. Each name is a nonempty line consisting of English letters, and its length is at most 20 symbols. The first letter of a name is capital and the other letters are lowercase.

Output

For each contestant mentioned in the input data output a line with their name and Isenbaev's number. If the number is undefined, output "`undefined`" instead of it. The contestants must be ordered lexicographically.

Example

standard input	standard output
7	Ayzenshteyn 2
Isenbaev Oparin Toropov	Burmistrov 3
Ayzenshteyn Oparin Samsonov	Chevdar 3
Ayzenshteyn Chevdar Samsonov	Cormen undefined
Fominykh Isenbaev Oparin	Dublennykh 2
Dublennykh Fominykh Ivankov	Fominykh 1
Burmistrov Dublennykh Kurpilyanskiy	Isenbaev 0
Cormen Leiserson Rivest	Ivankov 2
	Kurpilyanskiy 3
	Leiserson undefined
	Oparin 1
	Rivest undefined
	Samsonov 2
	Toropov 1

Problem I. Bamboo

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

Gendo-sensei continues teaching young Shinji the art of sword fighting. Gendo fixes a thin bamboo stem of length l horizontally on n props and orders Shinji to cut it into two pieces. Gendo says that a samurai's sword must be as sharp and the stroke must be as fast that both pieces of the stem don't move after the stroke.

Shinji has noticed that not only samurai mastery is important but also the place where the sword cuts the stem. If the center of mass of a stem piece is not located between two props, the piece will fall. Shinji wants to paint some parts of the bamboo stem white so that if he cuts the stem at a white point at least one of the resulting pieces will fall. Help Shinji calculate the total length of the stem parts he will have to paint.

Input

The first line contains the integers l and n ($3 \leqslant l \leqslant 10^9$, $2 \leqslant n \leqslant 10^5$). In the second line you are given n integers smaller than l. They are the distances from the left end of the bamboo stem to the supporting props given in the ascending order. It is guaranteed that the initial position of the stem is stable.

Output

Output the total length of segments of the stem that Shinji should paint white. The answer should be rounded up to the nearest integer.

Example

standard input	standard output
5 4 1 2 3 4	4

Problem J. The Mentaculus (Division 1 Only!)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	8 seconds
Memory limit:	64 MiB

A serious man Larry, a professor of quantum physics at University of Minnesota, had a streak of bad luck. He learned that his wife wanted to ruin him, his daughter was stealing money from him for a plastic surgery, his son was having problems at school, and his university department was receiving libels upon him in anonymous letters.

But that was not all. The police arrested Larry's brother Arthur, who had lived in Larry's house for several month working on a mysterious book "The Mentaculus." When Larry wanted to read the Mentaculus he found out that the book was a collection of a lunatic's drawings — all the pages were filled with strange geometric shapes.

On one of the pages Larry saw a multitude of points and circular arcs. He thought for a moment that the points and arcs formed grinning faces. Could it be true that there were no warm feelings in Arthur's heart but only cold sarcasm? Larry wanted to calculate the number of smileys on the page. Being a scientist, he introduced a rigorous definition: a circular arc PQR and a pair of points A and B form a smiley if the following conditions hold:

1. the straight line PR separates the points A and B from the point Q;

2. the angles APR, ARP, BPR, BRP are acute;

3. the distance from the points A and B to the straight line PR is less than the doubled length of the segment PR;

4. the straight line AB has no common points with the segment PR.

Help Larry calculate the number of smileys on the page.

Input

The first line contains the number of arcs n and the number of points m ($1 \leqslant n \leqslant 100$; $1 \leqslant m \leqslant 10\,000$). In each of the following n lines, an arc is described by the coordinates of three points in the order in which they are located on the arc. The numbers are separated with a space. It is guaranteed that the three points describing an arc are distinct and do not lie in the same straight line. Each of the following m lines contains the coordinates of the points. All the coordinates are integers not exceeding $10\,000$ in absolute value. All the arcs and all the points are distinct.

Output

Output the number of smileys on the page of the Mentaculus.

Example

standard input	standard output
2 6 -2 2 0 0 2 2 -2 -2 0 0 2 -2 -1 3 1 3 0 5 -1 -3 1 -3 2 -3	2

Problem K. Victim of Advertising (Division 1 Only!)

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

Figure-skater Lev is preparing for his fifth Olympic Games. Together with his coach he is inventing a new free skating program, which will win the judges' hearts and guarantee Lev a gold medal if he performs it without mistakes.

Lev practices twice a day, in the morning and in the evening. His wife is a well-known producer, and she wants to convert the time spent by her husband for practicing into money. She has signed a contract with the advertising agency "You See − You Buy," which will shoot her husband at his training and make a cosmetics commercial with the use of this material.

So, n cameramen have come to Lev's training. They plan to shoot Lev performing his free skating program: the first cameraman will start the shooting, the second will continue, and so on. Each of the cameramen wants Lev to skate along a segment of a straight line from some point to another (and each has specified his own pair of points). Lev has decided to skate along all the specified segments passing from a segment to a segment along a circular arc so that his trajectory has the shape of a smooth curve. If there is no arc connecting two consecutive directed segments without breaks, Lev can extend one of the segments so as to connect them by an arc.

Lev has plotted a smooth curve passing through all the segments in the specified order, and now he is interested in finding the minimum time needed for skating along this curve. He knows that he cannot skate at a speed greater than 10 m/s or with a tangential acceleration greater than 1 m/s^2 in magnitude (a tangential acceleration is the acceleration directed along the trajectory). Moreover, Lev cannot skate along circular arcs with a centripetal acceleration greater than 1 m/s^2. Recall that a centripetal acceleration is calculated as v^2/R, where v is the speed and R is the radius of the arc.

Input

The first line contains the integer n ($1 \leqslant n \leqslant 1\,000$). In each of the following n lines you are given the coordinates of the beginning and of the end of the directed segment of a straight line specified by the i-th operator. The coordinates are integer and do not exceed $1\,000$ in absolute value. No two consecutive segments are parallel and co-oriented. It is guaranteed that Lev can plot a smooth curve passing through all the segments.

Output

Output the minimum time (in seconds) Lev needs to skate along the smooth curve passing through the segments specified by the cameramen. Lev must start moving at the beginning of the first segment and finish at the end of the n-th segment. Lev's speed at the starting and finishing moments is zero. You must output the time with an absolute or relative error of at most 10^{-6}.

Examples

standard input	standard output
1 0 0 4 0	4.000
2 -2 4 0 4 4 0 4 -2	7.1415926536

Problem L. Chess and Domino (Division 2 Only!)

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

You have standard chessboard 8×8, with two distinct squares which are removed from it. The object is to check if this modified chessboard can be completely covered by 31 dominoes.

The square in row p and column q is denoted by (p, q). Each domino have size 1×2 and can be placed horizontally or vertically onto the chess board, so it can cover either two squares $((x, y)$ and $(x, y + 1))$ or $((x, y)$ and $(x + 1, y))$.

Input

The first line of input file contains the number of scenarios $1 \leqslant k \leqslant 2100$. Each of the following k lines contains 4 space-separated integers a, b, c, and d ($1 \leqslant a, b, c, d \leqslant 8$). These integers represent the chess board from which the squares (a, b) and (c, d) are removed. You may assume that squares (a, b) and (c, d) are distinct.

Output

For every scenario in new line print the number 1, if the board in this scenario can be completely covered by 31 dominoes, otherwise write a 0.

Example

standard input	standard output
3	1
2 5 8 4	0
1 1 8 8	0
7 1 4 4	

Problem M. MMORPG (Division 2 Only!)

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

In MMORPG "Fields of Lovecraft" you can practice with guildmasters and raise your skills: sword mastery for 100 gold and no gems per level, archery for 125 gold and 50 gems per level, two-weapon fighting for 50 gold and 100 gems.

Given your current resources and how much one level for certain skill increases your strength in battle, determine the maximum strength increase you can obtain.

Input

Input file consists of 5 integers M ($0 \leqslant M \leqslant 5 \times 10^4$), the amount of gold you have, G ($0 \leqslant G \leqslant 5 \times 10^4$), the amount of gas you have, S ($0 \leqslant S \leqslant 1000$), the strength increase for one additional level in sword mastery, A ($0 \leqslant A \leqslant 1000$), the strength increase for one additional level in archery, and T ($0 \leqslant T \leqslant 1000$) — the strength increase for one additional level in two-weapon fighting.

Output

Output a single line containing the strength increase you can obtain.

Example

standard input	standard output
900 800 15 25 35	355

Problem N. Pixels (Division 2 Only!)

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

On huge display as pixels are used squares with opposite corners (x, y) and $(x + 1, y + 1)$ for each pair of integers (x, y). A pixel is is lit if it have more than one common point with circle being drawn. Command for drawing a circle have three parameters: two coordinates of center and radius of the circle.

Compute the exact number of pixels that are lit when a circle with a given command for drawing a circle.

Input

Input file consists of three integers x, y, and r $(1 \leqslant x, y, r \leqslant 10^6)$, specifying respectively the center (x, y) and radius r of the circle. It is guaranteed that display is really big $(10^9 \times 10^9)$, and origin is put into center of display.

Output

Print the number of pixels that are lit in the circle, specified by given command.

Examples

standard input	standrad output
2 2 1	4
6 7 5	88

Problem O. Rectangles (Division 2 Only!)

Input file:	standard input
Output file:	standard output
Time limit:	9 seconds
Memory limit:	64 MiB

There are N axis-parallel rectangles in the plane. Calculate the total area they cover.

Input

The first line of input file contains a positive integer N ($1 \leqslant N \leqslant 2 \times 10^5$). N lines then follow, each with four space-separated integers x_1, x_2, y_1, y_2 — a rectangle $x_1 \leqslant x \leqslant x_2$, $y_1 \leqslant y \leqslant y_2$ ($0 \leqslant x_1 < x_2 \leqslant 10^9$, $0 \leqslant y_1 < y_2 \leqslant 10^9$).

Output

Output the total area covered by the given N rectangles. Any region covered by multiple rectangles should be counted only once.

Example

standard input	standard output
2 0 3 1 2 1 2 0 3	5