A. Ancient Berland Circus

Nowadays all circuses in Berland have a round arena with diameter 13 meters, but in the past things were different.

In Ancient Berland arenas in circuses were shaped as a regular (equiangular) polygon, the size and the number of angles could vary from one circus to another. In each corner of the arena there was a special pillar, and the rope strung between the pillars marked the arena edges.

Recently the scientists from Berland have discovered the remains of the ancient circus arena. They found only three pillars, the others were destroyed by the time.

You are given the coordinates of these three pillars. Find out what is the smallest area that the arena could have.

Input

There are multiple test cases in the input file, terminated by EOF. For each test case:

The input file consists of three lines, each of them contains a pair of numbers — coordinates of the pillar. Any coordinate doesn't exceed 1000 by absolute value, and is given with at most six digits after decimal point.

Output

Output the smallest possible area of the ancient arena. This number should be accurate to at least 6 digits after the decimal point. It's guaranteed that the number of angles in the optimal polygon is not larger than 100.

Sample Input

```
0.000000 0.000000
1.000000 1.000000
0.000000 1.000000

0.000000 0.000000
1.000000 1.000000
0.000000 1.000000
```

Sample Output

```
1.00000000
1.00000000
```

(Almost empty page.)

B. Keyboard

CsFerng got a new keyboard on his birthday. On this unusual keyboard it has $n \times m$ keys arranged in n rows and m columns. Moreover, all but the key at the upper-left corner are covered by 1×2 domino blocks. So in total there are $(nm - 1)/2$ dominoes. CsFerng can perform movements on a block such that it **shifts** onto an uncovered key and remain another key uncovered. Also, he may press down the key only if it is uncovered at that time.

Now, CsFerng want to test all the keys labeled with vowels, i.e. characters 'a', 'e', 'i', 'o', 'u', and 'y'. Find the minimum number of **shifts** that needs to be performed.

Input

There are multiple test cases in the input file, terminated by EOF. For each test case:

The first line of standard input there are two numbers n and m ($1 \leq n, m \leq 70$) — The dimensions of the keyboard. Subsequent n lines contains m lower case letters, which describe the various rows of the keyboard. In the following n lines located on the m characters describing the arrangement of dominoes: '`.`' (ASCII code 46) is uncovered, '`-`' (ASCII code 45) is the key concealed dice set horizontally, and '`|`' (ASCII code 124) is key concealed dice set vertically.

Output

If it is impossible to solve this, please output "`NO`". Otherwise output the minimum number of shifts in order to press all the vowels.

Sample Input

```
3 3
ytr
hgf
dsa
.--
|||
|||
```

Sample Output

```
2
```

(Almost empty page.)

C. Monopolist

Day has finally arrived: the gates Byteotia finally knocked on the Internet. The first step will be upgrading the wiring of the capital. This task very keen to certain well-known communications company, but it is not so simple because of the force in Byteotia rules and constraints in infrastructure.

In the capital there is n skyscrapers, each of them at the intersection of a street and one of the alleys. The streets run from north to south and avenues from east to west. The distance between adjacent alleys and streets adjacent shall be one bajtometr. The streets are numbered integers, their numbers grow to the east. Similarly, we use numbers for the alleys, the numbers are increasing in a northerly direction.

The cables connecting the buildings can be placed only on streets and avenues. To connect the building located at the point (x_1, y_1) (i.e., at the intersection of the street number x_1 the avenue number y_1) With the building at the point (x_2, y_2) must be used $|x_1 - x_2| + |y_1 - y_2|$ centermeters cable. Moreover, a single cable length must not exceed c centermeters and can not be combined outside of buildings.

To prevent a monopoly, each supplier can install on the roof of a building exactly the intruder-transmitting antenna. It will provide Internet access to those towers, which are directly or indirectly connected cables to the building with an antenna.

President PZFT wonders what is the maximum number of recipients, which can provide Internet access, and at least how many other providers will work in bajtockiej capital, where the Internet is to be delivered to each building.

Input

There are multiple test cases in the input file, terminated by EOF. For each test case:

The first line of standard input contains two integers n and c ($1 \leq n \leq 10^5, 1 \leq c \leq 10^9$) Denoting respectively the number of skyscrapers and the maximum length of cable. Skyscrapers are numbered for simplicity consecutive integers, starting by 1. In subsequent n lines are lines of skyscrapers. Each of these lines contains two integers x_i and y_i ($1 \leq x_i, y_i \leq 10^9$), Which means that i-th skyscraper located at a point at these coordinates.

Output

You must print each answer on a single line. The standard output should be written accordingly two numbers indicate the minimum number of other Internet providers, which will have to compete PZFT, and the maximum number of recipients to whom the Internet will be able to deliver.

Sample Input

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

Sample Output

```
1 3
```

(Almost empty page.)

D. Garden

Byteman wife, Bajtolina, loves flowers, and decided to establish a garden near the house of marriage. Since Bajtolina is a perfectionist, wanted to make her garden was square, and its sides are parallel to the nearest meridian and parallel. In addition, Bajtolina wished that, in every corner of the garden was one of the n growing near the tree. Information about plans for his wife, and that the garden must be built immediately, Byteman surprised at the precise moment when he started the World Cup finals. Byteman knows that his wife is a person, which is not denied, and therefore kept a cool head and asked her if he knew vaguely, which wants to build a garden spot. Bajtolina, being a perfectionist, you'll check all the possible location of the garden, before you choose one or the other. Byteman would soon find out how long it will take it, assuming that each possible position of the garden his wife is able to assess at the time of one second.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line of standard input are an integer n, $1 \leq n \leq 10^5$ denoting the number of apple trees growing near the house of the spouses. For simplicity, we define the position of trees in a Cartesian coordinate system, in which the axis is near the meridian OY, And the closest parallel - axis OX. In each subsequent n lines there are two separate single-spaced integers x_i and y_i, $-10^6 \leq x_i, y_i \leq 10^6$, denoting the coordinates i-th tree. No pair of coordinates is repeated in the input.

Output

For each test case, the standard output should be written a single integer equal to the number of seconds that Bajtolina need to check all possible position of the square gardens, one at each corner has one of the apple.

Sample Input

```
6
0 0
0 1
1 0
1 1
3 0
3 1
```

Sample Output

```
1
```

(Almost empty page.)

E. The least round way

There is a square matrix $n \times n$, consisting of non-negative integer numbers. You should find such a way on it that

- starts in the upper left cell of the matrix;
- each following cell is to the right or down from the current cell;
- the way ends in the bottom right cell.

Moreover, if we multiply together all the numbers along the way, the result should be the least "round". In other words, it should end in the least possible number of zeros when written in decimal.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line contains an integer number n ($2 \leq n \leq 1000$), n is the size of the matrix. Then follow n lines containing the matrix elements (non-negative integer numbers not exceeding 10^9).

Output

For each test case, print the least number of trailing zeros when write down the number in decimal.

Sample Input

```
3
1 2 3
4 5 6
7 8 9
2
10 10
10 10
3
1 2 2
5 10 2
5 5 1
```

Sample Output

```
0
2
0
```

(Almost empty page.)

F. Highways

Bajtocja is a small country, in which the n cities combined $n-1$ two-way roads. With every city you can get to each other, with residents using Byteotia carefully. This implies that the roads are notoriously bajtockie congested. So additionally built a number of highways and combined them selected pairs of cities.

By the route we understand the sequence of subsequent respiratory and/or motorways connecting nearby towns. Cities on the route can not be repeated. For a given pair of cities a, b there is exactly one route, which does not use any highway, we call it the main route between a and b.

Residents driving from the city a to town b may choose to go the route the main, if they want to benefit from a highway. In the latter case the path can not intersect the main route out of the cities a and b and must use exactly one highway.

Your task is to write a program that will answer questions about the correct number of routes between pairs of cities.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line of standard input contains an integer n ($1 \leq n \leq 100000$) denoting the number of cities in Byteotia. Cities are numbered integers from 1 to n. Subsequent $n-1$ lines contains two integers a_i, b_i ($1 \leq a_i, b_i \leq n$) indicate that there is a road between the towns a_i and b_i.

The next line is the number of m ($1 \leq m \leq 100000$) Denoting the number of highways, the next m lines contain their names. The next line is the number of q ($1 \leq q \leq 500000$) Denoting the number of queries that are described in q subsequent rows. Both descriptions of the highways and the queries are given in the same format as names of roads.

Output

For each query please output the answer of that query.

Sample Input

```
9
1 2
2 3
4 2
1 5
5 6
7 5
7 8
9 7
4
2 5
3 4
6 4
8 3
4
4 9
2 5
1 6
1 7
```

Sample Output

```
1
4
2
2
```

G. Holidays

Tmt plans to select some days to take a break. It is based on the weather forecast for the next $3n$ days. He is interested in only the highest temperature proveded for each day.

Additionally Tmt is told by his boss that he cannot leave too frequently. During each consecutive n days Tmt can leave at most k days. Please help Tmt to plan his vacation so that the sum of temperatures in the days of leave is as large as possible?

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line of input contains two integers n and k ($1 \leq n \leq 200, 1 \leq k \leq 10, k < n.$) The second line contains $3n$ positive integers not greater than 10^6 describing the temperature provided for each of the next $3n$ days.

Output

For each test case, please output the maximum sum of temperatures during the holidays that are selected meeting the constraints.

Sample Input

```
5 3
14 21 9 30 11 8 1 20 29 23 17 27 7 8 35
```

Sample Output

```
195
```

(Almost empty page.)

H. Commentator problem

The Olympic Games in Bercouver are in full swing now. Here everyone has their own objectives: sportsmen compete for medals, and sport commentators compete for more convenient positions to give a running commentary. Today the main sport events take place at three round stadiums, and the commentator's objective is to choose the best point of observation, that is to say the point from where all the three stadiums can be observed. As all the sport competitions are of the same importance, the stadiums should be observed at the same angle. If the number of points meeting the conditions is more than one, the point with the maximum angle of observation is prefered.

Would you, please, help the famous Berland commentator G. Berniev to find the best point of observation. It should be noted, that the stadiums do not hide each other, the commentator can easily see one stadium through the other.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The input data consists of three lines, each of them describes the position of one stadium. The lines have the format x, y, r, where (x, y) are the coordinates of the stadium's center ($-10^3 \leq x, y \leq 10^3$), and r ($1 \leq r \leq 10^3$) is its radius. All the numbers in the input data are integer, stadiums do not have common points, and their centers are not on the same line.

Output

For each test case, print the coordinates of the required point with five digits after the decimal point. If there is no answer meeting the conditions, the program shouldn't print anything. The output data should be left blank. (or you can just omit this test data.)

Sample Input

```
0 0 10
60 0 10
30 30 10
```

Sample Output

```
30.00000 0.00000
```