A. Qin Shi Huang's National Road System

Description

During the Warring States Period of ancient China(476 BC to 221 BC), there were seven kingdoms in China ---- they were Qi, Chu, Yan, Han, Zhao, Wei and Qin. Ying Zheng was the king of the kingdom Qin. Through 9 years of wars, he finally conquered all six other kingdoms and became the first emperor of a unified China in 221 BC. That was Qin dynasty --- the first imperial dynasty of China(not to be confused with the Qing Dynasty, the last dynasty of China). So Ying Zheng named himself "Qin Shi Huang" because "Shi Huang" means "the first emperor" in Chinese.

Qin Shi Huang undertook gigantic projects, including the first version of the Great Wall of China, the now famous city-sized mausoleum guarded by a life-sized Terracotta Army, and a massive national road system. There is a story about the road system:

There were n cities in China and Qin Shi Huang wanted them all be connected by n-1 roads, in order that he could go to every city from the capital city Xianyang. Although Qin Shi Huang was a tyrant, he wanted the total length of all roads to be minimum,so that the road system may not cost too many people's life. A daoshi (some kind of monk) named Xu Fu told Qin Shi Huang that he could build a road by magic and that magic road would cost no money and no labor. But Xu Fu could only build ONE magic road for Qin Shi Huang. So Qin Shi Huang had to decide where to build the magic road. Qin Shi Huang wanted the total length of all none magic roads to be as small as possible, but Xu Fu wanted the magic road to benefit as many people as possible ---- So Qin Shi Huang decided that the value of A/B (the ratio of A to B) must be the maximum, which A is the total population of the two cites connected by the magic road, and B is the total length of none magic roads.

Would you help Qin Shi Huang?

A city can be considered as a point, and a road can be considered as a line segment connecting two points.

Input

The first line contains an integer t meaning that there are t test cases(t <= 10).

For each test case:

The first line is an integer n meaning that there are n cities(2 < n <= 1000).

Then n lines follow. Each line contains three integers X, Y and P (0 <= X, Y <= 1000, 0 < P < 100000). (X, Y) is the coordinate of a city and P is the population of that city.

It is guaranteed that each city has a distinct location.

Output

For each test case, print a line indicating the above mentioned maximum ratio A/B. The result should be rounded to 2 digits after decimal point.

Sample Input

```
2
4
1 1 20
1 2 30
200 2 80
200 1 100
3
1 1 20
1 2 30
2 2 40
```

Sample Output

```
65.00
70.00
```

B. Hou Yi's secret

Description

Long long ago, in the time of Chinese emperor Yao, ten suns rose into the sky. They burned the crops and scorched the bushes and trees, leaving the people with nothing to eat.

Hou Yi was the greatest archer at that time. Yao wanted him to shoot down nine suns. Hou Yi couldn't do that job with ordinary arrows. So Yao send him to God to get some super powerful magic arrows. Before Hou Yi left, Yao said to him: "In order to manage our country in a better way, I want to know how many years can I live from now on. Please ask God this question for me." Hou Yi promised him.

Hou yi came back from God with ten magic arrows. He shot down nine suns, and the world returned to harmony. When Yao asked Hou Yi about the answer of his question, Hou Yi said: "God told me nothing. But I happened to see a 'life and death book' with your name on it. So I know the answer. But you know, I can't tell you because that's God's secret, and anyone who gives out God's secret will be burned by a thunder!"

Yao was very angry, he shouted: "But you promised me, remember?" Hou Yi said: "Ooo-er, let's make some compromise. I can't tell you the answer directly, but I can tell you by my only precious magic arrow. I'll shoot the magic arrow several times on the ground, and of course the arrow will leave some holes on the ground. When you connect three holes with three line segments, you may get a triangle. The maximum number of similar triangles you can get means the number of years you can live from now on." (If the angles of one triangle are equal to the angles of another triangle respectively, then the two triangles are said to be similar.)

Yao was not good at math, but he believed that he could find someone to solve this problem. Would you help the great ancient Chinese emperor Yao?

Input

There are multiple test cases, and the number of test cases is no more than 12.

The first line of every test case is an integer n meaning that Hou Yi had shot the magic arrow for n times ($2 < n <= 18$).

Then n lines follow. Each line contains two integers X and Y ($-100 < X, Y < 100$), the coordinate of a hole made by the magic arrow.

Please note that one hole can be the vertex of multiple triangles.

The input ends with n = 0.

Output

For each test case, print a line with an integer indicating the maximum number of similar triangles Yao could get.

Sample Input

```
3
1 1
6 5
12 10
4
0 0
1 1
2 0
1 -1
0
```

Sample Output

```
1
4
```

C. Three Kingdom Chess

Description

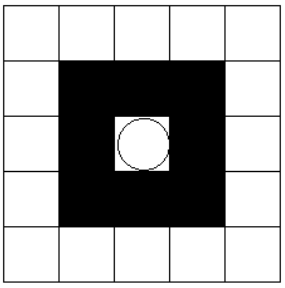
Zhuge Liang and Zhou Yu were famous strategists in The Three Kingdoms Period. During The War of the Red Cliff in which Cao Chao was defeated, they often sat together to play chess. But the chess they played was special.

We can call the chess "Three Kingdom Chess". There are 2 players, and each one has some soldiers. All the soldiers are put on an N × M chessboard. Each grid on the chess board can be mountain, plain or lake. And there are 3 kinds of soldiers which are footman, archer and rider. All kind of soldiers can stay at or pass through plains. None of them can stay at or pass through lakes. Only footmen and archers can stay at or pass through mountains.

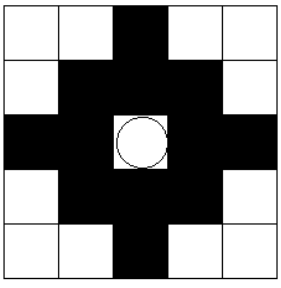
There are at most K turns in the game. Two players take turns to act. The first turn is Zhuge Liang's turn, the second turn is Zhou Yu's, the third turn is Zhuge Liang's…and so on. When one player's soldiers are all destroyed or after the Kth turn, the game ends. In each turn, the player can move one of his soldiers to a destination and then let it attack one of the opponent's soldiers.

The rule of moving is as below. Every kind of soldiers has its "pace length". A soldier with "pace length" of q can move at most q steps(you can also let your soldier move 0 step). On each step, a soldier can move up, down, left or right by one grid. But please note that no soldier can pass a lake and a rider can't pass a mountain, as mentioned above. A soldier is also not able to pass a grid which is occupied by an enemy soldier. A soldier can pass, but cannot stay at a grid which is occupied by his comrade.

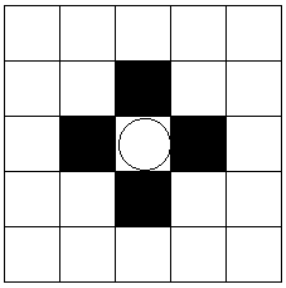
After a soldier reaching his moving destination, he can launch an attack. A soldier can attack an enemy soldier who is in his "attack region". The attack regions of different kinds of soldiers are shown in the figures below:



footman



archer



rider

It means that the soldier in the grid with a circle can attack one enemy soldier who is in the black grids.

Every soldier has a "strength" property. A soldier's strength will decrease if he is attacked. The strength decrement equals to S × F, which S is the attacker's strength, and F is the attacking factor. The attacking factor is 2 when a footman attacks an archer, an archer attacks a rider and a rider attacks a footman. It's 1 when a footman attacks a footman, a rider

attacks a rider and an archer attacks an archer. It's 0.5 when a footman attacks a rider, a rider attacks an archer and an archer attacks a footman.

A soldier will be destroyed and disappear if its strengths is equal to or less than 0.

In one turn, a soldier can only launch one attack, and he can't move again in the same turn after attacking.

At the end, the score you get is the sum of strength of all your soldiers minus the sum of strengths of all your opponent's soldiers. So the score can be negative. Suppose Zhuge Liang and Zhou Yu were both very clever and always chose the best strategy to get as many score as possible, so what's the maximum score could Zhuge Liang get in the game?

Input

There are several test cases. For each test case:

The first line contains 3 integers, N, M (1 <= N, M <= 5) and K (1 <= K <= 10), indicating that the chessboard is N × M, and the game will end after K turns.

Then N lines follow, each containing M integers. Every integer represents a grid, showing the grid's property. 0 stands for plain, 1 stands for mountain and 2 stands for lake.

The next line contains 4 integers, T (1 <= T <= 6), S1, S2 and S3, indicating that there are T soldiers on the chessboard at the beginning. It is guaranteed that no more than one soldier stay at the same grid. S1, S2 and S3 mean the "pace length" of footman, rider and archer.

For the next T lines, each line contains 5 integers x, y, a, b and c, describing a soldier. The soldier is in row x and column y (The coordinates x, y start from 1). If a=0 then the soldier is Zhuge Liang's and if a=1 then it is Zhouyu's. The strength of the soldier is b. c=0 means the soldier is a footman, c=1 means it is a rider and c=2 means it is an archer.

The input ends with N = M = K = 0.

Output

For each test case, output one line containing the maximum score Zhuge Liang can get in the game.

Sample Input

```
3 3 2
0 0 0
0 0 0
0 0 0
2 1 1 1
2 1 0 100 0
2 3 1 100 0
0 0 0
```

Sample Output

```
100
```

D. The Voyages of Zheng He

Description

Zheng He (1371–1433) was a Hui-Chinese mariner, explorer, diplomat and fleet admiral, who commanded seven voyages to Southeast Asia, South Asia, the Middle East, and East Africa, collectively referred to as the Voyages of Zheng He. His fleet was by far the largest and most advanced fleet in the world at his time, and his voyages were about 80 years earlier than Columbus' America discovering voyage.

Recently some Chinese ACMers just found an old document about Zheng He's Voyage. It said:

Once upon a time, when Zheng He was sailing along the Malaysia coast, a strange volcano suddenly erupted.The volcano threw some strange hot rocks on the sea. Those rocks floated on the water at first, and after some time, when water went into their center, they would explode. Every rock could be considered as a point and it had a set of properties X, Y, R, T and L, meaning that:

The position of the rock was (X, Y). The rock would explode at time T, and the explosion would last until time T+L. During the time interval [T, T+L](both ends are included), any ship whose distance from that rock was no more than R would be destroyed.

At time 0, Zheng He's ship was at the position (0, 0), and his ship could also be considered as a point. When talking about "distance", it means the Manhattan Distance. In a plane, the Manhattan Distance between (x1, y1) and (x2, y2) is |x1 - x2| + |y1 - y2|. Zheng He's ship could only move horizontally or vertically. The maximum speed of Zheng He's ship was 1 per second. That means, if Zheng He's ship was at (x, y) now, then 1 second latter it may arrive at any point in the region S(S={(x1,y1) | |x1-x|+|y1-y| <= 1}).

Suppose Zheng He knew every rock's properties. Given time P, Zheng He wanted to know whether he could survive after time P.

Input

Input contains several test cases. For each test case:

The first line contains 2 integers, N and P (1<=N<=1000,1<=P<=1000000), indicating that there were N rocks on the sea and Zheng He wanted to know whether he could survive after time P.

Then N lines follow. Each line describes a rock by 5 integers ---- X, Y, R, T and L (-50<=X, Y<=50, 1<=R<=50, 1<=T, L<=10000) mentioned above.

Input ends with N = P = 0.

Output

For each test case, If Zheng He can survive after time P, please print "Zheng can survive." But if P <= 100, you should print one extra line "The survive area is : A", where A is the area of the region which Zheng He can safely reach at time P (rounded to 3 digits after the decimal point). If Zheng He cannot survive, please print "Zheng dies at : H", where H is the latest time Zheng He can survive (H is an integer and Zheng He will be alive at time H but be dead at time H+1). Note that there are one space before the mark ":" and one after it.

Sample Input

```
4 30
50 50 50 50 100
-50 50 50 50 100
50 -50 50 50 100
-50 -50 50 50 100
3 20
-1 -4 4 3 7
-4 2 8 6 1
4 -3 10 10 10
0 0
```

Sample Output

```
Zheng can survive.
The survive area is : 1800.000
Zheng dies at : 10
```

E. Peach Blossom Spring

Description

Portrait of Tao Yuanming

Tao Yuanming(365-427) was a Chinese poet of Eastern Jin dynasty. One of his most famous works is "Peach Blossom Spring", which is a fable about a chance discovery of an ethereal village where the people lead an ideal existence in harmony with nature, unaware of the outside world for centuries. So in Chinese, "Peach Blossom Spring" means "utopia".

In the story of "Peach Blossom Spring", there was a mysterious place. In Qin dynasty, some people escaped to that place during the civil unrest and built a village. They and their descendants never left and never had any contact with the outside world since then, until centuries latter a fisherman of Jin dynasty found them.

Recently, some Chinese ACMers happened to find the relics of the village mentioned in"Peach Blossom Spring". They also found a document about building hiding places to escape from Qin army. The document said:

There were n houses and m roads in the village. Each road connected two houses. These houses were numbered from 1 to n. There were k families, each living in a different house. The houses they lived were house 1, house 2, … , house k. There were also k broken houses: house n-k+1, house n-k+2, ... , house n, with secret basements so that those houses could be used as hiding places.

The problem was that all roads were broken. People wanted to repair some roads so that every family could reach a hiding place through the repaired roads. Every hiding place could only hold one family. Each road cost some labor to be repaired. The head of the village wanted to find out the minimum cost way of repairing the roads, but he didn't know how to do.

Would you solve the problem which the ancient village head never solved?

Input

The input begins with a line containing an integer T(T<=50), the number of test cases. For each case, the first line begins with three integers ---- the above mentioned n (4<=n<=50), m (0<=m<=1000) and k (1<=k<=5, 2k<=n). Then m lines follow, each containing three integers u,v and w, indicating that there is a broken road connecting house u and v, and the cost to repair that road is w(1<=w<=1000).

Output

For each test case, if you cannot find a proper way to repair the roads, output a string "No solution" in a line. Otherwise, output the minimum cost to repair the roads in a line.

Sample Input

```
2
4 3 1
4 2 10
3 1 9
2 3 10
6 7 2
1 5 1000
2 6 1000
1 3 1
2 3 1
3 4 1
4 5 1
4 6 1
```

Sample Output

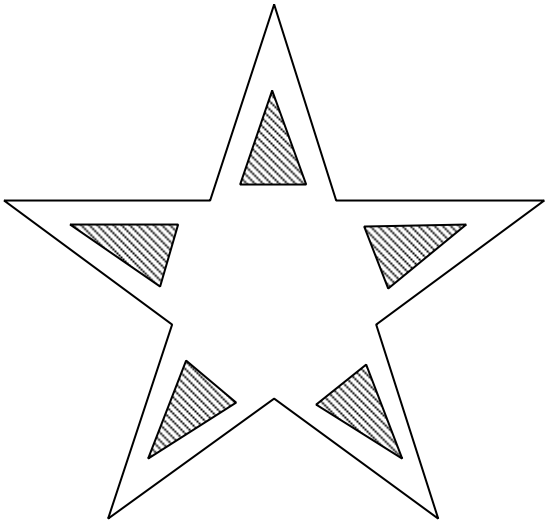
```
29
5
```

F. Harry Potter and the holy banquet

Description

This year, the greatest magical school Hogwarts will celebrate its 2000th birthday. The school committee decided to hold a banquet that would invite all the students, teachers, alumnus and celebrities. Harry Potter and his friends took part in the "Banquet Preparatory Committee of Students" and he had been told to divide a huge celebration cake and to deliver it to the students in each house at the banquet.

The cake was pretty odd, which is obviously a familiar situation to us muggles in this magical world. It had only one level, and to look down the cake it was shaped as a polygon! Indeed, it was polygonal, not round. The top surface of the cake was mostly covered by cream. Besides cream, fruits and vegetables such as dragon fruit slides and pumpkin slides were used to decorate the cake's top surface. The oddest thing was that all of them were shaped as polygons. For example, the following figure shows a possible decoration of the cake, in which the white space was covered by cream while shadow space was covered by other food.



As we all know, Hogwarts had four houses which were named after their founders, Gryffindor, Hufflepuff, Ravenclaw and Slytherin. Harry needed to divide the cake into four pieces by using an incantation "Diffindo". By using "Diffindo" once, the cake would be divided by a straight line, so Harry needed to use the incantation twice in total in order to divide the cake into four. He also recognized that students in Hogwarts were crazy about creams. So he had to make the four pieces of cake covered by same area of cream.

Since the cake could not be done until the day of banquet, harry asked Professor McGonagall to get the final design paper of the cake. In this paper, the top surface of the cake was demonstrated as a polygon in Cartesian coordination system. Incidentally, Prof McGonagall told Harry that the first incantation ("straight line") needed to paralleled to the x-axis because of some secret taboo.

Harry was confused about this task. He asked Ron Weasley and Hermione Granger to help him figure it out which two straight lines should be chosen. Their conversation was as follows:

Harry Potter: I'm wondering whether there is any solution in such strict constraints.

Ron Weasley: Um…perhaps there's more than one solution. What's your opinion, Hermione?

Hermione Granger: Hush! I'm working on it.

Could you help them work it out?

Input

The input contains several test cases.

The first line of each test case is an integer N (N<=50) representing the number of edges of the cake's top surface (big polygon). Each of the following N lines contains two real numbers xi, yi (-1000 <= xi, yi <= 1000). They show N vertices of the polygon in clockwise order. The following line contains an integer M (M<=50), representing the number of small polygons that were not covered by cream. Then M groups of lines follow, describing M polygons (small polygons) in the same way of describing the big cake polygon.

The input guarantees that the number of vertices of these small polygons is less or equal to 50. All the small polygons are strictly inside the big cake polygon and will not touch the edge of the big polygon. Each of two small polygons will not overlap. In the big polygon, the area that is not covered by small polygons is all covered by cream.

The input file ends by N = 0.

Output

For each test case, if there is no solution, output a string "No answer" in a line. If there is more than one legal cut solution, output a string "Multiple answers" in a line. Otherwise, output 6 real numbers in a line:

a1 b1 c1 a2 b2 c2

Where a1x+b1y+c1=0 is the equation of the first straight line which is paralleled to the x-axis, and a2x+b2y+c2=0 is the equation of the second straight line. To normalize the equations, you should make sure that for each ax+by+c=0, if the factor a is not 0, it must be 1. If a = 0 ,then b must be 1. All the real numbers are rounded to 4 digits after decimal point.

Sample Input

```
4
2 2
2 -2
-2 -2
```

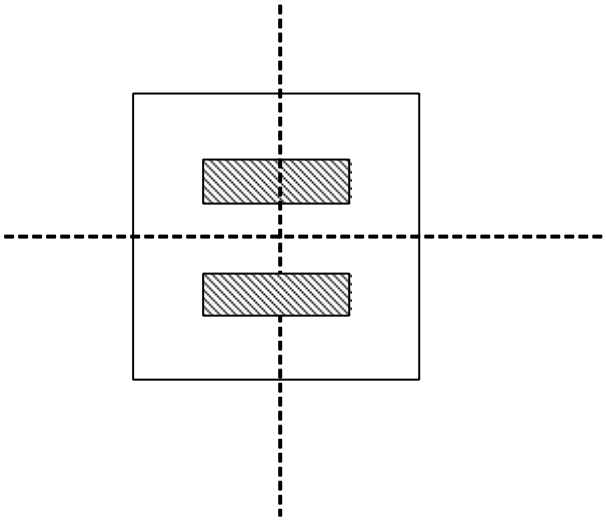
-2 2
2
4
1 1
1 0.5
-1 0.5
-1 1
4
1 -0.5
1 -1
-1 -1
-1 -0.5
0

Sample Output

0.0000 1.0000 0.0000 1.0000 0.0000 0.0000

Hint

The figure of sample is as follows, in which the dashed lines demonstrate the two straight cut.



G. A Letter to Programmers

Description

Dear Programmers:

I can imagine how surprised you are when you receive this strange letter. Well, be patient, I am going to talk about some really exciting things that you must be interested in.

First of all, I have to congratulate everyone of you - the gifted programmers, for you are so lucky to have a God-given chance to be my inheritor - a new Deity of Stars. However, you know that it is difficult for an ordinary person to become a deity, so only the best one among you can finally be chosen. Therefore, you are facing a hard test for estimating your abilities. Try your best to compete!

The Deity of Stars, of course, is the unique dominator of all stars in the whole universe, which means controlling the stars' tracks and ensuring that the stars move in their own orbit are his/her most important responsibilities. What? You will be sick in managing incalculable stars? Don't worry, it will be a piece of cake once you have a wonderful tool - a special kind of programming language. That is why I am going to choose my inheritor from you.

So in your test, you will be given a special program and the initial positions of some stars (In deities' eyes, the stars are so small that they can be regarded as points), you need to figure out the new positions of these stars after the program is executed.

Considering all of you are green hands, I will just give you a program in a simple version during the test, which contains only several kinds of instructions listed below:

1. translate tx ty tz

Everything in (x, y, z) must be moved to (x+tx, y+ty, z+tz)

2. scale a b c

Everything in (x, y, z) will be moved to (ax, by, cz)

3. rotate a b c d

It will make everything rotate. The rotation axis is the straight line from (0, 0, 0) to (a, b, c), and the angle of rotation is d (measured in degrees). If you stand at (a, b, c) and look at (0, 0, 0),you will see that the rotation is counterclockwise.

4. repeat k

The instructions between a "repeat" instruction and an "end" instruction matched with it (will be explained later) will be executed for k times. The integer k is non-negative and a 32-bit signed integer is sufficient to deal with it.

5. end

If there are some unmatched "repeat" instructions, the "end" instruction will be matched with the nearest unmatched "repeat" instruction before it; otherwise, it indicates the end of the program. Please note that a repeat-end pair may include other repeat-end pairs.

Now the test is coming. Are you ready?

Good Luck,

Zi Wei, Emperor of North Polaris

Input

The input contains no more than 20.

Each test case begins with one integer n (1 <= n <= 1000), indicating the number of the given points. Then there is a correct program without any extra blanks or redundant characters and it contains less than 100 lines. Each line contains only one instruction. Then n lines follow, each containing three numbers which indicate the coordinates of a point in 3D universe. All numbers except n and k are floats and no more than 1000 in absolute value.

Two consecutive cases are separated by a blank line.

The input ends with n = 0.

Output

For each test case, print n lines, each line contains three float numbers indicating the new position of a point. Please round the results to two digits after decimal point. You should print the n points in the same order as in input.

Print a blank line **after** each test case.

Sample Input

```
2
rotate 1.0 1.0 1.0 90.0
translate 2.0 2.0 2.0
end
1.0 1.0 1.0
1.0 0.0 0.0

3
repeat 100
translate 2.7 -0.2 1.1
translate -2.6 0.0 -1.0
end
scale 1.0 0.0 0.5
end
0.5 2.7 1.1
0.22 0 7.0
1.2 3.4 5.6

0
```

Sample Output

```
3.00 3.00 3.00
2.33 2.91 1.76

10.50 0.00 5.55
10.22 0.00 8.50
11.20 0.00 7.80
```

H. Healing

Description

Do you know the popular game World Of Warcraft (WOW) made by Blizzard? Tom plays a Blood Elf Paladin in WOW. The Paladins have 3 kinds of talent trees: Holy, Protection and Retribution.

The Holy Paladins in a team are healers, who provide healing service, heal the wounded; the Protection Paladins in a team are tanks, who attract the enemy's fire and protect the teammates; the Retribution Paladins in a team are melee damage dealers.

After the version Cataclysm is published, the Retribution Paladins are found weakened by Blizzard. But fortunately, the Holy Paladins become more and more powerful amount the healers.

In order to join the dungeons and raids easier, Tom choose the talent of Holy to be his role's main talent (because the dungeons and raids are lack of healers). What a nice job the Holy Paladin is! Instead of standing in front of the monsters and enduring the hit, the only thing the Holy Paladins should do is to heal teammates and hardly worry about the monsters would attack them.

Unlike the Retribution Paladins' operation of "Keyboard Rolling", the Holy Paladins have many spells to use of healing, so that some part of the pressing of some spells would be overlapping with each other. Furthermore, once a spell was cast successfully, it would possibly lead to casting one spell easily, that means you can get a buff which would allow you cast one spell in another way (The spell the buff effects can be anyone he can cast).

It is high-operation-frequency when in the dungeons, so Tom can hardly notice whether he cast a spell successfully or how much he had healed. And Tom really wants to know that, so he turns to you for a favor, asks you to write an Add-On which can help him record the total healing points and which spell brings higher total healing points.

About the spells:

Each spell has a distinct name.

Spell needs Mana Points(MP). You cannot cast the spell when there is not enough mana.

Spell has Cool Down Time. Once you cast a spell successfully, you cannot cast the same spell during the next Cool Down Time.

If you fail to cast a spell, the keys you have pressed can be the prefix of the next spell.

If spell-2 is the suffix of spell-1, then spell-1 is priority.

No two spells can be cast in same moment.

Some spells will lead to some buffs(described above) so that when you press some other keys sequences, you will cast some spells, too. Notice that the buff will exist until you cast the exact spell successfully, no matter you use the buff or not. (In other word, if you get the buff of spell A, then you don't use the buff but cast the spell A, the buff of spell A will disappear.)

One spell will immediately be cast once it fits the spell condition.

Besides, the Holy Paladins have a talent called Meditation, which will regenerates one mana every second. Meditation will regenerate MP immediately when one second starts. And Tom can press 5 keys every second.

Input

There are no more than 20 test cases, end by EOF.

In each test case:

First line contains 2 integers N (0<N<=10000) and MP (0<=MP<=100000), indicating there will be N spells and you have MP Mana Points at the beginning and you can have MP Mana Points at most.

Then follows N lines:

Each line contains Spell Name, Spell Press Key Sequence, Spell Mana Cost(MC), Spell Healing Points(HP), and Spell Cool Down Time(CD). The Spell Name is no more than 50 characters; Spell Press Key Sequence is no more than 20 characters and all the characters are capital letters; -MP<=MC<=MP, the spell will regenerate manas if the MC is negative; 0<=HP<=100000; 0<=CD<=1000, notice that here the CD is base on 0.2 second, (For example: If CD=5, then the Spell Cool Down Time is 1 second).

Then follow integer M (M+N<=10000), indicates the buffs may appear.

Then M lines follow:

Each line contains Spell-1 Name, Spell-2 Name, Spell-2's Another Press Key Sequence, which means when you cast Spell-1, you can get the buff of Spell-2, the effect of the buff is Spell-2's Another Press Key Sequence. The Spell-1 Name and Spell-2 Name is the Spell Name appear in the N lines, Spell-2's Another Press Key Sequence is no more than 20 characters and all the characters are capital letters.

The last line is Tom's press sequence, the length is no longer than 500000 and all the characters are capital letters.

Output

For each case, please output :

Case X:

The Total Healing Point is Y.

Then several lines follow(3 lines at most):

The first line contains the information of the spell with highest total healing points; the second line contains information of the spell with second highest; and the third line contains the third highest. The informations contains Spell Name, Total Spell Healing Points, Spell times. Indicate the spell's name, spell's total healing points and how many times the spell had been cast. If the total Healing Points is equal then compare with the times who was cast most, if it still the same, then ordered by the Lexicographic order. If there is less than 3 spells, output the rest.

(Here X is the case number, Y is the total Healing Points)

If Y is not positive, just print the following text instead:
Case X:
No Healing Spell!

Print a blank line **between** test cases.

Sample Input

```
3 10
HolyShock ASDF 5 10 3
Judgements SDFG -10 0 10
LightsOfDawn DFGH 10 25 10
2
HolyShock Judgements G
Judgements LightsOfDawn H
ASDFSDFGH

1 10
WordOfGlory A 1 10 1
0
AAAAAAAA

1 1
HolyLight A 1 10 1
0
AAAAAAAAAA
```

Sample Output

```
Case 1:
The Total Healing Point is 35.
LightsOfDawn 25 1
HolyShock 10 1

Case 2:
The Total Healing Point is 40.
WordOfGlory 40 4

Case 3:
The Total Healing Point is 20.
HolyLight 20 2
```

I. Activation

Description

After 4 years' waiting, the game "Chinese Paladin 5" finally comes out. Tomato is a crazy fan, and luckily he got the first release. Now he is at home, ready to begin his journey. But before starting the game, he must first activate the product on the official site. There are too many passionate fans that the activation server cannot deal with all the requests at the same time, so all the players must wait in queue. Each time, the server deals with the request of the first player in the queue, and the result may be one of the following, each has a probability:

1. Activation failed: This happens with the probability of p1. The queue remains unchanged and the server will try to deal with the same request the next time.

2. Connection failed: This happens with the probability of p2. Something just happened and the first player in queue lost his connection with the server. The server will then remove his request from the queue. After that, the player will immediately connect to the server again and starts queuing at the tail of the queue.

3. Activation succeeded: This happens with the probability of p3. Congratulations, the player will leave the queue and enjoy the game himself.

4. Service unavailable: This happens with the probability of p4. Something just happened and the server is down. The website must shutdown the server at once. All the requests that are still in the queue will never be dealt.

Tomato thinks it sucks if the server is down while he is still waiting in the queue and there are no more than K-1 guys before him. And he wants to know the probability that this ugly thing happens.

To make it clear, we say three things may happen to Tomato: he succeeded activating the game; the server is down while he is in the queue and there are no more than K-1 guys before him; the server is down while he is in the queue and there are at least K guys before him. Now you are to calculate the probability of the second thing.

Input

There are no more than 40 test cases. Each case in one line, contains three integers and four real numbers: N, M (1 <= M <= N <= 2000), K (K >= 1), p1, p2, p3, p4 (0 <= p1, p2, p3, p4 <= 1, p1 + p2 + p3 + p4 = 1), indicating there are N guys in the queue (the positions are numbered from 1 to N), and at the beginning Tomato is at the Mth position, with the probability p1, p2, p3, p4 mentioned above.

Output

A real number in one line for each case, the probability that the ugly thing happens. The answer should be rounded to 5 digits after the decimal point.

Sample Input

2 2 1 0.1 0.2 0.3 0.4
3 2 1 0.4 0.3 0.2 0.1
4 2 3 0.16 0.16 0.16 0.52

Sample Output

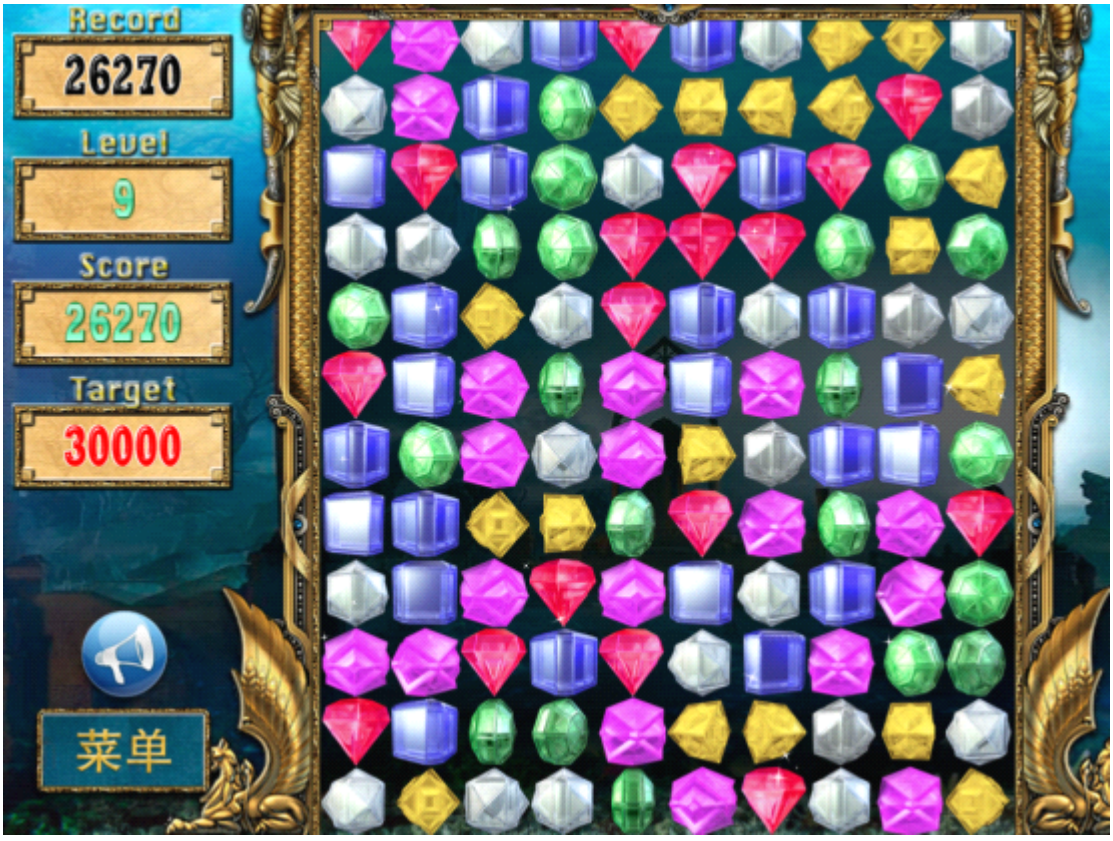
0.30427
0.23280
0.90343

J. Gem And Prince

Description

Nowadays princess Claire wants one more guard and posts the ads throughout the kingdom. For her unparalleled beauty, generality, goodness and other virtues, many people gather at the capital and apply for the position. Because princess Claire is very clever, she doesn't want a fool to be her guard. As Claire is clever, she invents a game to test the applicants. The game is described as follows.

The game begins with a rectangular board of n rows and m columns, containing n*m grids. Each grid is filled with a gem and each gem is covered by one color, denoted by a number.(as the following shows).




Record
26450
Level
9
Score
26450
Target
30000
7 BLOCKS 245 POINTS
菜单


Record
26450
Level
9
Score
26575
Target
30000
125
20
45
80
5
菜单

If a gem has the same color with another one, and shares the same corner or the same border with it, the two are considered to be adjacent. Two adjacent gems are said to be connective. And we define that if A and B are connective, B and C are connective, then A and C are connective, namely the adjacency is transitive. Each time we can choose a gem and pick up all of the gems connected to it, including itself, and get a score equal to the square of the number of the gems we pick this time(but to make the game more challenging, the number of gems to be picked each time must be equal or larger than three).Another rule is that if one gem is picked, all the gems above it(if there is any)fall down to fill its grid,and if there is one column containing no gems at all, all the columns at its right(also if there is any) move left to fill the column. These rules can be shown as follows.

```
1 1 3        0 0 3        0 0 0        0 0 0
1 2 1   -> 0 2 0    ->   0 0 3    ->   0 3 0
1 1 2        0 0 2        0 2 2        2 2 0
 [a]          [b]          [c]          [d]
```

As the picture [a] above,all the gems that has color 1 are connective. After we choose one of them to be picked, all the gems that are connected to it must also be picked together, as the picture [b] shows (here we use 0 to denote the holes generated by the absence of gems).

Then the rest gems fall, as shown in picture [c]. Then the rest gems move left, as shown in picture [d]. Because we picked six gems at this time, our score increases 6*6=36.And furthermore, because we cannot find another gem, which has at least three gems connected to it(including itself),to be picked, the game comes to an end.

Each applicant will face such a board and the one who gets the highest score will have the honor to serve princess Claire.

Aswmtjdsj also wants to serve for princess Claire. But he realizes that competing with so many people, even among whom there are powerful ACMers, apparently there is little chance to succeed. With the strong desire to be the lucky dog, Aswmtjdsj asks you for help. Can you help make his dream come true?

Input

There are no more than 15 test cases, separated by a blank line, end with EOF. Each case has n+1 lines, the first line of a case has three integers n, m, k (1<=n, m<=8, 1<=k<=6). Each of the next n lines contains m integers. The integer at (i+1)th line and jth column denotes the color of the gem at the grid (i, j), where the grid(1, 1) denotes the top left one, while the grid(n, m) is the lower right one. The integer in the grid is among [1, k].

Output

For each case you should output the highest score you can get in one single line.

Sample Input

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

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

Sample Output

```
36
103
```