# 7069 Dogs' Candies

Far far away, there live a lot of dogs in the forest. Unlike other dogs, those dogs love candies much more than bones.

Every candy has two attributes: the sweetness degree $p$ and the sourness degree $q$. Different dogs like different candies. A dog also has two attributes: the fondness degree for sweetness $x$ and the fondness degree for sourness $y$. So the deliciousness degree of a candy for a dog is defined as $p \times x + q \times y$.

The dog king has a huge candy box. At first, the box is empty. The king can add candies to the box or take some candies from the box and eat them. There are always some dogs who want to know which candies in the box are the most delicious for them. Please help the king to answer their questions.

## Input

The input consists of at most 10 test cases. For each test case, the first line contains an integer $n$ indicating that there are $n$ candy box operations ($1 \leq n \leq 50000$).

The following $n$ lines describe the $n$ operations.

Each operation contains three integers $t$, $x$ and $y$ ($0 \leq |x|, |y| \leq 10^9$). The first integer $t$ may be '`-1`', '`0`', or '`1`'.

If $t$ equals '`-1`', it means that a candy in the box with sweetness degree $x$ and sourness degree $y$ is eaten by the dog king.

If $t$ equals '`1`', it means that a candy with sweetness degree $x$ and sourness degree $y$ is added to the candy box.

If $t$ equals '`0`', it means that a dog with sweetness fondness degree $x$ and sourness fondness degree $y$ wants to know the maximal deliciousness degree of the candies in the box for him.

It is guaranteed that every candy is unique in the box.

The input ends by $n = 0$.

## Output

For each operation in which $t$ equals to 0, you should print the maximal deliciousness degree of the best candy for the dog.

## Sample Input

```
6
1 2 1
1 1 2
1 1 1
0 2 1
-1 2 1
0 2 1
0
```

## Sample Output

```
5
4
```

# 7070 The E-pang Palace

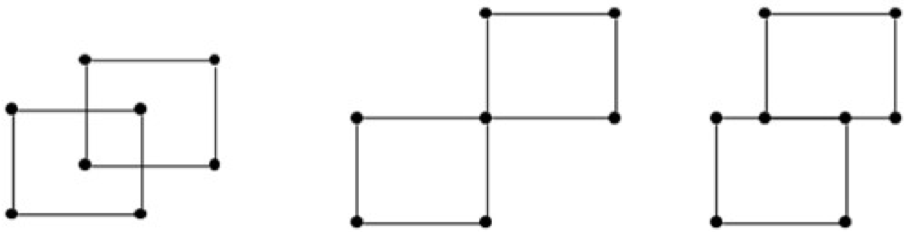
E-pang Palace was built in Qin dynasty by Emperor Qin Shihuang in Xianyang, Shanxi Province. It was the largest palace ever built by human. It was so large and so magnificent that after many years of construction, it still was not completed. Building the great wall, E-pang Palace and Qin Shihuang's tomb cost so much labor and human lives that people rose to fight against Qin Shihuang's regime.

Xiang Yu and Liu Bang were two rebel leaders at that time. Liu Bang captured Xianyang — the capital of Qin. Xiang Yu was very angry about this, and he commanded his army to march to Xianyang. Xiang Yu was the bravest and the strongest warrior at that time, and his army was much more than Liu Bang's. So Liu Bang was frighten and retreated from Xianyang, leaving all treasures in the grand E-pang Palace untouched. When Xiang Yu took Xianyang, he burned E-pang Palce. The fire lasted for more than three months, renouncing the end of Qin dynasty.

Several years later, Liu Bang defeated Xiangyu and became the first emperor of Han dynasty. He went back to E-pang Palace but saw only some pillars left. Zhang Liang and Xiao He were Liu Bang's two most important ministers, so Liu Bang wanted to give them some awards. Liu Bang told them: "You guys can make two rectangular fences in E-pang Palace, then the land inside the fences will belongs to you. But the corners of the rectangles must be the pillars left on the ground, and two fences can't cross or touch each other."

To simplify the problem, E-pang Palace can be consider as a plane, and pillars can be considered as points on the plane. The fences you make are rectangles, and you MUST make two rectangles. Please note that the rectangles you make must be parallel to the coordinate axes.

The figures below shows 3 situations which are not qualified (Thick dots stands for pillars):



cross touch touch

Zhang Liang and Xiao He wanted the total area of their land in E-pang Palace to be maximum. Please bring your computer and go back to Han dynasty to help them so that you may change the history.

## Input

There are no more than 15 test case.

For each test case: The first line is an integer $N$, meaning that there are $N$ pillars left in E-pang Palace($4 \le N \le 30$). Then $N$ lines follow. Each line contains two integers $x$ and $y$ ($0 \le x, y \le 200$), indicating a pillar's coordinate. No two pillars has the same coordinate.

The input ends by $N = 0$.

## Output

For each test case, print the maximum total area of land Zhang Liang and Xiao He could get. If it was impossible for them to build two qualified fences, print '`imp`'.

## Sample Input

```
8
0 0
1 0
0 1
1 1
0 2
1 2
0 3
1 3
8
0 0
2 0
0 2
2 2
1 2
3 2
1 3
3 3
0
```

## Sample Output

```
2
imp
```

# 7071 Yong Zheng's Death

Some Chinese emperors ended up with a mysterious death. Many historians like to do researches about this. For example, the 5th Qing dynasty emperor Yong Zheng's death is often argued among historians. Someone say that he was killed by the top assassin Lu Siniang whose family were almost wiped out by Yong Zheng. Someone say that Yong Zheng was poisoned to death because he liked to eat all kinds of Chinese medicines which were said to have the functions of prolonging human lives. Recently, a new document was discovered in Gu Gong (the Forbidden City). It is a secret document written by Yong Zheng's most trusted eunuch. It reads on the cover: "This document tells how Yong Zheng died. But I can't write this in plain text. Whether people will understand this is depend on Gods." Historians finally found out that there are totally n strings in the document making a set $S = \{s_1, s_2, \ldots, s_n\}$. You can make some death ciphers from the set. A string is called a DEATH CIPHER if and only if it can be divide into two substrings $u$ and $v$, and $u$ and $v$ are both a prefix of a string from $S$ (Note that $u$ and $v$ can't be empty strings, and $u$ and $v$ can be prefixes of a same string or two different strings).

When all DEATH CIPHERs are put together, a readable article revealing Yong Zheng's death will appear.

Please help historians to figure out the number of different death ciphers.

## Input

The input consists of no more than 20 test cases.

For each case, the first line contains an integer $n$ ($1 \leq n \leq 10000$), indicating the number of strings in $S$.

The following $n$ lines contain $n$ strings, indicating the strings in $S$. Every string only consists of lower case letters and its length is between 1 and 30 (inclusive).

The input ends by $n = 0$.

## Output

For each test case, print a number denoting the number of death ciphers.

**Hint:**

For the sample, the death ciphers are `{aa, aba, aca, aab, aac, abac, acab, abab, acac}`

## Sample Input

```
2
ab
ac
0
```

## Sample Output

```
9
```

# 7072 Signal Interference

Two countries A-Land and B-Land are at war. The territory of A-Land is a simple polygon with no more than 500 vertices. For military use, A-Land constructed a radio tower (also written as A), and it's so powerful that the whole country was under its signal. To interfere A-Land's communication, B-Land decided to build another radio tower (also written as B). According to an accurate estimation, for any point $P$, if the euclidean distance between $P$ and B is no more than $k$ ($0.2 \leq k < 0.8$) times of the distance between $P$ and A, then point $P$ is not able to receive clear signals from A, i.e. be interfered. Your task is to calculate the area in A-Land's territory that are under B-Land's interference.

## Input

There are no more than 100 test cases in the input.

In each test case, firstly you are given a positive integer $N$ indicating the amount of vertices on A-Land's territory, and an above mentioned real number $k$, which is rounded to 4 digits after the decimal point.

Then $N$ lines follow. Each line contains two integers $x$ and $y$ ($|x|, |y| \leq 1000$), indicating a vertex's coordinate on A's territory, in counterclockwise or clockwise order.

The last two lines of a test case give radio tower A and B's coordinates in the same form as vertexes' coordinates. You can assume that A is not equal to B.

## Output

For each test case, firstly output the case number, then output your answer in one line following the format shown in sample. Please note that there is a blank after the ':'.

Your solution will be accepted if its absolute error or relative error is no more than $10^{-6}$.

This problem is special judged.

## Sample Input

```
4 0.5000
-1 -1
1 -1
1 1
-1 1
0 0
-1 0
```

## Sample Output

```
Case 1: 0.2729710441
```

# 7073 Song Jiang's rank list

$\ll ShuiHuZhuan! \gg$, also $\ll WaterMargin \gg$ was written by Shi Nai'an — an writer of Yuan and Ming dynasty. $\ll ShuiHuZhuan! \gg$ is one of the Four Great Classical Novels of Chinese literature. It tells a story about 108 outlaws. They came from different backgrounds (including scholars, fishermen, imperial drill instructors etc.), and all of them eventually came to occupy Mout Liang (or Liangshan Marsh) and elected Song Jiang as their leader.

In order to encourage his military officers, Song Jiang always made a rank list after every battle. In the rank list, all 108 outlaws were ranked by the number of enemies he/she killed in the battle. The more enemies one killed, one's rank is higher. If two outlaws killed the same number of enemies, the one whose name is smaller in alphabet order had higher rank. Now please help Song Jiang to make the rank list and answer some queries based on the rank list.

## Input

There are no more than 20 test cases.

For each test case:

The first line is an integer $N$ $(0 < N < 200)$, indicating that there are $N$ outlaws.

Then $N$ lines follow. Each line contains a string $S$ and an integer $K$ $(0 < K < 300)$, meaning an outlaw's name and the number of enemies he/she had killed. A name consists only letters, and its length is between 1 and 50(inclusive). Every name is unique.

The next line is an integer $M$ $(0 < M < 200)$, indicating that there are $M$ queries.

Then $M$ queries follow. Each query is a line containing an outlaw's name.

The input ends with $n = 0$.

## Output

For each test case, print the rank list first. For this part in the output, each line contains an outlaw's name and the number of enemies he killed.

Then, for each name in the query of the input, print the outlaw's rank. Each outlaw had a major rank and a minor rank. One's major rank is one plus the number of outlaws who killed more enemies than him/her did.One's minor rank is one plus the number of outlaws who killed the same number of enemies as he/she did but whose name is smaller in alphabet order than his/hers. For each query, if the minor rank is 1, then print the major rank only. Or else print the major rank, blank, and then the minor rank. It's guaranteed that each query has an answer for it.

## Sample Input

```
5
WuSong 12
LuZhishen 12
SongJiang 13
LuJunyi 1
HuaRong 15
5
WuSong
LuJunyi
```

```
LuZhishen
HuaRong
SongJiang
0
```

## Sample Output

```
HuaRong 15
SongJiang 13
LuZhishen 12
WuSong 12
LuJunyi 1
3 2
5
3
1
2
```

# 7074 Train Scheduling

Elihc is a strange country occupying a long, narrow strip of land from north to south. There is only one main railway line in this country. This railway line is a straight line. It starts from the northernmost station, traverses the whole country southward, and finishes at the southernmost station.

Unfortunately, there are too many trains travelling on this railway line all the time. Long delays, even serious railway accidents are quite common here. Now, Railways Bureau of Elihc decides to solve these problems by scheduling the train in a better way, and hires you to write the program.

There are $(N + 1)$ stations on this railway line, and they are numbered from 0 to $N$ from north to south. There are also $M$ trains numbered from 0 to $M - 1$. Each train has an initial station, a terminal station, expected time of departure and speed limit. Initially, it parks at its initial station. It departs at the expected time or after the expected time, and is bound for its terminal station. The train has to stop at every station on its route. Different trains may have different speed limits. During the journey, a train should always run within its own speed limit (it is allowed to run at any speed not exceeding the limit anywhere). Compared with the railway line, both stations and trains are so small that they can be regarded as points in your scheduling program.

For each pair of adjacent stations, the part of the railway line between them is called a section (stations are not included). The positions of the stations are well designed so that the length of each section is exactly $S$ kilometer. All stations are sufficient to park any number of trains. However, due to some financial difficulties, there is just one track for each section. For safety reasons, trains running on the same section should always follow the rules below.

1. They are running in the same direction.
2. A train can catch up with, but can never pass any other trains in front of it.

An officer of Railways Bureau provides you some scheduling strategies, which you have to use in your program:

1. During scheduling, trains that are not expected to depart yet should be ignored. If a train has already arrived at its terminal station, it will be ignored forever.
2. Once a train is expected to depart from the original station, or arrives at a station except the terminal one, it stops and waits to move on the next section immediately.
3. When a train is stopping in some station, it will not start to move to the next section until (1) no running train is coming from the opposite direction on this section, and (2) No train with smaller number is stopping and waiting to move on this section from station at either end of this section.
4. A train should always run as fast as it can, without passing any train in front running on the same section.

Now, please help Railways Bureau to schedule the trains and figure out when each train will reach its terminal station.

## Input

There are several test cases in the input.

The first line contains an integer $C$ $(1 \leq C \leq 10)$ — the number of test cases.

Each test case begins with three integers $N$, $M$, $S$ $(1 \leq N \leq 10,\ 1 \leq M \leq 10,\ 1 \leq S \leq 1000)$, indicating the number of stations, the number of trains and the length of section (in kilometer).

Then $M$ lines follow, describing trains from number 0 to $M-1$ in order, one per line. Each line contains four integers $O$, $T$, $E$, $L$ ($0 \leq O \leq N$, $0 \leq T \leq N$, $O \neq T$, $0 \leq E \leq 10000$, $1 \leq L \leq S$), indicate that this train travels from station $O$ to station $T$, expected to depart at minute $E$, and its speed limit is $L$ kilometer per minute.

## Output

For each test case, output the arrival time (in minute) of each train one per line, in ascending order of train number. Your answers should be rounded up to the nearest integer.

**Hint:**
In the first test case:

At minute 0, both train 0 and train 2 are expected to depart and waiting to move to the same section. According to our strategies, train 0 starts to go and train 2 has to stay in station 1 while train 0 is running on the section. At minute 20, train 0 arrives at its terminal station. At this time, both train 1 and train 2 are waiting to move to the same section. Then train 1 starts to go and poor train 2 has to keep waiting again.

In the second test case:

Train 0 departs at minute 0 and runs straight forward to its terminal station. The case of train 1 is quite complicated. Train 1 departs at minute 2 and catches up with train 0 at minute 10. Since train 1 should never pass train 0 on the section, it has to follow train 0. Both of them arrive at station 1 at minute 25. Then, train 0 starts first (because of the smaller number), and train 1 has to follow train 0 again.

## Sample Input

```
2
1 3 100
0 1 0 5
0 1 20 5
1 0 0 5
2 2 100
0 2 0 4
0 2 2 5
```

## Sample Output

```
20
40
60
50
50
```

# 7075 Squared Frequency

You are now working in a physical laboratory. One day, when you were skimming through your records of experiments, you find that the squared frequency, defined as $(P/Q)^2$, in which $Q$ indicates times of experiments and $P$ means number of experiments in which the expected phenomenon appears, is somehow unreasonable. The squared frequency $F$ $(0 < F < 1)$ is written in decimal form, and rounded to $K$ $(K \leq 9)$ numbers after the decimal point. You think that $Q$, i.e. times of experiments, is too small to obtain such a number. Now you need to work out a fraction $P/Q$, so that rounding $(P/Q)^2$ to $K$ numbers after the decimal point gets exactly $F$, and minimizes $Q$.

## Input

Input contains no more than 2000 test cases.

Each test case has a single line, which contains a decimal fraction indicating $F$, the squared frequency.

## Output

For each test case, output your answer in a line with the case number, follow the format in sample. You should print a blank after ':'.

If the answer is not unique, output the one with the minimum $P$.

## Sample Input

```
0.3
0.5
0.50
```

## Sample Output

```
Case #1: 1/2
Case #2: 5/7
Case #3: 12/17
```

# 7076 Highway

You just got your year-end bonus. As you had a lot of money, you decided to take your family to the United States for a twenty-day self-driving travel. One day, when you were driving on the Great Plains, you found you had left highway by accident. After checking your GPS, you realized that you were now $D$ $(0 < D \leq 1000)$ miles from the highway. The highway is straight and extends infinitely. When you are driving outside the highway, your maximum speed is $v_0$ mph, but on the highway you can move in a maximum speed of $v_1$ mph $(200 \geq v_1 > 1.2v_0 > 0)$. It took no time to get on or off the highway. Suddenly, it came to your mind that there was a region inside which any point can be reached within $T$ $(0 < T \leq 1000)$ hours. You wanted to know area of this region.

## Input

Input contains no more than 50 test cases.

Each test case is a single line containing 4 integers $v_0$, $v_1$, $D$ and $T$, as above mentioned.

## Output

For each test case, output your answer in a line with the case number, follow the format in sample. Its unit should be square mile. Your answer will be accepted if its absolute or relative error is less than $10^{-6}$.

**Hint:** You should print a blank after ':' in the output.

## Sample Input

```
5 10 10 10
5 20 10 10
```

## Sample Output

```
Case 1: 9360.97707377
Case 2: 14873.82733943
```

# 7077 Little Zu Chongzhi's Triangles

Zu Chongzhi (429–500) was a prominent Chinese mathematician and astronomer during the Liu Song and Southern Qi Dynasties. Zu calculated the value of| to the precision of six decimal places and for a thousand years thereafter no subsequent mathematician computed a value this precise. Zu calculated one year as 365.24281481 days, which is very close to 365.24219878 days as we know today. He also worked on deducing the formula for the volume of a sphere.

It is said in some legend story books that when Zu was a little boy, he liked mathematical games. One day, his father gave him some wood sticks as toys. Zu Chongzhi found a interesting problem using them. He wanted to make some triangles by those sticks, and he wanted the total area of all triangles he made to be as large as possible. The rules were :

1) A triangle could only consist of 3 sticks.
2) A triangle's vertexes must be end points of sticks. A triangle's vertex couldn't be in the middle of a stick.
3) Zu didn't have to use all sticks.

Unfortunately, Zu didn't solve that problem because it was an algorithm problem rather than a mathematical problem. You can't solve that problem without a computer if there are too many sticks. So please bring your computer and go back to Zu's time to help him so that maybe you can change the history.

## Input

There are no more than 10 test cases. For each case:

The first line is an integer $N$ ($3 \leq N \leq 12$), indicating the number of sticks Zu Chongzhi had got. The second line contains $N$ integers, meaning the length of $N$ sticks. The length of a stick is no more than 100. The input ends with $N = 0$.

## Output

For each test case, output the maximum total area of triangles Zu could make. Round the result to 2 digits after decimal point. If Zu couldn't make any triangle, print '`0.00`'.

## Sample Input

```
3
1 1 20
7
3 4 5 3 4 5 90
0
```

## Sample Output

```
0.00
13.64
```

# 7078 Yue Fei's Battle

Yue Fei is one of the most famous military general in Chinese history.He led Southern Song army in the wars against the Jin dynasty of northern China. Yue Fei achieved a lot of victory and hopefully could retake Kaifeng ,the former capital of Song occupied by Jin. Fearing that retaking Kaifeng might cause the Jin to release former Emperor Song Qinzong, threatening his throne, Emperor Song Gaozong took some corrupted officers' advice, sending 12 urgent orders in the form of 12 gold plaques to Yue Fei, recalling him back to the capital.

Then Yue Fei was put into prison and was killed under a charge of "maybe there is" treason. But later Yue Fei was posthumously pardoned and rehabilitated, and became a symbol of loyalty to the country. The four corrupted officers who set him up were Qin Hui,Qin Hui's wife Lady Wang, Moqi Xie and Zhang Jun. People made kneeling iron statues of them and put the statues before Yue Fei's tomb (located by the West Lake, Hangzhou). For centuries, these statues have been cursed, spat and urinated upon by people. (Now please don't do that if you go to Hangzhou and see the statues.)

One of the most important battle Yue Fei won is the battle in Zhuxian town. In Zhuxian town, Yue Fei wanted to deploy some barracks, and connected those barracks with roads. Yue Fei needed all the barracks to be connected, and in order to save money, he wanted to build as less roads as possible. There couldn't be a barrack which is too important, or else it would be attacked by enemies. So Yue Fei required that NO barrack could connect with more than 3 roads. According to his battle theory, Yue Fei also required that the length of the longest route among the barracks is exactly $K$. Note that the length of a route is defined as the number of barracks lied on it and there may be several longest routes with the same length $K$.

Yue Fei wanted to know, in how many different ways could he deploy the barracks and roads. All barracks could be considered as no different. Yue Fei could deploy as many barracks as he wanted.

For example, if $K$ is 3, Yue Fei had 2 ways to deploy the barracks and roads as shown in figure1. If $K$ is 4, the 3 kinds of layouts is shown in figure 2. (Thick dots stand for barracks, and segments stand for roads):

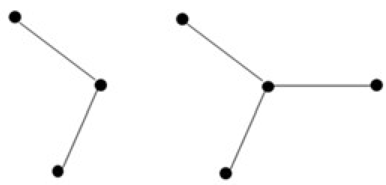


figure 1

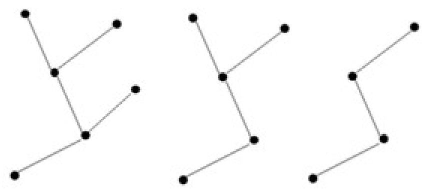


figure 2

Please bring your computer and go back to Yue Fei's time to help him so that you may change the history.

## Input

The input consists of no more than 25 test cases.

For each test, there is only one line containing a integer $K$ $(1 \leq K \leq 100,000)$ denoting the length of the longest route.

The input ends by $K = 0$.

## Output

For each test case, print an integer denoting the number of different ways *modulo* 1000000007.

## Sample Input

```
3
4
0
```

## Sample Output

```
2
3
```

# 7079 How Many Maos Does the Guanxi Worth

"Guanxi" is a very important word in Chinese. It kind of means "relationship" or "contact". Guanxi can be based on friendship, but also can be built on money. So Chinese often say "I don't have one mao (0.1 RMB) guanxi with you." or "The guanxi between them is naked money guanxi." It is said that the Chinese society is a guanxi society, so you can see guanxi plays a very important role in many things.

Here is an example. In many cities in China, the government prohibit the middle school entrance examinations in order to relief studying burden of primary school students. Because there is no clear and strict standard of entrance, someone may make their children enter good middle schools through guanxis. Boss Liu wants to send his kid to a middle school by guanxi this year. So he find out his guanxi net. Boss Liu's guanxi net consists of $N$ people including Boss Liu and the schoolmaster. In this net, two persons who has a guanxi between them can help each other. Because Boss Liu is a big money (In Chinese English, A "big money" means one who has a lot of money) and has little friends, his guanxi net is a naked money guanxi net — it means that if there is a guanxi between $A$ and $B$ and $A$ helps $B$, $A$ must get paid. Through his guanxi net, Boss Liu may ask $A$ to help him, then $A$ may ask $B$ for help, and then $B$ may ask $C$ for help ...... If the request finally reaches the schoolmaster, Boss Liu's kid will be accepted by the middle school. Of course, all helpers including the schoolmaster are paid by Boss Liu.

You hate Boss Liu and you want to undermine Boss Liu's plan. All you can do is to persuade ONE person in Boss Liu's guanxi net to reject any request. This person can be any one, but can't be Boss Liu or the schoolmaster. If you can't make Boss Liu fail, you want Boss Liu to spend as much money as possible. You should figure out that after you have done your best, how much at least must Boss Liu spend to get what he wants. Please note that if you do nothing, Boss Liu will definitely succeed.

## Input

There are several test cases.

For each test case:

The first line contains two integers $N$ and $M$. $N$ means that there are $N$ people in Boss Liu's guanxi net. They are numbered from 1 to $N$. Boss Liu is No. 1 and the schoolmaster is No. $N$. $M$ means that there are $M$ guanxis in Boss Liu's guanxi net. ($3 \le N \le 30$, $3 \le M \le 1000$)

Then $M$ lines follow. Each line contains three integers $A$, $B$ and $C$, meaning that there is a guanxi between $A$ and $B$, and if $A$ asks $B$ or $B$ asks $A$ for help, the helper will be paid $C$ RMB by Boss Liu.

The input ends with $N = 0$ and $M = 0$.

It's guaranteed that Boss Liu's request can reach the schoolmaster if you do not try to undermine his plan.

## Output

For each test case, output the minimum money Boss Liu has to spend after you have done your best. If Boss Liu will fail to send his kid to the middle school, print '`Inf`' instead.

## Sample Input

```
4 5
1 2 3
1 3 7
```

```
1 4 50
2 3 4
3 4 2
3 2
1 2 30
2 3 10
0 0
```

## Sample Output

```
50
Inf
```