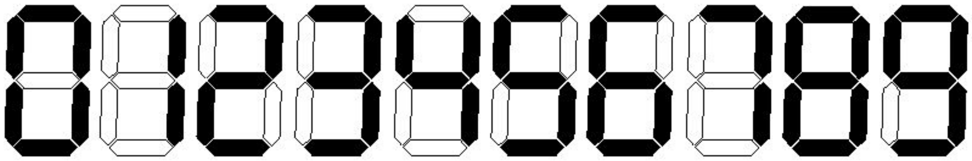
Shiraz University
Internet Programming Contest 2015

acm International Collegiate Programming Contest

دانشگاه شیراز

A – Amazing Elevator

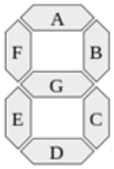
Morteza lives in an apartment with 10 floors. The floors are numbered from 0 to 9 and the parking is located on floor 0. This apartment has an elevator with a seven-segment-display (SSD) in each floor that shows the location of the elevator. The parking SSD is amazing. Every day some random number of the segments become completely disabled.



One midnight, after parking his car in the parking, Morteza decided to use the elevator to reach his home. Initially, the elevator was on a floor which is called, from now on, as the initial location. During waiting in the parking, it becomes a kind of game for him to find the initial location of the elevator as soon as possible. He pushes the button of the elevator and watches SSD during changing the floors (we are sure that at this time there is not any other person that wants to use the elevator). Although some segments of SSD may be corrupted, but he can sense changes of the floor from the noises that the elevator makes. Help him to find the initial location of the elevator as soon as possible. In order to clear the problem, it should be underlined that, during this game Morteza is waiting in the parking and traces the elevator by watching SSD.

Input

The first line of the input is an integer n<=100 that shows the number of test cases. Each test case is presented in a separate line and started with the initial location of the elevator (0<=k<=9) followed by a binary string of size 7 (ABCDEFG). Each element of this string corresponds to a segment of the SSD according to the following image.



In this string 1 means the segment is healthy and 0 means it is completely disabled.

Output

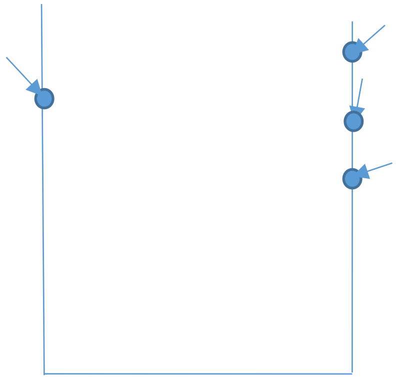
For each test case, output the floor in which, Morteza becomes sure about the first location of the elevator in a separate line.

Sample Input	Sample Output

2
5 1111111
6 0101100
	4
	5

B – Billyard

Bill has invented a new game in the yard of his home called as Billyard. In this game, he has made a tall vertical board with some guns on its left or right vertical boarders as shown in the figure.



At the time 0, each gun shoots a ball toward the ground with a specified power and horizontal angle. Each ball moves with a constant speed along a straight path until reaches one of the borders (left, right or bottom). After such contact, the ball is reflected with opposite angle respect to the boarder. Due to that there is no upper boarder; these balls may be thrown out of the game board and may be lost. You should trap all of them in the board by putting a horizontal wood at top of them at a time t≥0. It is desired to minimize the distance of the wood from the ground. You can put this wood just once and changing its location is not easy. Hence, you can wait for the best opportunity.

Input

The number of test-cases is given as T<=100 in the first line. In following, each test-case is started by a line containing positive integers L, R and N, all less than 1,000. L and R are x-positions of left and right boarders, respectively. In followed N lines, positions of balls are described, one line per ball. In each line positive integers X_0, Y_0, X_1 and Y_1 as coordination of associated ball at time t=0 and t=1 have been given, respectively. It is clear that, X_0 is equal to L or R. In addition, following conditions are true: $L \le X_1 \le R$ and $0 \le Y_1 < Y0 \le 109$. No ball reaches the ground sooner than t=1. You can assume that due to have 3 dimensions, balls never contact to each other.

Output

For each test-case, print the best y-position of the wood with two digits after decimal point.

Sample Input	Sample Output

2
5 7 2
5 10 6 9
7 9 6 7
0 10 4
0 1000 0 800
0 900 0 650
0 900 0 800
	3.67
	516.67

C – Cashier Machines

In new supermarkets there are cash machines to help ease manpower shortage. These machines have a large amount of coins for each available coin type. The customers should follow the following three steps to pay for their items:

1 - At first step, customers should scan all their items to know the amount that they should pay.
2 - Then, they can start feeding the machine by coins one by one. When the amount of money becomes enough for the item's total price, the machine stops receiving new coins.
3 - Finally, the machine returns the minimum number of coins for the amount that it should return back to the customer.

One of the customers wants to use this machine and he wants to minimize the number of coins in his pocket.
Knowing the coins that he has in his pocket and the amount of money that he should pay, help him to spend his coins in a way that minimizes the number of coins that he would have after the payment. We know that he has enough money to buy all his items.

Input

The first line of the input contains an integer T<=100 denoting the number of test-cases. Each test-case begins with two integers N and A, denoting the number of coin types and the amount of money that the customer should pay respectively (1<=N<=20 and 1<=A<=1,000). The next N lines each contain two numbers 1<=C<=50 and 0<=K<=1,000, denoting the value of the coin type and the number of this coin type that the customer has. It is guaranteed that the coin type values are all different and one of the coin type values is equal 1.

Output

For each test-case, output on a single line the final number of coins.

Sample Input	Sample Output
2	10
3 15	4
1 10	
4 7	
2 5	
3 9	
1 8	
2 0	
9 1	

D – Doodle

Doodle is a site in which, you can collect free time-intervals of some persons to have a session. You should define the candidate days, then other persons can vote to them. Mohammad wants to have an important session with the students to discuss about the future goals of ACM group in ShirazU. This is why; he defined N consecutive days starting from tomorrow on Doodle for voting. Some students vote to their non-busy days just now. Some of them see the poll on tomorrow and some students later. If a student sees the poll on Dth day, he only can vote to the next days.

At the end of each day (containing today), Mohammad counts the number of votes given to each day. He may decide to finish the poll and to hold the session on the next day or may wait for more votes in near future. He should be sure that the session is held on the day with the maximum vote. Hence, he only waits for future votes if there is certainly a day in the future as good as tomorrow or even better.

For example, assume N is 3. The days are numbered from 0 to N where, 0 and 1 represents today and the 1st day of polling, respectively. Today, Saam and Amir voted to their non-busy days such that the number of votes for days 1, 2 and 3 are 2, 1 and 2, respectively. Mohammad does not finish the poll because the 3rd day is as good as the 1st one. Tomorrow (at the 1st day), Babak and AmirHossein see the poll and both of them vote just to the 2nd day. Therefore, the votes of days 2 and 3 would be 3 and 2, respectively. On tomorrow night, Mohammad decides to finish the poll and inform all that the session will be held on the 2nd day. He doesn’t know that Ali and Younes will vote to 3rd day after seeing the poll on the 2nd day. In other words, he makes a risk-free decision.

Input

In the first line, T<50 is given as the number of test-cases. In following, each test-case starts with positive integers N<1000 and M<1000 as the number of candidate days and voters, respectively. M next lines represent the votes of M students, one line per student. The ith line (out of these M lines) starts with an integer Di that represents the ID number of the day in which, ith student sees the poll. The rest of the line contains ID numbers of non-busy days of that student.

Output

For each test-case, print the ID number of the day of the session in a separate line.

Sample Input	Sample Output

1
3 6
0 1 2 3
1 2
2 3
2 3
0 1 3
1 2
	2

E – Expected Cost

Bahareh is a good ACM competitor of RazShahr University. Her coach has found out that she may go to Shiraz University in the next year. He has N independent programs to improve her skills. A non-empty subset of these programs will be finally chosen with a special permutation to achieve a perfect effect. For example by having 2 programs {A, B}, there are four different program-lists: [A], [B], [A, B], [B, A]. Also, for three programs {A, B ,C} there are 15 program-lists.

Each program has an independent cost. Due to that Bahareh may be not the student of this university in the next regional competition, the coach wants to measure the expectation of the total cost of training Bahareh. If the costs of A and B in the former example is 4 and 6, respectively; the candidate lists have costs equal to 4, 6, 10 and 10, with the same order. Therefore, the total cost is expected to be 7.5.

Input

There are T<100 test-cases. T is given at the first line. Afterwards, each test-case is presented one by one, each one in two lines. The first line contains a positive integer N≤20 as the number of programs. The second line contains N integers as the cost of the programs.

Output

For each test-case, print in a separate line, the expected total cost with six digits after decimal point.

Sample Input	Sample Output

2
2
4 6
3
1 2 3
	7.500000
	4.400000

F – Find Pairs

Matching pairs is a memory game that all of you may play at least once. There are (M*N)/2 distinct pictures that each of them is printed on the face of exactly two tiles. These tiles are initially laid face down and are distributed on an M by N board. It is clear that at least one of M and N should be even.

At each turn we choose one tile and flip it to see its picture, and then we select another tile and flip it in order to find the match for the previous flipped tile. If they are the same, both of them will remain face up, otherwise they return back face down. The goal is to match all of the pictures on the board.

I have a very young clever cousin that likes playing games. For the game described, she can only memorize K pictures along with their locations in her mind. When she flip a new tile, she see the picture of that tile and so she can compare it to her memorized pictures. Then, she can decide to forget the new tile, match the tile with the tiles in her memory or add its picture and location to her mind if she has still available memory.

As I told you, I know that she is very clever to finish the game as soon as possible. Tell me the maximum number of flips that she would have to finish the game.

Input

The first line of the input contains an integer T<=200 denoting the number of test-cases. Each test-case contains three space separated integers M, N, (1<=M,N<=1,000) and K (1<=K<=100) denoting the number of rows and columns of the board and the memory size of my cousin respectively.

Output

For each test-case, output on a single line the maximum number of flips that my cousin would have to finish the game.

Sample Input	Sample Output

2
2 3 5
2 2 1
	10
	8

G – Game Playing

Mohammad has a game club in CSE Dept. of Shiraz University. Although many students like to have fun in his club in the rest time, he has a few number of toys. For example, he has only one table of Tennis (Ping-Pong) while most of the game players are interested in playing this game. Based on the type of the game, only N students can play with each other in each turn, although more than N candidates may exist. For example, only two players for Ping-Pong and 12 players for volleyball can play in each turn. In addition, each player, after his playing, wants to play again. Mohammad decided to manage the candidates of playing by considering the following rules:

1. In the new turn, the players with major priority are chosen for playing.
2. The students who have played less than others are prior.
3. In the case of equal turns of playing, the one who has played later (at his last turn) has less priority.
4. Between two students with similar conditions, the one with smallest number is prior. The candidates are numbered from 1 to M.

Now, Mohammad feels a headache and Morteza (his best friend) is going to manage the candidates of one of the games. He knows all the history of the game (K turns have been passed). In the new turn, which candidates should be chosen? Morteza thinks that the 4th rule is not fair. This is why; he ignores it in his decision. Now, he may be not capable to select a unique set of players for the next turn. Would you please let him know if there is any ambiguity?

Input

The dataset starts with a positive integer T<200 in the first line which is followed by T lines each one of which represents a test-case. Each test-case is determined by three positive integers N,M and K (N≤M<109 and K<109). N is the number of players in each turn, M is the total number of candidates and K is the number of passed turns.

Output

For each test-case, print in a separate line “Unique” if Morteza can find a solution and print “Ambiguity” otherwise.

Sample Input	Sample Output
10	Unique
2 2 10	Ambiguity
2 3 1	Unique
2 3 2	Unique
2 4 1	Unique
2 4 2	Ambiguity
2 5 2	Ambiguity
2 5 3	Unique
2 5 4	Ambiguity
3 4 2	Unique
4 6 2	

H – Homework Matching

Some distances between two strings have been defined as the number of operations should be done to make the sequences equal (for example edit distance in information retrieval). We have defined a new nondeterministic operation as followed: Find a common substring (CS) and replace it in both strings with a new symbol.

A CS is a sequence of characters which has been seen in both strings consecutively. In each operation just one replacement is done in each string even if there are more occurrences of that substring. For example, both "ABAB" and "ABABAB" are CS'es in "ABCABABABB" and "ABBABABABCAB". By replacing "ABAB" with the new symbol Z, in "ABAABABABB", the string can be one of "ABAZABB" or "ABAABZB". Assume there is an infinite set of new symbols which you can use in the replacements. However, each symbol can be used just once.

Due to that this program will be used for plagiarism detection in homeworks; the new symbols should be occurred with the same order in both strings. This progress continues while the size of strings can decrease. Distance of two strings is defined as minimum possible size of the largest string after applying the best operations. For two strings "ABCABABABB" and "ABBABABABCAB", you can replace "ABABAB" by Z_1 to achieve "ABCZ_1B" and "ABBZ_1CAB", respectively. Then by replacing "AB" with Z_2, final strings will be formed as "Z_2CZ_1B" and "Z_2BZ_1CAB", respectively. Distance of these strings is 6.

Input

The number of test-cases is given as T<100 in the first line. In followed 2T lines, T test-cases have been given (two lines per test). In each line of each test-case, one of the associated strings is presented by at most 1000 consecutive characters of ‘A’, ‘B’ or 'C'.

Output

Print the distance of two given strings in a separate line per test-case.

Sample Input	Sample Output
6 ABCABABABB ABBABABABCAB ABCABABABB BABABABCAB ABABABAB BABABABA AAAAABBBBB BBBBBAAAAA AAAAABBBBB ABABABABAB AACBAC ABCAA	6 5 2 6 9 5

I – Wonder Island

Ebrahim interested in traveling around the world. He usually prefers going on road trips with his friends. This time he decided to become familiar by the peoples in different provinces of the Wonder Island. So, when he enter a city of a province he try to leave the province as soon as possible in order to see more provinces and become familiar with more cultures. This Island is named Wonder because of its road map structure between the cities of each province. Two cities A and B belong to a same province if and only if we can have a road trip from A to B and also from B to A.

Tourist manager of Wonder Island wants to plan a satisfactory trip for Ebrahim. Unfortunately, there is not any road path between Ebrahim's country and the Wonder Island, but there is a direct flight between his country and all the cities of the Wonder Island in both directions. Help the tourist manager of the country to plan a trip for Ebrahim so that he can visit maximum number of provinces as soon as possible.

Because of some military restrictions, Ebrahim can not leave his country more than once. Therefore, in the trip plan you can consider only two flights; one for traveling to Wonder Island and the other to return back home.

Input

The first line of the input contains an integer T<=100 denoting the number of test-cases. Each test-case begins with two integers 1<=N<=1,000 and 0<=M<=N*(N+1)/2, denoting the number of cities and the number of directed roads in Wonder Island. The next N lines each contain two not equal numbers 1<=A,B<=N, referring to a direct road from city A to city B. It is guaranteed that all the roads are distinct.

Output

For each test-case, output in a single line the number of provinces and the number of cities that Ebrahim will visit during his trip to Wonder Island.

Sample Input	Sample Output

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