PROSOLVE

PROGRAMMING CONTEST PROBLEM SET

This problem set contains 10 problems (A-J)

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Hosted by
Artificial Intelligence Society
Faculty of Computer and Mathematical Sciences
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A. The Repeater

Author: *Fahmi*
Time Limit: *1s*

Every single word often has repetition of same characters. Your job is to count and print how many every single character appears.

Input

The first line contains a single word S (lowercase alphabet with no spaces), where length of S_n ***(1 ≤ n ≤ 100)***.

Output

Print all occurrences of each character from the above input in the format of **character:count**. The character ordering must be sorted in increasing order.

Sample Input	**Sample Output**
psychophysicotherapeutics	a:1 c:3 e:2 h:3 i:2 o:2 p:3 r:1 s:3 t:2 u:1 y:2

B. The Best Lumberjack

Author: *Ikhwan*
Time Limit: *1s*

Every year, a competition will be held in Sunshine Village to determine the best lumberjack in town. Jason and Jimmy, both working as lumberjack, decided to join the competition in duo category where both will enter under the same team. In the qualifier round, they need to chop off *n* trees to proceed to the next round. Jimmy can swing an axe with frequency *x* hits per second and Jason can swing an axe with y hits per second. They both have a fixed time to raise an axe (1/*x* seconds for Jason and 1/*y* seconds for Jimmy) and hit the tree. The *i*-th tree chopped off after receive h hits. Each team will be given several trees for every round, where both need to hit into the same tree.

After the round is over, they want to brag about it to their girlfriends. Unfortunately, they don't know who makes the last hit on each tree. If Jason and Jimmy make the last hit at the same time, we assume that both have made the last hit.

Input

The first line contains three integers*,* ***n, x, y (1 ≤ n ≤ 10000, 1 <= x, y <= 10000)*** - the number of trees, frequency of Jason's swing and frequency of Jimmy's swing.

The next *n* lines contain integers ***h (1 ≤ h ≤ 10000)*** – number of hits needed to chop off the *i*-th tree.

Output

In the *i*-th line print word "Jason", if the last swing on the *i*-th tree was performed by Jason, "Jimmy", if the last swing on the *i*-th tree was made by Jimmy or "Both", if both boys performed it at the same time

Sample Input	**Sample Output**
4 3 2 1 2 3 4	Jason Jimmy Jason Both
2 1 1 1 2	Both Both

Tips:
For the first test case, Jason (0.3s) will have the last hit as he is faster than Jimmy (0.5s).

For the second test case, Jason will start swinging to hit the tree because he is faster (0.33s), but the tree isn't chopped yet (as it needs 2 hits), Jimmy will finish up the job by his first swing (0.5s).

For the third test case, Jason will start with the first hit (0.33s), but then the tree isn't down yet, Jimmy will swing his first (0.5s), then Jason will finish the job by his second swing (0.66s).

For the fourth test case, Jason will start (0.33s), next Jimmy (0.5s), next Jason (0.66s), and then here is the catch, for the fourth hit, both Jason and Jimmy hit the tree at the same time at 1.0s. So, we consider them both as last hit to the tree.

C. Farming Simulation

Author: *Ikhwan*
Time Limit: *1s*

A new game, Harvest Sun, has been released yesterday. The game is about a boy who can't get a job and decided to continue his grandfather's legacy as a farmer. Narkib, an enthusiastic gamer, has waited almost a year for the release of the game. So, when it came out, he decided to buy it and give it a go.

After several hours of playing, Narkib managed to unlock a new feature in the game. He managed to get automatic sprinklers. In his farm, there are *n* number of farm beds, numbered from 1 to *n*. From these *n* beds, only *k* beds each contain an automatic sprinkler such that the i-th sprinkler is on the bed X_i. If the sprinkler is turned on, it will start delivering water to neighboring beds too. After one second has passed, bed X_i will be watered. After two seconds, beds X_i + 1 and X_i - 1 will be watered; after *f* seconds have passed, beds from segment X_i + (*f*-1), X_i - (*f*-1) will be watered.

Farm from test 1. White color denotes a farm bed without a tap and the grey color represent a farm with a sprinkler.

The farm from test 1 after 2 seconds have passed after turning the sprinkler. White tab denoted as unwater farm bed while blue color determine a watered bed.

The farm from test 1 after 3 seconds have passed after turning the sprinkler.

The farm from test 1 after 4 seconds have passed after turning the sprinkler.

Narkib want to turn all the automatic sprinklers at the same time and calculate the minimum number of seconds that has to pass after he turns on all sprinklers until the whole farm is watered. Help him find the answer!!!

Input

The first line contains integer *t* – number of test case to be solved ***(1 ≤ t ≤ 200)***

For each test case, the first line contains two integers ***n*** and ***k (1≤ n ≤ 100), (1≤ k ≤ n)*** – number of farm beds and automatic sprinklers, respectively.

The next line contains *k* integers X_i ***(1 ≤*** X_i ***≤ n)***

Output

For each test case, print an integer *S*; the minimum number of seconds that has to pass until the whole farm is watered.

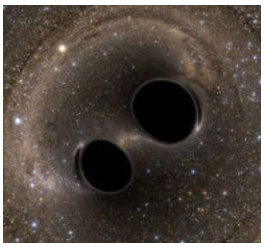
Sample Input	**Sample Output**
3 4 1 1 5 1 3 3 3 1 2 3	4 3 1

D. Binary Black Holes

Author: *Shahril*
Time Limit: *10s*

Black holes are among the strangest things in the universe. They are massive objects – collections of mass – with gravity so strong that nothing can escape, not even light.

As black holes attract everything, including light, scientists have been studying about possibilities of two black holes, near each other's, attracting both between them. This creates a phenomenon where these two black holes will orbit around each other's, and closer and closer as time passes by. These orbiting is very fast (you can imagine a rotating kitchen blender), and by time it is sooo near with each other's, these two black holes will merge. This merging process is so fast, and when this happen, it will release a massive amount of energy, creating a ripple in the space-time fabric. This phenomenon is called ***gravitational wave***.



In February 11, 2015, aLIGO (a research group) announced the first confirmed observation of gravitational waves from colliding black holes. This news was a blast throughout the scientific community, as it is a first direct evidence of two black holes merging (previously it is just a Einstein's theory without any evidence).

As a programmer applying job into NASA, they have given you a task where you need to find the possibilities of finding two black holes that are going to merge. The simplest idea is to find the most nearest of two black holes. ***Given a set of black holes in the cartesian plane, you need to find the nearest euclidean distance of two black holes***. Another constraint given to you is ***your algorithm needs to be very fast***, as this universe contains billions of black holes. As a starter, NASA has given you a set of test cases, where the largest test case will contain 100,000 of black holes' coordinate.

Input

The first line contains an integer ***N, (1 ≤ N ≤ 100,000)***, the number of black holes' coordinates contains inside the NASA's test case.

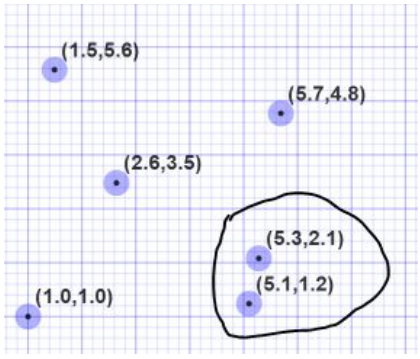
For the next N lines, each will contain two sets of floating numbers ***X, Y (0 ≤ X,Y ≤ 2,000,000)***. This X and Y represents the location of a black hole in the universe, represented in Cartesian plane format.

Output

Find the nearest two black holes and print their Euclidean distance.
Round off your answer to 4-decimal places.

Sample Input	**Sample Output**
6 1.0 1.0 5.1 1.2 5.3 2.1 5.7 4.8 2.6 3.5 1.5 5.6	0.9220

Explanation:



These two black holes A (5.3, 2.1) and B (5.1, 1.2) have the nearest distance from each other's, with the value of 0.9220.

E. Good Neighbor

Author: *Shahril*
Time Limit: *10s*

Harith is a very good neighbor. Every time his family cooked large amount of foods, he frequently will donate some of his family's food to all of his neighbors around his village, usually by walking to one neighbor's house, and then to another house, so on and lastly, he will return back to his house. Harith ***will not visit any houses twice***; that would waste his time.

But he has a problem, as Harith is not slim enough. He usually will pick up any house randomly and walk there, and then will randomly decide again which next house he will visit. By his experience, using this technique isn't good, as some of the route he chose usually isn't shortest enough.

Harith hates to use motorcycle or any ease of transportation. He just loves to walk. You're his smart kid, so he asked you find the ***cost*** of the shortest path that he needs to travel to all houses in the village, and then return back to his home. Using your superior and programming prowess, please help your poor dad. :')

Input

The first line contains an integer ***N (1 ≤ N ≤ 10)***, the number of houses in Harith's village (including his house). Houses in the Harith's village will be represented using 0-based index.

The next single line contains an index ***H (0 ≤ H ≤ 9)***, where it represents Harith's index house in the village.

The next single line contains positive integer ***P (1 ≤ N ≤ 45)***, which represents number of path exists inside Harith's village.

For the next ***P*** lines, there will be three integer ***S, D (0 ≤ S, D ≤ 9)*** and ***C (0 ≤ C ≤ 1000)***. S and D represent an undirected path from house ***S*** to house ***D***. ***C*** represents cost of travelling from house S to house D. The following are the conditions for the house connection:

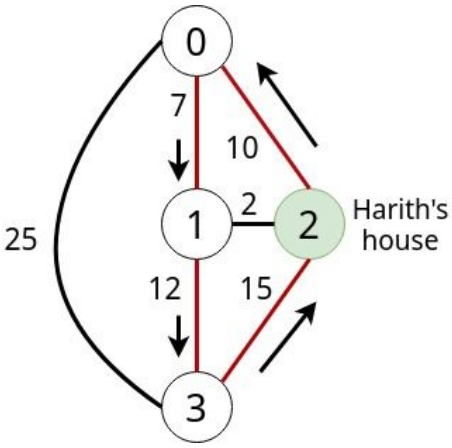
1. All houses will be connected to someone house, here will be no house that connects to itself.
2. From one house to another, there is guarantee only one path exist — that is, no multiple path from one house to another house.

Output

The shortest total path ***cost*** that is required to be taken for Harith (from his house) to visit all his neighbors' houses, and then return back to his home.

Sample Input	**Sample Output**
4 2 6 0 1 7 0 2 10 0 3 25 1 2 2 1 3 12 2 3 15	44

Explanation for above sample:



For the following houses in the Harith's village, Harith could choose between these two routes:

1) 2 ➜ 0 ➜ 1 ➜ 3 ➜ 2
2) 2 ➜ 3 ➜ 1 ➜ 0 ➜ 2

Both routes cost is 44. (he could travel backward or forward using same route)

F. Save the Alphabet!

Author: Fahmi
Time Limit: 1s

A sentence can contain a mix of different type of characters. In this problem, you need to rescue only alphabet(s) from a string containing wild and weird characters!

Input

The first line contains a single string **S**, where length of S_n ***(1 ≤ n ≤ 1000)***. Inside **S** there shall be no whitespace, and will have at least one alphabet.

Output

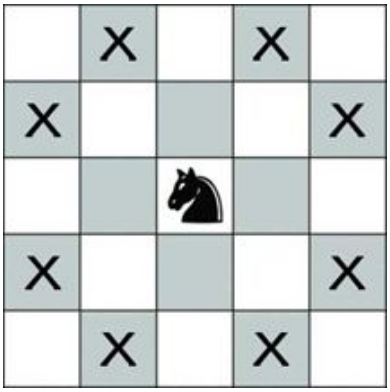
Print only alphabet(s) out of mix of wild characters.

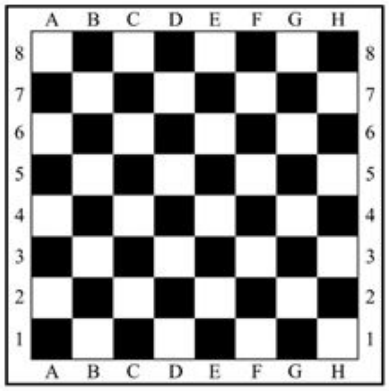
Sample Input	**Sample Output**
h32!e932ll&*2+o	hello
F@#!a43%@h6m$@i**j2e3r	Fahmijer

G. Horseman's Travel

Author: Harith
Time Limit: 1s

A knight (horse) is a special piece in chess since it can move in an L shape.





Given the initial coordinate of a knight is A1 (first column and last row in the diagram above), find the ***shortest move*** that can be made in an 8x8 chess board to reach another specified coordinate.

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Input

The first line contains ***T (1 ≤ T ≤ 100)***, the number of test case(s).
The following ***T*** lines contain ***A, B (A ⊆ {A,B,C,D,E,F,G,H}, 1 ≤ B ≤ 8)*** coordinates.

Output

For each test case, output the ***shortest number of moves*** in accordance of each coordinate destination. Each test case is printed on different lines.

Sample Input	**Sample Output**
3 C2 B6 G4	1 4 3

H. Linear Algebra

Author: Ariff Yasri
Time Limit: 1s

Write a program to solve a n x n linear system of simultaneous equations. For example:

$$x + 2y + 3z = 14$$
$$2x + 3y + 4z = 20$$
$$3x + 4y + 4z = 23$$

In short, the above equations can be represented as an augmented matrix. An augmented matrix for a system of equations is a matrix of numbers in which each row represents the constants from one equation (both the coefficients and the constant on the other side of the equal sign) and each column represents all the coefficients for a single variable. The first row consists of all the constants from the first equation with the coefficient of the x in the first column, the coefficient of the y in the second column, the coefficient of the z in the third column and the constant in the final column.

$$\left(\begin{array}{ccc|c} 1 & 2 & 3 & 14 \\ 2 & 3 & 4 & 20 \\ 3 & 4 & 4 & 23 \end{array}\right)$$

Solving above equation will result in x = 1, y = 2 and z = 3. Using this value, you can solve the above simultaneous equations.

Input

The first line of input contains an integer ***T (T ≤ 100)***, the number of test cases. Each test case will begin with a line that contains the size of matrix ***n (n ≤ 10)***. This line is followed by n lines which contain the n+1 values of each simultaneous equations for ***x, y, z, and c (1 <= x,y,z,c <= 100)*** in the form of an augmented matrix.

Output

For each test case, the output contains a line in the format **Case #x: M**, where x is the case number (starting from 1) and M is the variable values in one decimal point separated by single space.

Sample Input	**Sample Output**
3 2 4 3 7 1 1 -1 3 1 2 3 14 2 3 4 20 3 4 4 23 3 1 1 1 25 5 3 2 0 0 1 -1 6	Case #1: 10 -11 Case #2: 1 2 3 Case #3: -26.2 28.6 22.6

I. Microsoft Word Editor

Author: Harith
Time Limit: 1s

Microsoft Word allows its users to edit the sentence in 5 forms; lowercase, uppercase, sentence case, toggle case and capitalize each word.
Write a program to edit the sentence input by the user in all five forms.

Input

The first line of the input contains an integer ***T (T ≤ 100)***, the number of test cases.

Each of the following ***T*** lines will contain the string ***S***, where length of S_n ***(1 ≤ n ≤ 1000)***. Inside ***S***, it should contain more than 3 words.

Output

Output the answer with each form separated by a newline in the order of lowercase, uppercase, sentence case, toggle case and capitalize each word. Separate each test case with a single blank line except the last test case.

Sample Input	**Sample Output**
2 prosolve is the BEST competition i really love ice-cream	prosolve is the best competition PROSOLVE IS THE BEST COMPETITION Prosolve is the BEST competition PROSOLVE IS THE best COMPETITION Prosolve Is The BEST Competition i really love ice-cream I REALLY LOVE ICE-CREAM I really love ice-cream I REALLY LOVE ICE-CREAM I Really Love Ice-cream

J. Weird Fahmi

Author: Shahril
Time Limit: 1s

Fahmi is an owner of a shop across the road in our fine Hope County. He has a "*bad"* habit, he loves to think about unthinkable things.

Suddenly, with no particular reason at all, he wants to solve a problem that he has been thinking since last night. Given ***N*** amount of money and an infinitely amount of ***S = {S1, S2, …, Sm}*** coins, what is the least number of coins that when those coins summed up will eventually be equal with N. You don't need to be worried about those N that can't be divided, as Fahmi will always have coins with the value of 1 inside his set of coins.

Well, you're his best friend. ;]
Don't you want to help Fahmi? ;]

Input

First line contains ***N (0 ≤ N ≤ 100)***, amount of money in cents that Fahmi wants to divide.

The next line contains ***M (0 ≤ M ≤ 10)***, number of different kind of coins.

For the next single line, there will be M number of C coins ***(1 ≤ C ≤ 100)***, where this C represent coin inside the set S***.*** It is confirmed that among set S there will always be a coin with a value of 1.

Output

Least number of coins that N can be divided.

Sample Input	**Sample Output**
7 4 5 3 4 1	2

Explanation: 7 cents can be obtained minimally by one 3 and one 4 cents coins.

END OF PROBLEM SET

Many thanks to dearest AJKs, friends and lecturers for contributing your ideas, supports, guidance and dedications towards this little event.

To dearest participants, thank you so much for willingly spend your time for this little event, hope the benefit would really flourish toward all of you.

Without all those things, this would not be possible.

Thank you so much!!