Problem Set

The 2021 ICPC Asia Topi Online Preliminary Programming Contest

Instructions

- Please read these instructions below.
- You can access domjudge system using icpc.giki.edu.pk:8012/domjudge link, but from GIK you should use gikicpc.giki.edu.pk/domjudge.
- If you have any question regarding the problems, send a clarification from the judges using DOMJudge.
- Students should avoid using internet access and avoid sharing materials to other teams, if copied work will be found it may lead to disqualification.
- Before submitting a run, make sure that it is executable via command line. For Java, it must be executable via "javac" and for GNU C++ via "g++". Java programmers need to remove any "package" statements and source code's file name must be the same as of main class. C++ programmers need to remove any getch() / system("pause") like statements.
- Do not attach input files while submitting a run, only submit/attach source code files, i.e., *.java or *.cpp or *.py.
- Language supported: C/C++, Java and Python3
- Source code file name should not contain white space or special characters.
- You must take input from Console i.e.: Standard Input Stream (stdin in C, cin in C++, System.in in Java, stdin in Python)
- You must print your output to Console i.e.: Standard Output Stream (stdout in C, cout in C++, System.out in Java)
- Please, don't create/open any file for input or output.
- Please strictly meet the output format requirements as described in problem statements, because your program will be auto judged by computer. Your output will be compared with judge's output byte-by-byte and not tolerate even a difference of single byte. So, be aware! **Pay special attention to spaces, commas, dots, newlines, decimal places, case sensitivity etc.**
- Unless mentioned in some problem, all your programs must meet the time constraint of 5 seconds.
- The decision of judges will be absolutely final based on domjudge score.

PROBLEM 1: Know your brackets

Time limit: 3 seconds

You are given a string S, consisting of only '(' and ')' characters. You need to find the length of the longest substring which is a regular bracket sequence and also find the count of such substrings with the same length.

Note: A bracket sequence is called regular if parenthesis in the given expression is balanced. For example, '()()', '(())' are the regular string but '(((()' is not a regular parenthesis string.

If no such substring exists, print "0 1" (without quotes).

Input

The first line of input contains an integer '*T*', 1 <= *T* <= 10, which denotes the number of test cases. Then each test case follows: Each line of the test case of length '*N*' (1 <= *N* <= 10^4) contains a string having characters '(' or ')' in it.

Output

For each test case print, 2 space-separated integers representing the length of the longest substring with regular bracket sequence and the number of such substrings present in the input string.

Sample input & output

Following is a sample input and corresponding correct output. Notice that in this sample the test cases are two and therefore the lines in output are also two.

Sample input	Sample Output
2)((()))(()())))(	6 2 0 1

PROBLEM 2: Tourist Guide

Time limit: 3 seconds

The task of the tourist guide is to move around the tourists while using minimum resources. In this problem, a tourist guide needs to take some tourists from one city to another. The cities are inter-connected with a road network. For each pair of neighboring cities, there is a bus service that runs only between those two cities and uses the road that directly connects them.

Each bus service has a limit on the maximum number of passengers it can carry. He cannot drop any passenger in the midway. Due to this, the tourist guide knows that some cities would require making extra trips if the number of tourists are more than seating capacity. For example, consider the following road map of 7 cities shown in Fig. 1. below. The edges connecting the cities represent the roads and the number written on each edge indicates the passenger limit of the bus service that runs on that road. To take 99 tourists from city 1 to city 7 requires at least 4 trips, and the route he would take is: 1 - 2 - 4 - 7.

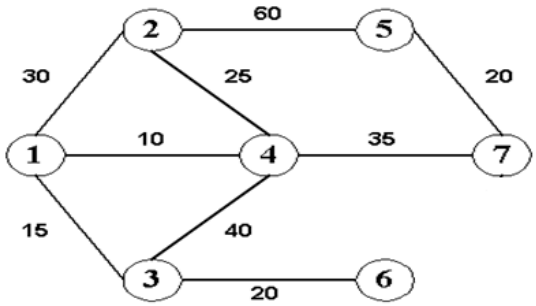

Fig. 1. Road map of 7 tourist cities.

Input

The first line of the file represents the number of cases. Each case first has two integers: N ($0 \le N \le 100$) and R($0 \le R \le 100$) representing the number of cities and the number of road segments respectively, e.g., 7 and 9 as in the figure. This will be followed by R lines. Each of the R lines will contain three integers C_1, C_2 and P, where C_1 and C_2 are the city numbers and P is the maximum number of passengers to be carried by the bus service on that route. The last line will contain three integers: the starting city (S), the destination city (D) and the number of tourists (T) to be transferred.

Output

For each test case, there should be an output (on separate lines), which is the minimum number of trips to be made to satisfy the last line of the input. E.g., in the above case the answer will be: 4 trips.

Sample input & output

Sample input	Sample Output
1 7 9 1 2 30 1 3 15 1 4 10 2 4 25 2 5 60 3 4 40 3 6 20 4 7 35 5 7 20 1 7 99	4 trips

PROBLEM 3: Pass the Quiz

Time limit: 3 seconds

Khao Jee School is the most sought-after school in Degpur such that there is not a single empty seat in any of its classrooms. Teachers at Khao Jee School are very lazy. When they take quiz back from students, instead of going to the students, they just stand at corner near the classroom door and ask all students to pass on their quizzes to their neighboring students. The process continues until all the quizzes are received by the teacher via the student closest to the teacher. The students at Khao Jee are equally lazy. Each student will Passover to the same adjacent student for all subsequent passes. No quiz can loop back to the same student twice. Each student has an option to either pass a single quiz or collect all and via a single pass. The students will give anything to know the maximum and minimum number of handovers to pass on their quizzes to the teacher. Please help the students in overcoming the challenge.

Input

The first line of the input consists of t, $(1 \leq t \leq 25)$ representing the total number of test cases given. The next t lines contain the test cases. Each test case has exactly two numbers, the number of number of rows in the classroom n, $(1 \leq n \leq 1000)$, followed by number of columns m $(1 \leq m \leq 1000)$.

Output

Output consists of t lines, each line contains exactly two numbers, a and b, i.e., the minimum number of passes required by all students combined to complete the hand-over, and the maximum number, respectively.

Sample input & output

Following is an example of input and output. In this case, there are 4 input test cases.

Sample input	Sample Output
4 1 1 4 1 1 4 8 32	1 1 4 10 4 10 256 32896

PROBLEM 4: Local bodies election

Time limit: 3 seconds

Recently, the local bodies elections were held in some parts of Pakistan. The main aim of such elections is to strengthen the democratic process. Keeping their long due promise, the government decided to introduce reforms in the election process. In the first stage, they introduced some changes in the local bodies' election. It was made mandatory for every citizen in the constituency to vote. In addition, for a fair selection, they also used the "Run-Off Voting" system. In this system, the winner candidate is decided using the following rules:

1) Each voter ranks the candidates in the order of their choice. On the ballot paper, voters fill-in numbered boxes to indicate their ranking of the candidates. The candidates are ranked based on their number in the sequence. For example, the first candidate in the list is represented by the number "1", the second candidate by "2", and so on.

2) Initially, only the 1st ranks are counted and if one candidate receives more than 50% of the vote as ranked 1st, that candidate is declared as winner.

3) If no candidate receives more than 50% as rank 1st, then the candidate with the fewest 1st rank votes is/are eliminated.

4) The ballots of supporters of the eliminated candidate are then transferred to whichever of the remaining candidates they marked as their 2nd rank. It is same if you told the supporters of the eliminated candidate that your candidate cannot possibly win, so which of the remaining candidates would you like your vote to go to?

5) After this transfer, the votes are then recounted to see if any candidate now receives a majority of the 1st rank vote.

6) The process of eliminating the lowest candidate and transferring their votes continues until one candidate receives a majority of the continuing votes and wins the election.

An example to illustrate the selection process is shown in the table below:

Table 1: Example of selection process.

Candidate	***First Count***	***Second Count***		***Third Count***		***Result***
	Original 1st Rank count	Transfer of Eliminated candidate votes	New count of 1st Rank	Transfer of Eliminated candidate votes	New count of 1st Rank	
Ahmad Raza	43	04	47	10	57	Winner
Zara Khan	32	05	37	06	43	
Ibrahim	10					
Sania Ijaz	15	01	16			

Suppose there are total 100 votes casted. From the table above, no candidate receives over 50% of the vote in the first count. Therefore, the lowest rank 1st candidate, Ibrahim, is eliminated and his ballots

are transferred to their second choices. Let 04 of Ibrahim's supporters ranked Ahmad Raza as their 2nd rank, and 05 voters indicated Zara Khan as their 2nd rank choice. The new totals show that no one yet has a majority, so the next lowest rank 1st, Sania Ijaz, is eliminated. Let 10 of Sania's votes are transferred to Ahmad Raza and 06 are given to Zara Khan. After this second vote transfer, now Ahmad Raza has secured over 50% of the total votes and he is finally declared as the winner.

You, as a good programmer, is tasked by the election commission to design a program to automate the result compilation for these elections. Give your best try and provide an optimize solution.

Input

The first line is the total number of test cases. For each case, we first have an integer $n \leq 20$ indicating the number of total candidates. The next ***n*** lines consist of the names of the candidates in order (***1, 2, 3, …., n***). Names may be up to 80 characters in length and may contain any printable characters. Up to 1000 lines follow; each line contains the contents of a ballot. That is, each line contains the numbers from ***1*** to ***n*** in some ranking order. The first number indicates the candidate of 1st rank choice; the second number indicates candidate of 2nd rank choice, and so on.

Output

The Output consists of a single line containing the name of the winner candidate.

Sample input & output

Example with 2 test cases have 4 and 5 candidates, respectively.

Sample Input	Sample Output
2 4 Jawad Khan Zara Ali Wahid Shah Sara Khan 1 3 4 2 2 1 4 3 2 4 1 3 1 4 3 2 3 1 2 4 5 Ibrahim Khan Zainab Ali Sania Shah Ahmad Ali Waqar Ali 5 1 3 4 2 2 3 1 4 5 3 2 4 1 5 2 1 5 3 4 2 3 1 5 4 1 3 1 4 5 3 2 4 1 5 5 3 1 2 4 4 3 2 1 5 1 4 3 2 5	Jawad Khan Sania Shah

PROBLEM 5: Woodman

Time limit: 3 seconds

A woodman was living happily in a village. He used to earn money by selling wood and that money was enough to easily meet his living expenses. But, with the passage of time, he was not able to earn enough money by cutting wood. So, he thought to start a small Game for village kids to increase his earnings. He brought various pieces of wood and wrote numbers on the wood. Now the rule of the game was that the player needs to cut the wood into small pieces in such a way that effort (cost) of splitting (cutting) the wood is minimum. The cost of splitting a sequence of positive integers (written on the wood) $X =< x_1, x_2, x_3, \dots, x_n >$ into two subsequences $< x_1, \dots, x_k >$ and $< x_{k+1}, \dots, x_n >$ is x_1+x_n. A split sequence of X is a sequence of splits of X and the resulting subsequences so that after applying all splits in split sequence, every subsequence of X has exactly one element. The cost of the split sequence is the sum of the costs of each split. Given a sequence of X of positive integers, we wish to find a split sequence of X with minimum cost.

For instance, if X= <5, 7, 3, 6>, then a sequence of splits and the cost of each split is:

Table 2: Example of splits.

Subsequences	Split	Cost
<5, 7, 3, 6>	Split <5, 7, 3, 6> into <5, 7, 3>, <6>	11
<5, 7, 3>, <6>	Split <5, 7, 3> into <5>, <7, 3>	8
<5> <7, 3> <6>	Split <7, 3> into <7>, <3>	10
<5> <7> <3> <6>		

The total cost for this sequence is 29.

Input

The first line of the input represents the number of test cases. Each subsequent line is a test case begins with "<" and ends with ">", with the subsequences separated by commas (without any spaces).

Output

The output should be one line per test case and gives the cost for the sequence.

Sample input & output

Following is a sample input and corresponding correct output. There is only one test case given.

Sample input	Sample Output
1 <5,7,3,6>	29

PROBLEM 6: Egg Laying Hens

Time limit: 3 seconds

A farmer in Neverhood has a poultry farm with a good number of hens. These hens are very beloved to him, and he take good care of them. So much so, that he has named these hens uniquely. He also tracks when these hens will lay eggs and how many days have gone by since the last egg was laid. He also tries to forecast when the hen may lay egg in the future. In doing all these calculations, he thought of a brilliant idea and need your support to program that for him. The plan is as follows.

Since all hens are ordered based on their unique names, the number of days for laying eggs is neither unique nor in any order. The farmer wants you to find the longest consecutive or non-consecutive sequence where number of days are in increasing manner.

For example, hen 0 had laid egg 28 days ago, hen 1 will lay egg after 2 days, hen 2 will lay tomorrow, hen 4 had laid egg 40 days ago and hen 5 had laid egg 60 days ago. This will be represented as

-28,2,1,-40,-60

The longest non-consecutive sequence will have only 2 days, either -28, 2 or -28, 1.

Input

The first line of the input consists of t, $(1 \leq t \leq 25)$ representing the total number of test cases given. The next t lines contain the test cases. Each test case has n, $(1 \leq n \leq 100)$ numbers representing numbers of hens with d $(-365 \leq d \leq 365)$, representing number of days.

Output

Output consists of t lines, each line contains exactly one number, representing the length of the longest sequence.

Sample input & output

Following is a sample input and corresponding correct output. Notice that in this sample, the test cases are 3 and therefore the lines in output are also 3.

Sample input	Sample Output
3 -1,0,8,4,12,2,10,6,14,1,9,15,13,3,11,7,15 4 -5,6,0,8,2	7 1 3

PROBLEM 7: Anagram

Time limit: 3 seconds

An anagram is a word or phrase formed by rearranging the letters of a different word or phrase, typically using all the original letters exactly once. Keeping the concept of anagram in mind this problem is designed.

In this problem, you are given two different strings. Your task is to determine if the second string can be formed using only the letters from the first string. Each letter in the first string can only be used once. There will be no punctuation in either string. For example, given the string "Flowers are blooming" can the sentence "loom ring lower" be formed? The answer is yes. However, given the list "Flowers are blooming" you can't form the sentence "bugs are problems".

Input

The first line gives the number of test cases. Each case has two strings, given on separate lines, with each string having at least one character. The second string may be longer, shorter, or the same length as the first string. All letters input will be lowercase. Read all the data from the console.

Output

Display the word "possible" if the second string can be created using the letters contained in the first string. Display the word "not possible" if the second string can't be created using the letters contained in the first string. Display the output on the monitor.

Sample input & output

This example has 2 test cases. The first test case has the string "apple is a healthy fruit" as the first string and "heal tart has" as the second string, and its answer is "Possible".

Sample Input	Sample Output
2 apple is a healthy fruit heal tart has it is cold driving car	Possible Not Possible